



Marian Quest
A Bi-annual Multidisciplinary Research Journal
St. Mary's College (Autonomous)
(Re-accredited with 'A+' Grade by NAAC)
Thoothukudi



November 2024

Volume 18

ISSN 2249 – 7145

Patron

Rev. Sr. Dr. Jessie Fernando

Principal, St. Mary's College (Autonomous)
Thoothukudi

Associate Editors

Dr. Colette Sharmila,

Associate Professor of English,
V.O.Chidambaram College,
Thoothukudi

Dr. R. Mystica,

Assistant Professor of English,
A. P. C. Mahalaxmi College for Women,
Thoothukudi

Dr. S. Anandha Vaishnavi,

Assistant Professor of English,
V.O.Chidambaram College,
Thoothukudi

Dr.M. Dhiliphan Kumar,

Professor and Head ,
Department of Management Studies,
Stella Mary's College of Engineering,
Kanniyakumai

Dr.Lilly Sandhya,

Assistant Professor,
Department of Management Studies,
SRM Institute of Science and Technology,
Ramapuram

Dr. Ed. Priyadharshini,

Assistant Professor of Commerce,
Sadakathullah Appa College (Autonomous),
Tirunelveli

Dr. N. Chandra Lekha,

Head and Assistant Professor of Chemistry, SF,
Kamaraj College,
Thoothukudi

Dr. M. Sathiya Bama,

Assistant Professor of History,
Nazareth Margoschis College,
Pillaiyanmanai

Dr. S. Gomathinayagam,

Head and Assistant Professor of Computer
Science,
V.O. Chidambaram College,
Thoothukudi

Dr. S. Jackson,

Assistant Professor of Mathematics,
V.O. Chidambaram College,
Thoothukudi

Dr. M. Tamilselvi,

Associate Professor of Zoology,
V.V. Vanniaperumal College for Women,
Virudhunagar

Dr. S. Sonia,

Assistant Professor of Physics,
Holy Cross College (Autonomous),
Nagercoil

Dr. N. Sudha Kumari,

Assistant Professor of Education,
Annammal College of Education for Women,
Thoothukudi

Dr. M. Neela Devi,

Associate Professor of Economics,
V.O.Chidambaram College,
Thoothukudi



Editorial

Editorial Board

Dr.A.Josephine Alangara Betsy

Research Coordinator
Associate Professor,
Department of English

Dr.S.Arul Josephine

Assistant Professor
Department of Tamil

Dr.G.Sharon Roque Corera

Assistant Professor
Department of English

Dr.A.Lakshmi

Assistant Professor
Department of Chemistry

Dr.J.Arul Jesti

Assistant Professor
Department of Mathematics

Dr.S.M.Vimala

Assistant Professor
Department of History

Dr.S.Bulomine Regi

Assistant Professor
Department of Commerce

Dr.A.Vithya Vijayalakshmi

Assistant Professor
Department of Computer
Science

Sustained, rigorous research remains the cornerstone of national progress, shaping advancements in science, technology, and the humanities. A nation's future increasingly depends on the intellectual capacity of its citizens and their ability to contribute meaningfully to a rapidly evolving knowledge economy. In this context, fostering an environment that encourages high-calibre inquiry is essential for achieving academic distinction and societal development.

Across the globe, research and innovation have become defining features of higher education systems. As nations invest heavily in scholarly pursuits, India too has emerged as a key contributor to global academic discourse. Recognising the significance of this momentum, St. Mary's College (Autonomous), Thoothukudi, continues to strengthen its commitment to research excellence. Through its dedicated Research Forum, the institution aspires to nurture a culture of critical inquiry and to support young scholars in shaping meaningful research trajectories.

Aligned with the vision of empowering students and enriching academic quality, the forum regularly organises seminars, orientation programmes, workshops, and conferences. These platforms enable budding researchers to refine their skills, engage with contemporary debates, and gain exposure to interdisciplinary approaches. The present volume brings together a curated collection of student research papers that reflect careful study, thoughtful analysis, and the growing research competence within the campus. Each paper has been evaluated by subject experts, ensuring that the work presented upholds strong academic standards.

We take this opportunity to express our sincere gratitude to the management for its continual encouragement and support. Our heartfelt thanks are also extended to the reviewers, whose expertise and constructive insights have greatly enhanced the quality of this publication. We acknowledge with appreciation the contributions of the scholars and the dedicated efforts of the Research Forum team, whose commitment has made this issue possible.

With firm confidence, we believe that Marian Quest will continue to serve as a meaningful academic platform, enriching the intellectual landscape of St. Mary's College (Autonomous), Thoothukudi.

Warm regards,
The Editors

Marian Quest, Marian Research Forum

marianresearchforum@gmail.com



Guidelines for Submission of Articles

Marian Quest the Bi-annual Multidisciplinary Research Journal of St. Mary's College (Autonomous), Thoothukudi, publishes articles of high reputation and innovation. The articles intended for publication must be typed in A4 size format, 1.5 line space and Times New Roman Font 12. Tamil papers should be in Bamini Font. The latest writing manual for MLA Hand book should be followed in Literature articles. Footnotes, References, Citation Marks should also be included in the research paper.

For reviewing and correction purpose, kindly send one hard copy with the soft copy. Full paper generally consists of the title, pictures, charts, graphs etc., along with Footnotes.

Instructions to contributors (for Science Articles)

Title : It should be short & informative

Keywords : Five or six keywords indicating the contents of the manuscript.

Address of Authors : It includes author's name, institution name, telephone number (office only), and e-mail address. Author for correspondence should be indicated with an asterisk (*).

Main Heading : Each article should be divided into the following main headings: Abstract, Introduction, Materials and Methods, Results and Discussion, Conclusion, Acknowledgement and References.

All articles are, as a rule, referred to experts in the subject concerned. Those recommended by the referees alone will be published in the journal.

S.No.	Content	Pg.No.
1	FASTER EMERGENCY RESPONSE TIME WITH SMART AMBULANCE POSITIONING R. Poomiga	1
2	AUTOMATED RANSOMWARE DEFENSE SYSTEM USING BILSTM AND DATA PROTECTION V. Anandham Nithiya	10
3	ASSESSMENT OF SOCIO-ECONOMIC CONDITIONS OF ICE- PLANT WORKERS IN SILUVAIPATTI AREA OF THOOTHUKUDI DISTRICT A. Amali Joan Sophia* and B. Mahesh Vanitha	20
4	EVALUATE THE FACTORS INFLUENCING CONSUMER PREFERENCE TOWARDS MOBILE NETWORK SERVICE PROVIDER IN LIONTOWN AREA OF THOOTHUKUDI DISTRICT Alphonse kepsiba*and A. Sudha	30
5	VALUATING CONSUMER PREFERENCES AND KEY FACTORS INFLUENCING THE ADOPTION OF ELECTRIC VEHICLES AT VEPPALODAI OF THOOTHUKUDI DISTRICT B. Esakki Selvi* and G.Sumathi	39
6	ANALYSING THE SOCIO - ECONOMIC CONDITIONS OF MASON WORKERS IN SPIC NAGAR OF THOOTHUKUDI DISTRICT M. Anusiya* and G. Sumathi	48
7	ASSESSMENT OF SOCIO-ECONOMIC CONDITIONS OF ICE- PLANT WORKERS IN SILUVAIPATTI AREA OF THOOTHUKUDI DISTRICT A. Amali Joan Sophia* and B. Mahesh Vanitha	57
8	EVALUATE THE FACTORS INFLUENCING CONSUMER PREFERENCE TOWARDS MOBILE NETWORK SERVICE PROVIDER IN LIONTOWN AREA OF THOOTHUKUDI DISTRICT Alphonse kepsiba*and A. Sudha	66
9	EVALUATING CONSUMER PREFERENCES AND KEY FACTORS INFLUENCING THE ADOPTION OF ELECTRIC VEHICLES AT VEPPALODAI OF THOOTHUKUDI DISTRICT B. EsakkiSelvi* and G.Sumathi	74
10	ANALYSING THE SOCIO - ECONOMIC CONDITIONS OF MASON WORKERS IN SPIC NAGAR OF THOOTHUKUDI DISTRICT M. Anusiya* and G. Sumathi	83
11	THE SILENCED VOICES OF AFGHAN WOMEN IN KHALED HOSSEINI'S <i>A THOUSAND SPLENDID SUNS</i> Antony Snowba B.	92

12	ERASED AND DISPLACED IDENTITIES IN S.J WATSON'S BEFORE I GO TO SLEEP Arockia Jessy Sephin S.	100
13	C.S. Lewis' <i>The Lion, The Witch, and the Wardrobe</i> : A Study of Good Versus Evil through a Christian Allegory Aruna Alias Sangeetha. M	108
14	Surviving Injustice: Race and Intersectionality in Colson Whitehead's The Nickel Boys Bavani T.	117
15	Innocence Vs Cruelty: A Study of John Boyne's <i>The Boy in the Striped Pyjamas</i> Blessi S.	125
16	Activism as Social Emancipation in Angie Thomas <i>The Hate U Give</i> Jemema J.	133
17	Hybridity and Transcultural Identity Crisis in Chimamanda Ngozi Adichie's <i>Americanah</i> Jenitta S.	142
18	CelesteNg's <i>Everything I Never Told You</i> : A Study of the Dichotomy between the Chinese and the Western Family Teleology Jerina S.	152
19	Tracing Justice and Morality: An Excavation of Human Psyche in Agatha Christie's <i>Murder on the Orient Express</i> Jumana Hasin M H.	162
20	Resilience and Resistance of Women in Isabel Allende's <i>The Japanese Lover</i> Karputha Selvi K.	169
21	Trauma and Human existence in Elif Shafak's 10 minutes 38 Seconds in This Strange World Lourde Tatina	177
22	Echoes of Oppression: A Patriarchal Analysis of Shashi Deshpande's The Dark Holds No Terrors Maria Kate Winslet V.	187
23	Culture Alienation in Anita Desai's <i>Bye-Bye Blackbird</i> Maria Thrace Blesida J.	196
24	Redefining Disability: Confronting Stereotypes and Ethical Dilemmas in Jojo Moyes' <i>Me Before You</i> Pavithra E.	206
25	PANIYAS OF KARIKKAMUNDU IN GUDALUR NILGIRIS DISTRICT Ms. K. Rosy	213
26	CRAFTING CULTURE: TERRACOTTA ART OF THE INDUS VALLEY CIVILIZATION J. Lisha	218

27	GAUSSIAN TRIBONACCI r -GRACEFUL AND TRIBONACCI PRODUCT CORDIAL LABELING OF PATH RELATED GRAPHS A. Swetha Theres	225
28	Contra $\mathfrak{M}\alpha^*$ -Continuous and Contra $\mathfrak{M}\alpha^*$ -Irresolute Functions in Micro Topoigical Spaces S. Sefri Dalmi	235
29	CONTRA FUNCTIONS USING NANO $g\alpha^*$ - CLOSED SETS IN NANO TOPOLOGICAL SPACES K. Gomathi Ambigai	246
30	CONTRA CONTINUOUS AND CONTRA IRRESOLUTE FUNCTIONS VIA NANO PRE*- OPEN SETS S. Jinimol	256
31	ON MICRO α^* -HOMEOMORPHISM IN MICRO TOPOLOGICAL SPACES A.Anisha Briskillal	266
32	STRUCTURAL AND OPTICAL CHARACTERIZATION CuO THIN FILMS BY SILAR METHOD S.V. Abi Nivetha, A.Nirmala Shirley	278
33	EFFICIENCY ENHANCEMENT AND CHARACTERIZATION OF IRON NANOPARTICLES SYNTHESIZED VIA ULTRASOUND-ASSISTED LEAF EXTRACT OF SOLANUM S. Irudhaya Sahaya Lancy, A. Anto Snowlyn	284
34	A BIOGENIC APPROACH FOR IRON OXIDE NANOPARTICLES: COCONUT WATER AS A SUSTAINABLE PRECURSOR A. Evangelin , J. Kethzy Agnes	290
35	SUSTAINABLE SYNTHESIS OF SiO_2 – NiMoO_4 FROM PULVERISED FUEL ASH FOR ELECTROCHEMICAL ENERGY STORAGE R. Geethapriya, C. Infant Francita Fonseka	295
36	SACCHARUM OFFICINARUM DERIVED GRAPHENE OXIDE REDUCED BY TAGETES ERECTA EXTRACT: A NOVEL APPROACH TO REDUCED GRAPHENE OXIDE/COBALT OXIDE NANOCOMPOSITE A. Mary Miraculin, C. Infant Francita Fonseka	302
37	A NOVEL GREEN SYNTHESIS ROUTE TO ZnO NANOPARTICLES: RED BANANA PEEL-MEDIATED SYNTHESIS AND MULTIANALYTICAL CHARACTERIZATION S. Sakthi Parkavi , J. Kethzy Agnes	310
38	ENHANCED OPTICAL CHARACTEIZATION OF CASSAVA STARCH MEDIATED CERIUM OXIDE NANOPARTICLES R. Sankaraeswari, S. Irudaya Sahaya Lancy	314
39	SELF-COMPASSION AND RESILIENCE AMONG POLICE OFFICERS AND ARMY PERSONNEL	319

	Bhavani. K* and John Suresh	
40	A STUDY ON PERCEIVED PARENTING, DOGMATISM AND OPENNESS TO EXPERIENCE AMONG SIBLING AND NON-SIBLING ADOLESCENTS Kavya Meera. M* and John Suresh	327
41	A STUDY ON SELF- DOUBT AND OSTRACISM AMONG ADOLSCENCE Mathu Mitha. S* and S. Jeya Bharathi	336
42	SCREENING OF ACTINOMYCETES FROM MARINE ENVIRONMENT Sivasankari T , R. Sri Priya	345
43	Integration of Gut Microflora and Enzymatic Profiles in <i>Lambis lambis</i> from the Gulf of Mannar Coastal Region Nithya J, Esther Elsie.T and C. Shibana	353
44	A STUDY ON AI-ASSISTED LEARNING PLATFORM FOR STUDENTS IN THOOTHUKUDI Ancina C and * A. Amora	359
45	ENTREPRENEURIAL INTENTION OF COMMERCE AND MANAGEMENT STUDENTS Jerisha.E and S. Bulomine Regi	373
46	TUDY ON CUSTOMER TRUST AND SECURITY ON ONLINE OPPING IN THOOTHUKUDI DISTRICT Andrew Dafny A and O. Sony	383
47	HOUSEHOLD PURCHASING DECISION MAKING POWER OF HOMEMAKERS Arul Jerusha.B and S. Bulomine Regi	390
48	IMPACT OF ELECTRONIC PAYMENT SYSTEM ON CONSUMER BUYING BEHAVIOR IN THOOTHUKUDI M.Bala Abirami and A.Amora	396
49	A STUDY ON CONSUMER PREFERENCE TOWARDS KHADI NATURAL HERBAL PRODUCT IN THOOTHUKUDI Brindha.S, and P. Bhanumathi	414
50	A COMPARATIVE STUDY ON LEVEL OF WORK-RELATED STRESS BETWEEN MEN AND WOMEN EMPLOYEES IN IT SECTOR Delphine Shiny Deroose V, *and P. Jayamary	423
51	IMPACT OF E-COMMERCE DISCOUNT ON CONSUMER SPENDING HABITS WITH REFERENCE TO THOOTHUKUDI Hebziba Beula.A, and P. Jayamary	430
52	OPPORTUNITIES AND CHALLENGES IN ADOPTION OF DIGITAL MEDIA – A STUDY WITH SPECIAL REFERENCE WITH WOMEN HOMEPRENEURS Infant Sharon A and T.Priyanka	438

53	ROLE OF ARTIFICIAL INTELLIGENCE IN ONLINE SHOPPING AND IT'S IMPACT ON CONSUMER PURCHASING BEHAVIOUR G.Jercy, and T.Priyanka	453
54	UNDERSTANDING THE ECONOMIC CONDITIONS OF MERCHANT NAVY ON SEAFARERS IN THOOTHUKUDI J.Joeffina and A. Amora	467
55	A STUDY ON STRESS MANAGEMENT OF DELIVERY PARTNERS Kaviya R* and A.Saleth Mary Vetriselvi	482
56	ENTREPRENEURIAL CHALLENGES TO REACH THE GENERATION Z CUSTOMERS THROUGH VIDEO MARKETING Madhuritha K, and T.Priyanka	494
57	AN ANALYSIS OF CUSTOMER OPINION TOWARDS AUGMENTED REALITY (AR) TRANSFORMS MARKETING Magdalena. M* and A. Amora	500
58	IMPACT OF MONETARY INCENTIVES ON EMPLOYEE'S PERFORMANCE Maria Shiny T,*and O.Sony	517
59	COMPARATIVE STUDY OF CUSTOMER PREFERENCE TOWARDS SMART BAZAAR VS DMART IN THOOTHUKUDI A.Afrin banu,*and P.Maria Sahaya Rossiyana	525

FASTER EMERGENCY RESPONSE TIME WITH SMART AMBULANCE POSITIONING

R. Poomiga

Department of Computer Science, St. Mary's College (Autonomous) Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

As traffic accidents increase globally, resulting in 1.3 million deaths and 50 million injuries annually, a major contributing factor is delayed medical assistance. Often, victims do not receive help in time due to long ambulance response times caused by routing issues and traffic congestion. This project aims to address these challenges by utilizing an innovative unsupervised generative clustering approach called Variational Deep Embedding (VaDE), along with Linear Regression to predict optimal ambulance placement locations based on historical accident data. VaDE, which combines deep neural networks and Gaussian Mixture Models, helps identify accident-prone areas, while Linear Regression analyses past accident data to forecast the closest ambulance positions. Additionally, the system provides real-time alerts to hospitals and traffic departments, enabling route clearance for faster ambulance travel. By strategically placing ambulances near high-risk areas and improving overall response coordination, this system seeks to reduce response times and save lives in emergency situations.

KEYWORDS

Emergency Response Optimization, Real-Time Data Analysis, Dynamic Resource Allocation, Traffic Pattern Prediction, Accident Hotspot Identification.

1. INTRODUCTION

This project aims to revolutionize emergency response systems on national highways by optimizing ambulance deployment and enhancing real-time communication. The primary objective is to reduce ambulance response times and improve overall efficiency in handling emergencies. By utilizing VaDE-based algorithms, the system analyses both historical accident data and real-time information to strategically position ambulances for faster and more effective responses. It also employs predictive analytics to determine the best-suited ambulance for a particular incident location. A real-time alert system ensures seamless communication with hospitals and traffic departments, facilitating immediate coordination and route clearance for ambulances. The project includes the development of a user-friendly interface for administrators at the National Highways Authority of India (NHAI) to

manage various aspects of emergency response, such as ambulance deployment, driver assignments, traffic management, hospital coordination, and emergency alerts. Additionally, a simulator provides real-time visualization of optimized ambulance positions on digital maps, aiding in efficient route planning. By focusing on dynamic ambulance deployment, the system adapts to changing conditions and incident patterns, ensuring a proactive response to emergencies. The project emphasizes rigorous testing and validation to ensure reliability, with efficient communication channels established among ambulance teams, traffic police, hospitals, and NHAI administrators for a coordinated and swift response. This innovative approach seeks to transform emergency services on national highways, saving lives by improving the speed and precision of responses.

2. MATERIALS AND METHODS

2.1 SYSTEM DESIGN

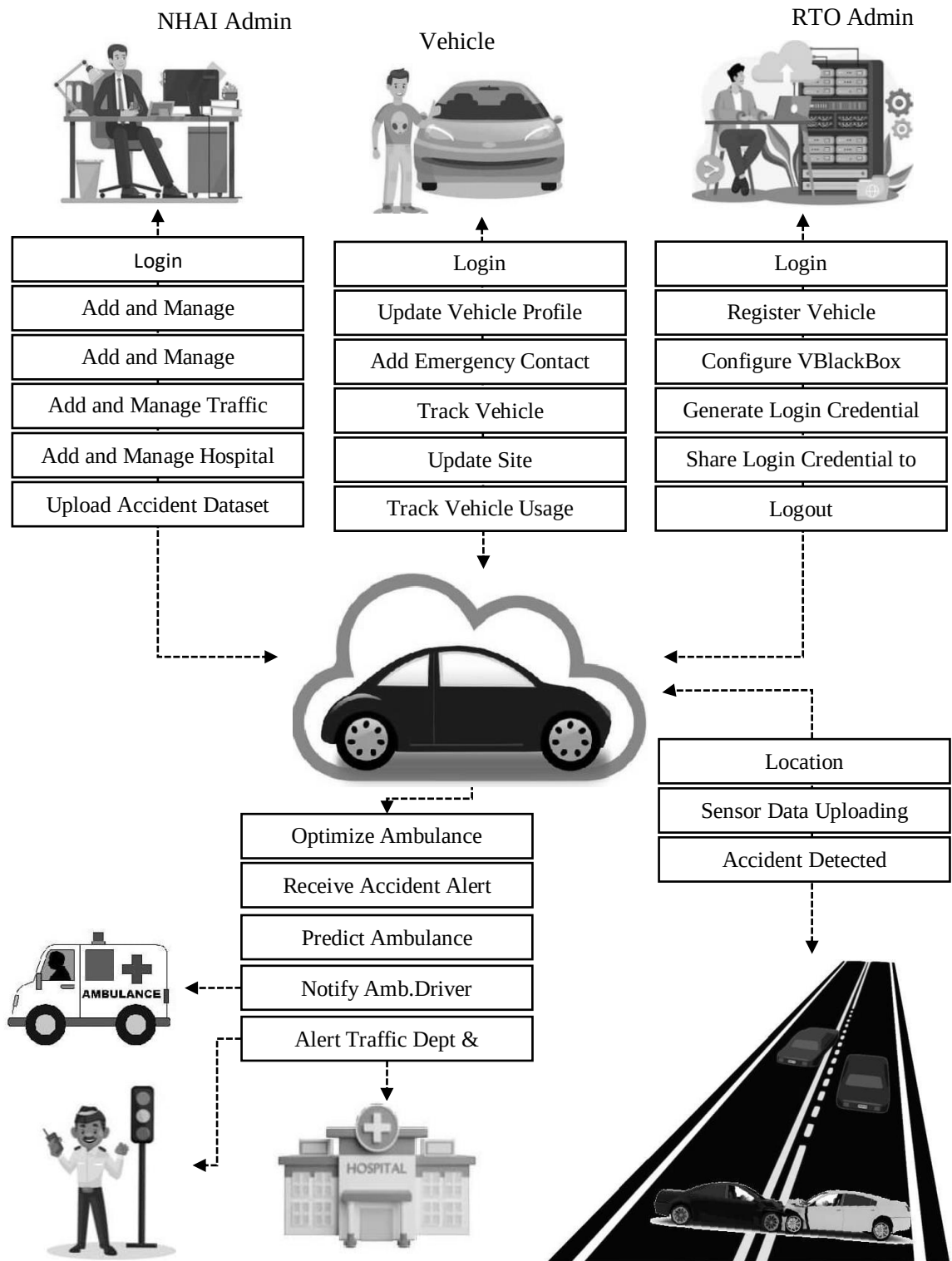


Figure 1: Architecture Design of Ambulance Deployment

2.2 DATA COLLECTION

Data collection involves obtaining historical accident records from government and police databases to pinpoint accident-prone areas. Analysing response times and ambulance routes from emergency services can aid in optimizing ambulance

placement. Using clustering techniques, historical data will help predict optimal locations for ambulances. Additionally, leveraging real-time alerts to hospitals and traffic authorities can ensure quick route clearance, minimizing delays and improving response times.

2.3 DATA ANALYSIS TECHNIQUE

Algorithms used: Variational Deep Embedding, linear regression

Variational Deep Embedding (VaDE): The Variational Deep Embedding algorithm is a clustering method that integrates Gaussian Mixture Models (GMMs) with Variational Auto-Encoders (VAEs). It uses a deep neural network to encode data into a latent space, modelling clusters as Gaussian distributions. By maximizing the Evidence Lower Bound (ELBO), VaDE jointly learns the clustering structure and latent representations. VaDE generalizes VAE in that a Mixture-of-Gaussians prior replaces the single Gaussian prior. Hence, VaDE is by design more suitable for clustering tasks^[1].

1. *Dimensionality Reduction:* Use techniques like Principal Component Analysis (PCA) or t-SNE to preprocess data and reduce noise before feeding it into VaDE.
2. *Cluster Validation:* Evaluate clustering performance using metrics like Silhouette Score, Adjusted Rand Index (ARI), or Normalized Mutual Information (NMI).
3. *Latent Space Analysis:* Visualize the latent embeddings generated by VaDE to understand the clustering structure and identify patterns.
4. *Gaussian Mixture Model (GMM) Analysis:* Analyse the parameters of the GMM (e.g., means, covariances) to interpret the clusters and their characteristics.
5. *Reconstruction Error:* Measure how well the model reconstructs the input data to assess the quality of the embeddings.

Linear Regression: The linear regression algorithm is a supervised learning technique used to model the relationship between a dependent variable and one or more independent variables. Linear regression is commonly used in mathematical research methods, where it is possible to measure the predicted effects and model them against multiple input variables^[2]. It fits a linear equation to the data by minimizing the sum of squared differences between the predicted and actual values. The algorithm assumes a linear relationship between variables and is optimized using methods like

Ordinary Least Squares (OLS). It's widely used for predicting numerical values and understanding variable dependencies.

1. *Residual Analysis*: Examine residuals (differences between observed and predicted values) to check for patterns or biases.
2. *Feature Importance*: Use techniques like Variance Inflation Factor (VIF) to identify significant predictors and address multicollinearity.
3. *Model Validation*: Perform cross-validation (e.g., k-fold) to ensure the robustness of the regression model.
4. *Error Metrics*: Evaluate the model using metrics like Mean Absolute Error (MAE), Mean Squared Error (MSE), or R-squared.
5. *Trend Analysis*: Analyse historical accident data trends to refine predictions and improve ambulance placement strategies.

2.4 TOOLS AND SOFTWARE USED:

Programming Language:

- *Python*: A versatile and powerful programming language used for implementing algorithms and developing the entire project framework. The language comes with large number of built-in methods as a part of standard library^[3].

Machine Learning Libraries:

- *PyTorch*: Utilized for building and training deep learning models, including the Variational Deep Embedding (VaDE) algorithm.
- *Scikit-learn*: Used for implementing Linear Regression, data preprocessing, and evaluation metrics.

Geospatial Services:

- *Google Maps API*: Google Maps JavaScript API the most commonly used Maps API for online mapping^[4]. Employed to integrate geospatial data, identify accident-prone areas, and map optimal ambulance routes.

Notification Services:

- *SMS API*: Implemented to send real-time alerts to hospitals and traffic departments for immediate action.

Data Processing and Analysis Tools:

- *Pandas*: For data manipulation and analysis.
- *NumPy*: Used for numerical computations and handling large datasets efficiently

3. RESULTS AND DISCUSSION

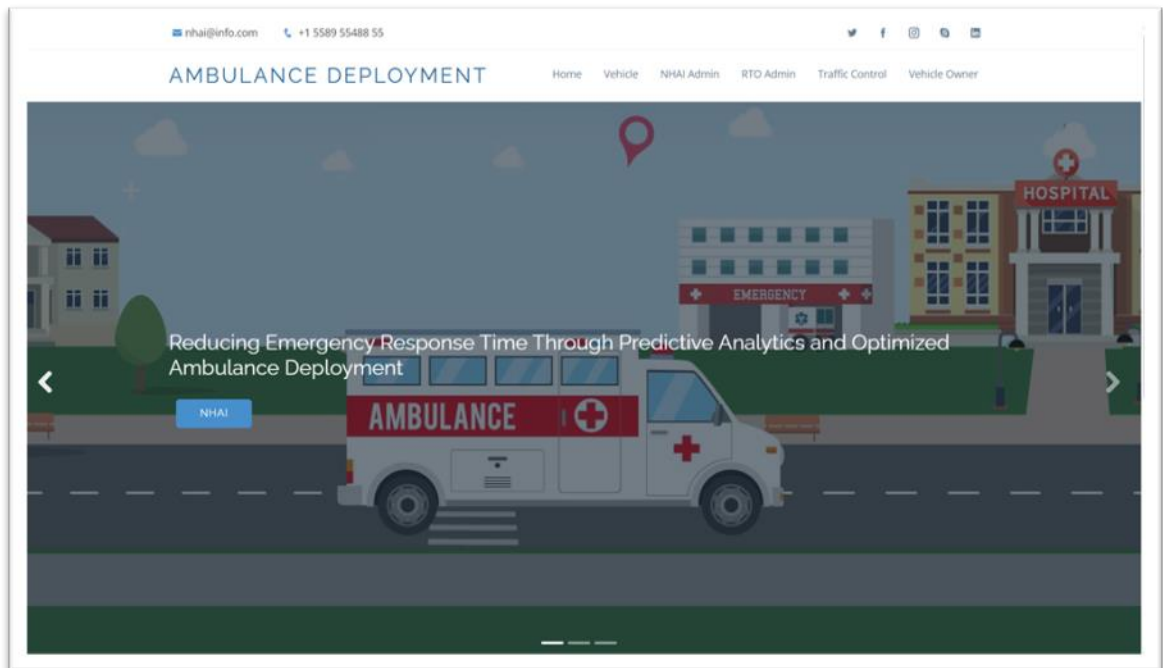


Figure 2: Home Page

It represents the homepage of an Ambulance Deployment system designed to reduce emergency response times.

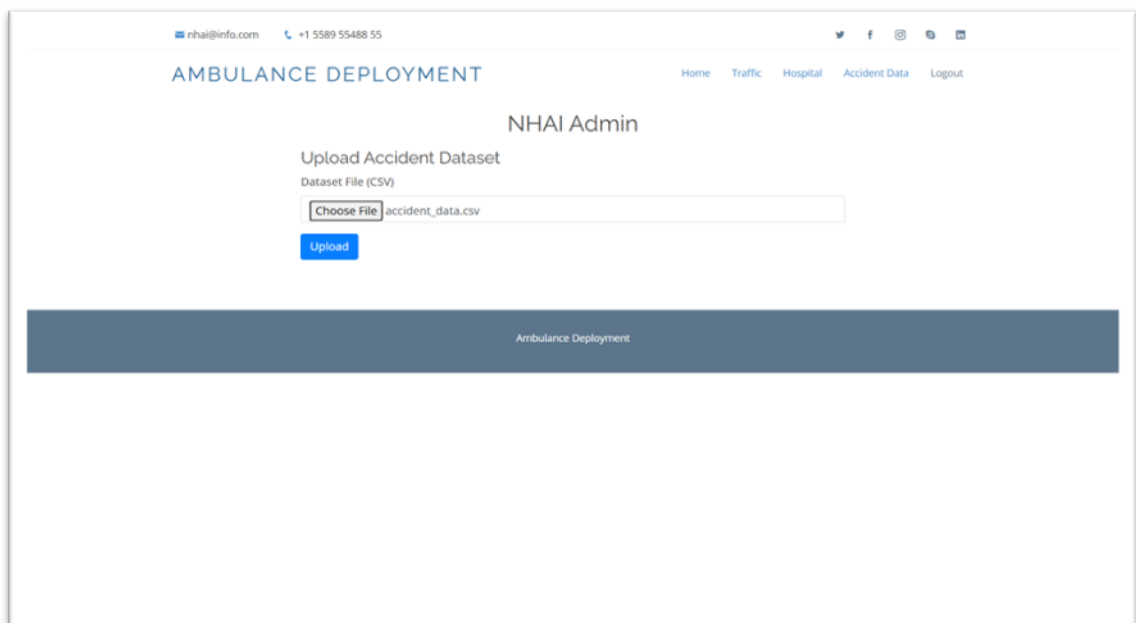


Figure 3: NHAJ Accident Dataset

It shows the NHAJ Admin interface for uploading an accident dataset (CSV) to the Ambulance Deployment system.

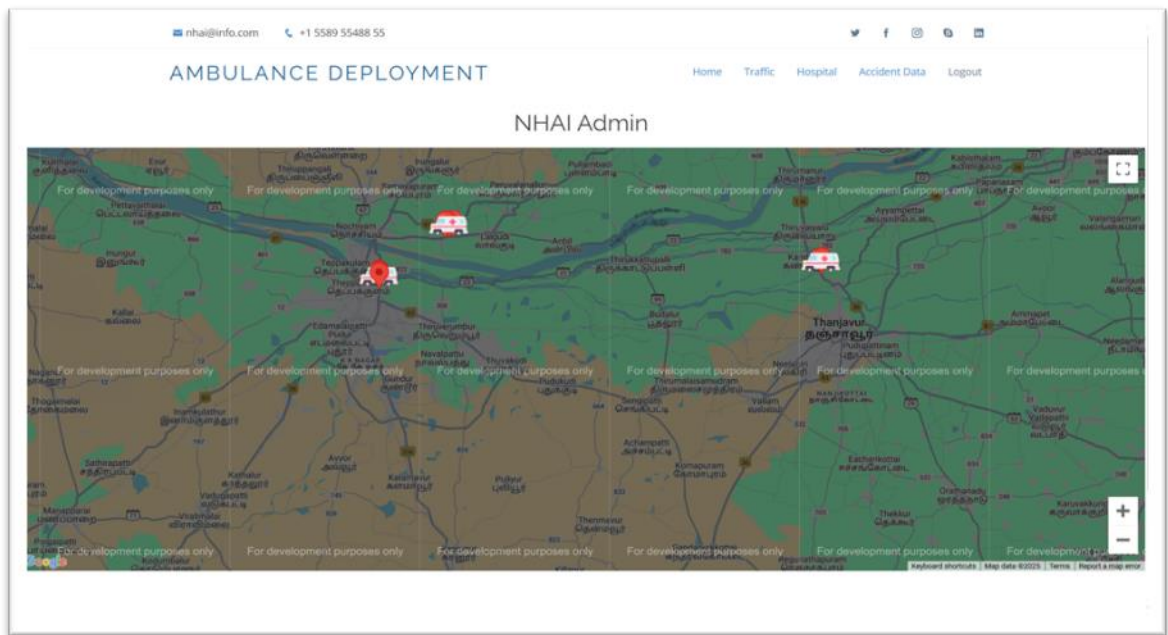


Figure 4: NHA admin (Geo Location)

It shows the NHA Admin dashboard with a map displaying real-time ambulance locations for efficient monitoring.

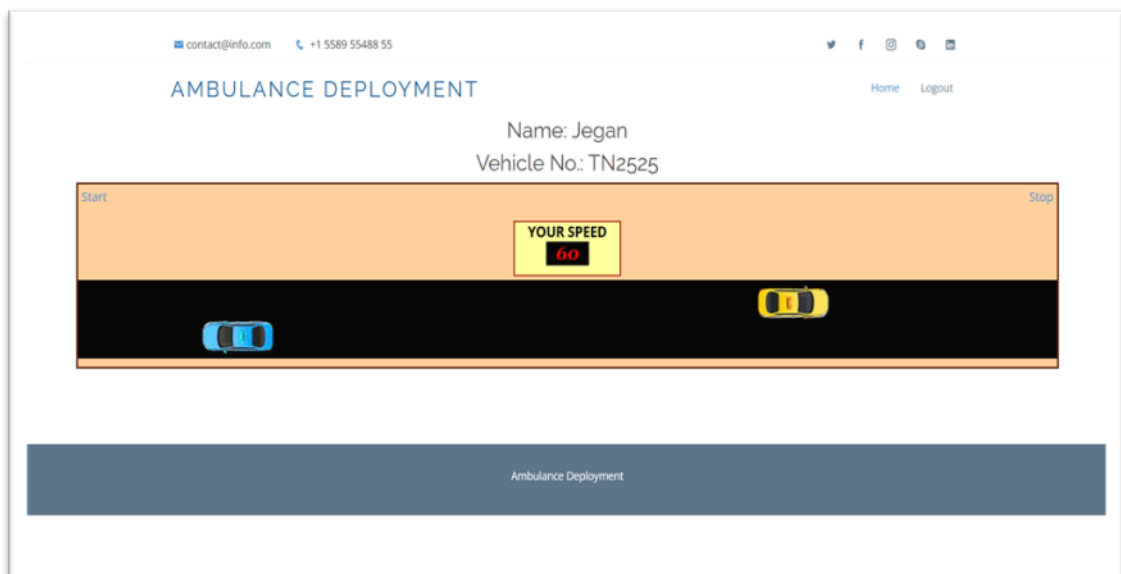
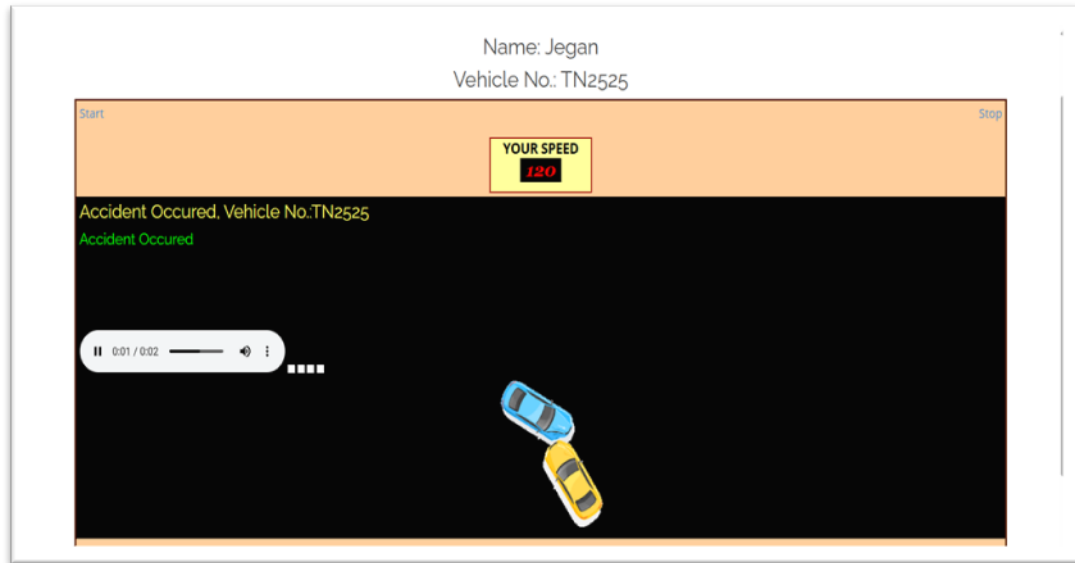


Figure 5: Vehicle Simulation

The image shows a vehicle speed tracking interface, displaying the speed of a vehicle in the Ambulance Deployment system.



F

Figure 6: Accident Occurred Notification Center

It shows a speed tracking interface with an accident alert for the vehicle in the Ambulance Deployment system.

Vehicle History

Vehicle No: TN2525

Sno	Vehicle Speed (Above 70)	Accident Status	Route	Date / Time
1	70	No Accident	Thanjavur	2024-03-08 09:19:45
2	110	No Accident	Thanjavur	2024-03-08 09:11:33
3	80	No Accident	Thanjavur	2024-03-08 09:19:22
4	100	Accident Occurred	Thanjavur	2024-03-08 09:19:45
5	110	No Accident	Trichy	2024-08-02 14:51:03
6	110	Accident Occurred	Erode	2024-08-02 14:51:36
7	120	No Accident	Chennai	2024-08-02 14:56:06
8	110	No Accident	Thanjavur	2024-08-02 14:56:17
9	70	Accident Occurred	Trichy	2024-08-02 14:56:28
10	100	Accident Occurred	Erode	2024-08-02 14:57:58
11	80	No Accident	Trichy	2024-12-10 12:57:07
12	80	Accident Occurred	Thanjavur	2024-12-10 12:57:17
13	80	No Accident	Erode	2024-12-17 15:53:40
14	80	No Accident	Trichy	2024-12-17 15:54:01
15	120	No Accident	Trichy	2024-12-17 15:54:20
16	100	Accident Occurred	Trichy	2024-12-17 15:54:44
17	80	No Accident	Thanjavur	2025-01-01 13:10:16
18	110	No Accident	Trichy	2025-01-01 13:10:35
19	70	No Accident	Erode	2025-01-01 13:10:49
20	70	No Accident	Erode	2025-01-01 13:10:52
21	120	No Accident	Trichy	2025-01-01 13:10:55
22	110	No Accident	Chennai	2025-01-01 13:10:57
23	120	No Accident	Trichy	2025-01-01 13:10:59
24	120	Accident Occurred	Chennai	2025-01-01 13:11:01

Figure 7: Vehicle History

This image shows the vehicle history log, displaying speed, accident status, route, and timestamps for each record.

4. CONCLUSION

The proposed system demonstrates a significant step forward in optimizing emergency response times through predictive analytics and advanced clustering techniques. By integrating Variational Deep Embedding (VaDE) and

Linear Regression, the project effectively identifies accident-prone areas and determines optimal ambulance placements. This innovative approach ensures a substantial reduction in response time, providing timely medical assistance and potentially saving countless lives. The integration of real-time notification systems and geospatial services enhances the operational efficiency of emergency medical services. Moreover, the predictive models not only improve ambulance placement strategies but also contribute to a more robust and responsive healthcare infrastructure. Future advancements may include incorporating additional real-time traffic data and exploring other machine learning algorithms to further refine the system. This project serves as a foundation for revolutionizing emergency response strategies, ultimately making roads safer and emergency services more effective.

5. REFERENCES

- [1] Abbasnejad E, Dick A, van den Hengel A, 2016. Infinite Variational Autoencoder for Semi-Supervised Learning. *arXiv preprint*, DOI: 10.48550/arXiv.1611.07800.
- [2] Lim HI, 2019. A Linear Regression Approach to Modeling Software Characteristics for Classifying Similar Software. *2019 IEEE 43rd Annual Computer Software and Applications Conference (COMPSAC)*, 942-943.
- [3] Jyothi PNS, Yamagant R, 2019. A Review on Python for Data Science, Machine Learning and IOT. *International Journal of Scientific & Engineering Research*, Volume 10, Issue 12, December 2019, p. 851. ISSN: 2229-5518.
- [4] Peterson MP, 2012. Online Mapping with APIs. *Online Maps with APIs and Map Services* (MP Peterson, ed.), Springer, pp. 3-12.

AUTOMATED RANSOMWARE DEFENSE SYSTEM USING BiLSTM AND DATA PROTECTION

V. Anandham Nithiya

Department of Computer Science, St. Mary's College (Autonomous) Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

Ransomware attacks pose a severe cybersecurity threat, encrypting critical files and demanding payment for decryption, often without guaranteeing recovery. Traditional detection methods struggle against evolving ransomware variants, leaving users and organizations vulnerable. The Project Automated Ransomware Defense System Using BiLSTM and Data Protection introduces an advanced, autonomous solution to combat cryptographic ransomware. Utilizing a BiLSTM (Bidirectional Long Short-Term Memory) model, the system analyzes temporal behavior patterns to detect and block ransomware in real time, ensuring adaptive and robust protection. In addition to detection, the system employs Format Preserving Encryption (FPE) to proactively safeguard data by camouflaging files with excluded extensions and hiding them in obscure directories, minimizing the risk of unauthorized encryption. Unlike traditional signature-based defenses, this system integrates dynamic behavioral analysis and proactive data protection, enhancing resilience against both known and emerging threats. By autonomously mitigating ransomware attacks, this system provides a comprehensive and scalable defense for individuals, businesses, and government entities, securing critical systems and sensitive data.

KEYWORDS – *System Security, Algorithm, BiLSTM, FPE, File Guardian*

1. INTRODUCTION

Ransomware is a rapidly evolving cybersecurity threat that encrypts user or organizational files and demands payment for decryption. Over the past decade, Ransomware has become a significant cyber threat to both individuals and organizations^[1]. High-profile incidents like WannaCry, Snake, and Pemex have demonstrated the devastating impact of ransomware, resulting in significant financial losses, service disruptions, and data breaches. Despite continuous advancements in cybersecurity, traditional detection and prevention mechanisms struggle to combat the ever-changing nature of ransomware, particularly zero-day exploits and novel variants. Existing detection methods, such as signature-based approaches, are often ineffective

against new and unknown threats. While machine learning-based techniques have shown promise, they face challenges such as dataset imbalances, high false positive and false negative rates, and substantial computational demands. Many conventional solutions also lack adaptability, scalability, and proactive threat mitigation capabilities, leaving systems vulnerable to advanced ransomware attacks.

To address these limitations, The Project aims to develop an Automated Ransomware Defense System that enhances detection accuracy and strengthens data protection against evolving ransomware threats. It also introduces a proactive defense strategy that integrates BiLSTM (Bidirectional Long Short-Term Memory) and File Guardian technology to improve ransomware detection and mitigate encryption risks. The BiLSTM model dynamically analyzes ransomware behavior patterns, enabling early and accurate threat identification, even for novel variants. In parallel, File Guardian prevents unauthorized encryption by securely managing file access and preserving data integrity. This dual-layered approach ensures both real-time detection and proactive prevention, significantly reducing the impact of ransomware attacks.

The Project focuses on designing a scalable, adaptive, and user-friendly cybersecurity solution that incorporates real-time monitoring, automated alerts, and continuous learning mechanisms to adapt ransomware. By leveraging deep learning and cryptographic techniques, and aims to create a comprehensive, efficient, and resilient security system that safeguards critical data and systems against modern ransomware threats.

2. MATERIALS AND METHODS

2.1. System Design

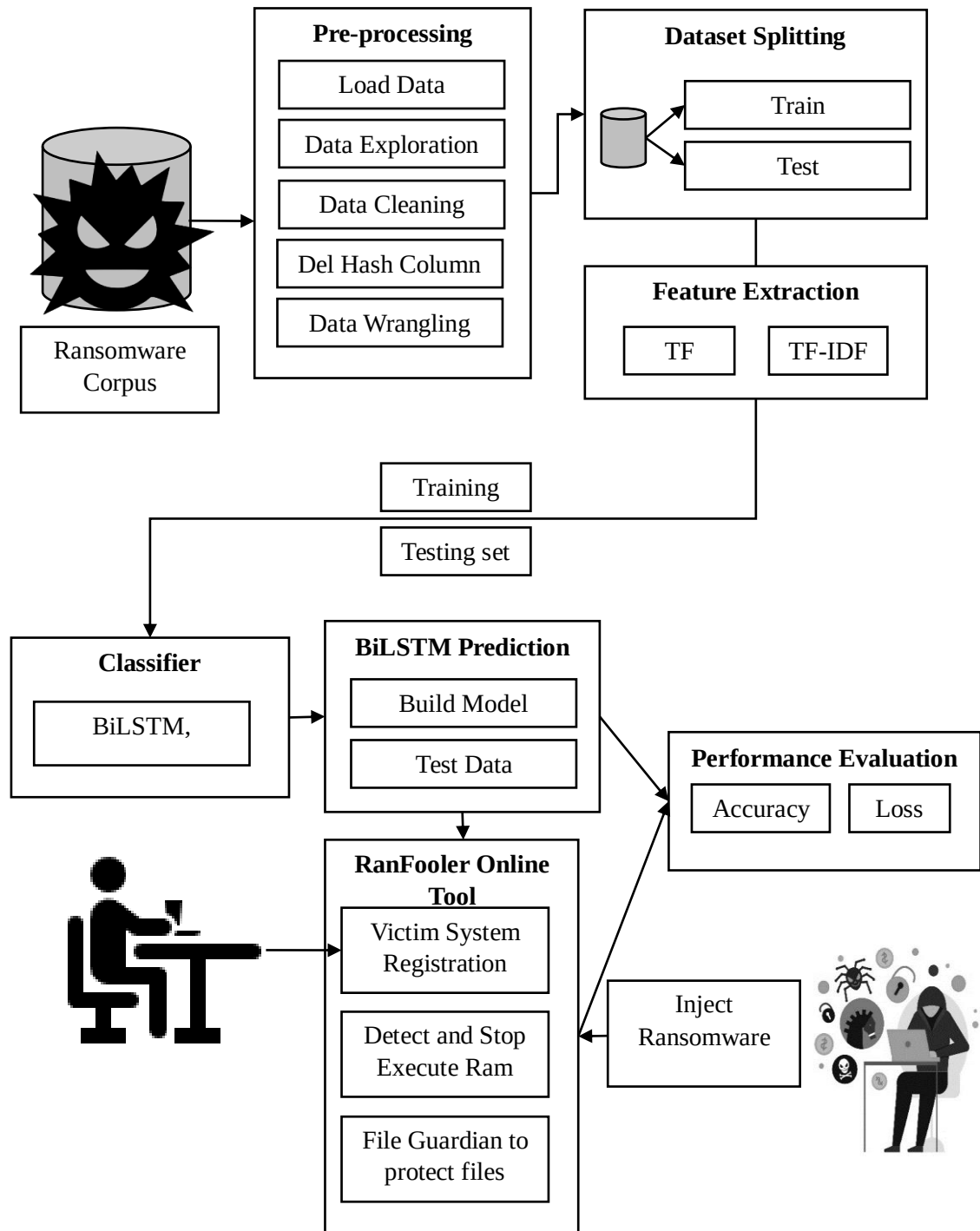


Figure 1: Architecture Design of Ransomware Defense System

2.2. Data Collection

The project gathers network threat intelligence data, including detailed information on ransomware attack incidents, for analysis. and evaluate the ransomware detection system^[2]. The dataset consists of various ransomware samples along with benign files, enabling the model to differentiate between malicious and

legitimate activities. It includes Portable Executable (PE) files, which contain detailed assembly instructions used for static and behavioral analysis.

The data was sourced from public cybersecurity repositories, malware databases, and research datasets, ensuring a diverse set of ransomware variants. Preprocessing steps were performed to clean the dataset, extract relevant features, and balance the data to avoid bias in model training. This dataset serves as the foundation for training the BiLSTM model, allowing it to recognize ransomware patterns and improve detection accuracy.

2.3. Data Analysis Techniques

Machine learning (ML) Algorithms used to teach machines how to handle the data more efficiently. The ransomware detection system leverages Bidirectional Long Short-Term Memory (BiLSTM) for behavior analysis and Format Preserving Encryption (FPE) for data protection^[3]. These techniques work together to enhance detection accuracy and safeguard critical files from ransomware attacks.

BiLSTM (Bidirectional Long Short-Term Memory)

- A deep learning model that analyzes ransomware behavior in both forward and backward directions.
- Recognizes complex temporal patterns, making it effective in identifying ransomware based on system behavior and file modifications.
- Learns from past and future contexts, improving adaptability to evolving ransomware threats.

FPE (Format Preserving Encryption)

- Encrypts files while maintaining their original format, preventing unauthorized modifications.
- Stores protected files in hidden directories to reduce ransomware exposure.
- Ensures that ransomware cannot modify critical files by disguising them with excluded extensions.

Algorithm: Ransomware Detection Using BiLSTM

1. *Input* : File access logs, system behavior data
2. *Preprocessing*:
 - Normalize File Behavior Data
 - Tokenize system logs into sequential input
3. *Feature Extraction*:

- Extract timestamps, file types, access frequency, and modification patterns.
- Encode Sequential behavior into numerical representations.

4. *BiLSTM Model Training:*

- Initialize BiLSTM layers with forward and backward processing
- Train model on labeled ransomware and non-ransomware data
- Optimize loss function using Adam optimizer

5. *Real Time Detection:*

- Feed new system logs into trained BiLSTM
- Generate probability scores for ransomware classification
- If probability exceeds a threshold → Alert user and trigger file protection mechanism

6. *Output:* Ransomware detection alert and activation of FPE for file protection.

Multi-Layered Defense Strategy:

- *Real-time Ransomware Detection:* BiLSTM continuously monitors user activity and system interactions.
- *Proactive Defense:* FPE automatically encrypts critical files, preventing unauthorized access.
- *Adaptive Learning:* The system updates itself to counter new ransomware variants.
- *Automated Alerts:* Users receive notifications when potential ransomware activity is detected

2.4. Tools and Software Used

- *Operating System – Windows 10:* Used as the primary development and testing environment, providing stability, compatibility with required software, and support for machine learning frameworks.
- *Python:* Python is a general purpose programming language that supports multiple programming paradigms. A high-level programming language that takes very few lines compared to other programming languages to accomplish a task. The language comes with large number of built-in methods as a part of standard library^[4].
- *TensorFlow:* An open-source machine learning framework used for building and training deep learning models. It provides extensive tools for neural

networks, making it ideal for implementing the BiLSTM model in ransomware detection. TensorFlow enables efficient computation and model optimization for large-scale data processing.

- *Pandas*: A powerful data analysis and manipulation library that simplifies handling structured data. It provides high-performance data structures and functions for data cleaning, transformation, and statistical analysis, making it essential for preprocessing ransomware datasets.
- *NumPy*: A core library for numerical computing in Python, providing support for large, multidimensional arrays and matrices. It enables efficient mathematical operations and is crucial for handling complex datasets required for deep learning models like BiLSTM.
- *Scikit-learn*: A machine learning library offering a range of classification, regression, and clustering algorithms. It is used for feature extraction, model evaluation, and performance tuning, complementing the deep learning capabilities of TensorFlow.
- *Flask*: A lightweight and flexible web framework used for developing backend services and APIs. It facilitates the integration of the ransomware detection system with a web-based interface, allowing users to interact with the security system seamlessly.
- *MySQL*: Databases play a crucial role in data management and information technology. They serve as foundational infrastructures storing essential data relied upon by numerous applications and systems ^[5].

3. Results and Discussion

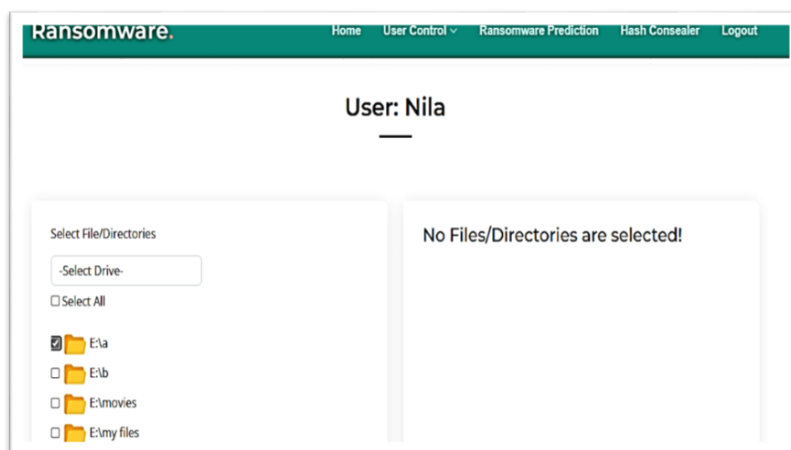


Figure 2: File Selection

Figure 2 shows an interface which allows an authenticated users to select specific files and directories for protection against ransomware attacks.

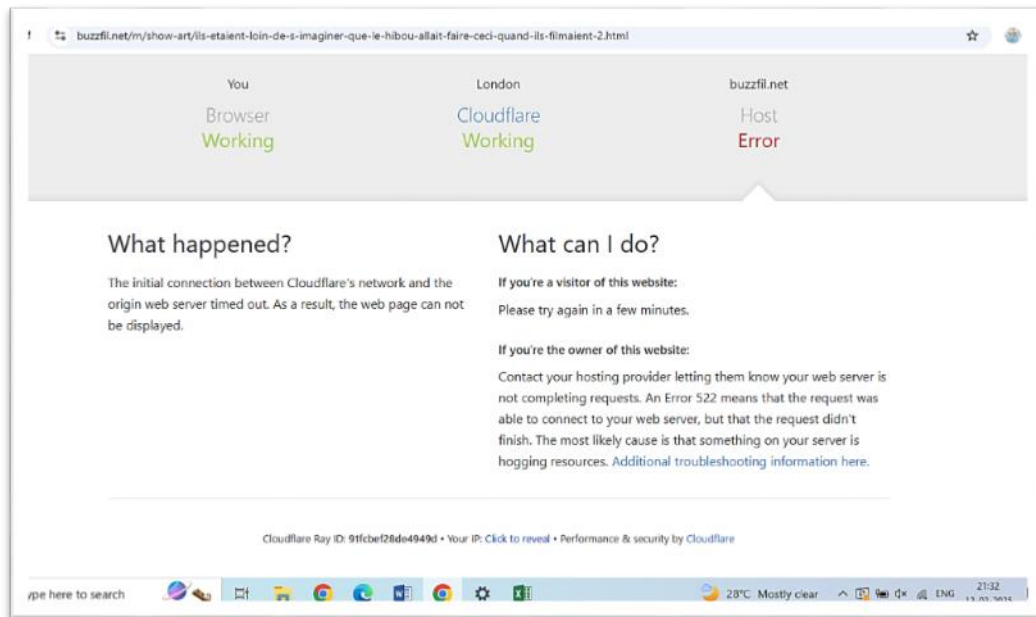


Figure 3: Browsing Malicious Website

In Figure 3 User Accessing a malicious website which can trigger ransomware infections by exploiting system vulnerabilities.

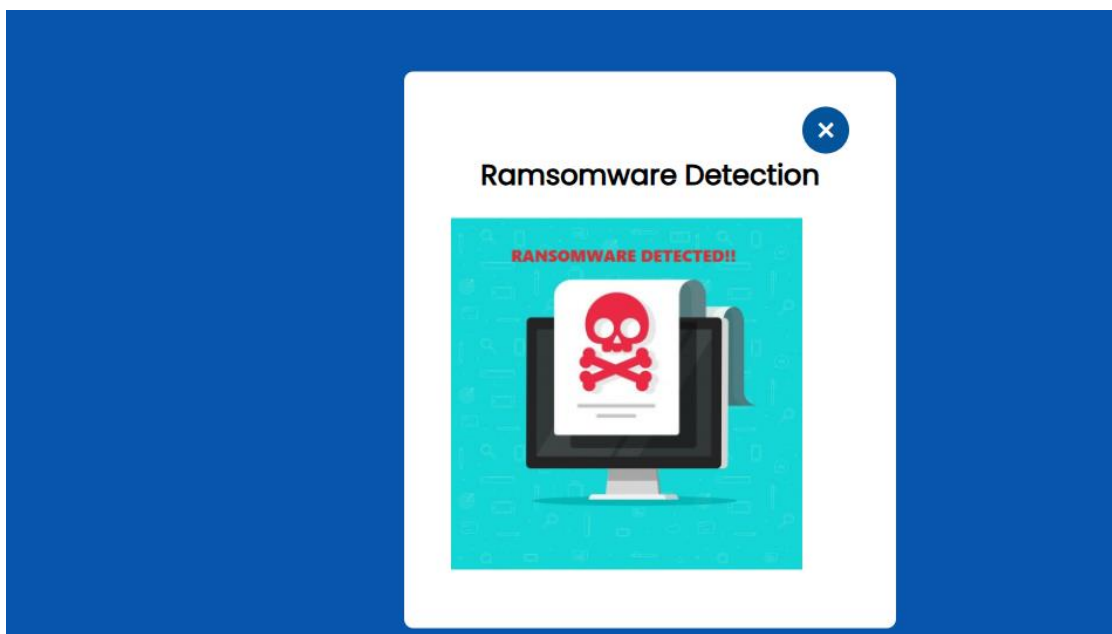


Figure 4: Ransomware Detection

Figure 4 shows the system has successfully detected a ransomware attack, alerting the user to potential data threats.

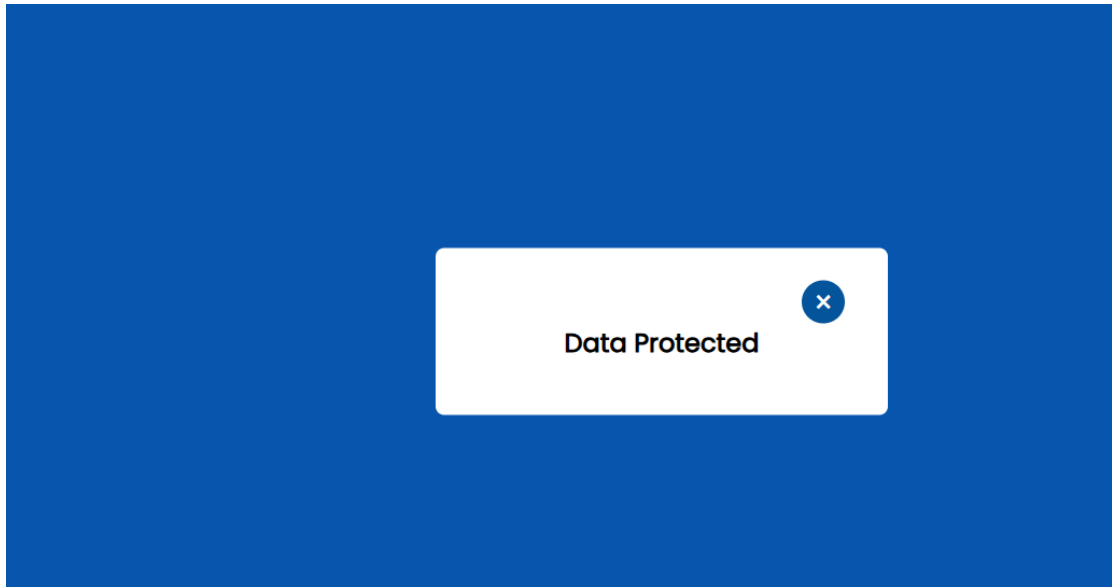


Figure 5: Data Protection

Figure 5 Illustrates once ransomware is detected, the selected files are automatically secured by converting them into a hidden format. This ensures that cybercriminals cannot access or encrypt the protected data.

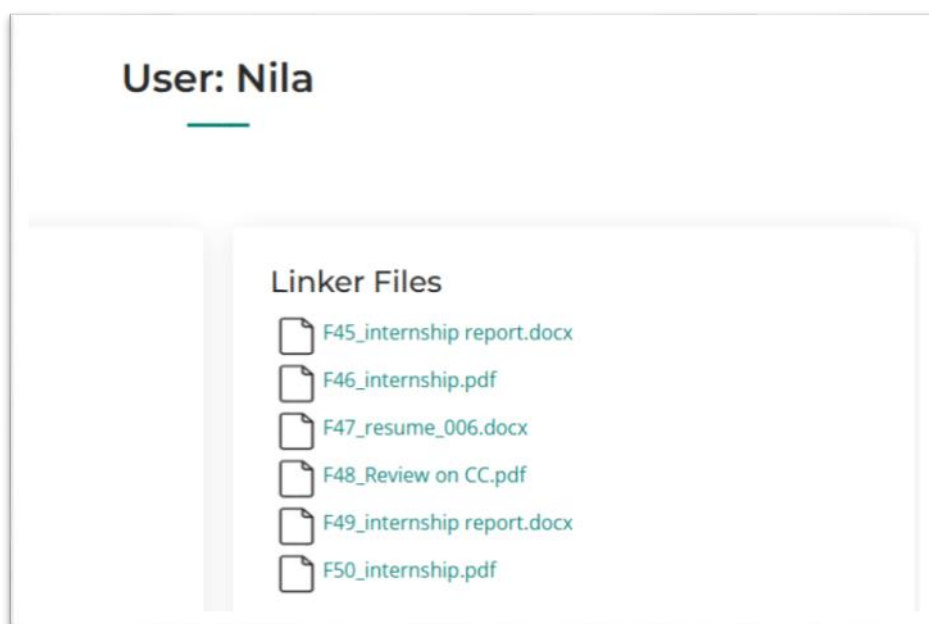


Figure 6: Hidden Layer

Figure 6 displays the hidden layer where the user's selected files are securely stored, contains encoded versions of the original files, making them inaccessible to ransomware.

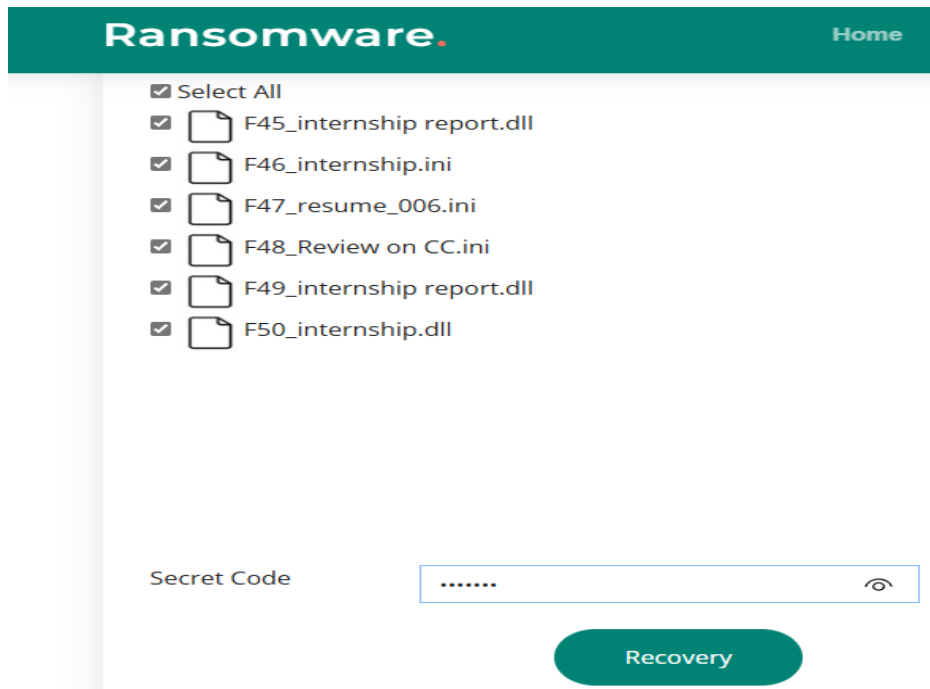


Figure 7: File Recovery

Figure 7 represents the original documents, which can be recovered using a secret code and ensures that even if ransomware infiltrates the system, the protected files remain untouched and retrievable.

4. Conclusion

The proactive defense system against ransomware, integrating BiLSTM and Proactive Data Protection, marks a significant advancement in cybersecurity. By combining BiLSTM's generative capabilities with cryptographic file concealment, the system creates a multi-layered defense that effectively disrupts ransomware operations. Designed for adaptability, it offers real-time monitoring, a user-friendly interface, and customizable security settings, fostering a collaborative approach to ransomware defense. Beyond individual protection, it sets a new industry standard, emphasizing continuous improvement, user education, and cross-platform resilience.

5. References

- [1] Smith D, Roy K, 2022. Machine Learning Algorithms and Frameworks in Ransomware Detection. *IEEE Xplore*. [DOI: 10.1109/ACCESS.2022.9934917].
- [2] Song Z, Tian Y, Zhang J, 2023. Similarity Analysis of Ransomware Attacks Based on ATT&CK Matrix. *IEEE Xplore*, [DOI: 10.1109/ACCESS.2023.10273710].



- [3] Mahesh B, 2020. Machine Learning Algorithms - *A Review*. International Journal of Science and Research (IJSR), 9(1). [ISSN: 2319-7064].
- [4] Jyothi PNS, Yamagant R, 2019. A Review on Python for Data Science, Machine Learning, and IoT. *International Journal of Scientific & Engineering Research*, 10(12): 851. [ISSN: 2229-5518].
- [5] Yadav B, Shrivastava V, Pandey A, Sharma P, 2024. MySQL: Database Design for Performance and Scalability. *International Journal of Research Publication and Reviews*, 5(3): 7631-7638. [ISSN: 2582-7421].

ASSESSMENT OF SOCIO-ECONOMIC CONDITIONS OF ICE-PLANT WORKERS IN SILUVAIPATTI AREA OF THOOTHUKUDI DISTRICT

A. Amali Joan Sophia* and Dr. B. Mahesh Vanitha

PG Department of Economics, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to ManonmaniamSundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

The ice-plant industry plays a crucial role in the fisheries and cold storage sector, providing essential support for seafood preservation and transportation. This study examines the socio-economic conditions of ice-plant workers in Siluvaipatti, a key industrial hub in Thoothukudi District, Tamil Nadu. The research explores various aspects, including demographic characteristics, income levels, working conditions, health and safety concerns, and the impact of employment on workers quality of life. Data were collected through field surveys and interviews with workers, highlighting the challenges they face, such as low wages, job insecurity, occupational hazards, and lack of social security measures. The findings suggest the need for policy interventions to improve working conditions, ensure fair wages, and implement safety regulations. Enhancing social security benefits and providing skill development programs could significantly improve the livelihoods of ice-plant workers.

Keywords

Ice-plant, ultraviolet, purification, compressor, condenser, expansion valve, evaporator, refrigeration system, ice crystals, fisheries industry, personal protective equipment (PPE) Lockout-tagout (LOTO).

Introduction

The demand for iceblock is as great today as it ever has been, despite advances made in the development of modern refrigeration equipment. Manufacture is used for producing refrigeration effect to freeze potable water in standard cans placed in rectangular tank which filled by brine. A good definition of refrigeration is the removal of heat energy so that a space or material is colder than its surroundings. An ice plant based on same principle as a simple refrigeration system. An ice plant contains various parts such as compressor, condenser, receiver, expansion valve, evaporator and refrigeration, accumulator. A refrigeration is always been a great deal for human being and play a vital role in preserving food, chemical, medicine,

fisheries and providing appropriate temperature in working entity of any industry . Refrigeration in the coming years becomes very essential deal for drastic development of the industrial sector. Our problem is an Ice plant that is next to our house in residential area. All neighbors are suffering from it. Ammonia leakage risks, noise pollution, commercial vehicles running around round the clock, disposal of its salt water caused burning of plants are some issues. Ice plant workers often face issues like exposure to extreme cold temperatures, potential hazards from ammonia leaks (a common refrigerant used in ice plants), repetitive strain injuries from manual handling of ice blocks, potential slips and falls on wet surfaces, and concerns regarding long working hours, particularly during peak demand periods. Working in consistently cold environments can lead to hypothermia, frostbite, and other cold-related health issues, especially when not properly dressed or with inadequate breaks.

Process of ice plant

Ice production often begins with the purification of water to remove pollutants and toxins. To create clean and clear water appropriate for ice manufacture, several filtering and treatment procedures, such as reverse osmosis or ultraviolet sterilization can be used. After purification, the water is held in a reservoir or tank particularly suited for ice production. The water is then fed into an ice maker or ice machine. Ice producers are made out of an insulated chamber and a refrigeration system.

A compressor, condenser, expansion valve, and evaporator comprise the refrigeration system. The compressor increases the temperature and pressure of a refrigerant gas by compressing it. The heated refrigerant gas then goes into the condenser, where it emits heat into the surrounding environment, causing it to cool and condense into a liquid.

An expansion valve decreases the pressure and temperature of the liquid refrigerant. This low-pressure, low-temperature refrigerant then enters the evaporator, where it absorbs heat from the water, dramatically lowering the water temperature. As a result, the water starts to freeze and turn into ice.

Mechanical agitators or revolving blades are often used by ice makers during the freezing process to avoid the creation of, favoring the manufacture of clean and compact ice cubes. Ice gradually accumulates and solidifies on the evaporator surface.

Types of Ice Plant Workers

Ice plants require a skilled workforce to ensure the efficient production, storage, and distribution of ice for various industrial and commercial applications. The workforce in an ice plant is diverse, with each category of worker performing specific tasks

crucial for the smooth operation of the facility. These workers can be classified into different types based on their roles and responsibilities, including

- Machine operators
- Maintenance technicians
- Quality control inspectors
- Packaging and handling staff
- logistics and delivery personnel
- Administrative and supervisory staff.

Each of these workers plays a significant role in ensuring that the ice production process runs efficiently and meets industry standards.

One of the most important types of workers in an ice plant is the machine operators. These individuals are responsible for running the ice-making machines, monitoring their performance, and ensuring that they function optimally. They oversee the ice production process, adjusting settings as necessary to produce ice in various forms, such as block ice, crushed ice, or tube ice, depending on the plant's requirements. Machine operators must have technical knowledge of the equipment, as they are responsible for troubleshooting minor issues and reporting any major malfunctions to the maintenance team. Without skilled machine operators, the production process would be inefficient and prone to frequent breakdowns, leading to delays and increased operational costs.

Another crucial category of ice plant workers is the maintenance technicians, who are responsible for the upkeep and repair of the machinery and refrigeration systems. Ice plants rely on heavy-duty equipment that operates continuously, and any technical failures can result in significant downtime. Maintenance technicians perform regular inspections, preventive maintenance, and emergency repairs to keep the machines running smoothly. They also handle refrigeration systems, ensuring that the cooling processes are efficient and that ice remains in the desired frozen state. Since ice production involves working with compressors, condensers, and evaporators, maintenance technicians must have expertise in refrigeration engineering and mechanical systems. Their role is critical in preventing unexpected breakdowns and ensuring the longevity of the equipment.

Safety Measures for Ice Plant Workers

Ice plants are essential in industries such as food preservation, fisheries, and cold storage. However, working in an ice plant involves exposure to extreme cold, hazardous machinery, and potential chemical leaks. To ensure the safety and well-being of workers, strict safety measures must be followed. These measures include proper protective equipment, safe handling of machinery, and prevention of ammonia leaks, training programs, and emergency preparedness.

Objectives of the study

1. To know the socio-economic conditions of the sample respondents
2. To know the various mode of payment.
3. To find out the health and safety measures available to workers.

Review of Literature

Occupational Safety and Health Administration (OSHA). (2022).Case studies of accidents in ice plants underscore the importance of proper training and machinery maintenance. OSHA (2022) reported that 45% of accidents could be prevented through adherence to lockout/tagout procedures and periodic inspections.

Wilson et al. (2022)studied the effectiveness of thermal gloves, jackets, and insulated footwear in reducing cold-related health issues. The study found that workers equipped with PPE experienced fewer cases of frostbite and hypothermia.

METHODOLOGY

The methodology adopted for the present investigation including selection of the respondents and objectives of the study together with source of data, sample, selection, period of study, scope and significance of the study and statistical tools used for data analysis.

PRIMARY DATA

To collecting primary data, through the schedule questionnaires have been distributed to the sample respondents to get information regarding the case study.

SECONDARY DATA

The secondary data also collected from various journals, books, newspaper, website etc.

SAMPLE SIZE

Forthe present study from the socio- economic conditions of ice- plant workers in siluvaipattiarea of thoothukudi district. Totally 130 sample respondents were selected by using simple random sampling method.

TOOLS FOR ANALYSIS

Based on the nature of data and relevance of information required, linear – regression and statistical tools like percentage, bar diagram and averages were used for the analysis of data.

PERIOD OF THE STUDY

This study period is November 2024 to March 2025.

ANALYSIS OF DATA

TABLE-1

Educational Qualification of the sample Respondents

S.NO	Educational Qualification	No of the Respondents	Percentage
1.	Primary school	8	7%
2.	Secondary school	86	66%
3.	Degree	13	10%
4.	Illiterate	23	17%
	Total	130	100%

Source: Primary data

This table reveals that educational qualifications among the respondents. 7% of the respondents completed their primary level, 66% of the respondents completed their secondary level, 10% of the respondents completed their degrees, and finally 17% of the respondents illiterate respectively.

Figure 1.1

Educational Qualification of the sample Respondents

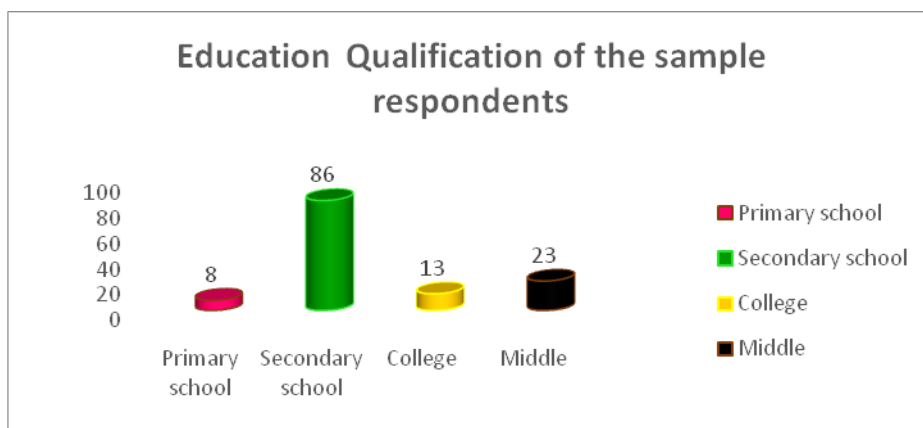
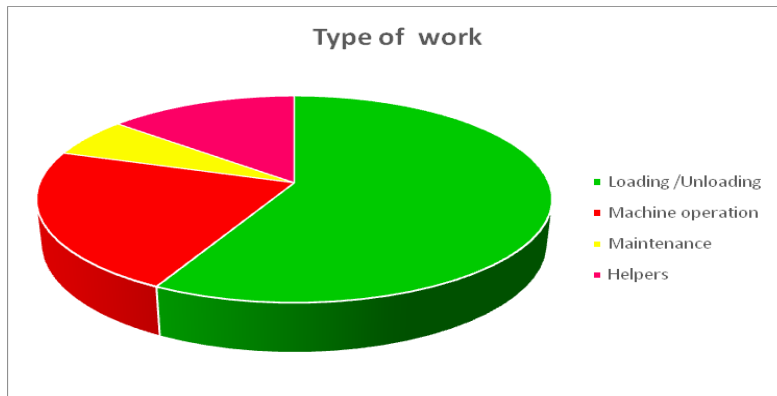


TABLE-2
Type of work among the respondents

S. No	Type of work	No of the Respondents	Percentage
1.	Loading /Unloading	75	57%
2.	Machine operation	29	22%
3.	Maintenance	8	7%
4.	Helpers	18	14%
	Total	130	100%

Source: Primary data

This table shows that the type of work of the respondents, 57% of the respondents work is loading /Unloading, 22% of the respondents working type is machine operation, 7% of the respondents work type is maintenance and 14% of the respondents work is helper respectively.

Figure -2.1
Type of work among the respondents

TABLE-3
Monthly Income of the respondents

S.No	Monthly Income	No of the Respondents	Percentage
1.	Below 8,000	8	7%
2.	8,000-12,000	13	10%
3.	12,000-15,000	99	76%
4.	Above 15,000	10	7%
	Total	130	100%

Source: Primary data

Out of 130 sample respondents 7% of the respondents earning their income below Rs.8,000, 10% of the respondents earning their income belongs to the

categories of Rs.8000 – Rs.12000, 76% of the respondents earning their income belongs to the categories of Rs.12000 – Rs.15000, finally 7% of the respondents earning their income above Rs.15,000 respectively.

Figure -3.1

Monthly Income of the respondents

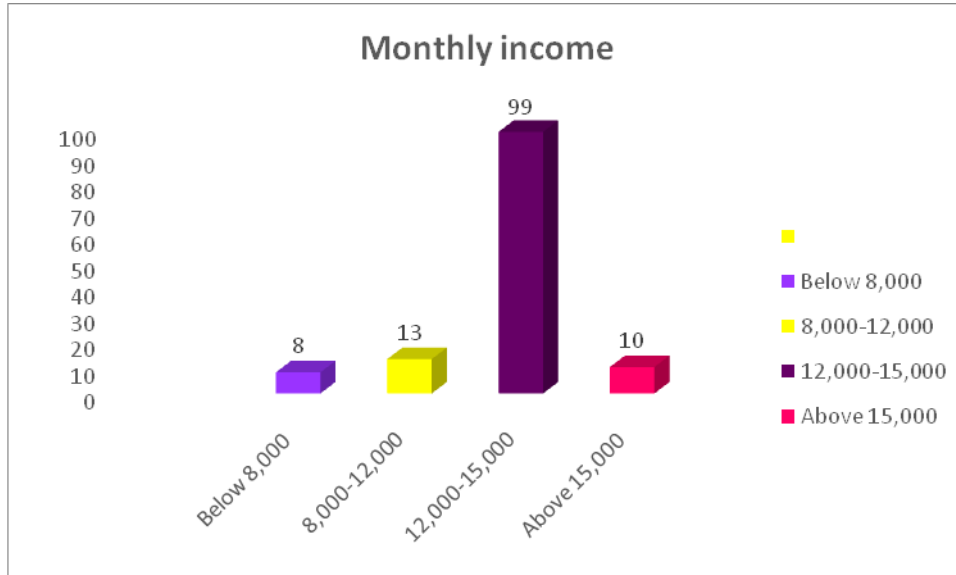


TABLE-4

Monthly Expenditure of the respondents

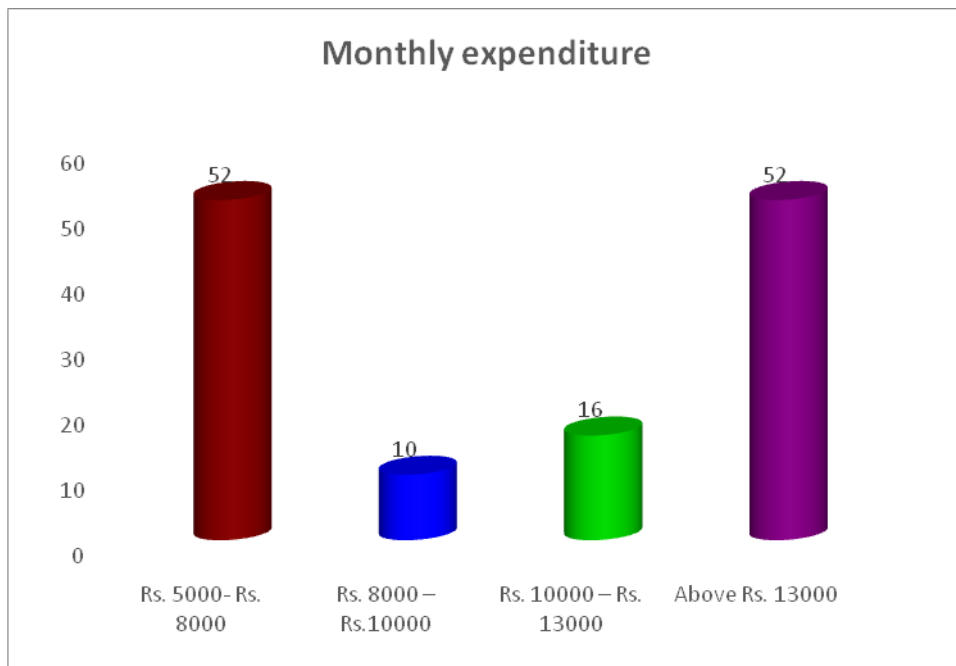
S. No	Expenditure	No of the respondents	Percentage
1.	Rs. 5000- Rs. 8000	52	40%
2.	Rs. 8000 – Rs.10000	10	8%
3.	Rs. 10000 – Rs. 13000	16	12%
4.	Above Rs. 13000	52	40%
	Total	130	100%

Source: Primary data

The table explains that monthly expenditure of the respondents. 40% of the respondents to spent between Rs. 5000 – Rs. 8000, 8% of the respondentstospent between Rs. 8000 – Rs. 10000, 12% of the respondents to spent between Rs. 10,000 – Rs. 13000,and 40% of the respondents spent above Rs. 13000 per month respectively.

Figure -4.1

Monthly Expenditure of the respondents



RELATIONSHIP BETWEEN MONTHLY INCOME AND EXPENDITURE OF THE SAMPLE RESPONDENTS

Linear - Regression:

The linear regression analysis of ice plant workers' income and expenditure suggests a negative relationship between the two variables. This indicates that as income increases, expenditure on basic needs does not rise proportionally. The hypothesis is thus proven. Households tend to have a higher rate of expenditure on basic needs relative to income increases. This conclusion implies that ice plant workers' income levels influence their changing lifestyle patterns.

The formula for linear regression is given by:

Results:

$$Y = a + bX$$

$$Y = 41.16 - 0.26X$$

The socio-economic conditions, particularly income and expenditure patterns, influence ice plant workers in the study area. In this analysis, the independent variable is the annual income of the respondents, while the dependent variable is their annual expenses. The regression analysis reveals the relationship between annual income and annual expenses within the study area.

FINDINGS

- ❖ Out of 130 sample respondents, the majority have completed their secondary school education.
- ❖ 57% of the respondents are engaged in loading and unloading work.
- ❖ 76% of the respondents monthly income between Rs. 12,000 and Rs. 15,000.
- ❖ 40% of the respondents monthly expenditure above Rs. 13,000.

SUGGESTIONS

- ❖ Provide insulated gloves, boots, and protective clothing to prevent cold-related injuries.
- ❖ Conduct regular safety training on handling ice-cutting tools and heavy machinery.
- ❖ Schedule frequent short breaks to prevent frostbite and hypothermia.
- ❖ Ensure proper ventilation to prevent respiratory issues from prolonged cold exposure.

CONCLUSION

Highlights several challenges faced by these workers in terms of income, job security, and working conditions. Most workers come from economically weaker sections and depend on daily wages, which are often inconsistent and inadequate to support their families. Many workers are engaged in physically demanding tasks such as ice cutting, lifting, and packing, which expose them to harsh working conditions, including extreme cold and high humidity. The seasonal nature of the industry further adds to their financial insecurity, making it difficult for them to sustain a stable livelihood throughout the year.

Health and safety concerns remain a major issue among ice plant workers. Prolonged exposure to cold storage environments leads to respiratory problems, joint pain, and other occupational health hazards. Most workers lack proper protective gear such as insulated gloves, boots, and warm clothing, increasing their vulnerability to work-related injuries. emergencies.

References

- ❖ Occupational Safety and Health Administration (OSHA). 2022 Accident prevention in ice plants. Retrieved from osha.gov.
- ❖ Wilson, M., et al 2022 PPE for occupational safety in cold environments. Occupational Medicine Journal, (1)33, .49-41

**EVALUATE THE FACTORS INFLUENCING CONSUMER PREFERENCE
TOWARDS MOBILE NETWORK SERVICE PROVIDER IN LIONTOWN
AREA OF THOOTHUKUDI DISTRICT**

Alphonse kepsiba*and Dr. A. Sudha

PG Department of Economics, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to ManonmaniamSundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

A research study was conducted with an objective to understand the Indian consumers' perception choice in selecting cellular mobile telecommunication service providers. Consumers' perception is widely varied in accordance with the Communication quality, call service, facilities, price, customer care and service provider's attributes. A structured questionnaire was developed to collect the required primary data from the consumers. The outcome of this research shows a comprehensively integrated framework to understand the relationships among several dimensions. The study shows communication and price were most influential and most preferential factors in selecting telecommunication service provider. However, product quality and availability has a significant impact on consumer perception choice in selecting cellular mobile service provider.

Key Words: Mobile services, customer preferences, customer satisfaction, Mobile Network, Telecommunication, data

INTRODUCTION

Mobile services were introduced in India in the late 1990s and the population is the main advantage for any market player operating in India. The mobile network service providers are ready to serve their subscribers anywhere at any time to retain the existing subscribers to earn a new subscribers. By knowing the preference and buying behaviour of the consumers the mobile network service providers can develop the promotional method to survive in the competitive market. The healthy competition between the different mobile network service providers create the mobile number portability, value added service, voice message, MMS, SMS, unbreakable signals, scheme changes, easy to recharge, other comfortable and satisfactory service to the mobile network subscribers. Usage of the mobile network by the lower and middle

class people increased by reducing the mobile network subscribing tariff from Rs 14 to Rs. 1.

The mobile service first operator in India is the state-owned incumbent BSNL. Subsequently, after the telecommunication policies were revised to allow private operators, companies such as **VODAFONE**, **IDEA**, **AIRTEL**, **AIRCEL**, **JIO**, **RELIANCE**, **TATA DOCOMO** have entered the space in India. Mobile service providers have their own plans, policies, packages and corresponding rates. Although they are offered by various companies, they have only one common purpose of telecommunication services to the world. And that is to provide people with telecommunication services so that they could maintain good conversations either for personal purposes or for business reasons.

Consumers' Task

Choosing network is the main task of consumer. Which one is the best network among the various network? It is consumers' task to think about as to which company can provide him the Coverage & Network speed and quality, Price and plans, Customer Service & Reliability, Additional features & Benefits best service. Who offers the widest selection of features and excellent customer service and avoids hidden charges.

Factors that affect consumer preferences about network

- Network quality: Consumers prefer networks with stable coverage and high speeds
- Price: Consumers consider the cost of the service
- Brand image: Consumers may prefer brands they are familiar with or that have a good reputation
- Convenience: Consumers may prefer services that are easy to use
- Personal tastes: Consumers may have their own preferences based on their personal tastes

How to understand consumer preferences

Surveys and forms: Online surveys and forms can be used to collect feedback directly

Consumer

Studies: Studies can be conducted to explore and analyze consumer preferences

Customer choose a mobile network, here are some the factors to consider:**Coverage & Network Quality**

- Check which network has the best signal strength in their area.
- Ask if they travel frequently (nationally or internationally).
- Look for 4G/5G availability if they need high-speed data.

Pricing & Plans

- Prepaid vs. Postpaid: Do they prefer paying in advance or a monthly bill?
- Data Needs: Heavy data users need unlimited or high-data plans.
- Call & SMS: Are they making many calls or using mostly data-based apps?
- International Roaming: Do they call or travel abroad often?

Customer Service & Reliability

- Some networks offer better customer support than others.
- Check reviews for billing issues, complaint handling, and service quality.

Features & Benefits

- Bundled services like free streaming subscriptions or cloud storage.

Additional Family or group plans for cost savings

- Loyalty rewards or cashback offers
- Would you like help comparing specific networks or plan?

Consumer feedback

While browsing and gaming follow behind this indicated a trend towards social media engagement and entertainment consumer as majority drivers of mobile data demands. While mobile network coverage always not notable role and customer service although important is not majority deciding factor for most user.

Statement of the problem

At present, the demand for mobile phone is increasing. There are many players in the rolling in the modern industry. To market their services, every company is

adding many new features. The subscribers are provided with various schemes of mobile phone services. And the market for mobile phone has become very competitive. There is cut throat competition between private sector and public sector undertakings such as Bharat Sanchar Nigam Ltd. (BSNL). Due to poor area coverage, many mobile phone industries lost their market. Non-existence of towers in rural areas resulted in a great loss for many mobile phone industries.

Scope of the study

The main aim of the study is to establish a platform to examine the customer preferences for the selected mobile networks. The study also extends to understand the factors influencing to use the particular mobile network service.

Objectives of the study

1. To study the prominent factors which influence the choice of mobile service provider.
2. To find out the customer satisfaction towards various mobile network service providers.
3. To find out which service provider influences more customers.
4. To identify the various networks used by the respondents

REVIEW OF LITERATURE

Mack and Sharpies (2009) showed that availability is the most crucial determinant of mobile choice. Other attributes, particularly features, aesthetics, and cost, have implications for mobile brand choice.

Myilswamy, Ratheesh Kumar(2013) find that the postpaid and prepaid customer prefer to use Airtel mobile service because of the features, Rent, Tower coverage, Talk time, Advertisement and Corporate schemes.

Zafar (2013) examines the impact of the mobile service attributes like call rates, service quality, service availability; promotion and brand image of both the gender's purchasing decision.

METHODOLOGY

The study is conducted among respondents of different age groups to examine their consumer preferences for various mobile network service providers. The research was

carried out through the distribution of questionnaires to a sample of 110 respondents, from whom responses were collected.

Primary data

The primary data was collected using the simple random sampling method from the selected respondents. A structured questionnaire was used to gather information such as consumer preference, opinions and factors influencing their choice of mobile network providers.

Secondary data

Secondary data was collected from standard reference books, journals, articles and websites.

Tools used analysis

The tools used for data analysis include tables, pie charts, and bar diagram.

Limitations of the study

- This study is limited to 110 respondents. Therefore, the findings and suggestions based on this study cannot be generalized to the entire population.
- The study was conducted within a specific period, and consumer preference may change over time due to evolving market trends and technological advancements.

Table 1.1

Type of network speed

S.NO	Types of mobile network Speed	No. of the respondents	Percentage
1	2G	18	16%
2	3G	18	16%
3	4G	54	49%
4	5G	20	20%
	Total	110	100

Source: Primary data

This table clearly shows that mobile network speed used by 110 respondents. The majority 55 % of the respondents used 4G, indicating that is the most preferred network speed, a significant portion 20% of the respondents use 5G, showing some adoption of newer technology, 2G & 3G each account for 16% suggesting that a minority still rely on older network respectively.

Figure: 1.1.1

Types of mobile network speed

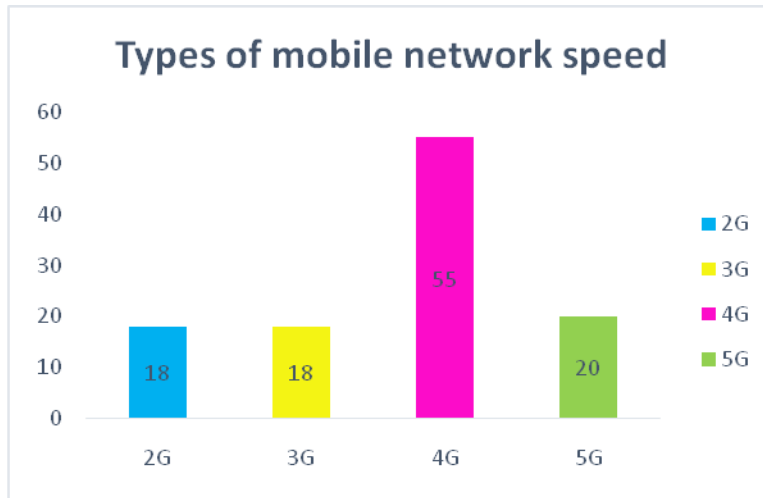


Table:1.2

Data plan per month

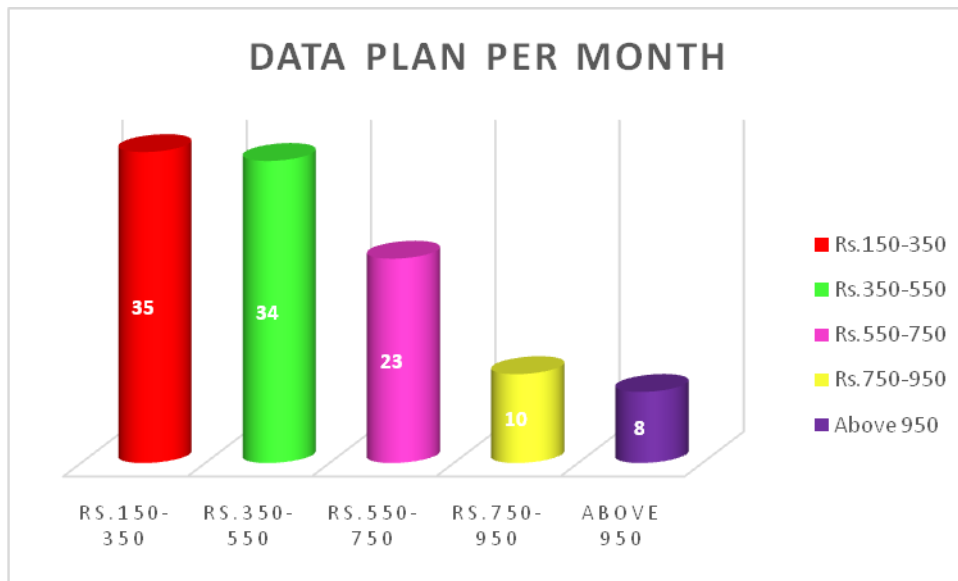
S. No	Data Plan	No. of the respondents	Percentage
1	Rs.150-350	35	32%
2	Rs.350-550	34	31%
3	Rs.550-750	23	20%
4	Rs.750-950	10	9%
5	Above 950	8	7%
	Total	110	100

Source: Primary data

This table presents data on the spending habits of the respondents on mobile data plans. 32% of the respondents spending Category Rs. 150 – 350, 31% of the respondents spending category is Rs. 350-550, 20% of the respondents range has Rs.550-750, 9% of the respondents range has Rs.750-950 and finally the lowest 7% of the respondents Rs. 950 above respectively.

Figure 1.2.2

Data plan per month



CORRELATION

The relationship between two variables like data plan spending and network speed. There is a positive correlation between data spending and network speed.

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Pearson correlation coefficient (r) = -0.31

P-value= 0.69

Interpretation:

The correlation coefficient of -0.31 suggests a weak negative correlation between data plan spending and network speed usage. This means that higher spending on data plans does not strongly correlate with the use of higher network speeds (4G/5G). The p-value (0.69) is high, indicating that the correlation is not statistically significant.

Conclusion:

The study on factors influencing consumer preference towards mobile service providers highlights several key determinants that shape consumer choice. Network

coverage, service quality, pricing, data speed, and customer support emerge as the most critical factors affecting consumer decisions. Additionally promotional offers, brand reputation, and value added services also play a significant role in shaping preferences. Findings suggest that consumers prioritize to data plan and high speed internet connectivity over other factors. However, affordability remains a crucial consideration, especially among price sensitive users. Customer service experiences also impact brand loyalty as consumer tend to switch providers when faced with unresolved issues or poor service support.

Furthermore, external factors such as technological advancements, market competition, and regulatory policies continue to influence consumer behaviour and network provider choices. As mobile networks evolve with emerging technologies like 5G, consumer expectations will likely shift towards faster and more efficient services. To remain competitive, mobile network providers must focus on enhancing service quality, offering competitive pricing, and improving customer engagement. Understanding consumer preference through regular surveys and feedback mechanisms will be essential for providers to adapt and innovate in an evolving telecom landscape.

FINDINGS

- Mostly 32% of the respondents spending mobile data Rs. 150 – 350.
- The majority of respondents 55% prefer 4G network marking in the most widely used network speed this indicates that 4G remains the dominated mobile network technology among the respondents.

SUGGESTION:

- 4G is the dominated network type among respondents while id growing 5G adoption relatively.
- The majority of respondents 54% use 1-5GB of mobile data per month. This indicates that most respondents have moderate mobile data used habit.

CONCLUSION

The Indian mobile telephony market has grown at a rapid speed in the last decade. Declining the call tariffs and favourable regulatory policies have led to a tremendous increase in the subscribers' base. Proper identification of the Customer preferences will

facilitate the favourableness towards the various mobile service providers. Continuous research on consumers will enhance the customer satisfaction.

REFERENCES

1. Shah C. Consumer Preferences for Mobile Service Providers: An Empirical Study in Bardoli. International Journal of Marketing and Technology 2012; 2(8): 269-288.
2. Jegan, Sudalaiyandi. Consumer Behaviour towards Mobile Phone Services in Kovilpatti, Thoothukudi District (India) - A Case Study. International Journal of Current Research 2012; 4(4): 261-265.
3. Myilswamy, Kumar R. Consumer Preference Utilizing Mobile Communication Service Providers in Coimbatore District. International Journal of Business and Management Invention 2013; 2(9): 1-5.

EVALUATING CONSUMER PREFERENCES AND KEY FACTORS INFLUENCING THE ADOPTION OF ELECTRIC VEHICLES AT VEPPALODAI OF THOOTHUKUDI DISTRICT

B. Esakki Selvi* and Dr. G.Sumathi

PG Department of Economics, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to ManonmaniamSundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

The demand for electric vehicles (EVs) is growing rapidly due to environmental concerns, rising fuel prices, and advancements in technology. This study aims to understand the key factors influencing consumer preferences when purchasing electric vehicles. The research focuses on factors such as environmental benefits, cost-effectiveness, battery performance, charging infrastructure, government incentives, advanced technology, and design features. Through surveys and data analysis, the study highlights how consumers prioritize these factors when making decisions. The findings of this research will help automobile manufacturers and policymakers develop strategies to meet consumer expectations and promote the adoption of electric vehicles.

Key words:

Electric Vehicle, Environmental awareness, Market trends, Vehicle affordability, Innovation in Transport, Fuel cost saving.

INTRODUCTION

Electric vehicles (EVs) are becoming more popular around the world. These vehicles run on electricity instead of gasoline or diesel, which makes them eco-friendly and cost-effective. People are choosing EVs for various reasons, such as saving money, protecting the environment, and enjoying advanced technology. Electric vehicles, or EVs, are becoming popular around the world. These vehicles run on electricity instead of gasoline or diesel. Many people prefer electric cars because they help protect the environment by reducing air pollution. EVs also save money on fuel and require less maintenance.

Consumer Preferences for Electric Vehicles (EVs)

Electric vehicles (EVs) are transforming the automobile industry by providing an eco-friendly and energy-efficient alternative to traditional gasoline-powered cars. As concerns about climate change, fuel prices, and sustainability grow, more consumers are considering EVs for their next vehicle purchase.

Increasing Awareness:

Consumers are increasingly aware of the environmental impact of traditional vehicles and the benefits of EVs in reducing emissions and promoting sustainability. Increasing awareness of electric vehicles (EVs) is crucial for promoting sustainable transportation and reducing environmental impact

EV Sales and Industry Developments

India has been actively building out its network of charging infrastructure. The Ministry of Heavy Industries has approved the building of 2,877 electric car charging stations throughout several states, along with 1,576 stations spread across 16 highways and 9 expressways, as part of the FAME India plan. With the help of this expanding network of public and private charging stations positioned thoughtfully throughout towns, business districts, and roads, electric vehicle owners will find it simpler to conveniently charge their vehicles.

Cost and Affordability:

The cost and affordability of electric vehicles (EVs) play a crucial role in their adoption. While EV prices have been historically higher than traditional gasoline cars, advancements in battery technology, increased production, and government incentives are making them more accessible to a broader range of consumers.

Maintenance and Operating Costs:

EVs typically have lower running costs due to the lower cost of electricity compared to gasoline and reduced maintenance needs.

Performance and Features:

EVs offer unique features like instant torque, quiet operation, and advanced technology, which can appeal to certain consumers.

Subsidies and Tax Credits:

Government incentives, such as subsidies and tax credits, can make EVs more affordable and attractive to consumers.

Government Policies and Incentive

Many governments worldwide offer financial incentives to encourage EV adoption. These incentives include tax credits, rebates, a reduced registration fees. In some regions, EV owners also benefit from perks such as free parking, toll exemptions, and access to carpool lanes. Consumers often consider these incentives when deciding whether to purchase an EV. A strong policy framework can significantly boost consumer interest in electric vehicles.

Objectives of the Study:

- ❖ To analyze the consumer awareness of EVs bike of the respondents.
- ❖ To understand what factors influencing consumer preferences towards EVs.
- ❖ To analyze the level of satisfaction of consumers towards EVs.

REVIEW OF LITREATURE

Singh & Verma (2020) – Leasing options make EVs more attractive to budget-conscious buyers. Lower monthly payments encourage first-time EV users. Flexibility in ownership reduces long-term uncertainty.

Smith et al. (2021) – Environmental awareness drives interest, but cost and charging infrastructure limit adoption. Younger consumers show more interest. Brand trust affects decisions.

Brown & Green (2022) – Social influence and peer recommendations impact EV choices. Urban consumers show more interest. Government policies on emissions shape demand.

METHODOLOGY

The study follows a descriptive research design, aimed at understanding the preferences, attitudes and behaviour of consumer towards electric bikes.

Limitations of the Study

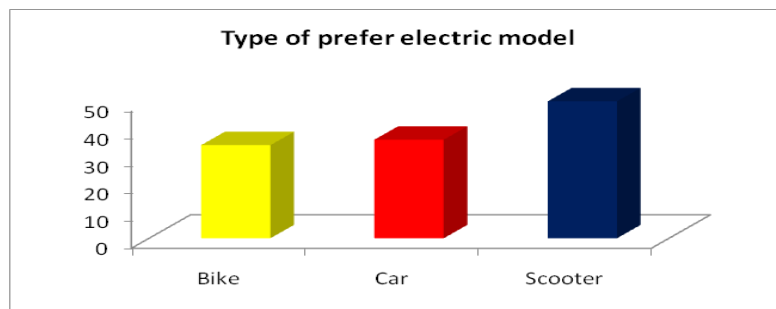
- Limited geographical coverage.
- Possible response bias in self - reported data.

Table 5.1
Types of Prefer Electric Model

S.NO	Types of prefer Electric model	No of the respondents	Percentage
1	Bike	34	28%
2	Car	36	30%
3	Scooter	50	42%
	Total	120	100

Source: Primary data

The survey data on the type of preferred electric vehicles among the 120 respondents. 28% of the respondents prefer an electric bike, 30% of the respondents prefer an electric car and 42% of the respondents prefer an electric scooter respectively.

Figure: 5.1.1
Type of Prefer Electric Model

Table 5.2
Current Trends for buying Electric vehicle

S.No	Trends	No of the respondents	Percentage
1	Price	12	10%
2	Charging possibilities	10	8%
3	Design	12	10%
4	Safety	46	38%
5	Being Environmental friendly	26	22%
6	Cheaper road tax	-	-
7	Resale value	-	-
8	No Noise pollution	14	12%
	Total	120	100

Source: Primary data

The table presents data on the current trends for buying electric vehicles. 10% of the respondents believe that the price is very affordable for buying EVs, 8% of the respondents said charging possibilities is available at every home so they choosing Evs, 10% of the respondents like that design of EVs, 38% of the respondents believe the safety is on the EVs, 22% of the respondents accept the EVs an being environment friendly, zero respondents from two category its cheaper road ta x and resale value, 12% of the respondents believe no noise pollution on EVs respectively.

Figure: 5.1.2

Trends in Electric vehicle

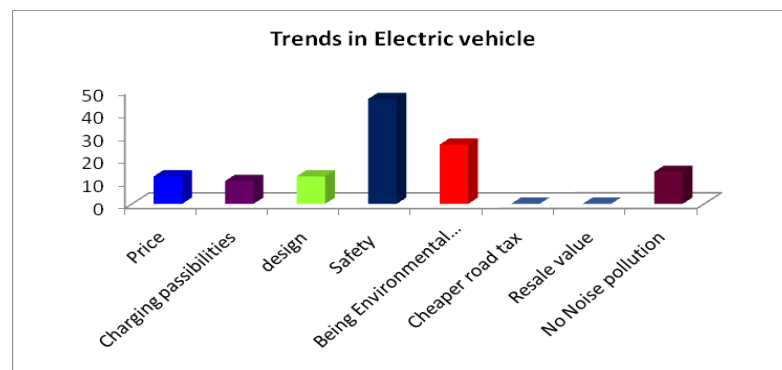


Table 5.3

Factor influencing buyers of E-Vehicle

S.no	Buyers of E-Vehicle	No of the respondents	Percentage
1	Re-sale value	22	18
2	Environmental impact	27	22
3	Prices	30	25
4	Charging stations	32	27
5	Others	10	8
	Total	120	100

Source: Primary data

The table explain the factors influencing buyers of electric vehicles..18% of the respondents is a moderate concern about re-sale, its indicating that some buyers

consider long time investment returns, Environmental impact (22%) is also a strong motivator, suggesting that many buyers are eco-conscious, the second most important factor is price 25% of the respondents affordability is a major concern for potential buyers, Charging station availability 27% is the most significant factor, indicating that consumers prioritize ease of access to charging infrastructure, finally 8% of other factor play a smaller role in influencing decisions respectively.

Figure: 5.1.3 Factor influencing buyers of E-Vehicle

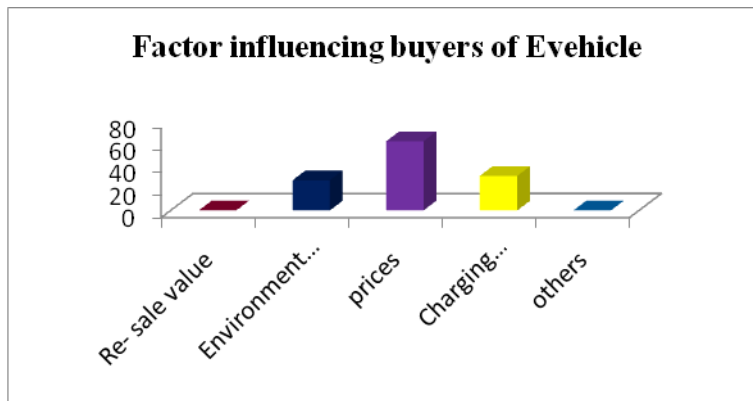


Table 5.4

Reasons for choosing electric vehicle over a fuel vehicle

S.no	Reasons for choosing electric vehicle over a fuel vehicle	No of the respondents	percentage
1	yes	54	45%
2	No	66	55%
	Total	120	100

Source: Primary data

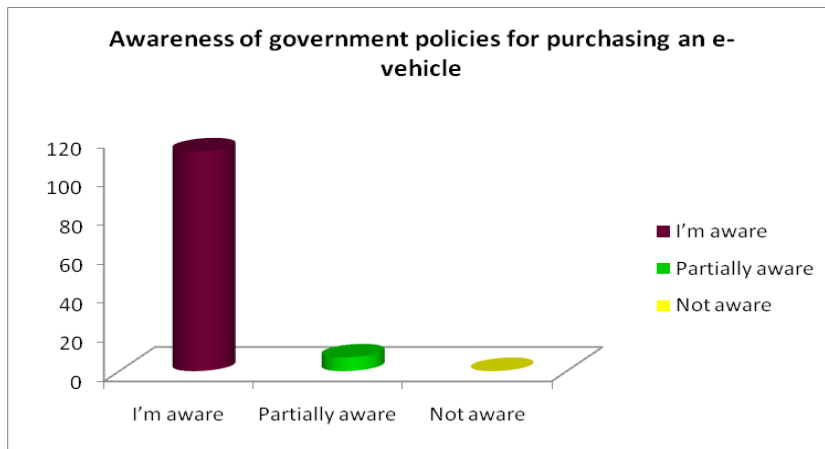
The table shows that reason for choosing E- vehicle among 120 respondents.45% of the respondents to choosing of e-vehicle55% of the respondents not choosing on e-vehicle respectively

Figure 5.1.4**Reasons for choosing electric vehicle over a fuel vehicle****Table 5.5****Awareness of Government policies for purchasing an E- vehicle**

S.NO	Awareness of Government policies for purchasing an e-vehicle	No of the respondents	Percentage
1	I'm aware	113	94
2	Partially aware	7	6
3	Not aware	-	-
	Total	120	100

Source: Primary data

This table shows that how aware of the respondents about governments policies for buying Electric vehicle ,Maximum 94% of the respondents are fully aware of government policies.6% of the respondents are partially aware of these policies. Zero respondents reported being completely unaware of the government policies respectively.

Figure: 5.5**Awareness of Government policies for purchasing an E- vehicle****FINDINGS**

- Mostly 42% of the respondents are preferred electric model Scooters.
- 38% of the respondents are safety based buying electric vehicle.
- 27% of the respondents most significant factors in charging station.
- Mostly 80% of the respondents awareness of tax discount.
- 55% of the respondents not choosing on e- vehicle.

SUGGESTIONS

- Lower Costs offer government subsidies, tax benefits, or installment plans to make EVs more affordable.
- Better Charging Infrastructure increase the number of fast-charging stations, especially in rural and suburban areas.
- Longer Battery Life invests in research to improve battery efficiency and reduce charging time.
- Increase Public Awareness educates consumers about EV benefits, such as lower fuel costs and environmental impact.

CONCLUSION

Consumer preference for electric vehicles (EVs) is driven by a combination of environmental concerns, cost savings, technological advancements, and government incentives. While challenges such as high initial costs, limited charging infrastructure, and range anxiety remain, improvements in battery technology and expanding

charging networks are helping to increase adoption. As consumers become more environmentally conscious and automakers continue to innovate, the demand for EVs is expected to grow, shaping the future of sustainable transportation.

REFERENCES

1. . Ashraf Javid, M., Ali, N., Abdullah, M., Campisi, T., & Shah, S. A. H. (2021). Travelers' adoption behavior towards electric vehicles in Lahore, Pakistan: an extension of norm activation model (NAM) theory. *Journal of Advanced Transportation*, 1–14.
2. Augenstein K (2015) Analysing the potential for sustainable e-mobility–The case of Germany. *Environ InnovSoc Trans* 14:101–115
3. Augurio A, Castaldi L, Addeo F, Mazzoni C, Matarazzo O (2022) Purchase intention in the Italian e-mobility market. *J Clean Prod* 373:133815

ANALYSING THE SOCIO - ECONOMIC CONDITIONS OF MASON WORKERS IN SPIC NAGAR OF THOOTHUKUDI DISTRICT

M. Anusiya* and Dr. G. Sumathi

PG Department of Economics, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

Construction workers are the foundation of the nation since they build the infrastructure required for a nation's development. Construction workers construct or repair homes, roads and infrastructure. They engage in strenuous physical labour and frequently work outside in a variety of weather situations. They construct the homes, the streets, bridges, highway, the rivers, dams, shopping centers and parks; etc. By building smart cities, IT centers, complexes, metros, telephony and other infrastructure in the domain of innovation, they are the ones that establish new economic regions. The builders of the economy are often known as construction workers. In fact, majority of people depend on this industry for employment and income. It is important to note that this an unorganized sector which is the basis for economic development. The workers engaged in construction works are socially and economically backward and so that they are unable to organize themselves in pursuit of their common interest. Generally, construction workers face financial problems, health problems, diseases, mishaps and even loss of life. Moreover, lack of social welfare measures and social security and medical benefits affect the construction workers.

Keywords:

Construction sector, Mason workers, Infrastructure, Practitioners, Interlocking bricks, Stone blocks

CHAPTER-I

INTRODUCTION

Mason workers play a crucial role in the construction industry by building houses, roads, and other infrastructure. However, their socio-economic conditions often remain challenging. This project aims to study the living standards, income levels, working conditions, and social challenges faced by mason workers. Many

mason workers earn daily wages and do not have job security, making their financial situation unstable. They often lack access to health care, education, and social benefits. Harsh working conditions, long hours, and exposure to dust and chemicals also affect their health.

Construction activity is an integral part of a country's infrastructure and industrial development; it includes hospitals, schools, townships, offices, houses, and other buildings, urban infrastructure (including water supply sewerage, drainage) highways, roads, ports, railways, airports, power system, irrigation and agriculture systems, telecommunications etc. The construction becomes the basic input for socio–economic development of country.

Mason work in construction

Mason work, or masonry, is a construction trade that entails building structures out of component parts made of various materials, such as brick or stone. Practitioners of masonry, known as masons, are manual labourers who lay these components together and usually bind them with a substance such as mortar, a paste made with a mixture of cement, lime, sand and water that hardens when dried. Masonry involves skilled labor, as most forms of mason work involve laying individual components in precise arrangements and are thus resistant to mechanization.

Masonry

Masonry is the craft of building a structure with brick, stone, or similar material, including mortar plastering which are often laid in, bound, and pasted together by mortar. The term masonry can also refer to the building units (stone, brick, etc.) themselves.

The common materials of masonry construction are bricks and building stone, rocks such as marble, granite, and limestone, cast stone, concrete blocks, glass blocks, and adobe. Masonry is generally a highly durable form of construction. However, the materials used, the quality of the mortar and workmanship, and the pattern in which the units are assembled can substantially affect the durability of the overall masonry construction.

Limitation of the study

On the basis of the data collection from the respondent, income and expenditure pattern will be studied. The scope of study will be related to the Spic Nagar. Some variables such as Income, Expenditure, Saving and Investment will be calculated from the average number of working days. Since the job is irregular, accordingly the given figure may not denote the exact figure.

Objectives of the study

- To analyze the working conditions of the sample respondents.
- To analyze the skills and techniques used in masonry work.
- To find out the challenges faced by the mason workers.

REVIEW OF LITERATURE

- ❖ **Seenivasan (2023)** investigated women construction workers in Tamil Nadu, identifying issues like gender discrimination, low wages, and lack of social security, calling for governmental intervention
- ❖ **Hariharan (2024)** focused on migrant brick-kiln workers in Tamil Nadu, revealing poor wages, inadequate medical facilities, and the necessity for policy interventions to improve their socio-economic status.

METHODOLOGY

Research Design:

Descriptive research design is being adapted in this study. In the proposed research work, nature of study requires both the quantitative and qualitative data collection techniques. The proposed study focuses on comprehensive study of primary data which will be collected through surveys, interviews and observation. The necessary primary data will be collected from 120 respondents. And secondary data also used in this study like books, journals, articles, website etc.

Area of Study:

Spic Nagar - Thoothukudi district

Sample Size: Totally 120 respondents were selected in the study area.

Types of sampling: Simple random sampling is adapted for this study.

Scope of the Study: This includes identifying the specific tasks that need to be completed, such as bricklaying, stone veneer installation, or concrete block construction. Additionally, outline any materials or equipment that will be required for the project. Examples of milestones could include completing the foundation, finishing the exterior walls, or installing the chimney.

Need for the study: Masonry is non-combustible, so improves fire protection for the building and its occupants. Fireplaces are commonly made of masonry for the same reason. Masonry offers a high resistance against rotting, pests, weather, and natural disasters such as hurricanes and tornadoes.

Tools of analysis:

The researcher used by table, Pie chart, Bar diagram.

Table 1

Types of Mason workers

S. No	Types of Masons	No. of the Respondent	Percentage
1	Cement Mason	21	18
2	Brick Mason	20	17
3	Tile Mason	26	22
4	Stone Mason	19	16
5	Chithal (helpers)	34	29
	Total	120	100

Source: Primary Data

This table shows that types of workers among the 120 respondents. 18 % of the respondents worked as a Cement Mason, 17% of the respondents worked as a Brick Mason, 22% of the respondents worked as a Tile Mason, 16% of the respondents worked as a Stone Mason , 29% of the respondents as a Chithal (helpers) respectively.

FIGURE 1

TYPES OF WORK

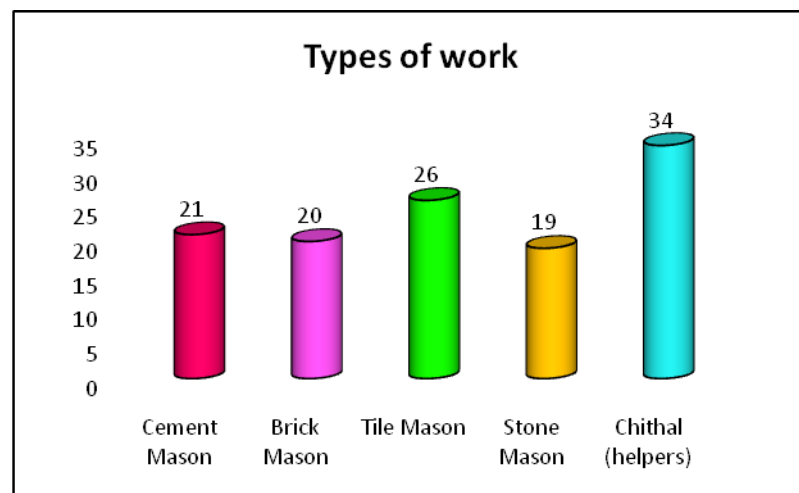


Table 2
Monthly Income of the Respondent

S. No	Income	No. of the Respondent	Percentage
1	Below 20000	15	13
2	20000- 25000	52	43
3	25000-30000	46	38
4	30000 above	7	6
	Total	120	100

Source: Primary Data

Above the table shows that monthly income of the respondents. Out of 120 respondents 13% of the respondents monthly income is below 20000, 43% of the respondents are 20000-25000, 38% of the respondents 25000-30000 and 6% of the respondents are more than 30000 respectively.

FIGURE 2
INCOME OF THE RESPONDENT

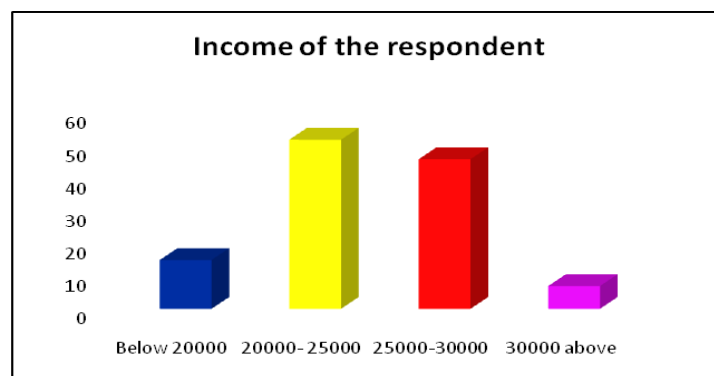


Table 3
Monthly Expenditure of the Respondent

S. No	Expenditure	No. of the Respondent	Percentage
1	Below ₹10000	72	60%
2	₹10000-₹15000	38	32%
3	₹15000-₹20000	7	6%
4	Above ₹20000	3	2%
	Total	120	100

Source: Primary Data

This table shows that monthly expenditure of the respondents.60% of the respondents monthly expenditure is below 20000, 32% of the respondents monthly expenditure between 10000 -15000 and 6% of the respondents monthly expenditure between 15000-20000. 2% of the respondents monthly expenditure less than 20000 per month respectively.

FIGURE 3

MONTHLY EXPENDITURE OF THE RESPONDENT

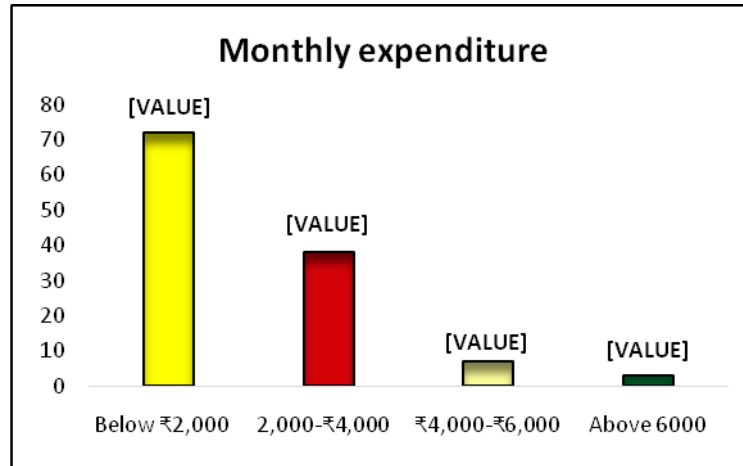


Table 4

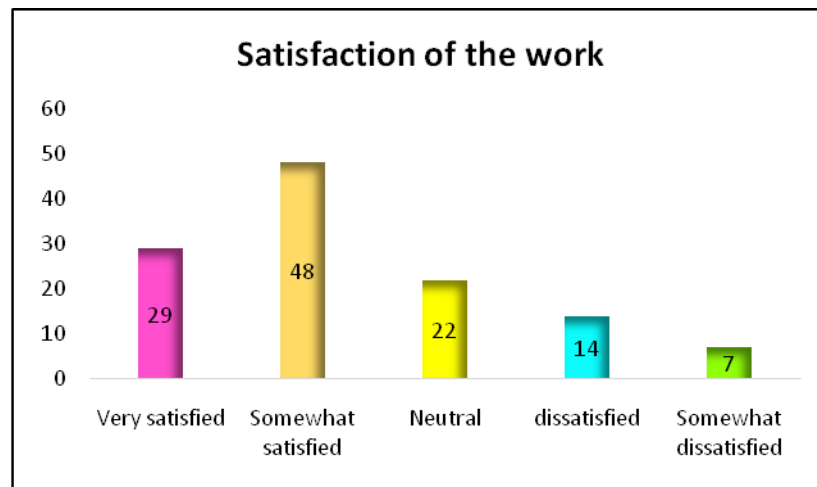
Satisfaction of the Work

S. No	Satisfaction of the Work	No of respondents	Percentage
1	Very satisfied	29	24
2	Somewhat satisfied	48	40
3	Neutral	22	18
4	Dissatisfied	14	12
5	Somewhat dissatisfied	7	6
	Total	120	100

Source: Primary Data

Above table shows that worker's satisfaction with their job. 24% of the respondents feel very satisfied, 40% of the respondents feel somewhat satisfied, meanwhile 24% of the respondents feel neutral, 12% of the respondents feel dissatisfied and 6% of the respondents feel Somewhat dissatisfied respectively.

FIGURE 4
SATISFACTION OF THE WORK



CO-EFFICIENT CORRELATION:

To find out the relationship between Income and Expenditure of the respondents. The researcher is using the statistical tool of Co-efficient Correlation. The calculation the following formula is used Pearson's Correlation Formula,

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

$$r = -0.094$$

RESULTS

There is a negative correlation.

HYPOTHESIS RESEARCHER HAS LAID DOWN THE FOLLOWING HYPOTHESIS:

- That there is a direct relationship between income and Expenditure.
- That the socio-economic condition of mason labours is not good.
- In light of above discussion and present scenario of labours in the mason work, the researcher has selected this topic for the purpose of this research.

FINDINGS, SUGGESTIONS AND CONCLUSION

- ❖ Maximum 34% of the respondents are working Cement Mason.

- ❖ Majority 43% of the respondents getting good salary becoming a mason worker.
- ❖ 60% of the respondents monthly expenditure is below 20000 per month.
- ❖ 84% of the respondents accept their construction provide refreshment during working hours.
- ❖ Maximum 24% of the respondents feel very satisfied about their job.

SUGGESTIONS

- Role of Employers & Contractors employers should take responsibility for fair treatment, timely payments, and better work conditions.
- Health & Safety Measures ensure proper safety equipment, medical insurance, and better working conditions.
- Access to Social Security provide benefits like pensions, accident insurance, and provident funds.
- Improved work environment regulates working hours, prevent exploitation, and ensure hygienic conditions at worksites.

CONCLUSION

The socio-economic status of the workers showed that they were poor. They are daily wage earners and maintain their family with small income with difficulty. It was noted that most of them were literate. They were addicted to alcohol, smoking bidi, cigarette. They did not consume adequate amount of nutritious food. In most of the cases it was found that they lived in kacha houses. A good proportion of workers cook their food in the same room in which they leave. They used wood for cooking their food. The source of drinking and cooking water was public tube wells or taps. Latrine facility was available in most cases. Their monthly income was less due to which they had to borrow from relatives or neighbors for fulfillment of their needs. They were not aware of the different social security schemes.

BIBLIOGRAPHY

1.Yadav, S., &Yadav, R. (2013). Socio-economic status of unorganized construction workers: A case study in Rajasthan. International Journal of Social Sciences and Humanities Research, 2(3), 45-53.



2. Kumar, A., & Mishra, S. (2017). Economic conditions and work-life challenges of migrant construction workers in India. *International Journal of Business and Economic Research*, 5(2), 88-96.
3. Sharma, P., & Singh, K. (2018). Wage disparities and living conditions of brick kiln and construction workers. *Journal of Labour Economics*, 7(1), 102-118.
4. Patel, M., & Mehta, D. (2015). Social security and welfare measures for construction workers in Gujarat. *Economic and Political Weekly*, 50(5), 28-35.

ASSESSMENT OF SOCIO-ECONOMIC CONDITIONS OF ICE-PLANT WORKERS IN SILUVAIPATTI AREA OF THOOTHUKUDI DISTRICT

A. Amali Joan Sophia* and Dr. B. Mahesh Vanitha

PG Department of Economics, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to ManonmaniamSundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

The ice-plant industry plays a crucial role in the fisheries and cold storage sector, providing essential support for seafood preservation and transportation. This study examines the socio-economic conditions of ice-plant workers in Siluvaipatti, a key industrial hub in Thoothukudi District, Tamil Nadu. The research explores various aspects, including demographic characteristics, income levels, working conditions, health and safety concerns, and the impact of employment on workers quality of life. Data were collected through field surveys and interviews with workers, highlighting the challenges they face, such as low wages, job insecurity, occupational hazards, and lack of social security measures. The findings suggest the need for policy interventions to improve working conditions, ensure fair wages, and implement safety regulations. Enhancing social security benefits and providing skill development programs could significantly improve the livelihoods of ice-plant workers.

Keywords

Ice-plant, ultraviolet, purification, compressor, condenser, expansion valve, evaporator, refrigeration system, ice crystals, fisheries industry, personal protective equipment (PPE) Lockout-tagout (LOTO).

Introduction

The demand for ice block is as great today as it ever has been, despite advances made in the development of modern refrigeration equipment. Manufacture is used for producing refrigeration effect to freeze potable water in standard cans placed in rectangular tank which filled by brine. A good definition of refrigeration is the removal of heat energy so that a space or material is colder than its surroundings. An ice plant based on same principle as a simple refrigeration system. An ice plant contains various parts such as compressor, condenser, receiver, expansion valve, evaporator and refrigeration, accumulator. A refrigeration is always been a great deal for human being and play a vital role in preserving food, chemical, medicine,

fisheries and providing appropriate temperature in working entity of any industry . Refrigeration in the coming years becomes very essential deal for drastic development of the industrial sector. Our problem is an Ice plant that is next to our house in residential area. All neighbors are suffering from it. Ammonia leakage risks, noise pollution, commercial vehicles running around round the clock, disposal of its salt water caused burning of plants are some issues. Ice plant workers often face issues like exposure to extreme cold temperatures, potential hazards from ammonia leaks (a common refrigerant used in ice plants), repetitive strain injuries from manual handling of ice blocks, potential slips and falls on wet surfaces, and concerns regarding long working hours, particularly during peak demand periods. Working in consistently cold environments can lead to hypothermia, frostbite, and other cold-related health issues, especially when not properly dressed or with inadequate breaks.

Process of ice plant

Ice production often begins with the purification of water to remove pollutants and toxins. To create clean and clear water appropriate for ice manufacture, several filtering and treatment procedures, such as reverse osmosis or ultraviolet sterilization can be used. After purification, the water is held in a reservoir or tank particularly suited for ice production. The water is then fed into an ice maker or ice machine. Ice producers are made out of an insulated chamber and a refrigeration system.

A compressor, condenser, expansion valve, and evaporator comprise the refrigeration system. The compressor increases the temperature and pressure of a refrigerant gas by compressing it. The heated refrigerant gas then goes into the condenser, where it emits heat into the surrounding environment, causing it to cool and condense into a liquid.

An expansion valve decreases the pressure and temperature of the liquid refrigerant. This low-pressure, low-temperature refrigerant then enters the evaporator, where it absorbs heat from the water, dramatically lowering the water temperature. As a result, the water starts to freeze and turn into ice.

Mechanical agitators or revolving blades are often used by ice makers during the freezing process to avoid the creation of, favoring the manufacture of clean and compact ice cubes. Ice gradually accumulates and solidifies on the evaporator surface.

Types of Ice Plant Workers

Ice plants require a skilled workforce to ensure the efficient production, storage, and distribution of ice for various industrial and commercial applications. The workforce in an ice plant is diverse, with each category of worker performing specific tasks crucial for the

smooth operation of the facility. These workers can be classified into different types based on their roles and responsibilities, including

- Machine operators
- Maintenance technicians
- Quality control inspectors
- Packaging and handling staff
- logistics and delivery personnel
- Administrative and supervisory staff.

Each of these workers plays a significant role in ensuring that the ice production process runs efficiently and meets industry standards.

One of the most important types of workers in an ice plant is the machine operators. These individuals are responsible for running the ice-making machines, monitoring their performance, and ensuring that they function optimally. They oversee the ice production process, adjusting settings as necessary to produce ice in various forms, such as block ice, crushed ice, or tube ice, depending on the plant's requirements. Machine operators must have technical knowledge of the equipment, as they are responsible for troubleshooting minor issues and reporting any major malfunctions to the maintenance team. Without skilled machine operators, the production process would be inefficient and prone to frequent breakdowns, leading to delays and increased operational costs.

Another crucial category of ice plant workers is the maintenance technicians, who are responsible for the upkeep and repair of the machinery and refrigeration systems. Ice plants rely on heavy-duty equipment that operates continuously, and any technical failures can result in significant downtime. Maintenance technicians perform regular inspections, preventive maintenance, and emergency repairs to keep the machines running smoothly. They also handle refrigeration systems, ensuring that the cooling processes are efficient and that ice remains in the desired frozen state. Since ice production involves working with compressors, condensers, and evaporators, maintenance technicians must have expertise in refrigeration engineering and mechanical systems. Their role is critical in preventing unexpected breakdowns and ensuring the longevity of the equipment.

Safety Measures for Ice Plant Workers

Ice plants are essential in industries such as food preservation, fisheries, and cold storage. However, working in an ice plant involves exposure to extreme cold, hazardous machinery, and potential chemical leaks. To ensure the safety and well-being of workers, strict safety

measures must be followed. These measures include proper protective equipment, safe handling of machinery, and prevention of ammonia leaks, training programs, and emergency preparedness.

Objectives of the study

1. To know the socio-economic conditions of the sample respondents
2. To know the various mode of payment.
3. To find out the health and safety measures available to workers.

Review of Literature

Occupational Safety and Health Administration (OSHA). (2022).Case studies of accidents in ice plants underscore the importance of proper training and machinery maintenance. OSHA (2022) reported that 45% of accidents could be prevented through adherence to lockout/tagout procedures and periodic inspections.

Wilson et al. (2022)studied the effectiveness of thermal gloves, jackets, and insulated footwear in reducing cold-related health issues. The study found that workers equipped with PPE experienced fewer cases of frostbite and hypothermia.

METHODOLOGY

The methodology adopted for the present investigation including selection of the respondents and objectives of the study together with source of data, sample, selection, period of study, scope and significance of the study and statistical tools used for data analysis.

PRIMARY DATA

To collecting primary data, through the schedule questionnaires have been distributed to the sample respondents to get information regarding the case study.

SECONDARY DATA

The secondary data also collected from various journals, books, newspaper, website etc.

SAMPLE SIZE

Forthe present study from the socio- economic conditions of ice- plant workers in siluvaipattiarea of thoothukudi district. Totally 130 sample respondents were selected by using simple random sampling method.

TOOLS FOR ANALYSIS

Based on the nature of data and relevance of information required, linear – regression and statistical tools like percentage, bar diagram and averages were used for the analysis of data.

PERIOD OF THE STUDY

This study period is November 2024 to March 2025.

ANALYSIS OF DATA

TABLE-1

Educational Qualification of the sample Respondents

S.NO	Educational Qualification	No of the Respondents	Percentage
1.	Primary school	8	7%
2.	Secondary school	86	66%
3.	Degree	13	10%
4.	Illiterate	23	17%
	Total	130	100%

Source: Primary data

This table reveals that educational qualifications among the respondents. 7% of the respondents completed their primary level, 66% of the respondents completed their secondary level, 10% of the respondents completed their degrees, and finally 17% of the respondents illiterate respectively.

Figure 1.1

Educational Qualification of the sample Respondents

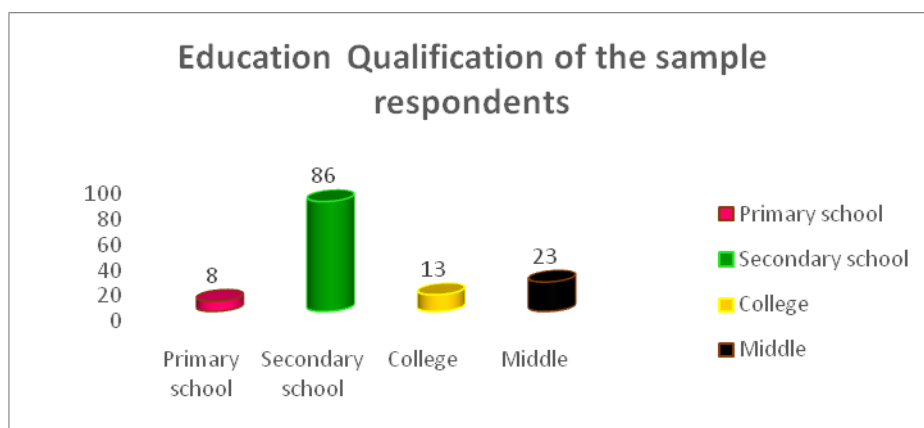


TABLE-2

Type of work among the respondents

S. No	Type of work	No of the Respondents	Percentage
1.	Loading /Unloading	75	57%
2.	Machine operation	29	22%
3.	Maintenance	8	7%
4.	Helpers	18	14%
	Total	130	100%

Source: Primary data

This table shows that the type of work of the respondents, 57% of the respondents work is loading /Unloading, 22% of the respondents working type is machine operation, 7% of the respondents work type is maintenance and 14% of the respondents work is helper respectively.

Figure -2.1

Type of work among the respondents

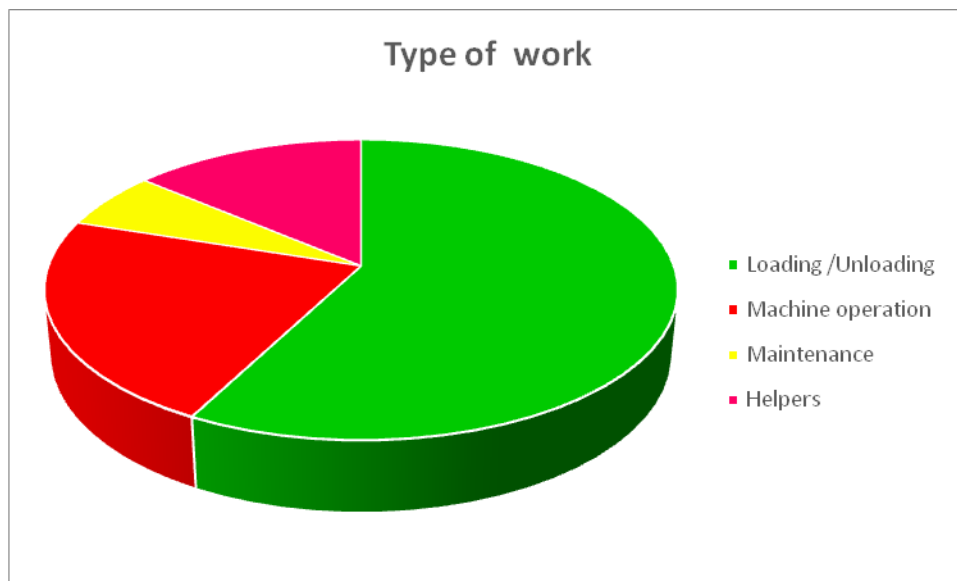


TABLE-3

Monthly Income of the respondents

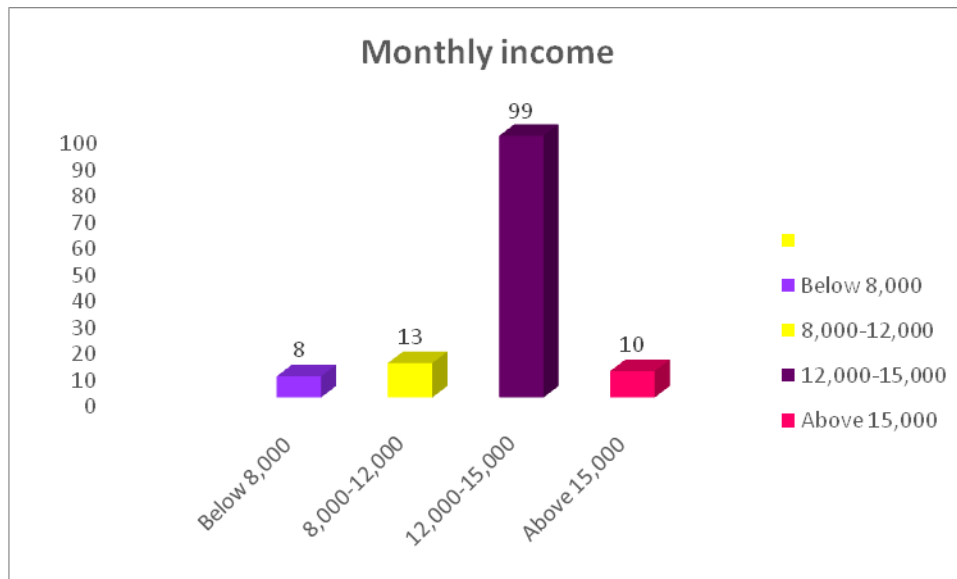
S.No	Monthly Income	No of the Respondents	Percentage
1.	Below 8,000	8	7%
2.	8,000-12,000	13	10%
3.	12,000-15,000	99	76%
4.	Above 15,000	10	7%
	Total	130	100%

Source: Primary data

Out of 130 sample respondents 7% of the respondents earning their income below Rs.8,000, 10% of the respondents earning their income belongs to the categories of Rs.8000 – Rs.12000, 76% of the respondents earning their income belongs to the categories of Rs.12000 – Rs.15000, finally 7% of the respondents earning their income above Rs.15,000 respectively.

Figure -3.1

Monthly Income of the respondents

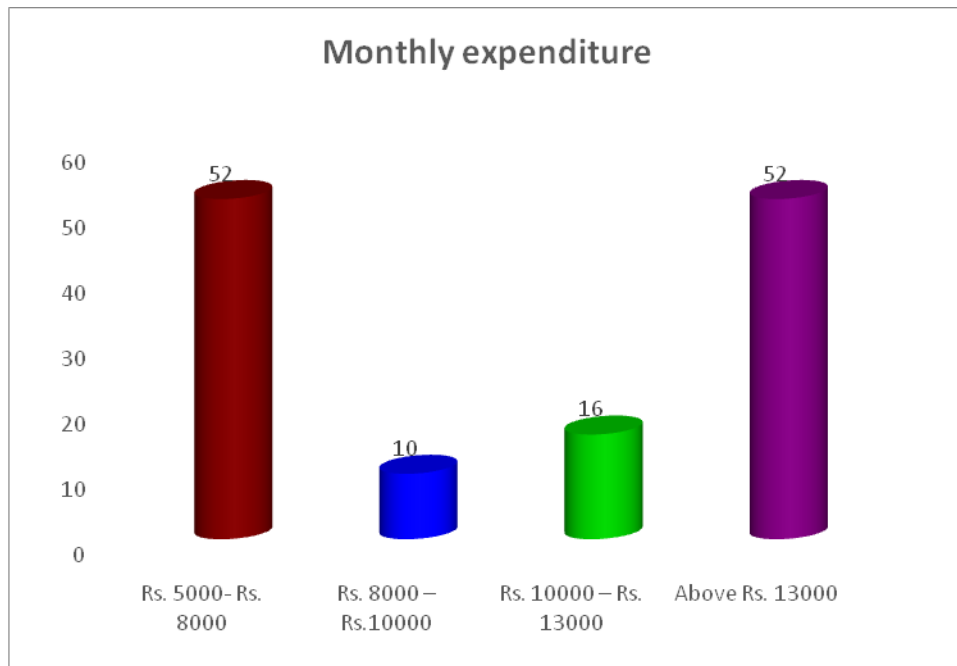

TABLE-4
Monthly Expenditure of the respondents

S. No	Expenditure	No of the respondents	Percentage
1.	Rs. 5000- Rs. 8000	52	40%
2.	Rs. 8000 – Rs.10000	10	8%
3.	Rs. 10000 – Rs. 13000	16	12%
4.	Above Rs. 13000	52	40%
	Total	130	100%

Source: Primary data

The table explains that monthly expenditure of the respondents. 40% of the respondents to spent between Rs. 5000 – Rs. 8000, 8% of the respondentstospent between Rs. 8000 – Rs. 10000, 12% of the respondents to spent between Rs. 10,000 – Rs. 13000,and 40% of the respondents spent above Rs. 13000 per month respectively.

Figure -4.1
Monthly Expenditure of the respondents



RELATIONSHIP BETWEEN MONTHLY INCOME AND EXPENDITURE OF THE SAMPLE RESPONDENTS

Linear - Regression:

The linear regression analysis of ice plant workers' income and expenditure suggests a negative relationship between the two variables. This indicates that as income increases, expenditure on basic needs does not rise proportionally. The hypothesis is thus proven. Households tend to have a higher rate of expenditure on basic needs relative to income increases. This conclusion implies that ice plant workers' income levels influence their changing lifestyle patterns.

The formula for linear regression is given by:

Results:

$$Y = a + bX$$

$$Y = 41.16 - 0.26X$$

The socio-economic conditions, particularly income and expenditure patterns, influence ice plant workers in the study area. In this analysis, the independent variable is the annual income of the respondents, while the dependent variable is their annual expenses. The regression analysis reveals the relationship between annual income and annual expenses within the study area.

FINDINGS

- ❖ Out of 130 sample respondents, the majority have completed their secondary school education.
- ❖ 57% of the respondents are engaged in loading and unloading work.
- ❖ 76% of the respondents monthly income between Rs. 12,000 and Rs. 15,000.
- ❖ 40% of the respondents monthly expenditure above Rs. 13,000.

SUGGESTIONS

- ❖ Provide insulated gloves, boots, and protective clothing to prevent cold-related injuries.
- ❖ Conduct regular safety training on handling ice-cutting tools and heavy machinery.
- ❖ Schedule frequent short breaks to prevent frostbite and hypothermia.
- ❖ Ensure proper ventilation to prevent respiratory issues from prolonged cold exposure.

CONCLUSION

Highlights several challenges faced by these workers in terms of income, job security, and working conditions. Most workers come from economically weaker sections and depend on daily wages, which are often inconsistent and inadequate to support their families. Many workers are engaged in physically demanding tasks such as ice cutting, lifting, and packing, which expose them to harsh working conditions, including extreme cold and high humidity. The seasonal nature of the industry further adds to their financial insecurity, making it difficult for them to sustain a stable livelihood throughout the year.

Health and safety concerns remain a major issue among ice plant workers. Prolonged exposure to cold storage environments leads to respiratory problems, joint pain, and other occupational health hazards. Most workers lack proper protective gear such as insulated gloves, boots, and warm clothing, increasing their vulnerability to work-related injuries. emergencies.

References

- ❖ Occupational Safety and Health Administration (OSHA). 2022 Accident prevention in ice plants. Retrieved from osha.gov.
- ❖ Wilson, M., et al 2022 PPE for occupational safety in cold environments. Occupational Medicine Journal, (1)33, .41-49

EVALUATE THE FACTORS INFLUENCING CONSUMER PREFERENCE TOWARDS MOBILE NETWORK SERVICE PROVIDER IN LIONTOWN AREA OF THOOTHUKUDI DISTRICT

Alphonse kepsiba*and Dr. A. Sudha

PG Department of Economics, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

A research study was conducted with an objective to understand the Indian consumers' perception choice in selecting cellular mobile telecommunication service providers. Consumers' perception is widely varied in accordance with the Communication quality, call service, facilities, price, customer care and service provider's attributes. A structured questionnaire was developed to collect the required primary data from the consumers. The outcome of this research shows a comprehensively integrated framework to understand the relationships among several dimensions. The study shows communication and price were most influential and most preferential factors in selecting telecommunication service provider. However, product quality and availability has a significant impact on consumer perception choice in selecting cellular mobile service provider.

Key Words: Mobile services, customer preferences, customer satisfaction, Mobile Network, Telecommunication, data

INTRODUCTION

Mobile services were introduced in India in the late 1990s and the population is the main advantage for any market player operating in India. The mobile network service providers are ready to serve their subscribers anywhere at any time to retain the existing subscribers to earn a new subscribers. By knowing the preference and buying behaviour of the consumers the mobile network service providers can develop the promotional method to survive in the competitive market. The healthy competition between the different mobile network service providers create the mobile number portability, value added service, voice message, MMS, SMS, unbreakable signals, scheme changes, easy to recharge, other comfortable and satisfactory service to the mobile network subscribers. Usage of the mobile network by the lower and middle class people increased by reducing the mobile network subscribing tariff from Rs 14 to Rs. 1.

The mobile service first operator in India is the state-owned incumbent BSNL. Subsequently, after the telecommunication policies were revised to allow private operators, companies such as **VODAFONE ,IDEA, AIRTEL, AIRCEL, JIO, RELIANCE, TATA DOCOMO** have entered the space in India. Mobile service providers have their own plans, policies, packages and corresponding rates. Although they are offered by various companies, they have only one common purpose of telecommunication services to the world. And that is to provide people with telecommunication services so that they could maintain good conversations either for personal purposes or for business reasons.

Consumers' Task

Choosing network is the main task of costumer. Which one is the best network among the various network? It is consumers' task to think about as to which company can provide him the Coverage & Network speed and quality, Price and plans, Customer Service & Reliability, Additional features & Benefits best service. Who offers the widest selection of features and excellent customer service and avoids hidden charges.

Factors that affect consumer preferences about network

- Network quality: Consumers prefer networks with stable coverage and high speeds
- Price: Consumers consider the cost of the service
- Brand image: Consumers may prefer brands they are familiar with or that have a good reputation
- Convenience: Consumers may prefer services that are easy to use
- Personal tastes: Consumers may have their own preferences based on their personal tastes

How to understand consumer preferences

Surveys and forms: Online surveys and forms can be used to collect feedback directly

Consumer

Studies: Studies can be conducted to explore and analyze consumer preferences

Customer choose a mobile network, here are some the factors to consider:

Coverage & Network Quality

- Check which network has the best signal strength in their area.
- Ask if they travel frequently (nationally or internationally).
- Look for 4G/5G availability if they need high-speed data.

Pricing & Plans

- Prepaid vs. Postpaid: Do they prefer paying in advance or a monthly bill?
- Data Needs: Heavy data users need unlimited or high-data plans.
- Call & SMS: Are they making many calls or using mostly data-based apps?
- International Roaming: Do they call or travel abroad often?

Customer Service & Reliability

- Some networks offer better customer support than others.
- Check reviews for billing issues, complaint handling, and service quality.

Features & Benefits

- Bundled services like free streaming subscriptions or cloud storage.

Additional Family or group plans for cost savings

- Loyalty rewards or cashback offers
- Would you like help comparing specific networks or plan?

Consumer feedback

While browsing and gaming follow behind this indicated a trend towards social media engagement and entertainment consumer as majority drivers of mobile data demands. While mobile network coverage always not notable role and customer service although important is not majority deciding factor for most user.

Statement of the problem

At present, the demand for mobile phone is increasing. There are many players in the rolling in the modern industry. To market their services, every company is adding many new features. The subscribers are provided with various schemes of mobile phone services. And the market for mobile phone has become very competitive. There is cut throat competition between private sector and public sector undertakings such as Bharat Sanchar Nigam Ltd.

(BSNL). Due to poor area coverage, many mobile phone industries lost their market. Non-existence of towers in rural areas resulted in a great loss for many mobile phone industries.

Scope of the study

The main aim of the study is to establish a platform to examine the customer preferences for the selected mobile networks. The study also extends to understand the factors influencing to use the particular mobile network service.

Objectives of the study

1. To study the prominent factors which influence the choice of mobile service provider.
2. To find out the customer satisfaction towards various mobile network service providers.
3. To find out which service provider influences more customers.
4. To identify the various networks used by the respondents

REVIEW OF LITERATURE

Mack and Sharpies (2009) showed that availability is the most crucial determinant of mobile choice. Other attributes, particularly features, aesthetics, and cost, have implications for mobile brand choice.

Myilswamy, Ratheesh Kumar(2013) find that the postpaid and prepaid customer prefer to use Airtel mobile service because of the features, Rent, Tower coverage, Talk time, Advertisement and Corporate schemes.

Zafar (2013) examines the impact of the mobile service attributes like call rates, service quality, service availability; promotion and brand image of both the gender's purchasing decision.

METHODOLOGY

The study is conducted among respondents of different age groups to examine their consumer preferences for various mobile network service providers. The research was carried out through the distribution of questionnaires to a sample of 110 respondents, from whom responses were collected.

Primary data

The primary data was collected using the simple random sampling method from the selected respondents. A structured questionnaire was used to gather information such as consumer preference, opinions and factors influencing their choice of mobile network providers.

Secondary data

Secondary data was collected from standard reference books, journals, articles and websites.

Tools used analysis

The tools used for data analysis include tables, pie charts, and bar diagram.

Limitations of the study

- This study is limited to 110 respondents. Therefore, the findings and suggestions based on this study cannot be generalized to the entire population.
- The study was conducted within a specific period, and consumer preference may change over time due to evolving market trends and technological advancements.

Table 1.1

Type of network speed

S.NO	Types of mobile network Speed	No. of the respondents	Percentage
1	2G	18	16%
2	3G	18	16%
3	4G	54	49%
4	5G	20	20%
	Total	110	100

Source: Primary data

This table clearly shows that mobile network speed used by 110 respondents. The majority 55% of the respondents used 4G, indicating that is the most preferred network speed, a significant portion 20% of the respondents use 5G, showing some adoption of newer technology, 2G & 3G each account for 16% suggesting that a minority still rely on older network respectively.

Figure: 1.1.1

Types of mobile network speed

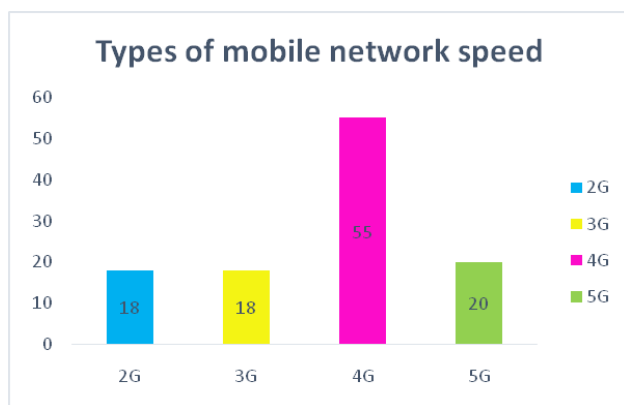


Table:1.2

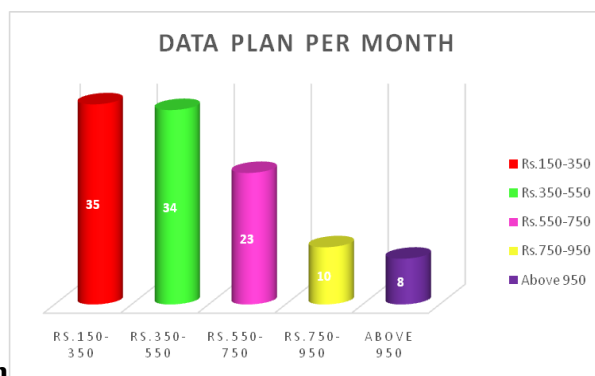
Data plan per month

S. No	Data Plan	No. of the respondents	Percentage
1	Rs.150-350	35	32%
2	Rs.350-550	34	31%
3	Rs.550-750	23	20%
4	Rs.750-950	10	9%
5	Above 950	8	7%
	Total	110	100

Source: Primary data

This table presents data on the spending habits of the respondents on mobile data plans. 32% of the respondents spending Category Rs. 150 – 350, 31% of the respondents spending category is Rs. 350-550, 20% of the respondents range has Rs.550-750, 9% of the respondents range has Rs.750-950 and finally the lowest 7% of the respondents Rs. 950 above respectively.

Figure 1.2.2



Data plan per month

CORRELATION

The relationship between two variables like data plan spending and network speed. There is a positive correlation between data spending and network speed.

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Pearson correlation coefficient (r) = -0.31

P-value= 0.69

Interpretation:

The correlation coefficient of -0.31 suggests a weak negative correlation between data plan spending and network speed usage. This means that higher spending on data plans does not strongly correlate with the use of higher network speeds (4G/5G). The p-value (0.69) is high, indicating that the correlation is not statistically significant.

Conclusion:

The study on factors influencing consumer preference towards mobile service providers highlights several key determinants that shape consumer choice. Network coverage, service quality, pricing, data speed, and customer support emerge as the most critical factors affecting consumer decisions. Additionally promotional offers, brand reputation, and value added services also play a significant role in shaping preferences. Findings suggest that consumers prioritize to data plan and high speed internet connectivity over other factors. However, affordability remains a crucial consideration, especially among price sensitive users. Customer service experiences also impact brand loyalty as consumer tend to switch providers when faced with unresolved issues or poor service support.

Furthermore, external factors such as technological advancements, market competition, and regulatory policies continue to influence consumer behaviour and network provider choices. As mobile networks evolve with emerging technologies like 5G, consumer expectations will likely shift towards faster and more efficient services. To remain competitive, mobile network providers must focus on enhancing service quality, offering competitive pricing, and improving customer engagement. Understanding consumer preference through regular

surveys and feedback mechanisms will be essential for providers to adapt and innovate in an evolving telecom landscape.

FINDINGS

- Mostly 32% of the respondents spending mobile data Rs. 150 – 350.
- The majority of respondents 55% prefer 4G network marking in the most widely used network speed this indicates that 4G remains the dominated mobile network technology among the respondents.

SUGGESTION:

- 4G is the dominated network type among respondents while id growing 5G adoption relatively.
- The majority of respondents 54% use 1-5GB of mobile data per month. This indicates that most respondents have moderate mobile data used habit.

CONCLUSION

The Indian mobile telephony market has grown at a rapid speed in the last decade. Declining the call tariffs and favourable regulatory policies have led to a tremendous increase in the subscribers' base. Proper identification of the Customer preferences will facilitate the favourableness towards the various mobile service providers. Continuous research on consumers will enhance the customer satisfaction.

REFERENCES

1. Shah C. Consumer Preferences for Mobile Service Providers: An Empirical Study in Bardoli. International Journal of Marketing and Technology 2012; 2(8): 269-288.
2. Jegan, Sudalaiyandi. Consumer Behaviour towards Mobile Phone Services in Kovilpatti, Thoothukudi District (India) - A Case Study. International Journal of Current Research 2012; 4(4): 261-265.
3. Myilswamy, Kumar R. Consumer Preference Utilizing Mobile Communication Service Providers in Coimbatore District. International Journal of Business and Management Invention 2013; 2(9): 1-5.

EVALUATING CONSUMER PREFERENCES AND KEY FACTORS INFLUENCING THE ADOPTION OF ELECTRIC VEHICLES AT VEPPALODAI OF THOOTHUKUDI DISTRICT

B. EsakkiSelvi* and Dr. G.Sumathi

PG Department of Economics, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to ManonmaniamSundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

The demand for electric vehicles (EVs) is growing rapidly due to environmental concerns, rising fuel prices, and advancements in technology. This study aims to understand the key factors influencing consumer preferences when purchasing electric vehicles. The research focuses on factors such as environmental benefits, cost-effectiveness, battery performance, charging infrastructure, government incentives, advanced technology, and design features. Through surveys and data analysis, the study highlights how consumers prioritize these factors when making decisions. The findings of this research will help automobile manufacturers and policymakers develop strategies to meet consumer expectations and promote the adoption of electric vehicles.

Key words:

Electric Vehicle, Environmental awareness, Market trends, Vehicle affordability, Innovation in Transport, Fuel cost saving.

INTRODUCTION

Electric vehicles (EVs) are becoming more popular around the world. These vehicles run on electricity instead of gasoline or diesel, which makes them eco-friendly and cost-effective. People are choosing EVs for various reasons, such as saving money, protecting the environment, and enjoying advanced technology. Electric vehicles, or EVs, are becoming popular around the world. These vehicles run on electricity instead of gasoline or diesel. Many people prefer electric cars because they help protect the environment by reducing air pollution. EVs also save money on fuel and require less maintenance.

Consumer Preferences for Electric Vehicles (EVs)

Electric vehicles (EVs) are transforming the automobile industry by providing an eco-friendly and energy-efficient alternative to traditional gasoline-powered cars. As concerns

about climate change, fuel prices, and sustainability grow, more consumers are considering EVs for their next vehicle purchase.

Increasing Awareness:

Consumers are increasingly aware of the environmental impact of traditional vehicles and the benefits of EVs in reducing emissions and promoting sustainability. Increasing awareness of electric vehicles (EVs) is crucial for promoting sustainable transportation and reducing environmental impact

EV Sales and Industry Developments

India has been actively building out its network of charging infrastructure. The Ministry of Heavy Industries has approved the building of 2,877 electric car charging stations throughout several states, along with 1,576 stations spread across 16 highways and 9 expressways, as part of the FAME India plan. With the help of this expanding network of public and private charging stations positioned thoughtfully throughout towns, business districts, and roads, electric vehicle owners will find it simpler to conveniently charge their vehicles.

Cost and Affordability:

The cost and affordability of electric vehicles (EVs) play a crucial role in their adoption. While EV prices have been historically higher than traditional gasoline cars, advancements in battery technology, increased production, and government incentives are making them more accessible to a broader range of consumers.

Maintenance and Operating Costs:

EVs typically have lower running costs due to the lower cost of electricity compared to gasoline and reduced maintenance needs.

Performance and Features:

EVs offer unique features like instant torque, quiet operation, and advanced technology, which can appeal to certain consumers.

Subsidies and Tax Credits:

Government incentives, such as subsidies and tax credits, can make EVs more affordable and attractive to consumers.

Government Policies and Incentive

Many governments worldwide offer financial incentives to encourage EV adoption. These incentives include tax credits, rebates, a reduced registration fees. In some regions, EV owners also benefit from perks such as free parking, toll exemptions, and access to carpool lanes. Consumers often consider these incentives when deciding whether to purchase an EV. A strong policy framework can significantly boost consumer interest in electric vehicles.

Objectives of the Study:

- ❖ To analyze the consumer awareness of EVs bike of the respondents.
- ❖ To understand what factors influencing consumer preferences towards EVs.
- ❖ To analyze the level of satisfaction of consumers towards EVs.

REVIEW OF LITREATURE

Singh & Verma (2020) – Leasing options make EVs more attractive to budget-conscious buyers. Lower monthly payments encourage first-time EV users. Flexibility in ownership reduces long-term uncertainty.

Smith et al. (2021) – Environmental awareness drives interest, but cost and charging infrastructure limit adoption. Younger consumers show more interest. Brand trust affects decisions.

Brown & Green (2022) – Social influence and peer recommendations impact EV choices. Urban consumers show more interest. Government policies on emissions shape demand.

METHODOLOGY

The study follows a descriptive research design, aimed at understanding the preferences, attitudes and behaviour of consumer towards electric bikes.

Limitations of the Study

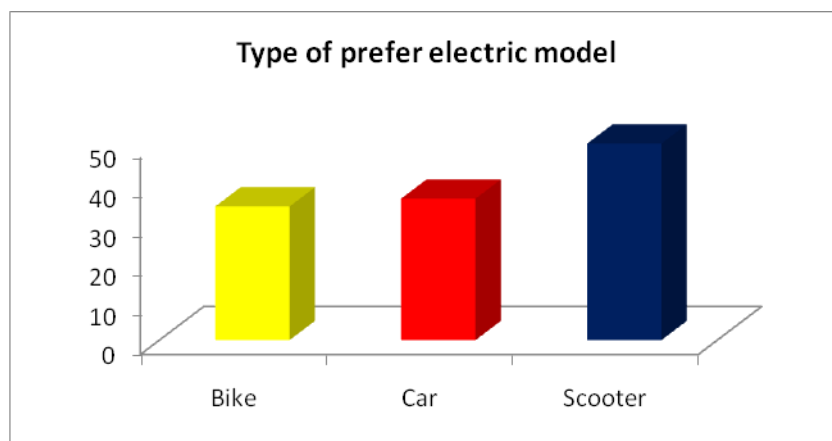
- Limited geographical coverage.
- Possible response bias in self - reported data.

Table 5.1
Types of Prefer Electric Model

S.NO	Types of prefer Electric model	No of the respondents	Percentage
1	Bike	34	28%
2	Car	36	30%
3	Scooter	50	42%
	Total	120	100

Source: Primary data

The survey data on the type of preferred electric vehicles among the 120 respondents. 28% of the respondents prefer an electric bike, 30% of the respondents prefer an electric car and 42% of the respondents prefer an electric scooter respectively.

Figure: 5.1.1
Type of Prefer Electric Model

Table 5.2
Current Trends for buying Electric vehicle

S.No	Trends	No of the respondents	Percentage
1	Price	12	10%
2	Charging possibilities	10	8%
3	Design	12	10%
4	Safety	46	38%
5	Being Environmental friendly	26	22%
6	Cheaper road tax	-	-
7	Resale value	-	-
8	No Noise pollution	14	12%
	Total	120	100

Source: Primary data

The table presents data on the current trends for buying electric vehicles. 10% of the respondents believe that the price is very affordable for buying EVs, 8% of the respondents said charging possibilities is available at every home so they choosing Evs, 10% of the respondents like that design of EVs, 38% of the respondents believe the safety is on the EVs, 22% of the respondents accept the EVs an being environment friendly, zero respondents from two category its cheaper road ta x and resale value, 12% of the respondents believe no noise pollution on EVs respectively.

Figure: 5.1.2

Trends in Electric vehicle

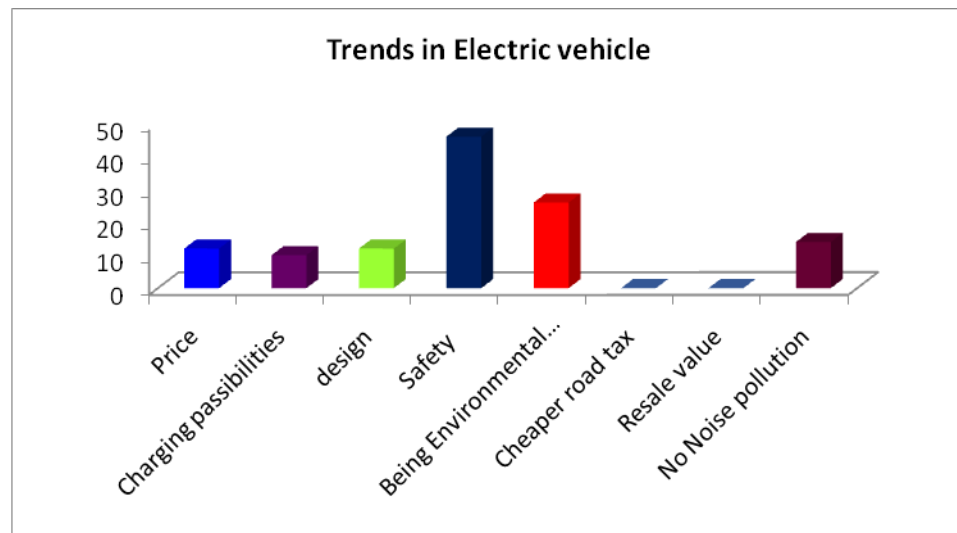


Table 5.3

Factor influencing buyers of E-Vehicle

S.no	Buyers of E-Vehicle	No of the respondents	Percentage
1	Re-sale value	22	18
2	Environmental impact	27	22
3	Prices	30	25
4	Charging stations	32	27
5	Others	10	8
	Total	120	100

Source: Primary data

The table explain the factors influencing buyers of electric vehicles..18% of the respondents is a moderate concern about re-sale, its indicating that some buyers consider long time investment returns, Environmental impact (22%) is also a strong motivator, suggesting that many buyers are eco-conscious, the second most important factor is price 25% of the respondents affordability is a major concern for potential buyers, Charging station availability 27% is the most significant factor, indicating that consumers prioritize ease of access to charging infrastructure, finally 8% of other factor play a smaller role in influencing decisions respectively.

Figure: 5.1.3 Factor influencing buyers of E-Vehicle

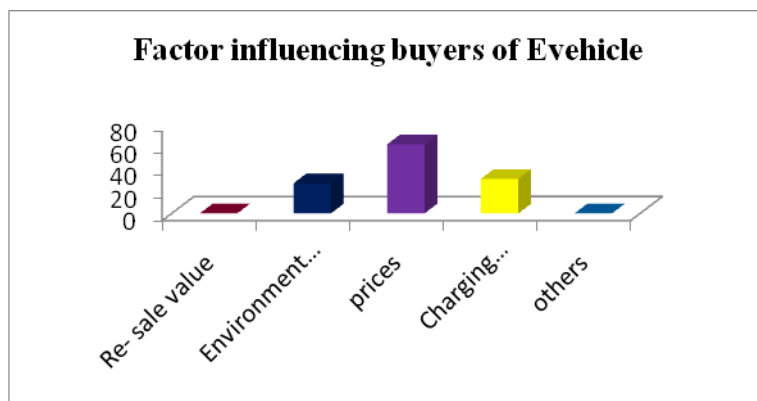


Table 5.4

Reasons for choosing electric vehicle over a fuel vehicle

S.no	Reasons for choosing electric vehicle over a fuel vehicle	No of the respondents	percentage
1	Yes	54	45%
2	No	66	55%
	Total	120	100

Source: Primary data

The table shows that reason for choosing E- vehicle among 120 respondents.45% of the respondents to choosing of e-vehicle55% of the respondents not choosing on e- vehicle respectively.

Figure 5.1.4

Reasons for choosing electric vehicle over a fuel vehicle

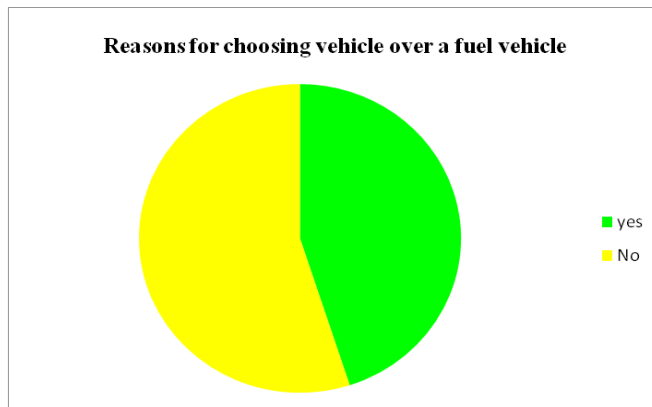


Table 5.5

Awareness of Government policies for purchasing an E- vehicle

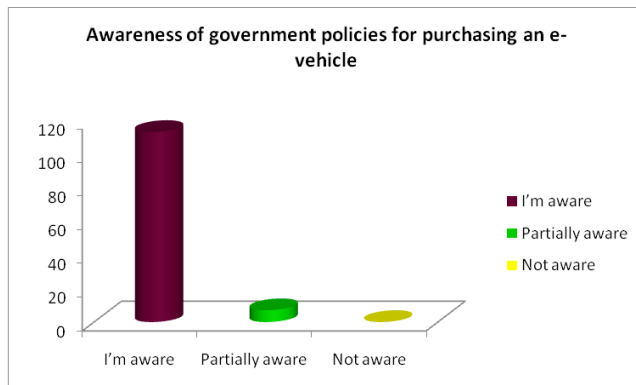
S.NO	Awareness of Government policies for purchasing an e- vehicle	No of the respondents	Percentage
1	I'm aware	113	94
2	Partially aware	7	6
3	Not aware	-	-
	Total	120	100

Source: Primary data

This table shows that how aware of the respondents about governments policies for buying Electric vehicle ,Maximum 94% of the respondents are fully aware of government policies.6% of the respondents are partially aware of these policies. Zero respondents reported being completely unaware of the government policies respectively.

Figure: 5.5

Awareness of Government policies for purchasing an E- vehicle



FINDINGS

- Mostly 42% of the respondents are preferred electric model Scooters.
- 38% of the respondents are safety based buying electric vehicle.
- 27% of the respondents most significant factors in charging station.
- Mostly 80% of the respondents awareness of tax discount.
- 55% of the respondents not choosing on e- vehicle.

SUGGESTIONS

- Lower Costs offer government subsidies, tax benefits, or installment plans to make EVs more affordable.
- Better Charging Infrastructure increase the number of fast-charging stations, especially in rural and suburban areas.
- Longer Battery Life invests in research to improve battery efficiency and reduce charging time.
- Increase Public Awareness educates consumers about EV benefits, such as lower fuel costs and environmental impact.

CONCLUSION

Consumer preference for electric vehicles (EVs) is driven by a combination of environmental concerns, cost savings, technological advancements, and government incentives. While challenges such as high initial costs, limited charging infrastructure, and range anxiety remain, improvements in battery technology and expanding charging networks are helping to increase adoption. As consumers become more environmentally conscious and automakers

continue to innovate, the demand for EVs is expected to grow, shaping the future of sustainable transportation.

REFERENCES

1. . Ashraf Javid, M., Ali, N., Abdullah, M., Campisi, T., & Shah, S. A. H. (2021). Travelers' adoption behavior towards electric vehicles in Lahore, Pakistan: an extension of norm activation model (NAM) theory. *Journal of Advanced Transportation*, 1–14.
2. Augenstein K (2015) Analysing the potential for sustainable e-mobility–The case of Germany. *Environ InnovSoc Trans* 14:101–115
3. Augurio A, Castaldi L, Addeo F, Mazzoni C, Matarazzo O (2022) Purchase intention in the Italian e-mobility market. *J Clean Prod* 373:133815

ANALYSING THE SOCIO - ECONOMIC CONDITIONS OF MASON WORKERS IN SPIC NAGAR OF THOOTHUKUDI DISTRICT

M. Anusiya* and Dr. G. Sumathi

PG Department of Economics, St. Mary's College (Autonomous), Thoothukudi.
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

Construction workers are the foundation of the nation since they build the infrastructure required for a nation's development. Construction workers construct or repair homes, roads and infrastructure. They engage in strenuous physical labour and frequently work outside in a variety of weather situations. They construct the homes, the streets, bridges, highway, the rivers, dams, shopping centers and parks; etc. By building smart cities, IT centers, complexes, metros, telephony and other infrastructure in the domain of innovation, they are the ones that establish new economic regions. The builders of the economy are often known as construction workers. In fact, majority of people depend on this industry for employment and income. It is important to note that this an unorganized sector which is the basis for economic development. The workers engaged in construction works are socially and economically backward and so that they are unable to organize themselves in pursuit of their common interest. Generally, construction workers face financial problems, health problems, diseases, mishaps and even loss of life. Moreover, lack of social welfare measures and social security and medical benefits affect the construction workers.

Keywords:

Construction sector, Mason workers, Infrastructure, Practitioners, Interlocking bricks, Stone blocks

CHAPTER-I

INTRODUCTION

Mason workers play a crucial role in the construction industry by building houses, roads, and other infrastructure. However, their socio-economic conditions often remain challenging. This project aims to study the living standards, income levels, working conditions, and social challenges faced by mason workers. Many mason

workers earn daily wages and do not have job security, making their financial situation unstable. They often lack access to health care, education, and social benefits. Harsh working conditions, long hours, and exposure to dust and chemicals also affect their health.

Construction activity is an integral part of a country's infrastructure and industrial development; it includes hospitals, schools, townships, offices, houses, and other buildings, urban infrastructure (including water supply sewerage, drainage) highways, roads, ports, railways, airports, power system, irrigation and agriculture systems, telecommunications etc. The construction becomes the basic input for socio-economic development of country.

Mason work in construction

Mason work, or masonry, is a construction trade that entails building structures out of component parts made of various materials, such as brick or stone. Practitioners of masonry, known as masons, are manual labourers who lay these components together and usually bind them with a substance such as mortar, a paste made with a mixture of cement, lime, sand and water that hardens when dried. Masonry involves skilled labor, as most forms of mason work involve laying individual components in precise arrangements and are thus resistant to mechanization.

Masonry

Masonry is the craft of building a structure with brick, stone, or similar material, including mortar plastering which are often laid in, bound, and pasted together by mortar. The term masonry can also refer to the building units (stone, brick, etc.) themselves.

The common materials of masonry construction are bricks and building stone, rocks such as marble, granite, and limestone, cast stone, concrete blocks, glass blocks, and adobe. Masonry is generally a highly durable form of construction. However, the materials used, the quality of the mortar and workmanship, and the pattern in which the units are assembled can substantially affect the durability of the overall masonry construction.

Limitation of the study

On the basis of the data collection from the respondent, income and expenditure pattern will be studied. The scope of study will be related to the Spic Nagar. Some variables such as Income, Expenditure, Saving and Investment will be calculated from the average number of working days. Since the job is irregular, accordingly the given figure may not denote the exact figure.

Objectives of the study

- To analyze the working conditions of the sample respondents.
- To analyze the skills and techniques used in masonry work.
- To find out the challenges faced by the mason workers.

REVIEW OF LITERATURE

- ❖ **Seenivasan (2023)** investigated women construction workers in Tamil Nadu, identifying issues like gender discrimination, low wages, and lack of social security, calling for governmental intervention
- ❖ **Hariharan (2024)** focused on migrant brick-kiln workers in Tamil Nadu, revealing poor wages, inadequate medical facilities, and the necessity for policy interventions to improve their socio-economic status.

METHODOLOGY

Research Design:

Descriptive research design is being adapted in this study. In the proposed research work, nature of study requires both the quantitative and qualitative data collection techniques. The proposed study focuses on comprehensive study of primary data which will be collected through surveys, interviews and observation. The necessary primary data will be collected from 120 respondents. And secondary data also used in this study like books, journals, articles, website etc.

Area of Study:

Spic Nagar - Thoothukudi district

Sample Size: Totally 120 respondents were selected in the study area.

Types of sampling: Simple random sampling is adapted for this study.

Scope of the Study: This includes identifying the specific tasks that need to be completed, such as bricklaying, stone veneer installation, or concrete block construction. Additionally, outline any materials or equipment that will be required for

the project. Examples of milestones could include completing the foundation, finishing the exterior walls, or installing the chimney.

Need for the study: Masonry is non-combustible, so improves fire protection for the building and its occupants. Fireplaces are commonly made of masonry for the same reason. Masonry offers a high resistance against rotting, pests, weather, and natural disasters such as hurricanes and tornadoes.

Tools of analysis:

The researcher used by table, Pie chart, Bar diagram.

Table 1

Types of Mason workers

S. No	Types of Masons	No. of the Respondent	Percentage
1	Cement Mason	21	18
2	Brick Mason	20	17
3	Tile Mason	26	22
4	Stone Mason	19	16
5	Chithal (helpers)	34	29
	Total	120	100

Source: Primary Data

This table shows that types of workers among the 120 respondents. 18 % of the respondents worked as a Cement Mason, 17% of the respondents worked as a Brick Mason, 22% of the respondents worked as a Tile Mason, 16% of the respondents worked as a Stone Mason , 29% of the respondents as a Chithal (helpers) respectively.

FIGURE 1

TYPES OF WORK

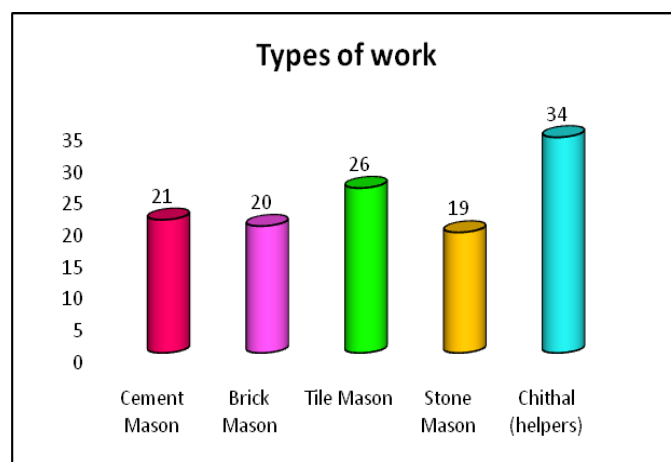


Table 2
Monthly Income of the Respondent

S. No	Income	No. of the Respondent	Percentage
1	Below 20000	15	13
2	20000- 25000	52	43
3	25000-30000	46	38
4	30000 above	7	6
	Total	120	100

Source: Primary Data

Above the table shows that monthly income of the respondents. Out of 120 respondents 13% of the respondents monthly income is below 20000, 43% of the respondents are 20000-25000, 38% of the respondents 25000-30000 and 6% of the respondents are more than 30000 respectively.

FIGURE 2
INCOME OF THE RESPONDENT

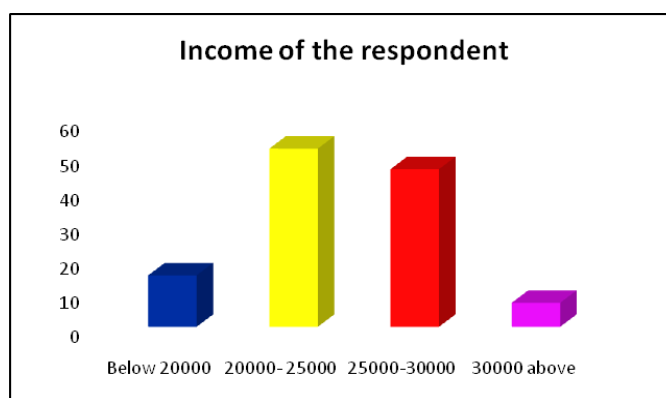


Table 3
Monthly Expenditure of the Respondent

S. No	Expenditure	No. of the Respondent	Percentage
1	Below ₹10000	72	60%
2	₹10000-₹15000	38	32%
3	₹15000-₹20000	7	6%
4	Above ₹20000	3	2%
	Total	120	100

Source: Primary Data

This table shows that monthly expenditure of the respondents.60% of the respondents monthly expenditure is below 20000, 32% of the respondents monthly expenditure between 10000 -15000 and 6% of the respondents monthly expenditure between 15000-20000. 2% of the respondents monthly expenditure less than 20000 per month respectively.

FIGURE 3

MONTHLY EXPENDITURE OF THE RESPONDENT

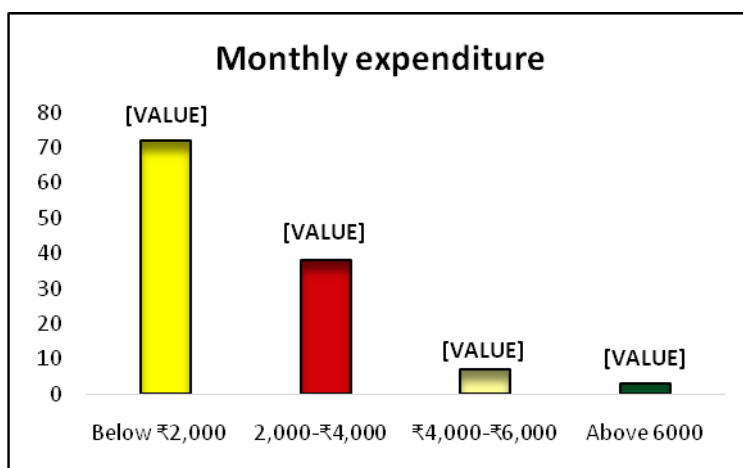


Table 4

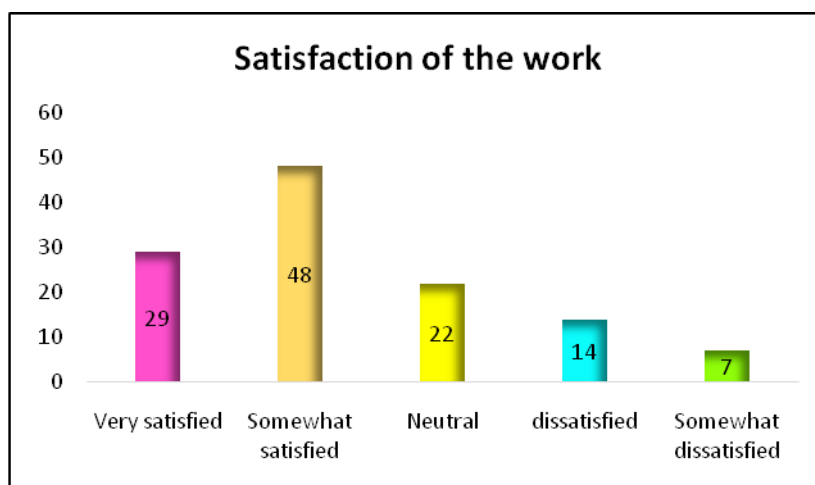
Satisfaction of the Work

S. No	Satisfaction of the Work	No of respondents	Percentage
1	Very satisfied	29	24
2	Somewhat satisfied	48	40
3	Neutral	22	18
4	Dissatisfied	14	12
5	Somewhat dissatisfied	7	6
	Total	120	100

Source: Primary Data

Above table shows that worker's satisfaction with their job. 24% of the respondents feel very satisfied, 40% of the respondents feel somewhat satisfied, meanwhile 24% of the respondents feel neutral, 12% of the respondents feel dissatisfied and 6% of the respondents feel Somewhat dissatisfied respectively.

FIGURE 4
SATISFACTION OF THE WORK



CO-EFFICIENT CORRELATION:

To find out the relationship between Income and Expenditure of the respondents. The researcher is using the statistical tool of Co-efficient Correlation. The calculation the following formula is used Pearson's Correlation Formula,

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

$$r = -0.094$$

RESULTS

There is a negative correlation.

HYPOTHESIS RESEARCHER HAS LAID DOWN THE FOLLOWING HYPOTHESIS:

- That there is a direct relationship between income and Expenditure.
- That the socio-economic condition of mason labours is not good.
- In light of above discussion and present scenario of labours in the mason work, the researcher has selected this topic for the purpose of this research.

FINDINGS, SUGGESTIONS AND CONCLUSION

- ❖ Maximum 34% of the respondents are working Cement Mason.

- ❖ Majority 43% of the respondents getting good salary becoming a mason worker.
- ❖ 60% of the respondents monthly expenditure is below 20000 per month.
- ❖ 84% of the respondents accept their construction provide refreshment during working hours.
- ❖ Maximum 24% of the respondents feel very satisfied about their job.

SUGGESTIONS

- Role of Employers & Contractors employers should take responsibility for fair treatment, timely payments, and better work conditions.
- Health & Safety Measures ensure proper safety equipment, medical insurance, and better working conditions.
- Access to Social Security provide benefits like pensions, accident insurance, and provident funds.
- Improved work environment regulates working hours, prevent exploitation, and ensure hygienic conditions at worksites.

CONCLUSION

The socio-economic status of the workers showed that they were poor. They are dailywage earners and maintain their family with small income with difficulty. It was noted thatmost of them were literate. They were addicted to alcohol, smoking bidi, cigarette. Theydid not consume adequate amount of nutritious food. In most of the cases it was found thatthey lived in kacha houses. A good proportion of workers cook their food in the sameroom in which they leave. They used wood for cooking their food. The source of drinkingand cooking water was public tube wells or taps. Latrine facility was available in mostcases. Their monthly income was less due to which they had to borrow from relatives orneighbors for fulfillment of their needs. They were not aware of the different social securityschemes.

BIBLIOGRAPHY

- 1.Yadav, S., &Yadav, R. (2013). Socio-economic status of unorganized construction workers: A case study in Rajasthan. International Journal of Social Sciences and Humanities Research, 2(3), 45-53.
2. Kumar, A., & Mishra, S. (2017). Economic conditions and work-life challenges of migrant construction workers in India. International Journal of Business and Economic Research, 5(2), 88-96.

3. Sharma, P., & Singh, K. (2018). Wage disparities and living conditions of brick kiln and construction workers. *Journal of Labour Economics*, 7(1), 102-118.
4. Patel, M., & Mehta, D. (2015). Social security and welfare measures for construction workers in Gujarat. *Economic and Political Weekly*, 50(5), 28-35.

The Silenced Voices of Afghan Women in Khaled

Hosseini's *A Thousand Splendid Suns*

Antony Snowba B.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

Khaled Hosseini, the first American writer of Afghan descent has made a name for himself by showing the human side of Afghanistan and re-establishing a personal connection with the country. The research examines the silenced voices of Afghan women in Khaled Hosseini's novel, *A Thousand Splendid Suns*. This research examines the experiences of Mariam and Laila, the novel's protagonists, whose stories serve as a microcosm for the broader struggles of Afghan women. It argues that Hosseini's work gives voice to the voiceless, highlighting Afghan women's resilience, agency, and resistance in the face of unimaginable adversity. The research explores the intersectionality's of gender, culture, and power in Afghan society, contributing to a deeper understanding of the complexities of women's lives in Afghanistan. It aims to shed light on the struggles and triumphs of Afghan women, promoting empathy, understanding, and social change.

Keywords: gender, trauma, resistance, identity, power.

Afghan literature refers to the literature produced in the Islami Emirate of Afghanistan influenced by central and South Asian literature. It is predominantly written in two native and official languages of Afghanistan, Dari and Pashto. Some regional languages such as Uzbek, Turkmen, Balochi, and Pashayi also appear in Afghan literature. While Afghanistan is a multilingual country, these languages are generally used as oral compositions and written texts by the Afghan writers and in Afghan curriculum. This literature is highly influenced by Persian and Arabic literature in addition to Central and South Asia. Khaled Hosseini, the first American writer of Afghan descent has made a name for himself by showing the human side of Afghanistan and reestablishing a personal connection with the country.

Khaled Hosseini's *A Thousand Splendid Suns* is a significant narrative which brings to fore the predicament of Afghan women who have lived under the debilitating shadows of patriarchal oppression and war. This research paper attempts to argue, in the

light of Hosseini's novel, how the patriarchy and persistent conditions of conflict have multiplied the oppression of women in Afghanistan. It is a fallacy which has become a recurrence when it comes to any academic or non-academic discussion about Afghanistan.

Afghan women are not a homogenous category in any way. There are various intersections like the class, ethnicity, regional belonging, or historical situation which the Afghan men and women tread like their counterparts in any other part of the world. This study focuses on how the unique historical circumstances, in the form of conflicts and wars that Afghanistan has now been coping with for almost half a century, have brought agonizing experiences for its women.

The women in the novel *A Thousand Splendid Suns* genuinely appear as suffering beings. The prolonged conditions of the conflict in Afghanistan have taken a heavy toll on human life and brought enormous sufferings and devastation for the country. In any conflict children and women, are always the worst sufferers because of their vulnerable positions in the society. As Chandra Talpade Mohanty argues, "Women have never been secure within (or without) the nation state-they are always disproportionately affected by war, forced migration, famine, and other forms of social, political, and economic turmoil" (514).

Afghanistan society, where patriarchal customs come into view as hard and rigid as its landscape, one is only left to wonder about the conditions of women when these customs are further entrenched by a prolonged conflict. It appears from the narrative of Hosseini's novel that women in Afghanistan have been victims both of patriarchy and the brutal situation of conflict that has now ravaged Afghanistan for the duration of almost half a century. In the novel, this is reflected in the words of Babi who despondently observes:

Babi said, women who were studying law, medicine, engineering. *Women have always had it hard in this country, Laila, but they're probably more free now, under the communists, and have more rights than they've ever had before,* Babi said, always lowering his voice, aware of how intolerant Mummy was of even remotely positive talk of the communists. (133)

The term "Patriarchy" has been defined as a word which refers to those systems

political, material and imaginative which invest power in men and marginalize women. The patriarchal society enforces ‘the ideal womanhood’ concept on women which has to be attained in any condition or circumstance. As reflected in the novel, in the Afghan society, it is the women who have to cultivate these ideals laid down by the patriarchy. The patriarchal society sees to it that women become the perfect accomplishments of these ideals. This concept becomes a major instrument of oppression on women.

Jayawerdana and de-Alwis underscore how the regulation of female sexuality, particularly through the lens of female modesty is a central, unifying feature across South Asian societies. Despite the diversity of religious, cultural, and social identities in the region ranging from Muslim, Christian, Hindu, and Buddhist communities, the fundamental principle of regulating women’s sexual behaviour and maintaining their modesty transcends these differences. It argues that the sexual and moral codes imposed on women are deeply embedded in a range of patriarchal institutions such as the state, law, religious frameworks, schools, and families that shape and enforce these norms. These institutions, whether secular or religious, act as instruments of social control, using prescribed codes of conduct to maintain women’s modesty as a key marker of social order and morality. By pointing out the similarities across these diverse systems, Jayawerdana and de-Alwis suggest that, regardless of a particular religious or cultural tradition, the overarching mechanism of controlling female sexuality remains largely the same. It reflects a broader, hegemonic patriarchal structure that consistently reinforces traditional gender roles, where women's sexual behaviour and modesty are tightly regulated to ensure conformity to societal norms.

The irony highlight is that despite the profound differences between various communities in South Asia, this shared emphasis on female modesty as a moral and social expectation becomes a unifying factor across these different groups. This speaks to the deeply entrenched patriarchy in South Asian societies, where the regulation of female sexuality is not only a private or familial matter but also a social, legal, and religious concern, actively maintained by institutions at all levels of society.

In the name of honour and ideal womanhood, it appears that the sexual predation and the brutalization of women are widespread in the Afghan society. In the novel, *A Thousand Splendid Suns*, Mariam, the protagonist cannot withstand her defiance. She has to bow down before the rigid customs of her society as she is

reluctantly dragged into marrying Rasheed. At the Nikka ceremony, the Mullah, without acknowledging Mariam's consent, remarks,

All that remains now is the signing of the contract," the mullah said. Mariam signed her name- the *meem*, the *reh*, the *ya*, and the *meem* again- conscious of all the eyes on her hand. The next time Mariam signed her name to a document, twenty-seven years later, a mullah would again be present.

"You are now husband and wife," the mullah said. Tabreek. Congratulation. (53-4)

Rasheed, husband of Mariam is apprehensive about the undercurrent sexual predation in the society which ironically prescribes moral codes for its women. Notwithstanding the seemingly 'sophisticated' culture of Kabul, of which he often brags about, he tells Mariam in strict terms to wear burqa and avoid strangers, even their family friends and guests. Mariam is not used to wearing burqa and finds it very suffocating. To quote:

Mariam had never before worn a burqa. Rasheed had to help her put it on. The padded headpiece felt tight and heavy on her skull, and it was strange seeing the world through a mesh screen . . . "You'll get used to it," Rasheed said. "With time, I bet you'll even like it". (71)

Rasheed gives similar dictates to his second wife Laila. In giving strict dictates to his wives, he falsely pretends to protect their "honour" and "integrity" while indulging in limitless cruelty of abusing and beating them regularly. After Mariam rightfully protests against his second marriage, Rasheed openly boasts of the practice of polygamy prevalent in the society when he tells her,

Don't be so dramatic. It's a common thing and you know it. I have friends who have two, three, four wives. Your own father had three. Besides, what I'm doing now most men I know would have done long ago. You know it's true.
"I won't allow it."

At this, Rasheed smiled sadly. (208-9)

Rasheed is averse to the idea of his wife meeting strangers. His hypocrisy is revealed when Mariam finds nude magazines lying hidden in his closet. At this, Mariam wonders about the existing double standards prevalent in the society. It is only the women who commit wrong and men simply cannot be wrong in this society. She learns it from her own experience as well as from her mother's life. After Jalil's illicit relationship with Nana which results in the birth of Mariam, Jalil blames Nana and disowns her because his honour in the society would be harmed. On this, Nana tells Mariam:

You know what he told his wives by way of defence? That I forced myself on him. That it was my fault. Didi? You see? This is what it means to be a woman in this world . . . Learn this now and learn it well, my daughter: Like a compass needle that points north, a man's accusing finger always finds a woman. Always. You remember that, Mariam. (7)

The case of Naghma, whom Mariam meets in the Taliban prison. She was lured into elopement by a Mullah's son, but after the Taliban's arrest them and put them to trial, the man testifies against Naghma blaming her for seduction. Leaving aside all the norms of justice, the Taliban's take his account to be true and set him free while sending Naghma to prison for five years. All this serves to reinforce the dubious and hollow nature of codes of honour formulated by the male society in Afghanistan for its women. In the dominant patriarchal setting, women also seem to be internalizing the essentialist patriarchal customs which traps them further in the web of marginalisation.

In *A Thousand Splendid Suns* women appear to share their part in the male hegemony. They internalise and essentialise views of the differences in human beings as embedded in the patriarchy dominated culture. Nana's various utterances seem to underlie this essentialist view. She tells Mariam, "It's our lot in life, Mariam. Women like us. We endure. It's all we have. Do you understand?" (18). Mariam herself reflects grimly, "As a reminder of how women like us suffer, how quietly we endure all that falls upon us" (90). In the beginning of the novel, Mariam expresses a great urge to go to school. She informs his friend and mentor, the elderly Mullah Faizullah, who gives his consent. But her mother Nana sees no purpose of education. She rebukes Mariam for even thinking about education and argues:

What is there to learn?... What's the sense schooling a girl like you? It's like shining a spittoon. And you'll learn nothing of value in those schools. There is only one, only one skill a woman like you and me needs in life, and they don't teach it in school. Look at me... only one skill. And it's this: tahamul. Endure. (18)

Mariam refuses to marry the forty-year-old Rasheed by saying "I don't want this. Don't make me this", Jalil's wives, in ironical terms, tell her to act rationally by accepting the marriage: "Now, be reasonable, Mariam. You can't spend the rest of your life here. Don't you want a family of your own? You have to move on" (47). This seems reflective of the set space and roles assigned to women in the patriarchal order. The prolonged era of conflict and violence in Afghanistan seems to have aggravated the gender inequality and women's subordination because the conflict is rooted in structures which are exclusively defined by males.

Gender is central to the construction of national, ethnic and religious identities, women's behaviour is perceived as a "cultural marker" of "their" communities. After the fall of Communists in Afghanistan, the Jihadi warlords, and later, the Taliban, articulated identities which were highly masculinized in which women suffered immense oppression. The Talibans, in particular, patronized patriarchal practice as a marker of national culture. They imposed harsh norms of female propriety. As a result, acts of violence were committed against women who were seen as not complying with this norm of female modesty. Since the Talibans carried out these activities at the official level, an environment was fomented in which violence on women spread across the whole society. During the long phases of violence and lawlessness in Afghanistan, when it was grappling with the violent struggle against the Soviets, followed by a civil war among the different Jihadi and Ethnic warlords, and lastly, the surge of Talibans, there was a sharp increase in the acts of violence in which women were subjected to rapes, kidnappings, and other acts of physical assault. Elaborating on the pathetic situations of Afghan women during this violent period in Afghanistan's history, in his postscript to the novel, Khaled Hosseini himself recalls, "Women were abducted and sold as slaves, forced into marriage to militia commanders, forced into prostitution, and raped, a crime particularly heinous and unforgivable that was used to intimidate families who were opposed to one faction or another" (411).

Manchanda points out, that cultural violence against women gets magnified as conflict promotes macho values which legitimize misogyny because of the demobilization of male combatants in large numbers and also, men try to compensate for their loss of power by exercising greater control over women. During the intense battles in Kabul which forces the closure of all businesses in the city, Rasheed is rendered jobless forcing him to stay passive at home. His frustration grows more and more, and it bears in his ever-increasing physical assaults on Mariam and Laila. The two women are just scared by his extended presence at home. The violent Taliban regime misinterpreted religious dictums to further strengthen the oppressive practices on women.

Women in Afghanistan suffered a lot during the Taliban rule. As described in the novel, *A Thousand Splendid Suns* the Talibans frequently carry out executions, flogging and stoning of women who are accused of defying their strict orders. Mariam become a victim to the Taliban's torture. Laila is also beaten many a time for venturing out without a male companion. During Mariam's trial, a young Taliban judge tells her: "I wonder," the young Talib said. "God has made us differently, you women and us men. Our brains are different. You are not able to think we can... This is why we require only one male witness but two female ones". (355)

The Talibans claim sarcastically, that they are doing all this for the sake of God. They are simply unfazed about the inhuman treatment they mete out to the women of Afghanistan. In some instances, it was a pre-existing feature of the Afghan society well before the takeover of Taliban. In the postscript to the novel, Hosseini writes, Life was a struggle for some women in Afghanistan well before the arrival of Talibans. But it became all but unbearable with the outbreak of factional war, anarchy and extremism. In conflict zones, it has been often found that violence on the bodies of women serves as a tool of political repression. Such acts of physical coercion are motivated by an idea of keeping a woman in complete confinement and submission.

Rasheed callously treats Mariam and Laila at home while the Talibans do the same to them outside it. Rasheed welcomes Talibans and is in all praise for their strict codes because his own patriarchal authority gets reinforced through their rigid dictums. To authenticate his own patriarchal hegemony, he defends Taliban's strict codes and laws for women, and sees nothing wrong in them.

The research highlights the fact that prolonged conditions of conflict in



Afghanistan have brought adverse impacts on its women by exacerbating the patriarchal oppression on them. As a result, they had to undergo relentless pain and suffering which, in Hosseini's own words, has been matched by a very few groups in recent world history. This pain and suffering were cast in their voicelessness. Through his narrative, Hosseini endeavours to provide a voice to the Afghan women by bringing their sufferings to the fore.

Works Cited

Hosseini, Khaled. *A Thousand Splendid Suns*. Bloomsbury books, 2013.

Jayawerdena, Kumari and Malathi de Alwis. Eds. Introduction. *Embodied Violence: Communalising Women's Sexuality in South Asia*. Kali for Women, 1996.

Manchanda, Rita. *Women, War and Peace in South Asia*. Sage Publications, 2001.

Mohanty, Chandra Talpade. "Under Western Eyes: Feminist Scholarship and Colonial Discourses." *Feminism without Borders: Decolonizing Theory, Practicing Solidarity*. Zubaan Publications, 2003.

ERASED AND DISPLACED IDENTITIES IN S.J WATSON'S***BEFORE I GO TO SLEEP*****Arockia Jessy Sephin S.**

PG and Research Department of English, St Mary's College (Autonomous), Thoothukudi.

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Watson's *Before I Go to Sleep* is a psychological thriller that examines the theme of erased and displaced identities, primarily through its protagonist, Christine. Due to anterograde amnesia, she wakes up each day with no recollection of her past, making her sense of identity unstable and vulnerable to external influence. She is trapped in a cycle of forgetting and relearning, forced to reconstruct herself based on the fragmented memories she gathers. The theme of identity displacement is central to the novel, as she is not only erased from her own past but also assigned a false identity. This paper explores the erasure of Christine's identity due to amnesia and Mike's deliberate displacement of her real identity with a false one. Her eventual resistance and effort to reconstruct her true self by analysing these aspects, this paper highlights how *Before I Go to Sleep* represents identity as something both fragile and resilient, capable of being erased but also reclaimed through persistence and self-awareness.

Keywords: Anterograde amnesia, identity, displacement, reconstruction.

Identity is an essential part of human existence, shaped by experiences, memories, and personal relationships. It gives individuals a sense of self-continuity, allowing them to understand who they are in relation to their past and present. S.J. Watson's *Before I Go to Sleep* presents an unsettling answer to these questions. Christine, the novel's protagonist, suffers from a severe form of amnesia that erases her memories each night, leaving her waking up every morning without any knowledge of her past. This condition renders her identity unstable, as she is unable to maintain a coherent sense of self over time. As a result, she must rely on others to tell her who she is, making her highly susceptible to deception. This makes her a prime target for manipulation and identity displacement. Her supposed husband, Mike, fabricates a false version of Christine's identity, controlling the information she receives. By doing so, he ensures that she remains trapped in a carefully constructed illusion, unable to challenge the narrative he imposes on her.

The novel's central conflict revolves around Christine's attempt to reclaim her lost identity, uncover the truth, and break free from the cycle of deception. This paper explores the theme of erased and displaced identities in the novel, focusing on three key elements — the erasure of Christine's identity due to memory loss, the displacement of her true self by an imposed, fabricated identity, her eventual resistance and effort to reconstruct her past and reclaim her autonomy. Through this analysis, *Before I Go to Sleep* offers a chilling examination of identity as something that can be stolen, reshaped, and ultimately reclaimed.

S. J. Watson, the author of the award-winning novel *Before I Go to Sleep*, takes the memory out of Christine's life to point out how an individual would be without remembering. Besides losing memories, an individual loses their independence, self-control and even their real families. It is underlined in the novel that having memory makes people independent; without memory, people do not have identity and life, and they have no control over themselves; lastly, without memory, people have no goals and no meaning in life. The story emphasises that remembering and having a memory is gaining independence.

Christine suffers from amnesia and she endeavours to reconstruct her identity by recording a journal of her memories. As a literary device, amnesia can blur time and memory, thereby expanding the scope of the unreliable narrator. Christine cannot reconcile who she was before the accident and who she is now because of her amnesia, which forces her to redefine who she is all the time. While exploring memory and identity, the story aids individuals in understanding themselves, as Christine does. She begins questioning her sanity as she wonders about her memories and their reasons.

People with anterograde amnesia suffer from loss of personal identity, which causes problems about self and authentic identity, and it is seen in the novel *Before I Go to Sleep*. As a storytelling device, it is technically anterograde amnesia that permits the creation of new memories but erases the previous ones every night. Amnesia is also a highly valued plot device used in literature worldwide, and it is a fiction novel of postmodern sensibility. As Melley suggests:

Narratives about amnesia seem to reflect the postmodern condition: the fragmentation of the self into parts not available to consciousness or memory; the inability to distinguish between authentic memories and

simulations; and the difficulty of finding sound correspondences between past events and narratives that purport to describe those events. (107)

This is what Christine experiences. She has some moments as records, but they all must be justified. The reader tries to combine the pieces to understand the whole story and experiences the same hesitation until the end. Christine and the reader have to rely on individual memory as a record, but it is not easy to believe in it.

As a plot device, amnesia disrupts the story's linear progression and the lives of its characters. Memory loss and its fractured nature aligns with postmodern trends, challenging established hierarchies. However, it is essential to note that amnesia fiction is not always postmodern. Amnesia is a flexible literary device that can be used outside of postmodern literature in various genres. A piece of art does not automatically become postmodern simply because it employs amnesia; rather, it depends on how the theme is investigated, dissected, or incorporated into the larger story and thematic concerns of the piece.

The novel *Before I Go to Sleep* presents postmodern elements such as fragmentation, deconstruction, identity constructed by society and hyper-reality. The story includes fragmented narratives because amnesia disrupts the linear flow of Christine's life and memories. Besides, as in other postmodern works, the novel emphasises that the protagonist, Christine, must rebuild her identity with the help of other people around her since she does not know herself. As the society itself, they have the opportunity to shape her identity.

Christine's amnesiac situation contributes to the deconstruction of her narration. Also, the novel explores the reconstruction of the realities of Christine's past and her life. As is seen in postmodern stories, amnesia creates the opportunity for unexpected story turns that blur the realities even at the end of the story. Watson succeeds in making this effect in the story because, in the end, the reader questions Christine's happy ending, which can be an invented story for her. The surprising endings or mysterious events are not the only reasons that attract attention.

Saliba Salman states that “amnesia has a de-centring drive and can shift emphasis to the social periphery” (2). When someone loses their identity, they must be reshaped and reconstructed by society and other external forces. It is the same for both personal identity and national identity. The novel that is the subject of this study deals with personal identity, and it highlights that amnesia is a weakness because remembering gives people the power to shape and save their identity. As Bartkevicius claims, since we live in an age of information (222), forgetfulness is a sign of weakness, and it is seen as vulnerability and remembering is to overcome death and grief.

However, it is also possible to see amnesia as a gift in other literature, especially when the characters have deep griefs and traumas hidden in their past. According to this, the characters who can overcome amnesia in the end prove themselves, and amnesia contributes to their character development. After regaining their identity, they become aware of what they have and who they are. In this way, they may be grateful for their life.

As cited by Tougaw, “memory and identity are entangled with each other” (3). Watson reveals it in his novel by creating an amnesiac character who has no memories and does not know who she is. Memory is the most crucial factor that constructs the most significant part of the identity. Judgements, decisions, behaviours, and thoughts are all related to identity. As a literary device, amnesia can create tension and transform a story into a quest. The amnesic character queries, questions, and assesses evidence to regain their sense of self. A person experiences changes because of a lost identity, including the chance to reflect on and evaluate their previous life. Buñuel, a famous filmmaker famous for his films about his patients, claims that:

You have to begin to lose your memory if only in bits and pieces, to realise that memory is what makes our lives. Life without memory is no life at all . . . Our memory is our coherence, our reason, our feeling, even our action. Without it, we are nothing.... (4)

The novel *Before I Go to Sleep* supports his claim, which exemplifies and offers a detailed exploration of elements of identity such as age, gender, physical attributes, personality, beliefs, and profession that remain when memory is lost. A new world is built around the amnesiac people. It tells the story of a woman who loses her identity and tries to rebuild it with the help of a partner, a doctor, and a journal she records daily. All

of them are constructed by others. Christine, wakes up with no memories every day, and what she records in her journal starts with what the man who claims to be her husband tells her, and she is called by her doctor every day to remind her she's keeping a journal and tells her where she can find it.

People with amnesia have to rely on others to construct their identity. In this novel, Christine has two different identities. One is built by the man who claims to be her husband, Ben. He is the man with whom she cheated on her real husband and then tried to break up. Because of her amnesia, she is not aware of this fact. On the other hand, Dr Nesh wants her to remember everything and gain independence by recording her memories and feelings.

According to the identity her partner tries to construct, Christine is a woman who lives happily with her husband, Ben. He is passionate and caring towards her. Before the car accident, she was working as a secretary, and years after the accident, her son, whom she does not remember now, was killed in the war in Afghanistan. After she lost her memory, her best friend moved to New Zealand, so she has no friends. A lot of evidence and photographs of her past were destroyed in a fire in the house they used to live in. When she asks why she has not seen a doctor, her husband tells her that they have tried everything, but her condition will not improve. Thus, this man is the only person in her life and, therefore, the only source of information about her past.

According to the second identity she is reconstructing by recording a journal, Christine is an amnesiac who strives to rebuild her identity with the help of the man who claims to be her husband. This man is not her husband, but her ex-boyfriend with whom she has cheated on her husband, and this man attacked her and caused amnesia when she wanted to break up. Thanks to Christine's diary, she regains her memory and learns that she is a novelist. She was writing her second novel just before the attack. She also knows she has a son who lives in another city due to his job. As she is told, she is not alone. She has a very close friend who lives in the same town. This friend reveals that the man she lives with is not her husband, Ben. She has been deceived.

The other critical point that is highlighted in the novel is amnesiac people's paranoia and anxiety. Not being aware of the reality of their own identity and the life they had before causes paranoia. At the novel's beginning, Christine and the reader know that she is a married woman who spends her time at home with no responsibilities

or duties. Christine says she lives as animals do: “...an animal. Living from moment to moment, day to day, trying to make sense of the world” (316). As Christine assembles her facts, readers can relate to her confused and uncertain point of view. The reader experiences the same anxiety and paranoia as the narrator does. When memory cannot be linked to present and future life, it is no different from brain death. “It’s not life, it’s just an existence, jumping from one moment to the next with no idea of the past and no plan for the future. its how I imagine animals must be.” (116). Ross Poole argues that memory has a “role of transmitting responsibilities and commitments from the past” (263). He draws attention to a significant facet of memory’s role in human societies.

Memory is not only a storehouse of personal experiences but also of cultural norms, traditions, and societal values. Individuals inherit not only a legacy of events through the transmission of shared memories but also a set of obligations and commitments that shape their identities and direct their future actions. Christine has a deep and realistic feeling that people dealing with amnesia or memory loss frequently feel. In the face of uncertainty and disorientation, it elicits a sense of urgency, frustration, and a need for agency. “But for how long can I be a visitor in my own life? Passive? I need to take control.” (132).

A person suffering from amnesia may feel deeply detached and alienated from their own identity and experiences due to losing personal memories. With no clear storyline or sense of continuity, they could feel as if they are only guests or spectators in their own lives. This may cause them to feel helpless and want to take back control of who they are and where they wish to go in the future. It is a fundamental need for humans to have autonomy and self-determination. To regain their self-control, they long for their memories.

Meanwhile, the process of recovery is open to external intervention. Although amnesiacs can overcome amnesia and regain their memories, the data they have cannot be reliable because people are picky about what they remember. Wilson and Ross claim that “Individuals’ current self-views, beliefs, and goals influence their recollections and appraisals of former selves. In turn, people’s current self-views are influenced by what they remember about their pasts and how they recall earlier selves (137). People might ignore some of the details from their past or modify them through deliberate forgetting according to their present desires and thoughts. However, it might

cause significant differences between their past and present selves.

Identity is constructed with memory; every detail can be crucial to a real identity. Identity can be defined as a lifeline, and memories are the building blocks of identity, so identity is affected when some of these blocks are missing. The gap can be filled through external sources, which can be unreliable. Therefore, the continuity of the lifeline is enabled thanks to remembering everything. It is underlined that philosophers like John Locke and Paul Ricoeur argue that continuity is imperative for existence to have meaning. In most fiction, the individual searches for a lifetime. This ontological principle depends on sound memories of one's previous self and a steady sense of one's future development (286).

Amnesia breaks this continuity and the ties between the past and future; the individual cannot continue their life as if they were the same person. In amnesia fiction, it is tried to be proven that forgetting the past causes the loss of identity, so the characters with amnesia are always in search of their own identity. In *Before I Go to Sleep*, the reader discovers that Christine has a different life and person from Ben. Except her name, almost everything she was told was fake.

Christine's inability to form lasting memories makes her vulnerable to manipulations, and she must question the honesty of those around her. Christine learns about herself from others and external sources, making it possible to receive unreal information. Once an individual experiences amnesia, they become both vulnerable and sceptical because the memories relayed to them are not deemed anymore.

Christine occasionally recalls something abruptly and tries to connect it to what Ben has told her. However, the images in her mind and the stories told her are very different. There is not a coherence of her moments. When she shares these images with Ben, he fabricates a new story to bridge the gaps between her pictures and Ben's fake stories. Christine feels as if she is watching a movie, and she is watching her own life as an outsider. She feels confused. Neither the protagonist nor the reader is sure about the reality until the novel's end. However, even at the novel's end, the truth of their existence remains in question.

The reader is convinced to believe in it by being presented with official documents from the police and detective, her ex and husband and the photographs. Lastly, since Christine has memories only before she goes to sleep, she has one day to

build an identity and understand the situation. The novel aims to reveal that identity is a construction that requires a sound foundation of memory. Using amnesia as a tool, the author emphasises how life would be without memories.

Before I Go to Sleep presents identity as both fragile and powerful. Christine's amnesia shows how memory loss can erase selfhood, leaving her vulnerable to manipulation. However, her journey also demonstrates that identity, even when displaced, is not entirely lost. Through persistence, she reclaims her past and ultimately reclaims her true self. The novel's exploration of erased and displaced identities raises critical questions about how selfhood is formed, maintained, and manipulated. Watson's portrayal of Christine suggests that while identity can be taken away, it is also something that can be fought for and rebuilt, making it both a vulnerable and a resilient force.

Works Cited

- Melley, Timothy. "Postmodern Amnesia: Trauma and Forgetting in Tim O'Brien's *In the Lake of the Woods*." *Contemporary Literature*, vol. 44, no. 1, 2003, pp. 106-131.
- Poole, Ross. "Memory, Responsibility, and Identity." *Social Research*, vol. 75, no. 1, 2008, pp. 263–286.
- Saliba, Salman. "Memory Disorders and the Extension of the Postmodern Fictional Boundary: Paul Auster's *Man in the Dark*." *Captures*, vol. 4, no. 2, 2019.
- Tougaw, Jason. "Amnesia Narratives: Memory, Forgetting, and Identity." *European Journal of American Studies*, vol. 16, no. 4, 2021.
- Watson, S. J. *Before I Go to Sleep*. Penguin Random House, 2011.
- Wilson, Anne, and Michael Ross. "The Identity Function of Autobiographical Memory: Time Is on Our Side." *Memory*, vol. 11, no. 2, 2003, pp. 137–149.



**C.S. Lewis' *The Lion, The Witch, and the Wardrobe*: A Study of Good Versus Evil
through a Christian Allegory**

Aruna Alias Sangeetha. M

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

C.S. Lewis' Christian allegorical fiction, *The Lion, the Witch, and the Wardrobe*, is set in the legendary realm of Narnia and examines the issue of good vs evil. The White Witch's harsh authority, which represents evil, is contrasted in the book with Aslan's just and selfless leadership, which represents Christ. The victory of good over evil is mirrored in Narnia's transition from perpetual winter to a thriving spring. Lewis creates a story that appeals to both children and adults by incorporating moral and spiritual lessons into an exciting story through rich imagery, symbolism, and approachable prose. The novel's enduring influence as a literary masterpiece and a reflection of Christian doctrine is facilitated by its structure, omniscient narrator, and use of legendary elements.

Keywords: Christian allegory, fantasy literature, White Witch, Narnia, symbolism, imagery, redemption, omniscient narration.

The Lion, the Witch, and the Wardrobe by C.S. Lewis presents a Christian worldview through a mythic tale. It takes place in Narnia, a world of magic. In this world, virtually every fairy tale or mythic creature imaginable comes alive. But unlike other fantasy novels, such as the realm of *Harry Potter*, Narnia is another world, a separate creation from ours. In Narnia, what one would call "magic" is simply part of the created order. The mythic elements are used as a vehicle to tell a bigger story, not to promote falsehood in the real world. "This is no thaw," said the dwarf, suddenly stopping. "This is Spring." (122)

The novel *The Lion, the Witch and the Wardrobe* is a fantasy, largely because of the setting which goes back to medieval age. It depicts people who live close to the land, fight using bows and arrows and swords, and are ruled by kings and queens who live in palaces. Mythical creatures populate it, not only the stock characters of today's fantasy world like

centaurs and dwarves, but more mythological characters too, like minotaur's and dryads. Interestingly, Narnia has no human population, but prophecy states that it needs to be ruled by four human beings, two male and two female two “sons of Adam” and two “daughters of Eve,” as the characters constantly remind.

Lewis had a love for mythology and imaginary tales from his youngest days. He wrote stories about a mouse world in which adults were the threatening forces of discipline; his elaborate construction of these alternative worlds gave him a sense of "momentous joy," one that he associated with the grand fantasias of Wagner and Teutonic legend. Later as an Oxford don and an atheist, he was still dabbling in his beloved myths and legends when his colleague J.R.R. Tolkien encouraged him to see the world's “mythical” aspects as Christian in origin. When C.S. Lewis was sixteen, he had a strange vision. It wasn't a spiritual vision or a great artistic vision or some kind of prophecy. It was just a mental picture - a picture of a Faun, a mythical half-man half-goat, carrying an armload of packages and sheltering himself with an umbrella as he walked through a snowy wood. This strange but innocent image would stay with Lewis for decades until his chance encounter with some children who had been evacuated from London during World War II.

Lewis was interested in the evacuees and what it might be like for children to be uprooted from their homes and sent into a strange, unknown world. Moreover, he himself had been sent away to several boarding schools as a child and an adolescent, and his memories of them were unpleasant.

“The Chronicles of Narnia”, though an imaginative story has some historic background. In 1940, Hitler turned his attention to London and its nine million people to invade Britain. Part of Hitler's reason for attacking the city of London was to destroy business and commercial targets. But Hitler also wanted to destroy the morale, or spirit and hopefulness of the British people. On September 7, 1940, the first bombers arrived to drop “incendiary bombs” on the London docks. Incendiary bombs are bombs used to start fires. This was the start of the Blitz-lightning war. The Blitz fell upon all of London. Countless shops, offices, churches, factories, docks and homes were destroyed. Due to

these more than 800,000 schoolchildren were sent away from London during the War to live in safety in the countryside, along with more than 100,000 teachers and helpers and more than 500,000 children under school age, who left with their mothers. The Blitz is the reason the four Pevensie children were sent away from London. Their mother felt they would be safer in the country, away from the bombing of the city. Little did their mother know that the four children would leave one war behind, only to find themselves fighting in another kind of war altogether.

Four children named Peter, Susan, Edmund, and Lucy go to the country to live in the large, mysterious house of an old Professor during the London air raids. One rainy day, the children take the opportunity to explore the house, peeking into spare bedrooms and old passageways, until Lucy, the youngest, pauses to look into a large wardrobe sitting in an empty room. She crawls past the long fur coats and finds herself standing in the middle of a forest. It is night, and snow is falling, though in London it is summer. She walks toward an iron lamppost and, thinking it is strange to come to a lamp-post in the middle of a wood, is met by a very surprised faun.

This faun, confirming that Lucy is a human girl, or a “Daughter of Eve,” invites her for tea, snacks, stories, and music in his cozy little cave. She trusts the faun and follows him, staying with him for what seems like many hours. Suddenly, she exclaims that she must be getting back, and the faun, Mr. Tumnus, begins to cry. He explains that he is in the service of the evil White Witch, who has cast a spell over Narnia so that it is always winter, yet never Christmas. Narnia is the name of the world into which Lucy has stumbled, a world that stretches from the lamppost to the eastern sea. Mr. Tumnus, however, decides to save Lucy, and leads her quietly back to the lamppost. She flees through the wardrobe door, and, tumbling out, cries that she is alright. For her brothers and sisters, however, no time has passed since they had last seen her. Lucy excitedly shares with them the news about Narnia, but when they check inside the wardrobe, they find that it is quite ordinary.

The next rainy day, while the children play hide-and-seek, Lucy crawls back into the wardrobe. Edmund, seeing her disappear, follows her and finds himself standing in the middle of a wood on a winter day. He reaches the lamppost, calling out to Lucy, when a

sledge pulled by reindeer comes to a halt. A lady in white fur with a gold wand and a crown announces that she is the Queen of Narnia and asks Edmund who he is. When she realises that he is a human boy, or a “Son of Adam,” she invites him to sit with her in her sledge, and conjures for him a warm drink and, at his request, a box of Turkish Delights. As Edmund eats the Turkish Delights, she tells him to return with his brother and sisters to her house, which she points out between the two hills in the distance. She leaves him at the lamppost, still craving more Turkish Delights. Lucy finds him and is excited that he has made it through; together, they tumble out of the wardrobe, and Edmund tells Susan and Peter that they had been pretending to be in Narnia. Lucy runs away and cries, and Susan and Peter, worried that Lucy has gone mad, go to talk to the Professor. The Professor, to their surprise, asks them why they do not believe Lucy’s story, since logic suggests that she is telling the truth.

One day, the housekeeper gives the children strict instructions to keep out of the way while she leads a tour group through the house, which is quite famous. As the children are playing, they suddenly realise that they are about to run right into the group. All four rush into the empty room, and into the wardrobe. Within moments, they find themselves standing in the wood. Peter apologises to Lucy for not believing her, and Edmund gives away the fact that he had been lying about previously having been in Narnia, angering Peter. Lucy leads the group to Mr. Tumnus’s house, but when they arrive at his door, they find that he has been arrested. A red robin leads them to Mr. Beaver, who takes them home, where Mrs. Beaver has prepared dinner. Mr. Beaver explains that Mr. Tumnus has been arrested and has probably been turned into stone at the Witch’s house. In the meantime, he has received word that Aslan is near and that they are all to meet him the next day at the Stone Table. After some time, Lucy realises that Edmund has gone, and Mr. Beaver expresses his belief that he has gone to the White Witch. They hurriedly prepare for the journey to the Stone Table and spend the night in an old hiding-place, waking in the morning to the sound of bells. Father Christmas has come, a sign that the Witch’s spell is turning weak. He presents gifts to each of them, as well as a wonderful tray of tea.

Meanwhile, Edmund makes his way through the cold night to the Witch's house and discovers a courtyard of stone statues. He is let in and tells the Witch that his brother and sisters are at the Beavers' house, and that Aslan is coming. The Witch is astonished and sends her wolves after the Beavers and the children, ordering her sledge to be prepared. Edmund realises that he is to be given no more Turkish Delights and begins to feel that he has made a big mistake. He is ordered into the sledge next to the Witch, and after traveling through the cold, they come into view of a small party celebrating Christmas morning in the wood. The Witch turns them into stone; when Edmund tries to stop her, she slaps him. The coming spring has made it impossible for the sledge to continue any further, so they begin walking. Edmund's hands are tied tightly behind his back.

When the Beavers and Peter, Susan, and Lucy arrive at the Eastern Sea, where they find the Stone Table and Aslan, the great lion, Aslan asks where the fourth has gone, and Mr. Beaver explains that Edmund has betrayed them to the Witch. Peter is then shown the castle of Cair Paravel, where there are four thrones waiting to be filled. Suddenly, they hear cries. The Witch's wolves have arrived, and Peter, in a show of courage, kills the leader by striking him in the heart. In appreciation for this act of bravery, Aslan makes Peter a Knight.

Edmund, meanwhile, is exhausted from the walking. He and the Witch come to a halt in a valley, where she ties him to a tree and prepares to kill him. At that moment, there is a commotion, and Edmund faints. The Witch and her dwarf escape, but Edmund is saved by Aslan. In the morning, he walks with Aslan, and they share a private conversation. When they return, Edmund tells his brother and sisters that he is sorry, and they all forgive him. The Witch then seeks an audience with Aslan. There is discussion about a deep magic that requires traitors such as Edmund to be handed over to the Witch. Aslan, however, takes her aside and reaches an agreement, one that no one dares ask about. The Witch goes, and the rest set up camp for the night.

During the night, Susan and Lucy have trouble falling asleep, feeling that something horrible is about to happen. They notice Aslan walking into the wood and

decide to follow him. He realises that they are following him, and they walk together to the Stone Table, where Aslan tells them that they must hide. They watch as he approaches the evil group, led by the Witch. He is tied down, and the Witch kills him with a knife. In the silence that follows, the two girls approach the dead body and begin to weep. As the sun rises, however, they hear a loud crash: the Stone Table has been broken. They find Aslan alive, and very real. He explains that there is another magic, deeper than the one the Witch knows, a magic from before the dawn of time. It allows the one who dies in the place of a traitor to come back to life. The two girls climb onto him, and Aslan leaps through the country to the Witch's house, where he jumps over the wall into the courtyard. Once there, he brings all of the stone statues back to life including Mr. Tumnus.

Having organised themselves to battle the White Witch, the group quickly proceeds to a narrow valley, where Peter, Edmund, and Aslan's army are fighting the Witch and her followers. Aslan pounces on the Witch and kills her, winning the battle. Edmund is injured, and Peter explains to the others that Edmund was the one to destroy the Witch's wand. Lucy uses her Christmas present, a little bottle full of the juice of fire-flowers from the sun, to restore him. Aslan instructs her to tend to the others, as well. Edmund's health condition improves and is better than ever before. Aslan makes him a Knight.

There is a celebration at Cair Paravel, and the prophecy comes true: the four thrones are filled by two Sons of Adam and two Daughters of Eve, and Peter, Susan, Edmund and Lucy each grow in renown. They rule Narnia fairly for many years, until one day, as they hunt for the White Stag in the Western Wood; they come upon a lamppost. It strikes them all oddly, like something from a dream. They move beyond it, and suddenly the trees become coats, and they tumble out of the wardrobe in their old clothes. The housekeeper and the tour group are just passing by in the hall.

The children tell the Professor the story in order to explain why four of the fur coats from the wardrobe are missing. He believes their story entirely and assures them that one day they will see Narnia again. He repeats what Aslan said to them as they had

assumed their thrones: they will always be kings and queens of Narnia.

The major theme of *The Lion, the witch and the Wardrobe* is the nature of good versus evil. The story is centred on good and evil. Good and evil is made to clash within the morals of people. The novel compares good and evil in many ways, where it is constantly being represented in the setting. The story allows the weather and environment to dictate the nature of what is good and evil. There is the battle of good and evil taking place in the Narnian atmosphere- seasons, settings and the animals. The conflict between good and evil is also demonstrated by the various conditions as well as the situations that are presented to the characters.

The scenery also creates a visual impact of what is good and what is evil. In the beginning Narnia is known as a winter land that is cold and white from snow. The wintry, frost filled weather also represents the reality of a harsh environment and a sense of ruthlessness. This could also symbolise the struggle to come and the possibility of facing severe hardships. The dull, colourless and icy land of Narnia gives the impression that the land is lifeless and had no vibrancy. It is winter at all times, but the jolly season and Christmas holiday never arrive. The dreadful stark white winter of Narnia represents the ruling of the White Witch. The witch is immensely evil and powerful. With her magic wand she is able to turn any living being into lifeless stone statues, which is another way that evil is represented in a stone-cold way.

Narnia is a wonderfully mystical place that can ignite the power of good and evil through the environment and weather conditions. When the witch was in control the weather was a cold snowfall that gave her the ability to ride and travel on her sledge with ease. However, when the lion gained control, the climate was shifted warm enough to cause the snow to melt and make the witch unable to travel on her sledge. The particular condition of the weather in Narnia demonstrated to the reader an idea about the source of power was good or evil.

Seasons play a very important role in the course of action in the novel. The Witch imposes an enchanted, eternal winter on Narnia, symbolising a dead, stagnant time. Nothing grows, animals hibernate, and people crouch around fires rather than enjoying the

outdoors. Nearly every human being has a visceral negative reaction to winter, even when it is a normal length. The Witch's winter destroys the beauty and the life in Narnia. There is a pristine appeal to woods blanketed in snow and frozen waterfalls, but our overall impression is one of a barren, empty land. The season of winter represents that Narnia has fallen under an evil regime. As snow falls, so does the land of Narnia. The Witch's snow hides all traces of Aslan, the Monarch of the mystical realm. Narnia is undoubtedly bleak and grim.

It is wondrous when spring occurs, when Aslan arrives in Narnia. It is obvious that Christmas occurs before spring can come, because Christmas is the birth of Christ. It is Christmas that signals hope for mankind. With the birth of Christ, the hope of new life is given. Spring follows Christmas and all of a sudden, the woods are completely alive flowers are blooming, springs and brooks are chuckling, birds are singing, and delightful smells waft past on gentle breezes. This is no ordinary spring. just as the Witch's winter was no ordinary winter. The spring is just as enchanted as the winter, only now Narnia is experiencing the epitome of life rather than death.

The brilliant style of C.S. Lewis in *The Lion, the Witch, and the Wardrobe* enables the readers of all ages and backgrounds to enjoy the world that the book creates. C.S. Lewis can be called the Hemingway of children's literature. *The Lion, the Witch and the Wardrobe* is an amazing book that allows to escape into an imaginative adventure. C.S. Lewis has achieved this by using a series of different devices such as imagery, symbols, and double meanings. He also successfully pulls the readers into the adventure by allowing the adventure to relate to the readers using characters that undergo the adventure themselves. The characters Lucy, Susan, Edmund and Peter learn things about themselves that they would never know without the experience of the story. C.S. Lewis uses this imaginative style of writing to draw the reader in and not let him go.

The children learn these intended messages on a sub conscious level; adults can look at Aslan, the Christ figure who died for the sins of others. The White Witch, the embodiment of evil that must be overcome; the wardrobe, the gate to a new world; the lamppost, a guide to enlightenment; the animals, representing the qualities needed

to overcome adversity and grow with change; and at the cycle of life, represented by the light of the moon and the change of the seasons.

In *Imagination and the Arts of C.S. Lewis*, Peter J. Schakel says:

Becoming absorbed in the atmosphere of the Narnian world with its fascinating mixture of paradise and imperfection, animal and human, adult and childlike [qualities] - being enabled to live imaginatively in that world for as long as the book lasts, is one of the powerful appeals of Lewis' stories(61)

Even though C.S. Lewis uses imagination in *The Lion, the Witch and the Wardrobe*, his focus was not on creating another fairy tale but actually following the pattern of the gospel. He uses the enchanted world of Narnia as a parallel to the world that exists but that the reader does not see. C.S. Lewis then uses the symbol of Aslan to represent Jesus himself. "You have a traitor there, Aslan," said the Witch. ... "His offense was not against you." ... "Who will give him their blood?" said the Witch. ... But Edmund had already been forgiven." (138) He does this by showing the reader how Aslan was without sin, just like Jesus.

Works Cited

- Lewis, C. S. *The Lion, the Witch, and the Wardrobe*. Harper Collins, 1950.
- Downing, David C. *Into the Wardrobe: C. S. Lewis and the Narnia Chronicles*. Jossey-Bass, 2005.
- Ford, Paul F. *Companion to Narnia: A Complete Guide to the Magical World of C. S. Lewis's The Chronicles of Narnia*. Harper One, 2005.
- Schakel, Peter. *The Way into Narnia: A Reader's Guide*. Eerdmans, 2005.
- Ward, Michael. *Planet Narnia: The Seven Heavens in the Imagination of C. S. Lewis*. Oxford UP, 2008.



Surviving Injustice: Race and Intersectionality in Colson Whitehead's The Nickel Boys

Bavani T.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

The paper delves into the politics of racism and its consequences in Colson Whitehead's *The Nickel Boys*. The novel is inspired by real events at the Arthur G. Dozier School for Boys, where an excavation uncovered mass graves of children who suffered under America's racial injustices. The story follows Elwood, a ten-year-old Black boy wrongly accused of theft and sent to a reformatory school, where he experiences firsthand the brutal realities of segregation and systemic violence. Through his journey, Whitehead exposes how racism has evolved yet remains deeply embedded in American society. The novel highlights how Black individuals are trapped in a relentless cycle of oppression and lawlessness. This study employs Kimberlé Crenshaw's theory of intersectionality, and Paulo Freire's theory of oppression to analyze the novel's depiction of racism, both overt and covert. By examining these theoretical perspectives, the research seeks to uncover how racial discrimination continues to shape the lives of Black Americans, reinforcing inequality across generations. Whitehead's narrative serves as both a historical account and a contemporary warning, urging society to confront its past and work toward justice and equality.

Keywords: Racism, Segregation, Oppression, Inequality, Justice.

The Nickel Boys is set in 1962, showing the ten-year-old Elwood who lives with his grandmother Harriet, and loves listening to the records of Martin Luther King, believing that protests and law can change things. Every day Harriet takes him to the restaurant where she works as a cleaner, and Elwood thinks of the time when a black man would sit at this place without having a mop in his hand. He believes that the staff likes him and he usually has dishwashing competitions with the kitchen staff in which he always wins. After one such competition, he wins a set of encyclopedias and excitedly takes it home. It later turns out to be all blank but Elwood is neither able to understand the smirks on the staff's faces, nor the reason

behind this act. His naivety remains intact when even after getting straight A's at school, he is not allowed to visit the Fun Town. He feels like many other people that the Brown v. Board decision has opened up new possibilities for blacks. However, the irony is clear in the sentence that "the morning after the decision, the sun rose and everything looked the same", and it complements Derrick Bell's aforementioned interest convergence principle (22).

School desegregation means nothing if black kids sit with white kids only to be degraded and are constantly reminded of their lower human status. Bell shows that the decision was the moment's necessity, especially for people like Elwood's father who fought alongside the whites in WWII and faced the same racial humiliation once they came back. This shows that the very basis of racial distinction, myths, and religious and biological beliefs became worthless when it came to fighting for the nation; the black became a man, a man fit enough to fight alongside a white man. Elwood is part of a broken family, a family that is trying to come to terms with its own past. His mother was stuck in the trauma of her own childhood after seeing her father being lynched by the Klan because of bumptious contact with a white woman. His father, when he came back from the war, was completely disillusioned because the war had changed nothing, and the nation was still as segregated as before. Elwood's family is but one example of those many families which were mentally and economically destroyed as a result of slavery.

The name Harriet conjures up the image of the famous Harriet Tubman, Elwood's grandmother's views are in stark contrast to hers. Whereas the former believed in stepping up, the latter not only embraced silence, but never allows Elwood to take part in any protest or movement. Despite this policy of subservience, Elwood is wrongly charged with stealing a Plymouth, and the judge sends him to the Nickel. Elwood's situation can be analyzed through Crenshaw's famous traffic metaphor, where a person faces injury due to traffic coming from various directions. It is clear that Elwood would have been declared guilty, with or without trial, because of the policeman's firm belief that only a black can steal a car. In this case, Elwood's age and race both play a role in the court's verdict.

Carastathis, while analyzing Crenshaw's traffic metaphor, states that "intersection functions as the site of an accident... law serves to reproduce deeply entrenched social

hierarchies: by offering remedy for discrimination only where claim are non-intersectional” (78). Perhaps Elwood would have been given a chance to defend himself if he were a white boy or a grown-up black man. Though Elwood is only fourteen, he is taken to the Nickel in handcuffs, as if he is a serious offender of the law. He meets some other young boys who are sent there on the basis of being “recalcitrant,” “truancy,” “mopery” or “malingering”, charges that they do not even understand. This complexity is deliberately created and is part of the broad racial schema that works in society. Since they do not understand these charges, which the authorities undoubtedly know, they are not able to question them.

The school building, to Elwood’s relief, is one of the most beautiful places he has ever seen, having no barbed wires or tall stone walls. Though Whitehead’s description of the school building with vast gardens and lush green trees shows how race works as an invisible factor in society, his choice of vocabulary is emblematic of the violence happening there. The superintendent’s creased dress looks like a sharp blade, and the keys on his belt sounded like spurs. Elwood learns that he can get out of there if he keeps moving up the ranks. He has to start from Grub, moving on to Explorer, Pioneer, and finally Ace. This ranking gives him false hope but he soon learns that there is no moving up the ladder and he will remain a Grub as long as he is black.

The Nickel is not only a symbol of modern racial violence but represents the fact that renaming the institution does not change its meaning. Apparently, the school seems to be an accomplishment on the part of the government that provides shelter to both black and white children, irrespective of their color. However, the seemingly perfect building is a symbol of the state’s “false generosity” that Freire talks about (51). Rather than taking actual redemptive measures, the state creates an aura of philanthropy to hide the inequalities of the system. In return, the oppressed are expected to show a certain level of humility and gratitude as they are the ones being taken care of. The place acts no different than a plantation where the students are forced to work in the fields and are even hired as private servants for the school officials. The novel shows that previously the idea of the white man’s burden justified this subordination; now it is legalized in the name of reformation. It can be seen that the Nickel boys are the ones who are working to make the school self-sufficient, and yet they have to be thankful for the scraps

that the school throws at them.

Elwood is shattered to see that despite being a reformatory school, none of the black students know how to read and the teacher makes no effort to change the situation. The students, on the contrary, are advised to work hard in the fields so that they can get freedom which again resonates with the idea that slavery did not end with the end of the plantation era. With the closing of each plantation, the state opened hundreds of places like the Nickel which worked on the same oppressor-oppressed formula. Elwood learns the rules quickly which include work, comportment, demonstration of compliance, and docility, the gist of which is silence and servitude. However, his journey toward reality begins when he intervenes, trying to save a little boy from being bullied. As a result, he is taken at night to a place called the white house and is beaten more brutally than the bullies.

The beating makes Elwood learn one of the fundamental rules that salvation lies in silence. He also learns why the campus has no barbed wires or fences around it: because fear itself is sufficient. Here Freire's definition of freedom is crucial, as for him, "Freedom is not an ideal located outside of man; nor it is an idea which becomes myth. It is rather the indispensable condition for the quest for human completion" (47). Hence, by showing the campus as an Edenic place where the kids' mobility is not restricted, Whitehead deromanticizes the idea of freedom. It shows that freedom is not in removing the shackles but in dislodging the system that enchains them. Moreover, the inside of the campus seems to be the bottom of the iceberg, the part that is hidden beneath the various layers of progress, change, desegregation and generosity.

During his visit to the white house, Elwood witnesses blood stains on the mattress and on the walls which shows that this sort of violence is an everyday norm at the Nickel. Elwood has to spend few days at the hospital as the and there he meets Turner, another black boy, who has eaten soap to take a few days off the Nickel. Turner's discussion with Elwood shows the difference through which the two view the world. For Turner, there is no difference between the Nickel and the world outside. Whereas outside, racial prejudice is hidden under niceties and kind words, inside the campus no one has to fake it anymore. The Nickel thus becomes a representation of how the world would have been if racism had not been disguised. Turner has a more strategic approach to survival and he tells Elwood that escaping Nickel is not easy, but

Elwood believes that it's not like the old day and they can stand up for themselves. Freire believes that oppression is a system of violence and dehumanization. This dehumanization is on both sides: the oppressor and the oppressed. The problem lies in the fact that the oppressed is a product of the same system that he is trying to overthrow. His actions and ideas are shaped by the same system, a system that revolves around violence.

The fact that the oppressed become as dehumanized as the oppressor can be seen in the episode when some campus boys including Elwood and Turner find horse medicine and want to add to the superintendent, Spencer's food. They discuss the plan every day, graphically describing and enjoying every single detail of it. For Turner, it is nice to picture one of their tormentors puking all over their yummy spread, face gone strawberry-red from pain, heaving until what came out wasn't food but his own dark blood. At this point, the boys exhibit the same oppressor consciousness that they themselves are a victim.

Elwood's vulnerability can be further analyzed through the lens of intersectionality according to Hill which "race, class, gender, sexuality, race... constitute interlocking, mutually constructing or intersecting systems of power" (33). It further shows that intersectionality is not only limited to the problems faced by women of color, but it talks about other disenfranchised groups as well. It states that "the young experience social inequalities that are associated with age as a system of power" (138). Students like Griff, though himself a black, mercilessly beat other black boys of younger age because their age further pushes them towards the margin. Though the white students in *The Nickel Boys* are also victims of school oppression, the position of black students is worse in terms of lodging, food, violence and education. Whenever the inspection committee visits the school, it hears and tries to ease the problems of the white campus only. This situation complements Crenshaw's basement metaphor through which she highlights the hierarchy that exists within the subordinate group. The white boys, though suppressed, are standing on the shoulders of the black boys who are standing below them.

A top-down problem-solving approach only alleviates the problems of the white students. Moreover, the school atrocities are not only limited to physical abuse but the students are victims of molestation as well. Elwood learns from Turner that not only the school psychologist is involved in this molestation but the school director, Trevor Nickel, himself had a

part in it. Hence, the school's brutality is an open secret because it is not only a matter of one or two people. The whole system, from top to bottom, is steeped in corruption. The previous stance that black kids are doubly oppressed can be seen from the boxing tournament that the school organizes between both campuses. The superintendent tells Griff, the black opponent, that he has to step down in the second round, but Griff does not do that. Consequently, he is taken out back and is never seen again. However, the narrator says that his body is dug after fifty years and its fractured wrists tell a story and attest to the violence that happened there. When Turner tells Elwood about "out back," a place from where nobody returns, the latter does not believe in that. However, he soon learns that he can change the law but you can not change people and how they treat each other wickedness went deeper than skin color.

Patricia Hill, in her book *Intersectionality*, talks about the duality of law. It is both "a site of repression and a site of social justice" (89). Elwood does not understand the repercussions of living in a white man's world and still believes in the supremacy of the law. He wants the world to know about the abuse happening at the school and, therefore, writes everything in a notebook with the aim of giving it to the inspection committee once it arrives. During the day of inspection, everything is made the way it is actually supposed to be. Elwood succeeds in giving the notebook to the inspection committee but, to his surprise, he is taken to the white house, locked in a dark chamber, and gets beaten every day. The second beating turns out to be an epiphanic moment for him and he understands how the system works. After a few days, Turner comes to his rescue because he has learned that they are going to take Elwood "out back" after which he will simply disappear like many other students before, and they both decide to run away that night. The plot sways between the past and the present, and shows the condition of Elwood in various timelines.

After coming out of Nickel, he tries not only to avoid the memories of that place but its people as well. He once meets a former student named Chickie Pete who went to army and got married many times but he still feels he is stuck somewhere in the past. Pete's broken state makes him realize that the school bend you in all kind of ways until you were unfit for straight life, good and twisted by the time you left. Even though Elwood has a successful moving business, he does not want to help Pete as he reminds him of the torture that he has faced there.

The novel then shows Elwood's life in the early 2000s and throws light on the lingering issue of racism. He lives in an area from where many whites have migrated and their racism, and fear and disappointment paid for his new life. In 2014, Elwood learns that the state has dug the campus and found the bodies of those who died of "natural causes". Here Whitehead blurs the line between fiction and facts, and the narrative interweaves with the actual investigation that took place once the bodies were found. Spencer, whose character seems to be based on Troy Tidwell, the superintendent, denies that he ever hit any boy. Upon this, Elwood realizes that he has to confront the past he has been running from. The last chapter has a climactic moment when we learn that Elwood never succeeds in escaping the campus and he is shot dead by the school officials. It is revealed that Elwood is actually Turner, who, after Elwood's death, takes on his identity because he believes that Elwood's story has to be told. In fact, the book cover, showing two boys presumably Elwood and Turner, casting a single shadow, forbodes the tragic ending of the novel. The single shadow implies that the fate of these two boys will be tragically intertwined. It also shows that it does not matter who tells it, Elwood or Turner, but it is the story that has to be revealed. A 'counter-narrative' has to be presented so that the world knows the story behind the broken bones that were found in the Boot Hill cemetery.

The repercussions of slavery are both tangible and intangible. The vicious cycle in which the blacks are stuck becomes an impediment to their progress: blacks cannot get high-level jobs because they are unintelligent and the proof of their unintelligence is the fact that they do not have any high-post jobs. It can be seen that slavery not only destroyed the blacks psychologically and physically but brutally damaged their family system. In Elwood's case, his parents leave him in the middle of the night and Whitehead never reveals their fate. Her grandmother, Harriet, has never had any proper goodbyes, neither to her father, who died during the slave trade nor to her husband who was lynched by the Klan. This is how slavery jeopardized the family system of blacks and many people died waiting for their loved ones to return. Hence, Whitehead succeeds in showing how far the idea of race has evolved by showing two different generations of blacks who are trying to make sense of the system that governs them. However, the tragedy lies in the fact that, on the one hand, several bodies are being dug



up, which are emblematic of a violent past, and on the other hand, there are people like Floyd and Martin who die every day facing the same fate as that of the Nickel boys.

Work Cited:

Bell, D. *Race, Racism and American Law*. Aspen Publishers, 2008.

Carastathis, A. *Intersectionality: Orgins, Contestioons, Horizons*. Lincoln, Nebraseka: University of Nebraseka, 2016.

Crenshaw, K. W. Demarginalizing of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory and Antiracist Politics. University of Chicago Legal Forum, vol. 1. No. 1, 140-167, 1989.

Freire, P. *Pedagogy of the Oppressed*. London: Continuum, 1968.

Hill, P., and S. Bilge. *Intersectionality*. Cambridge: Polity Press, 2016. Whitehead, Colson. *The Nickel Boys*. Fleet, 2019.



Innocence Vs Cruelty: A Study of John Boyne's *The Boy in the Striped Pyjamas*

Blessi S.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

John Boyne's *The Boy in the Striped Pyjamas* masterfully juxtaposes the innocence of childhood with the stark realities of war, set against the backdrop of Second World War and the Holocaust. This paper takes us into the story of Bruno, a nine-year-old German boy, who moves with his family from Berlin to a house near a concentration camp during the Second World War. Bruno's family's relocation to (Auschwitz) which is miss pronounced by Bruno as "Out-With" exposes him to a world marred by prejudice, hatred, and violence. Bruno, the young protagonist, represents the innocence of childhood. His experiences gradually expose him to the harsh realities of the world, leading to a loss of innocence. The central theme is the profound impact of war in the children's psyche.

Keywords: innocence, Holocaust, prejudice, hatred, violence, psyche

John Boyne's *The Boy in the Striped Pyjamas* has been subtitled 'A Fable'. It is a fable about human beings, set in the era of Nazi Germany's Third Reich that perpetrated the Holocaust. The novel and its film adaptation afford a post-modern revisioning of the horrors of the holocaust through the eyes of a naïve, innocent and puzzled German boy. Holocaust literature refers to a body of written works that document, reflect and experiences the aftermath of the Holocaust, the systematic genocide of six million Jews and millions of other persecuted groups by Nazi Germany during Second World War. The majority of the story takes place in Nazi Germany and at a fictionalized version of the Auschwitz concentration camp, from the perspective of an innocent child, Bruno, to show how children might perceive such a horrific event without understanding it.

The important theme of the novel is the loss of innocence by the consequences of war. Boyne masterfully portrays the character's innocence in the beginning of the novel and explores how the innocence is shattered by the societal norms, prejudice and the consequence of war. The terms 'innocence' is defined as a quality of absence of sin, guilt, or moral wrongdoing. The children in the novel are considered innocent because of their

lack of understanding, pure friendship, curiosity, and exploration. Bruno's character serves as a lens through which the researcher examines the gradual erosion of innocence.

This paper raises an awareness of how war, and brutality affect the lives and well-being of children during the holocaust and to identify the traumatic experiences that happened to them by exposing the minds of innocent children to the fear and confusion in the world of War. It also explores how one's childhood innocence and ignorance of their ethnic circumstances ultimately led to their demise. While adults perished during the Holocaust, it is the innocent children who suffered the dual tragedy of losing both their lives and their parents. This loss is particularly poignant, as children are inherently reliant on their parents for support and guidance.

The critical method that highlights the connection between literature and its historical setting in Stephen Greenblatt's "New Historicism" aims to comprehend how literary works both represent and influence the political, social, and cultural currents of their day. Greenblatt's New Historicism is used to describe the problems in the book in connection to the historical setting and to analyse how the book depicts the history and cultural circumstances of Nazi Germany. Despite the fact that the novel is fictional, studying human's innocent behaviour may help to outline the reality we live in emphasising the innocence of children.

Boyne's novel, brought to life the story of children's innocence during the 1941–1945 Holocaust in Germany, serves as an example of how New Historicism is positioned within a literary text to conceptualise the concerns surrounding a historical reality. Stephen Greenblatt's New Historicism served as the theoretical foundation for this investigation, which examined the problems in Germany that are reflected in the book.

The novel begins with Bruno, together with his family living in a luxurious home in Berlin. One afternoon, when Bruno returned home from school, he was surprised to find Maria, the family's maid packing his belongings. And we could find Bruno's innocence in the following conversation with his mother saying,

Mother, said Bruno, marching towards her, 'what's going on? Why is Maria going through my things?' 'She's packing them,' explained

Mother. ‘Packing them?’ he asked, running quickly through.... the events of the previous few days... whether he’d been particularly naughty... ‘Why?’ he asked then ‘what have I done?’.... ‘What is?’ he asked. Am I being sent away? (2-3)

Through the above lines we could find Bruno’s innocence in the troubled situation of his family, together moving from Berlin to Poland because Bruno’s father is promoted as the Commandant after a visit from Hitler himself. The family therefore relocates owing to the orders of the ‘Führer’ which Bruno mispronounces as “The Fury” (52). Bruno is not willing to leave his friends Daniel, Karl, and Martin and move to Out-With. In reality, “Out-With”

or “Auschwitz” concentration camp in Poland is the largest and deadliest camp during the Holocaust.

Bruno never stops feeling lonely because, he and his sister Gretel are home-schooled, unlike in Berlin, he has no companions to play with. His curiosity drives him to explore the house as an innocent child explorer both in his earlier home, Berlin and also in Out-With, Poland. His curiosity as an innocent explorer is found in the novel when Bruno started exploring the two houses. Both the present and the past houses now stand as a stark contrast as, “The house in Berlin was enormous, and even though he lived there for nine years he was still able to find nooks and crannies that he had not fully finished exploring yet. There were even whole rooms – such as Father’s office’ which was Out Of Bounds At All Times And No Exceptions-that he had barely been inside.” (13).

Bruno finds his old home big and that he has never fully explored it completely, mainly the father’s office which was strictly banned for him to enter into. Whereas his new house Out-With has not reached to his expectations for exploring, as the ‘house’ was the exact opposite from his previous ‘home’ at Berlin, as described further, “He went upstairs and turned slowly around in a full circle, hoping he might find a small door or cubby hole where a decent amount of exploration could eventually be done, but there wasn’t one... ‘This isn’t home and it never will be,’ he muttered” (17).

One day as Bruno was trying to search whether there was anything that could be of

interest to him, one thing caught his eye. Over the corner of the room opposite to the door there was a window in the ceiling that stretched down into the wall. This window could be called as a ‘Portal to the Unknown’, a portal that opens Bruno’s eyes to a world beyond his sheltered existence, leading him to a harsh reality of what lies beyond. The window also represents Bruno’s misinterpretations and his gradual realisation of the truth.

The novel not only portrays the innocence of Bruno but also his elder sister Gretel, where both siblings share their own interpretation of what they see through the window. The novel showcase the innocent curiosity of Bruno’s first view through the window as he misunderstands the camp as a farm and the people in it as farmers, not understanding their true plight, whereas his sister Gretel who is naive, and mentioned as “She’s a Hopeless Case” (20) who begins to shed some of her innocence as she peers out of the window and expresses her own confusion and misinterpretation about the camp which she initially perceived it as an odd farm with strange activities as “But we learned in geography class that in the countryside, where all the farmers are and the animals, and they grow all the food, there are huge areas like this where people live and work and send all the food to feed us.’ She looked out of the window again...’ This must be it. It’s the countryside.” (35)

Boyne’s novel has also portrayed Gretel’s change of innocence as the story progresses. The innocence of Gretel is deteriorating, by learning the history of Nazi, their propaganda and her father’s position. Her perspective is influenced by her sudden shift in her interest from dolls to maps, symbolising her transition from childhood innocence to a more matured understanding of the war and its implications. Bruno, on the other hand, continues to be an innocent explorer which finally results in the terrible ending of the novel. The novel’s protagonist Bruno highlights his untainted view and pure-hearted curiosity of questioning, which often serves as a challenge to the adults, forcing them to confront uncomfortable truths. For instance, Bruno’s father who is a high-ranking Nazi officer, is reminded of the moral implications of his actions which exposes Bruno to

understand more about the hypocrisy and moral decay occurring in his vicinity which is seen while he replies to Bruno's question. "Ah, those people, said Father, nodding his head and smiling slightly, 'Those people...well, they're not people at all, Bruno,' Bruno frowned. 'They're not?' he asked, unsure what Father meant by that... They're nothing to do with you. You have nothing whatsoever in common with them" (55). The words of Bruno's father when he refers to the prisoners as "not people at all" is a chilling example of dehumanisation.

Philosopher David Livingstone Smith is the main proponent of the idea of dehumanisation. He says that dehumanisation happens when persons are seen as "subhuman" regardless of their outward appearance—that is, as lacking a truly human nature. Dehumanization is a psychological process and as such it cannot be prevented from happening. Edmund Burke in Zimbardo states "The only thing necessary for evil to triumph is for good men to do nothing" (313). It still carries a lot of meaning when it comes to genocidal dehumanization.

The above language refers to the Nazi ideology that sought to strip Jews of their humanity. This is followed by an innocent and a confused question by Bruno, "They're not?" which reveals his inability to comprehend such cruelty. Bruno is a curious explorer who eventually finds a back door and breaks free one day into the forest, where he encounters a Jewish boy, Shmuel by a barbed-wire fence. They are the same age and have the same birthday. Being able to play with at least one new friend makes Bruno very happy. He sneaks out the back door to meet his new companion by the barbed-wire fence every day after class. They both share a conversation about the signs which is differs from one another which the children probably dose not know what it meant for, their conversation are as follows,

I came home from school and my mother was making armbands for us from a special cloth and drawing a star on each one. Like this.' Using his finger he drew a design in the dusty ground beneath him. 'And every time we left the house, she told us we had to wear one of these armbands.' 'My father wears one too,' said Bruno. On his uniform. It's very nice. It's

bright red with a black-and-white design on it. Using his finger he drew another design in the dusty ground on his side of the fence. ‘Yes, but they’re different, aren’t they?’ said Shmuel. ‘No one’s ever given me an armband,’ said Bruno. But I never asked to wear one, said Shmuel. (130)

It emphasises the stark contrast between Bruno and Shmuel’s lives as well as their innocence. The privileged and naive son of a Nazi commandant, Bruno displays his German ancestry through his father’s uniform. In the meantime, the Star of David, a physical and figurative symbol of tyranny, is worn by Shmuel, the Jewish kid who was imprisoned in Auschwitz. Bruno is incredibly innocent and ignorant about the war, Nazism, and even the reality of impoverished people in his immediate vicinity. Even though he never truly understands what is going on in the battle, he hopes to join the military like his father when he grows up.

Then the two friends converse upon how they both ended up in Berlin. Then Shmuel informed Bruno that they were being transported to Auschwitz by train, an inadequately ventilated train. Bruno declared loudly that he and his family had purchased a car and that he did not think Shmuel’s predicament was any different from his having to leave Berlin. While Bruno views Shmuel’s story as an adventure, Shmuel finds it to be painful. Bruno’s constant melancholy stems from the fact that he must leave his pals behind, and that Shmuel and all the other Jewish youngsters must dwell in concentration camps and ghettos. His existence as a prisoner is challenging. Unlike Shmuel, Bruno consumes a lot of the food and is accustomed to always having more than enough. In contrast to Shmuel, who is constantly hungry Bruno consumes a large portion of the meal, as seen by their conversation. “Chocolate,” said Shmuel very slowly. “I’ve only ever had chocolate once”. Bruno replied with utter confusion, “Only once? I love chocolate. I can’t get enough of it although mother says it’ll rot my teeth” (135).

The novel shows Bruno’s helping tendency where, Bruno offers to cut Shmuel some and he eats it quickly. Shmuel likely receives little to no food in the camp, which is why he is so thin and naturally asks Bruno if he has any food with him. Shmuel lives in constant fear and is reluctant to defy their commands as Nazi Germans treat their

prisoners, the Jews, with no pity. The difference between the lives of slave owners and slaves can be traced back to the early era like how the Germans punished the Jews by stealing, destroying, and confiscating their possessions.

The author uses a child's perspective to explain the Holocaust because he understood that the experience was indefinable. Bruno asks Shmuel, "Why do you wear pyjamas all day?" as a metaphor for his inability to comprehend the mass killings committed by Nazi Germans (157). During the Holocaust, racial hatred was evident, but it came from the system rather than the heart. Bruno is even naive that he cannot understand why Shmuel lives in a concentration camp.

At last Bruno's final exciting adventure with his secret companion to cross the fence with striped pyjamas and to look for Shmuel's lost father in the Concentration camp. Unfortunately, they couldn't locate him and when the troops came, they took the two youngsters along with a mob and were thrown into a long, cosy room. Bruno apologised to Shmuel for not finding his father, and both clutched their hands in fear and everything was over. Just before dying, Bruno admitted that Shmuel would always be his best buddy.

While Shmuel was taken as a prisoner, his youth and innocence were taken away from him; he was meant to enjoy his childhood, learn, and play with his friends. His mother, father, brother and grandfather all were taken away from him and imprisoned. He had little freedom and was constantly hungry where he was beaten by the Germans in the camp. So the results of war will always be catastrophic. This incident had a detrimental effect on all, particularly the youngsters, Bruno and Shmuel.

Bruno befriends Shmuel out of innocence and the horrors of the concentration camp highlights the devastating impact of war on the human psyche resulting to a heart breaking conclusion. As a powerful symbol of innocence and humanity overcoming prejudice and hatred, Bruno's friendship with Shmuel, a Jewish boy imprisoned in the concentration camp, highlights the tragic loss of innocence in a world consumed by conflict. Their innocent interactions stand in contrast to the cruelty and ignorance of the adult world.



Works Cited

- Blech, Benjamin. “The Boy in the Striped Pajamas.” *Aish.com/Jewlariious*, 2008,
www.aish.com/j/as/48965671.html. Review of *The Boy in the Striped Pyjamas*.
- Boyne, John. *The Boy in the Striped Pyjamas*. Vintage, 2012.
- Greenblatt, Stephen. *Renaissance Self-Fashioning: From More to Shakespeare*.
University of Chicago Press, 1980.
- Zimbardo, Philip. *The Lucifer Effect: Understanding How Good People Turn Evil*.
Random House, Inc, 2007.



Activism as Social Emancipation in Angie Thomas *The Hate U Give*

Jemema J.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

The paper examines how activism serves as a conduit for social emancipation within the African American community in the novel *The Hate U Give*. The narrative centers on Starr Carter, a 16-year-old who witnesses the tragic police shooting of her friend, Khalil. This pivotal event propels Starr into the realm of activism, compelling her to confront systemic racism and societal injustices. The novel also delves into the complexities of navigating dual identities. Starr's experiences at her predominantly white private school contrast sharply with her life in Garden Heights. The paper explores Starr's activism becomes a unifying force, enabling her to reconcile these facets of her identity and advocate effectively for her community's liberation. *The Hate U Give* portrays activism as a catalyst for social emancipation, emphasizing the importance of courage, community solidarity, and the relentless pursuit of justice in the face of adversity.

Keywords: Activism, Injustices, Identities, Justice, Solidarity.

Angie Thomas born on September 20, 1988, Jackson, Mississippi, U.S is an American writer. His first young-adult novel, *The Hate U Give* (2017), debuted at number one on The New York Times bestseller list, launching her to international fame. In the novel, Thomas tackles volatile and timely subjects as racism, privilege, and police brutality. Thomas grew up in an economically depressed African American neighborhood in Jackson, Mississippi. At an early age she was exposed to drug dealing and gun violence and found refuge in books. As a teenager Thomas performed as a rapper and appeared in *Right On*, a teen magazine devoted to African American celebrities. She went on to study creative writing at Belhaven University in Jackson, where she received a bachelor of fine arts degree in 2011. Thomas initial intention was to write fantasy and middle grade novels.

The Hate U Give is a young adult fiction by Angie Thomas. It is Thomas's debut



novel, expanded from a short story she wrote in college in reaction to the police shooting of Oscar Grant. The story is narrated by Starr Carter, a 16-year-old African-American girl from a poor neighborhood who attends an elite private school in a predominantly white, affluent part of the city. Starr becomes entangled in a national news story after she witnesses a white police officer shoot and kill her childhood friend, Khalil. She speaks up about the shooting in increasingly public ways, and social tensions culminate in a riot after a grand jury decides not to indict the police officer for the shooting.

Activism shape political outcomes by encouraging everyday citizens, rather than political insiders, to take action that brings public attention to specific issues or demands. This is often achieved by creating media coverage through events such as protests, strikes, or confrontations. Activism typically operates in a cycle where early actions attract attention and participation, leading to further activism and increased awareness. While some activism is strategically organized by established groups, other movements arise spontaneously when individuals unite to protest a common issue, sparking broader waves of action.

In the novel, activism emerges as a potent tool for social emancipation, embodying the novel's central theme of voicing opposition to injustice. Starr Carter, the main character, must balance her two worlds Garden Heights, her neighbourhood and her White prep school. She eventually becomes a force for change after seeing her friend Khalil shot by the police. Starr's journey demonstrates the effectiveness of activism as a strategy for fighting systematic oppression and regaining agency. Fear and pressure from different communities make Starr hesitant to speak up at first, but activism gives her potency in the end. With courage, she takes to her platform to confront the racism that permeates her society and to demand justice for Khalil.

The novel illustrates how activism can inspire collective action and solidarity. Starr's involvement in protests, media interviews, and community organizing inspires others to take part the fight against police aggression and racial discrimination. Through her activism, she sparks conversations about privilege, ally ship, and the pertinence of amplifying marginalized voices. Furthermore, the novel highlights how societal and

personal liberation are intertwined. Starr experiences personal growth as she battles for justice on the outside, facing her own prejudices and finding the courage to proudly embrace who she is. Essentially, Thomas presents activism as a vehicle for social change and personal empowerment in addition to a way to confront injustice. The novel emphasizes the ongoing importance of activism in the quest for righteousness and equality for all through Starr's journey.

Emancipation and empowerment strategies are woven throughout the narrative in the novel, illustrating the various ways characters seek liberation from oppressive systems and find strength in their identities. One prominent strategy for emancipation is through education and awareness. Starr, the protagonist, maneuvers between a community predominantly inhabited by Black residents and her white prep school. Through her experiences in both environments, she becomes increasingly aware of the discrimination and systemic racism that permeate society. This is evident in the novel "I should be used to my two worlds colliding, but I never know which Starr I should be. I can use some slang, but not too much slang, some attitude, but not too much attitude, so I'm not a "sassy black girl." I have to watch what I say and how I say it, but I can't sound "white" (316). This awareness empowers her to challenge stereotypes, confront bias, and educate others about the realities of being Black in America.

Empowerment is the cultivation of community and solidarity. Starr finds support and strength within her family, particularly her parents and siblings. They encourage her to use her voice to oppose discrimination. The whole family's support is highly reflective when Starr was going to "Grand Jury Room". Her mother is really supportive and her words motivate Starr as well as the readers. After receiving affectionate gestures and words of pride from her mother, Starr expresses disdain for the word brave. Despite her disapproval, her mother insists on her bravery and shares a look that conveys a deep understanding and warmth, which comforts her on a profound level:

Brave doesn't mean you're not scared, Starr," she says. "It means you go on even though you're scared. And you're doing that. She leans up slightly on her tiptoes and kisses my forehead as if that makes it true. For me it

kinda does. Daddy wraps his arms around both of us. “You got this, baby girl.” (293-94)

These lines show their bonding and support they give to Starr. Her half-brother Seven also encourages her to speak up. Expressing frustration, he declares his readiness to join whatever action Starr chooses, even suggesting a potentially destructive course of action. Additionally, she connects with activists and organizers who share her commitment to fighting for change. Together, they form a supportive network that amplifies their voices and fosters collective action.

Self-expression and authenticity emerge as crucial tools for emancipation and empowerment in the novel. Starr wrestles with the expectation to adhere to societal norms and expectations and code-switch between her two worlds. However, as she grows more confident in her identity and values, she learns to embrace her authentic self and speak her truth unapologetically. This journey towards self-acceptance empowers her to advocate for justice and demand accountability from those in power. Following the incident where Khalil was shot by a cop, Starr becomes a vocal advocate for justice. She participates in protests, speaks to the media, and engages in community organizing efforts. Through her activism, Starr not only seeks justice for Khalil but also empowers her and others to challenge the systemic injustices that perpetuate violence and discrimination.

The novel portrays a range of emancipation and empowerment strategies, including education, community building, self-expression, and activism. Through the experiences of the characters, the novel draws attention to the relevance of resilience, solidarity, and agency in the pursuit of liberation and social change. Activism plays a transformative role in Starr’s life, guiding her journey from silence to empowerment. Initially, Starr grapples with the consequences of speaking out about Khalil’s tragedy. Fearful of retaliation and torn between her Black neighbourhood, Garden Heights, and her white prep school, Williamson, Starr struggles to search for her voice amidst societal pressures and expectations.

The narrative develops, activism emerges as a guiding force, empowering Starr to confront injustice and assert her identity. Emboldened by her campaigner father, Maverick,

and inspired by the memories of Khalil, Starr begins to recognize the power of her voice as a means for change “We want freedom. We want the power to determine the destiny of our black and oppressed communities. Point seven. We want an immediate end to police brutality . . . other people of color, and oppressed people.” (283)

Starr channels her frustration and sorrow into action, participating in protests, advocating for justice, and speaking out against police brutality. Ms. O’frah is the activist she came across with, she is also her personal attorney who helped her to emerge from her shell. She and other activists conduct a protest against the injustice that Khalil faced. Starr, Seven, Chris and DeVante happen to see this and they joined the protest. In the protest, O’frah leads a chant affirming that a hairbrush cannot be mistaken for a gun, which is joined by others. Each time Starr mutters the chant she reminds herself “Khalil drops it into the side of the door . . . He opens the door to ask if I’m okay. Then pow-pow” (24). She screams as loudly as she can, raising her fist in the air. Tears were streaming down her face.

Starr finds solidarity and community support, both within Garden Heights and beyond. She forges connections with fellow activists, allies, and supporters who amplify her message and stand by her side for confronting against systemic racism. These relationships provide Starr with strength, encouragement, and a feeling of being accepted and included, reinforcing her commitment to the cause. Activism serves as a spark for self-improvement and self-discovery for Starr. As she negotiates the complexities of her dual identity and confronts her own biases, Starr masters to accept her authenticity and assert herself unapologetically.

She summons the bravery to challenge societal norms and expectations, refusing to be silenced or marginalized. She speaks “Everybody wants to talk about how Khalil died,”

I say. “But this isn’t about how Khalil died. It’s about the fact that he lived” (365). She asserted passionately that Khalil remained living and his life was also valuable. Through this act she only wants others to realise that Khalil’s life mattered.

Jay Shelat highlights, “Thomas confronts the racist institutions that determine

color lines and implements specifically black cultural symbols and capital to serve as foils to the racist ideologies and hierarchies at the heart of Starr's community" (70). Her coming-of-age journey as a young African-American is filtered through traditional and new media, which affect her self-discovery throughout the story. Indeed, among the other social networks, Twitter helps Starr to have a more consistent awareness of her friend hypocrisy and the several racist incidents happening in her country. Instead, the news affects her privacy and exposes Starr's past. In the first part of the novel, the media are an obstacle in her attempt to live a normal life. They contribute to the aforementioned circulation of hatred, from which Starr must find a way to escape.

Thomas represents the protagonist's response to the difficulties created by internal and societal turmoil's, and consequently, creates an outlook of the teenagers problems in overcoming violent systems. Discussing how young adult fiction, like *The Hate U Give*, explores racism and discrimination with an unconventional lens, Zara Rix explains that "the female narrators push the stories toward nuanced depictions of multiple types of violence, both systemic and personal" (53).

Activism becomes integral to Starr's identity and purpose, shaping her beliefs, values, and actions. It empowers her to liberate from the enclosures of silence and complacency, inspiring her to advocate for justice, equality, and change in her neighbourhood and beyond. Through her journey, Starr embodies the influence activism to create transformation in challenging oppression and fostering social emancipation. She finally reveals her face in front of everybody saying she is the witness.

Starr, speaking into a bullhorn, identifies herself as the witness to Khalil's death and declares that it was unjust. She receives affirmation from the people by saying 'yeahs' and 'amens' (364). Starr proclaims that they weren't doing anything wrong and criticizes Officer Cruise for assuming they were criminals, stating that he is the one acting unlawfully. This shows that she is no more afraid to speak up the truth and she is no more hiding herself from the global perspective.

Starr Carter grapples with a silence enforced by the weight of societal expectations and fear. Growing up in the Black clan of Garden Heights, she learns early

on the consequences of using voice to fight injustice. This silence is not only imposed externally by the threat of retaliation but also internally, as Starr struggles with reconciling her dual identity. As a result, she often feels pressured to hide aspects of herself, including her experiences in her neighbourhood, from her peers at Williamson Preparatory, where Starr is one among the few Black students.

Starr's transformation from passivity to voicing comes with the tragic death of her childhood pal Khalil by a white cop. Initially paralyzed by shock and fear, Starr wrests with the decision to remain silent or to speak out about what she witnessed. Kenya was mad at her for being silent after the incident because the white world is picturing Khalil as a thug and drug dealer. Kenya urges Starr to opine on television about the reality of the events that happened at the night Khalil was killed. She criticizes the media for portraying Khalil in an unfavourable manner, characterizing him as a thug, which Starr knows isn't true. She believes if Khalil were one of Starr's privileged friends, she would be defending him on television.

The injustices surrounding Khalil's death become increasingly apparent, Starr realizes the significance of disrupting her silence. She recognizes that her voice has the power to bring attention on the systemic racism besides abuse of power by police plaguing her community. Starr's journey from silence to voicing is gradual but profound. She starts to discover her voice through small acts of resistance, such as speaking up in discussions at school and challenging her friends' misconceptions about race. When Hailey makes some conflicts by being a racist Starr loses her control.

In a heated exchange, Maya, Hailey, and Starr engage in a conversation about the death of Khalil. Starr expresses disbelief and refuses to accept the idea of simply "getting over" the loss of Khalil. Hailey callously dismisses the gravity of the situation, rationalizing the Khalil's death due to his involvement in illicit activities. This callous remark triggers a visceral reaction from Starr, who retaliates by physically striking Hailey.

The act of violence, though painful, provides a momentary sense of satisfaction for Starr. She is infuriated by Hailey's lack of empathy and understanding. Hailey's stunned



reaction serves as a stark reminder of the impact of her words and the intensity of the emotions involved in the conversation. As she becomes more involved in activism and advocacy for Khalil, Starr's voice grows stronger and more unapologetic. She refuses to be silenced by intimidation or societal expectations, determined to seek justice for her friend and her community.

Starr's transformation exemplifies the strength of standing up in defiance of injustice. Her journey from silence to voicing is not only a personal one but also a political act of resistance against systemic oppression. Through her courage and determination, Starr becomes a guiding light of hope and motivation for others, demonstrating the capacity for transformation of discovering one's voice despite adversity. The novel offers a poignant portrayal of the evolving lives of African American young adults and their assistance to the betterment of American society. Through the lens of protagonist Starr Carter and her peers, the novel delves into the challenges they face, their resilience, and their potential for positive change.

The novel illuminates the challenges of steering dual identities for African American youth like Starr, who straddle two worlds, their predominantly Black neighborhoods and predominantly white institutions. This duality exposes them to different cultural norms, expectations, and systemic inequalities. Starr's journey reflects the struggle to reconcile these disparate experiences while forging her own identity. This can be seen in the given lines below "It's weird though-I'm not as hesitant to dance here as I was at Big D's party . . . White people assume all black people are experts on trends and shit. There's no way in hell I'd try that at a Garden Heights party though. (260)

Despite facing systemic oppression and racial discrimination, the characters in the novel demonstrate remarkable resilience and agency. Through activism and community solidarity, they are questioning the established order and championing equity. Starr's involvement in activism not only empowers her but also inspires others to join the fight against law enforcement violence and racial inequity. Despite being white her boyfriend Chris also participates in the protest along with her. Their collective efforts highlight the



potential of young African Americans to effect positive change and shape the discourse on social issues.

The Hate U Give underscores the importance of education and awareness in empowering African American youth to navigate and challenge systemic injustices. Starr's experiences at her predominantly white prep school expose her to privilege and racism, prompting critical self-reflection and dialogue. The paper offers a hopeful narrative of African American youth actively engaged in shaping a society characterized by equity and greater justice.

Works Cited

- Rix, Zara. "How YA books reflect the black lives matter movement": Booklist, Vol.113, 2017.
- Shelar, Jay. "I swear those things are so fresh': Sneakers, Race, and Mobility In *The Hate U Give*". CEA Critic, 2019.



Hybridity and Transcultural Identity Crisis in Chimamanda Ngozi Adichie's *Americanah* **Jenitta S.**

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi Affiliated to
Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

Transcultural identity crisis is a global issue that is mostly caused by the rise of globalisation, migration, and the existence of numerous cultural groups. When people come in contact with persons from different cultural origins; they struggle to balance the influences of the foreign culture with their own conventional cultural identity. Mixing of cultures causes cultural, racial, and linguistic hybridity. Hybridity affects human beings. This paper addresses the challenges faced by immigrants in other nations, revealing their experiences and sufferings. It also purports to highlight the issues with identification, cultural adaptation and assimilation. Hybridity causes transcultural identity crisis when people attempt to reconcile a variety of cultural backgrounds, identities and values. Moreover, this research paper explores how the main characters trace back to their roots to resist marginalisation in the United States of America, indicating a route of resistance and introspection.

Keywords: Hybridity, Assimilation, Marginalisation, Identity crisis, Resistance

Literature is a major art form through which people can exhibit their culture. It is

an ideal medium which encapsulates a mixture of reality and imagination focusing on human nature, culture, language and sensibility of people. It is used as a powerful tool in mirroring major issues and social predicaments of the nation such as identity crisis, cultural, gender and racial differences, slavery and ethnicity. By recording the political, cultural and emotional life of people, literary works have different impact on readers depending on their exposure. By reflecting society and culture and by presenting a realistic picture of human experience, literature enables individuals to relate with the problems described in the works and derive solutions from them.

Nigerian literature emerged with the birth of Nigeria as a separate country. Nigerian literary tradition originated from the oral literary tradition of the Africans. These oral traditions which include myths, folk tales, legends, proverbs and songs were

the primary means of transmitting cultural values and traditions from one generation to another. Nigerian literature addresses a wide range of themes that reflect the country's complex social, political, and economic realities. Some of the prominent themes in Nigerian literature include colonialism, postcolonialism, identity, corruption, gender and social injustice. Some of the most notable contemporary Nigerian writers include Ben Okri, Buchi Emecheta, Teju Cole, Helon Habila, Sefi Atta, Helen Oyeyemi, Taiye Selasi and Adimora Akachi Ezeigbo.

Chimamanda Ngozi Adichie is the most representative contemporary Nigerian writer belonging to the third generation women writers of Africa. An eminent writer and a versatile activist Chimamanda Ngozi Adichie was born on 15th September 1977 in Enugu, South-Eastern Nigeria. Adichie's works have received a lot of critical discussions both in Africa and Western media. Adichie has written three novels. Her first novel *Purple Hibiscus* (2003) was awarded the Commonwealth Prize for the Best First Book; her second novel, *Half of a Yellow Sun* (2006) won the Orange Broad Band prize for fiction in 2007. Her third and most successful novel *Americanah* published in 2013 has won Chicago Tribune Heart Prize and National Book Critics Circle Award in 2013 and was also shortlisted for Baileys Women's Prize for Fiction. Adichie's writing discusses social problems like inequality and questions societal conflict in a manner that raises consciousness and confronts societal norms. Her novels explore racism, identity, class, social inequality and sexism. Adichie's works discuss the inner workings of the African communities of both Nigeria and the United States.

The concept of hybridity and identity has grown more fluid, dynamic and complex in a society that is becoming more and more interconnected. The idea of hybridity is simultaneously challenging and beneficial, as it undermines power structures, challenges conventional knowledge and implies that the coloniser is never entirely in control of the language used in colonial rule. In order to integrate into their host society, the migrants are required to adapt to their new way of life. As a result, they must combine elements of their home culture with the culture of the host nation in order to develop a hybridised identity. They are excluded in both their ancestral and host societies and go through an identity

crisis as the outcome of their fusion.

Bhabha's concept of hybridity draws attention to how dominant cultures and subordinate cultures interact. It focuses on how the dominant civilization shapes the 'other.' Homi K. Bhabha describes hybridity in his book *The Location of Culture* as follows:

Hybridity is the sign of the productivity of colonial power, its shifting forces and fixities, it is the name for the strategic reversal of the process of domination through disavowal (that is, the production of discriminatory identities that secure the 'pure' and original identity of authority).

Hybridity

... displays the necessary deformation and displacement of all sites of discrimination and domination. (159)

Bhabha opines that cultural hybridity creates a kind of identity crisis in an individual. Adichie emphasises the complexities of immigration, identity development and intercultural experiences through the novel *Americanah*. As a consequence of the difficulties in managing numerous identities and the intricate interaction of various cultural influences, hybrid migrants who traverse borders and blend cultures frequently suffer from an identity crisis.

Identity theory emerged as a pivotal framework for understanding personal and collective sense of self in the 20th century. This concept has gained prominence amid global shifts, as diverse groups demand recognition and rights, challenging traditional norms of identity across gender, race, and sexuality. German Psychologist, Erik Erikson introduced the term 'identity crisis' to denote a disruption in personal values and experiences. The academic field of identity studies now intersects with postcolonialism and feminism, highlighting the ongoing negotiation between individual experiences and societal influences.

Cultural familiarity provides a sense of security and identity clarity, but exposure to new environments can trigger identity awareness and evoke personal sentiments during cross-cultural interactions. Diaspora aggravates these challenges, causing psychological

distress and integration struggles. In *Reflections on Exile and Other Essays*, Edward Said writes, “exile is strangely compelling to think about but terrible to experience” (137). Interactions with other cultures can prompt identity crisis and sparks self-exploration. An exile’s life is no more than efforts taken to overcome the sorrows of estrangement. Psychological stress and cultural disconnection significantly contribute to diasporas’ identity crisis, worsened by cultural disparities, language barriers and economic hurdles. In *Americanah*, Adichie concentrates on the disastrous effects of exile, hybridity and personal identities of the emigrants. These concepts might be understood in relation to transcultural problems of identity. The female protagonist of the novel, Ifemelu grapples with assimilation pressures in mainstream American culture, leading to a personal crisis after compromising her values for financial stability. This mirrors the broader struggle of diaspora individuals facing identity conflicts influenced by dominant ideologies.

Adichie addresses this issue of bicultural conflict and suggests the Africans to create their individual and cultural identities. The manipulation of the white people makes race and identity questionable. Most black people find it difficult to survive as representatives of a minority group in America which has created the issue of identity crisis and racism. By analysing *Americanah* from the perspective of diaspora theory, Edward Said wisely comments: “Exile is a punishment” (Ashcroft et al. 425). In the novel, Ifemelu moves to America in pursuit of her higher education. She faced many problems there like identity crisis, racism, marginalization, discrimination and issues of gender. All these issues arise as a result of migration to such a country as USA, where there is no check and balance for such kind of issues. In America, it is extremely difficult for African people to survive.

The main characters of the novel struggle with their identity as they move from Nigeria to America. For the sake of survival, they are forced to assume other names. Names are associated with one’s own tradition and identity. They are not just sounds but are a very important part of one’s identity construct, especially when they have cultural meanings and

its relativity. Louisa Uchum Egbunike in the chapter “Narrating the Past: Orality, History, and the Production of Knowledge in the works of Chimamanda Ngozi Adichie” in *A Companion to Chimamanda Ngozi Adichie* says about the significance of the names:

Within Igbo culture, an individual’s name serves as a form of incarnation or prayer which is repeated each time that person is called. The importance of naming is entwined with the belief in the power of the spoken word, as to repeatedly enunciate an intention is to conceivably usher it into being.
(25)

As names are connected with one’s culture and identity, the identity is completely lost in transnational situation. For example, in this novel, Obinze changes his name to Vincent, and Ifemelu to Ngozi Okonkwo, Uju, Ifemelu’s Aunty pronounces her name “yoo-joo” instead of sounding “oo-joo” (104) and Obinze’s companion Duerdinhito is addressed “Dee.” The crisis of identity initiated sociological circumstances leading to the psychological drift in an individual’s proceeding towards an existential depression emerging out as oppressed victims of the society.

Identity crisis in the character of Ifemelu is seen in her way of living a life in two cultures by building a cultural hybridity which not only highlights the white supremacy but also the supremacy of English language. Aunty Uju has learned that she must ‘subdue’ her natural hair in order to be considered respectable and professional as an American doctor. The following quote discusses, the discrimination African women face in the United States because of their hair choices; Aunty Uju says:

“I have to take my braids out for my interviews and relax my hair. Kemi told me that I shouldn’t wear braids to the interview. If you have braids, they will think you are unprofessional.” “So, there are no doctors with braided hair in America?” Ifemelu asked. “I have told you what they told me. You are in a country that is not your own. You do what you have to do if you want to succeed.” (119)

Ifemelu’s hairstyle can either make her career in America or destroy her career and identity while living in America. She has to lose her physical appearance at first in the

form of adopting the straight hair style which is different from her curly hairs. She never wanted to have a haircut and this type of hairstyling but she had to do this to save herself from any racial discrimination and for her survival in America.

Identity is a social construction. In “Cultural Identity and Diaspora” Stuart Hall argued that, “There are at least two different ways of thinking about ‘cultural identity’. The first position defines ‘cultural identity’ in terms of one shared culture, a sort of collective ‘one true self’, hiding inside the many other, more superficial or artificially imposed ‘selves’, which people with a shared history and ancestry hold in common” (Ashcroft et al. 435). The sense of guilt and disgust created by Ifemelu’s collective identity was just because of the dynamics of power politics which shaped the identity of African people as inferior and uncivilised. This notion can be applied to the collective identity of belonging to an African diaspora, for instance, African Americans share a background of slavery or the migrant conflicts of recent immigrants.

The collective history of Africans is full of traumatic memories of slavery since colonial times. Still those colonial attributes haunt them in the modern times. Nonetheless, white masters can rightly be blamed for these disasters of identity crisis not only in African people but all across the world. Ifemelu expresses thus: “To earn the prize of being taken seriously among Nigerians in America, among Africans in America, indeed among immigrants in America, she needed more years. Six years, she began to say when it was just three and a half” (16). This statement shows the struggle of Ifemelu to gain recognition in America by winning a prize. It is a very pathetic situation in which a person must be famous so he or she will feel secure, otherwise, things will go wrong every time. The focus is on the life of immigrants who live a poor life with low worth of self importance and with an unrecognised identity.

Aunt Uju’s modification of her Nigerian identity reflects the broader struggle of diasporic Africans to assimilate into American society, facing racial discrimination despite efforts to blend in. Aunt Uju’s son Dike also grapples with identity ambiguity, highlighting the isolating effect of assimilation pressures on preserving cultural roots. Ifemelu’s interracial relationships with Curt and Blaine further illustrate the complexities

of navigating identity within racial dynamics and societal expectations, portraying the multifaceted nature of diasporic African experiences in Western countries. The integration, driven by education and exposure to mainstream culture, often surpasses their connection to ancestral culture.

However, discrimination persists, exacerbating feelings of alienation, especially among second-generation individuals like Dike. Family dynamics significantly influences these challenges; Uju's preference for English over Igbo, distances Dike from his Nigerian heritage, compounded by racial discrimination. The novel poignantly contrasts the experiences of first-generation immigrants like Uju and Ifemelu with the second generation, born into cultural limbo and facing identity crisis heightened by external discrimination and internal familial choices. This highlights the complex interplay of family, culture and societal influences on diasporic identity across generations.

Obinze is a young Nigerian who seemed calm, perceptive and clever. Raised by his mother, a university professor, he is extremely well-read and has a strong fascination for America. In comparison to Ifemelu's achievements in America, Obinze's journey in London is almost entirely unsuccessful. Obinze's existence in England became ghostly as he does not have a valid identity proof and it develops a sense of constant fear in him, "he lived in London but invisibly, his existence like an erased pencil sketch; each time he saw a policeman, or anyone in a uniform, anyone with the faintest scent of authority, he would fight the urge to run" (257). Obinze had to assume Vincent's citizenship identity to work because of his unauthorised stay in England.

African immigrants who are already living in England with their National Identity number have invented a business by lending their NI number to their fellow Africans. Vincent says: "You can use my NI number and pay me forty percent of what you make". "It's business, innit. If I don't get what we agree on, I will report you" (250). The incapability of giving a raise of forty five percent to Vincent infuriated him and he reports Obinze's fake identity. It was the most humiliating blow to Obinze in England, his identity got revealed and police was on the way to arrest him. His detention of not having valid

papers to stay and work in England followed by the deportation, left Obinze in the state of shame and guilt, “there he was, in handcuffs, being led through the hall of Manchester Airport, and in the coolness and din of that airport, men and women and children, travellers and cleaners and security guards, watched him, wondering what evil he had done” (280). Through this situation, Adichie captures the experience of many Africans who got deported every day from England due to illegal migration.

Dike is a wonderful example of how important it is to embrace one’s root and history. Because of his mother, Auntie Uju, Dike lacks roots during his adolescence and is unable to discover his father’s genuine origins or develop a Nigerian identity. The problem exists because of Auntie Uju’s attraction towards America and her attempts to make her son, Dike a perfect American. Dike’s problem is not with America but his mother Uju, who tries to make him believe that he is an American. The following dialogue between Ifemelu and her Auntie Uju gives a clear picture of Dike’s tension.

“Dike, I *mechago*?” Ifemelu asked.

“Please don’t speak Igbo to him,” Auntie Uju said. “Two languages will confuse him.”

“What are you talking about, Auntie? We spoke two languages growing up.”

“This is America. It’s different.” (109)

This estrangement leads to disorientation because of various identities that are forced upon him by those around him. Since White Americans still hold the same discriminatory presumptions about Black people, Dike still has to bear all of his baggage despite Auntie Uju’s frequent assurances that he is not Black due to the misconceptions connected with African heritage in America.

When Dike was going through identity turmoil, he made a suicide attempt. Auntie Uju receives advice from Ifemelu that Dike should be allowed to return to Nigeria with her. Dike was able to fully recover himself and return to Nigeria after knowing who he really was with Ifemelu’s assistance. It becomes clear with these characters that cultural integration and embracing western values are the reasons of identity uncertainty

and transcultural identity crisis.

The theme of going back to one's roots and examining questions of self-identity and belonging recurs frequently in the book. After residing in America for a while, Ifemelu decides to return to Nigeria in order to strengthen her ties to her own country. Dike's return trip could be interpreted as an attempt to understand this problem, since he is also reaching out to his family and Nigerian heritage. As described in the following lines, "Back to Nigeria, like you were planning to. I'm going to be okay. I promise" (381). Returning to Nigeria symbolises Ifemelu's will to preserve her Nigerian heritage and her disapproval of certain aspects of the Western lifestyle.

Ifemelu's experiences in America have increased her awareness of the complex problems related to the immigrant experience and the fight for identity. Ifemelu is returning to Lagos to learn more about herself since she feels marginalised or finds it challenging to be herself in the Western society. Her decision represents her fight against the homogenising effects of the Western society as well as her wish to reclaim her cultural heritage. As mentioned in the following lines: "Her decision to move back was similar, whenever she felt besieged by doubts, she would think of herself as standing valiantly alone, as almost heroic. So, as to sequester uncertainty" (8). By going back to Nigeria, she confirms her independence to create her own identity and fights the need to conform to Western norms.

Through this novel *Americanah*, Adichie excellently shows how hybridity can lead to identity crisis for individuals, particularly when they are trying to reconcile the various aspects of their personalities and navigate the complex web of multiple cultural identities. The main characters of the novel Ifemelu, Dike, Auntie Uju and Obinze experience crossover cultures and struggle with their identity as they move from Nigeria. As they struggle with many social factors and cultural standards that contradict their perceptions of self, they experience a sense of relocation and loneliness. They struggle with the unsettling loss of self that emerges as a consequence of leaving known cultural contexts. Adichie skillfully demonstrates that the interaction of diverse cultures forms the distinct characteristics of her characters that are used to highlight the tensions and



opportunities that arise from their cross-cultural encounters. The struggle to be Americanised creates a new hybrid culture which is a blend of both the native and coloniser's cultural practices.

Works Cited

- Adichie, Chimamanda Ngozi. *Americanah*. Harper Collins Publishers, 2021.
- Ashcroft, Bill, et al., editors. Introduction to Part Sixteen. *The Postcolonial Studies Reader*. 2nd ed., Taylor and Francis, 2006, pp. 425-427.
- Bhabha, H. K. *The Location of Culture*. Routledge, 1994.
- Egbunike, Louisa Uchum. "Narrating the Past: Orality, History and the Production of Knowledge in the Works of Chimamanda Ngozi Adichie." *A Companion to Chimamanda Ngozi Adichie*, edited by Ernest N. Emenyonu, James Currey, 2017, pp. 15-30.
- Hall, Stuart. "Cultural Identity and Diaspora." *The Postcolonial Studies Reader*, edited by Bill Ashcroft et al., 2nd ed., Taylor and Francis, 2006, pp. 435-438.
- Said, Edward W. *Reflections on Exile and Other Essays*. Harvard UP, 2000.



**Celeste Ng's *Everything I Never Told You*: A Study of the
Dichotomy between the Chinese and the Western Family Teleology**
Jerina S.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

Celeste Ng's novel *Everything I Never Told You* delves into the emotional struggles of a mixed-race family, highlighting feelings of alienation, frustration, and depression rooted in flawed family dynamics. The article critically examines the novel's ethical dilemmas through the dynamics of marital, parent-child, and sibling relationships. James' emotional detachment from his children and Marilyn's overwhelming expectations on Lydia contribute to her psychological distress and eventual tragic death. Additionally, Ng illustrates how parental pressure, and the emotional neglect faced among siblings create emotional distance and disrupt family bonds. Through this depiction, Ng emphasises the vital role of a strong family structure in shaping an individual's identity and mental stability.

Keywords: Mixed-race family, Family dynamics, Parental pressure, Emotional neglect, Identity formation.

Family bonds refer to the emotional connections and relationships that tie family members together. These bonds are often formed through shared experiences, love, support, and a sense of belonging. Family bonds can be built among parents and children, siblings, extended family, and others who are considered as their family. These connections are important for emotional well-being, offering comfort, care, and security in times of need. In *Everything I Never Told You*, Celeste Ng explores the shattered family ethics of the Lee family, whose members are torn apart by secrets, unspoken expectations, and racial tensions. Lydia's tragic death exposes the deeper struggles within the family issues of identity, the weight of unrealised dreams, and the consequences of neglecting the emotional needs of each member. Through their broken bonds, Ng illustrates how the American Dream can both shape and destroy a family, highlighting the

complexities of race, ambition, and love in the pursuit of happiness.

In the early 20th century, America was still affected by the Chinese Exclusion Law. James' father came to California using a false name, like many other Chinese immigrants at the time. Because of this, most Chinese immigrants felt nervous all the time, afraid that someone might find out that they had entered the country illegally and that they could be sent back to China. They tried their best to blend into American society and hoped to disappear in the crowd. James was the first Eastern student to attend Lloyd (43). His classmates were curious about this Eastern boy and talked about him behind his back. This made him uncomfortable, and he started pretending to be just like everyone else.

The extra attention on James made him sensitive and feel bad about himself. When James fell in love with Marilyn and lived together before marriage, he felt like America had finally accepted him because Marilyn accepted him. Marilyn seemed like a lifeline to him, as he was overwhelmed with insecurity. Before they married, Marilyn only knew that James' parents had been gone for years. James never told her how his parents came to America or how his family had lived there. This was because economic independence does not completely represent racial equality and cultural identity (435). He was afraid to tell her the truth because he knew that once he told her the facts, his image would be shattered.

Chinese traditional family ethics say that men should take care of social matters, while women should handle things at home. According to these traditional views, a wife should stay at home and deal with the daily tasks such as cooking, cleaning, and washing. If a woman works outside the home, her husband might feel ashamed. James knew his wife wanted to be a doctor, but he persuaded Marilyn not to think about working when his colleagues invited her to be an assistant. He did this because he knew people would gossip. To protect his dignity as a man, he wouldn't let Marilyn go to work and mention the issue again.

After Lydia's death, James ordered the police to send Lydia's autopsy report to his office instead of his home. He refused Marilyn's request to see Lydia

one last time. All of his actions showed male chauvinism, which came from the belief from the traditional Chinese family ethics that men are superior to women. James stubbornly stuck to his views, and he never considered Marilyn's wishes, and in his mind, she was just a housewife. In the end, his male chauvinism and lack of communication in the marriage made family conflicts worse and became an emotional barrier.

Mrs. Walker was a home-economics teacher at Radcliffe and had been teaching the course for almost twelve years. She strongly believed that women should live as women. Women should be good at housework and always look dressed up when their husbands arrive home. But Marilyn didn't agree with her; she didn't want to be a housewife or a nurse, she wanted to be a doctor. She completed her physics and chemistry courses perfectly and refused to take the home-economics course.

In the 20th century, with the rise of the feminist movement, Marilyn gained the right to an education, bringing her closer to her dream of becoming a doctor. However, women still face pressure and discrimination in work and education, and society did not fully accept women's roles in all areas of life. Marilyn imagined that she could balance a career and family. Then she met Dr Woolf, who lived at the end of the street, and thought she could be a female doctor like Dr Woolf. To achieve her dream and self-worth, Marilyn decided to leave her husband and children. She didn't expect support from her husband and relied on her own efforts. This seems admirable to others, but once she became used to fighting alone, she grew more selfish. This is a typical example of individualism. In the end, however, due to her children's attachment, her moral conscience, and her responsibility to her family, the pregnant Marilyn had to face reality, and her dream was shattered at the same time.

Louisa was the first Oriental student James had ever met, and she looked like his favourite daughter, Lydia. In the fall semester, Louisa became an assistant professor to James. From her, we see the typical qualities of an Oriental woman:

gentleness, tenderness, and submission. When James complained about his hard work, she comforted him by saying, “Your life is not wasted.” When James put his hand over her shoulder, she immediately blushed (11). At that time, she liked James. When James saw his daughter’s autopsy report with no hope, Louisa invited him to her home, specifically to her bedroom. From that point on, they began an illicit relationship. James told her, “You’re the kind of girl I should have married” (205). Louisa began to imagine that James would divorce Marilyn and marry her. When Marilyn found out, Louisa panicked but still told herself it was just a coincidence. In the end, James simply said goodbye to end their relationship.

Love is an ethical relationship with emotional tension and significance in human relationships. Society supports proper love, which is a right for single youth or widowed elderly people, and it should be supported in all aspects. Modern love is based on mutual love. However, James only sought an outlet for his feelings and didn’t want to divorce Marilyn to marry Louisa. On the other hand, Louisa dreamed of marrying him, so their relationship was unequal and abnormal from the start. They only cared about satisfying their own desires and didn’t think about their moral responsibilities or future. A love that destroys other families should not exist.

Rousseau said that the most Important female quality is a gentle, docile personality (284). Lydia was both fortunate and unfortunate. The fortunate part was that she inherited her mother Marilyn’s physical traits perfectly, which made Marilyn favour Lydia. It seemed like Lydia was a precious jewel to Marilyn, but this preference also led to Lydia’s downfall. Marilyn once left her family to chase her dream of becoming a doctor, and young Lydia thought she must have done something wrong, which made her mother angry enough to leave. So, Lydia secretly promised herself to meet all of her mother’s wishes, hoping that it would keep Marilyn from leaving.

Marilyn didn’t fulfil her dream but instead started planning her own life by

imposing her dreams onto Lydia. She would ask Lydia questions from Maths subject at any time, and the yearly birthday gift was always a science book. When Lydia went into the kitchen, Marilyn would think that there was something she didn't know, and she wouldn't be happy about Lydia being in the kitchen. When Lydia's grades began to drop, Marilyn only scolded her and never gave Lydia a chance to explain. Eventually, Marilyn found condoms and cigarettes in Lydia's bag and began to doubt if she really understood her daughter. In reality, Marilyn had been imposing her own requirements on Lydia without truly understanding her. On the other hand, Lydia spent her days carefully, counting how many hugs her mother gave her and how many words she said. Every night, Lydia would check if she would see her mother the next day, and Lydia always answered "yes, yes, yes." These "yeses" reflected the constant tasks and wishes her mother expressed. Over time, the adolescent Lydia realised that the only option for her was to become a doctor. Maybe because of her mother's pressure or because she wanted to escape, Lydia eventually chose the most extreme way to escape, suicide.

Family teleology is about maintaining family harmony and peace. Lydia, wanting to make sure Marilyn wouldn't leave again, tried to meet all of Marilyn's expectations. This was a moral action based on family ethics, a conscious, voluntary, and self-chosen behaviour. Lydia represented the family's will and, as the centre of the family, she felt responsible for fulfilling her parents' dreams and maintaining family harmony. People are social beings with the ability to think, make decisions, and take actions (317). When Lydia was young, her parents controlled everything about her. As she grew older, her personality matured, and her desire for independence increased (246). She wanted her parents to see her as an independent person. Marilyn should have communicated with Lydia but never compromised on her dream of becoming a doctor.

The conflicts between Marilyn and Lydia were mainly in two areas. First, Marilyn wanted Lydia to become a doctor, but when Lydia grew up, she found that science was difficult for her and wanted to quit. They couldn't communicate well

about this, and Lydia faced two extreme choices in her mind: to continue her education or to escape all the pressures. Clearly, Lydia wanted freedom. Second, as a child grows up, it becomes independent with self awareness. If parents continue to control every aspect of their child's future, it causes sharp value conflicts within the child. Marilyn didn't realise that Lydia had grown up, refused to communicate with her, and this ultimately led to Lydia's suicide. James was very much concerned about his daughter Lydia's manners. When the police asked for pictures of Lydia, he carefully selected them. It seemed like he cared about her manners, but in reality, he was focused on how others saw her. After the police started investigating, James noticed that Lydia hadn't called her friends for a long time. Lydia had done something wrong and had lied to her parents. She assumed herself as a door to make her own choices open.

Lydia believed that her father was different from her mother and thought he would understand her, like her brother Nath did. That year, she was excited about the Christmas gift her father would choose for her. But when she opened it, she found a book called *How to Win Friends and Influence People*. James thought Lydia might need this book to help her with relationships, but for Lydia, it felt like an insult. She guessed that her father might have struggled with friendships when he was younger. So, she pretended to appreciate the gift and said nothing. James had often encouraged her to make friends and go on dates, hoping she would have many friends to fix what he saw as his own childhood flaws.

James kept reminding Lydia how love and friendship are important in one's life. He urged her to spend time with her friends and even gave her a book to help her make friends. But in the end, all of his actions led to Lydia's suicide. If he had communicated with Lydia more and understood her emotions, she might not have taken her own life. James was a good father in that he provided a decent home for his family, but he also failed because his actions indirectly led to his daughter's death.

Chinese traditional family stress that men are seen as more important than

women. Nath was the only male child in his family. James pushed him to learn swimming and to play games with other boys at school. But the other boys were not friendly; they made fun of Nath, which made him feel ashamed. However, James just wanted to push Nath to be a better man. Nath was too “thin” to join the rugby team, too “short” to play basketball, and too “foolish” to play baseball. The only way he could make friends was by reading, researching maps, and using a telescope (92). This made James feel deeply disappointed.

Nath was not the son he had hoped for. When Nath accidentally got interested in astronomy, he became obsessed with it and talked about it every day with his father. But James slapped Nath because he thought astronomy was not important, and he never brought it up again. Even when Nath received an offer to Harvard, James looked at him sadly. Although James had lived in the United States for a long time, his ideas were still influenced by Confucianism. According to Confucian family ethics, children have a duty to support their parents and must respect them. The ideal son in James’ mind was one who was both intellectual and strong. So, he forced Nath to learn swimming, join the rugby team, and play with other boys, but none of this worked because of Nath’s physical limitations.

Over time, James became more disappointed with Nath and began to dislike him. As a father, James’ responsibility was not just to provide for his children, but also to raise them emotionally and mentally strong, which is called paternal love. James wanted a son who could obey him, become like him, and even surpass him. His son should meet all his expectations, like many Chinese children are expected to do. But Nath was born in America and grew up with Western education. Western family focus on individualism, so Nath silently chased his dream of astronomy while his father remained indifferent. Nath was accepted into Harvard, a place his parents had dreamed of, but they didn’t pay attention to his success. All he wanted was his father’s approval, but he didn’t get it. James should have encouraged him to follow his dream and shared his experiences to help him, which would have brought the family closer. Their relationship shows the conflict

between the Chinese and the Western family teleology.

Nath was the only one who could give Lydia the warmth of family. As an older brother, he gave a lot of warmth, both as family and as a friend. This warmth made Lydia want to keep going. After Lydia found out her brother would go to Harvard, she hid his admission letter and wanted to trick him into thinking he hadn't been accepted. But the truth couldn't stay hidden for long. The neighbour Jack had sent the admission letter to her family. Nath expressed a strong desire to leave, even though Lydia tried to stop him. Lydia asked her brother to call her from school. Nath became busier and more impatient with Lydia until her death.

Siblings are the closest people in the world, beyond parents. Nath had done his duty as an older brother. According to Western family teleology, every family member has the right to follow their own dream and live for themselves, not just for the family. Learning is a normal part of life, but Lydia didn't think that way. She held on tightly to Nath, afraid that he would leave her. As his younger sister, Lydia should have supported her brother to finish his schooling. Siblings should help each other and respect their differences. Lydia could have also left, just like her brother. Western family values focus too much on individual independence, which can cause people to become too focused on their own needs while ignoring others. This is why Lydia just wanted to hold her brother back, while Nath wanted to escape from their situation.

Due to the lack of parental love, Nath found happiness and fulfilment only in astronomy. Ethics says that egoists, who are focused on their own pleasure, and utilitarians, who pursue personal happiness, can also express love for others by helping them for their own happiness (106). Despite trying many times to get his parents' attention, Nath failed, and this led him to want to escape. In family ethics, it is emphasised that everyone is equal. But Nath's parents focused all their attention on Lydia, which made him uncomfortable and that was why Nath wanted to escape. Parents should treat each child as a friend, communicate with them equally, and listen to them to help their children grow.

Hannah, the youngest child in the family, often hid under the dinner table or in small corners of the house because her parents and siblings paid no attention to her. She never dared to get too close to her family because they would ignore her. Her hobby was collecting things her family used and discarded. Despite being treated this way, she still loved everyone. After Lydia disappeared, Hannah once thought about what life would be like without her sister. She imagined sitting at the best seat at the table, living in the big bedroom, and getting all the best things from her parents. But this was just wishful thinking. She knew everything about her family, but no one cared to know her. After Lydia's death, her parents realised they had another daughter, and Nath realised he had only one sister.

Although Celeste Ng has lived in America for many years and is deeply influenced by Western family ethics, many elements of Chinese traditional family ethics can be found in her work. She skilfully integrates these elements into her literature. Modern Chinese family ethics support freedom in marriage. Modern marriage is based on love, and Engels pointed out, "In a marriage based on love, keeping love in marriage is what makes it moral" (78). Love is the main force in family relationships, as it is built on social and emotional bonds. Love can adjust relationships between spouses and serve as a basic moral foundation for marriage. Therefore, family is connected through the emotional bonds between spouses and children. Marilyn and James' marriage was based on love, but it wasn't completely pure.

Marilyn hid the fact that her mother had racial prejudice against James, and James hid his Chinese heritage to Marilyn. James considered himself American and emphasised on American culture, deliberately hiding his Chinese roots from Marilyn. So, their marriage was free but not completely honest. If their three children had been treated equally, Nath wouldn't have tried to escape, and Lydia wouldn't have died. This clearly shows love and equality are important. Traditional family ethics demanded that men should handle external affairs, and women should manage internal affairs. In her book, Celeste supports women



working outside but also emphasises the importance of a mother's role.

In a family, everyone should feel united, and the essence of individuals is found in their connection to the family, not just as independent people (177). Parents are responsible for raising and educating their children, while children are responsible for supporting and helping their parents. In *Everything I Never Told You* the concept of family teleology refers to the goals and expectations that shape the Lee family's relationships and decisions. Marilyn wants Lydia to succeed academically and professionally, also to accomplish the dreams she could not achieve. James, however, wants Lydia to be socially accepted, hoping to shield her from the racial alienation he experienced. These conflicting expectations place overwhelming pressure on Lydia, leading to miscommunication and isolation. The novel ultimately shows how rigid family goals, when based on personal regrets and societal pressures, can lead to unintended harm rather than unity.

Works Cited

Ng, Celeste. *Everything I Never Told You*. Penguin Press. 2014.

Shen, Yuan, and Ting Yang. "Family Ethics in Celeste Ng's *Everything I Never Told You*." *Advances in Social Science, Education and Humanities Research*, vol. 205, The 2nd International Conference on Culture, Education and Economic Development of Modern Society (ICCESE 2018), University of Jinan, 2018, Atlantic Press, <https://www.atlantic-press.com>.



**Tracing Justice and Morality: An Excavation of Human Psyche in Agatha Christie's
*Murder on the Orient Express***

Jumana Hasin M H.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

Agatha Christie's *Murder on the Orient Express* is undoubtedly one of her greatest mystery novels. The novel with a Belgian detective Hercule Poirot as the protagonist is a homicide puzzle. It comes under the detective genre of literature. It is a famous mystery crime fiction that revolves around a murder of a wealthy American criminal, Samuel Ratchett. An injustice was caused in a kidnap of Daisy Armstrong and the crime of Ratchett is a result of the long lost justice. The novel is analysed with a psychological view of Freudian theory. It investigates the motives behind crime. It aims at exploring the themes of justice and vengeance as instigated by Christie in the novel. The paper also examines how the novelist manipulates the reader into sympathizing with the murderers. Through a critical view the novel's plot and nature of the characters are analysed.

Keywords: kidnap, injustice, crime, investigation, revenge, morality, psychology, trauma.

Agatha Christie was the English legendary British mystery writer known for her 66 detective novels and 14 short story collections, particularly revolving around fictional detectives Hercule Poirot and Miss. Marple. Christie known as the Grand Dame of mysteries and the "Queen of Crime" was the representative of the Golden Age of detective fiction. Detective fiction is one of the most popular literary genres in recent years and Christie's detective stories are the most famous ones. Her works were translated into numerous languages making it the third most widely published book after *The Bible* and after Shakespeare. Her works were based on the influences of World War I and World War II.

Agatha Christie pleased readers with a variety of detective stories, experimenting with setting, detective characters and crime depiction. Christie has entered new contexts,

including feminism, interwar trauma, and critical representations of Empire. The majority of her stories revolve around a small group of people. Christie's superpower is her psychological depth. In her stories, materialistic profit and personal revenge have been major incentives.

Agatha Christie's 1934 novel *Murder on the Orient Express* is a homicide puzzle with a Belgian detective Hercule Poirot as the protagonist. It is a famous mystery crime fiction that revolves around a murder of a wealthy American criminal, Samuel Ratchett. The novel was inspired by Christie's own international train travel experiences. In her autobiography, Agatha Christie states that: "Plots come to me at such odd moments: when I am walking along the street, or examining a hat shop with particular interest, suddenly a splendid idea comes into my head" (390). Agatha Christie perfected her guessing for readers by creating a puzzle in the novel.

Agatha Christie loved the Orient Express and first travelled on it in late 1928. She made note of the details of the carriages and clues such as the position of door handles along the train to be featured in her novels. In 1929 the Simplon Orient Express was snowed in for five days at a small station in Turkey. This incident inspired Agatha Christie, although she chose Yugoslavia as the location for her 1934 novel *Murder on the Orient Express*. The kidnapping of Charles Lindbergh's child, a case that had rocked the nation was also a motivation for the novel. In fact, the first known murder on the train did not occur until one year after the publication of her novel.

The novel commences with a fashion similar to the plots of other mystery stories. It introduces many characters in the beginning as for the readers to glance at their behaviours and mannerisms. The story gradually develops into a locked room mystery as a person named Samuel Edward Ratchett is found stabbed to death in a running train. The plot thickens when Hercule Poirot is assigned a case of finding the murderer. The twist at the end not only comes as a surprise, but it is far ahead of its time as the twelve suspects were found to be guilty of murdering Ratchett. Each suspect took a turn stabbing Cassetti, who was travelling and using a name Ratchett, which he has only recently adopted.

Poirot interrogates and explains the motive for each of the characters. He finds

that, years prior Ratchett had been acquitted of murdering a young girl named Daisy Armstrong after holding her for ransom. Her family and their employees were the victims of a heinous crime committed by Ratchett, were seeking revenge and then executed it by each booking accommodation on the Orient Express. The death of Daisy Armstrong affected all twelve suspects in some way. It leads to the denial of justice and as a result the revenge takes place.

The investigation is carried out by Poirot on the basis of psychology over physical evidence which enables him to handle it in a more holistic manner. The psychological perspective of Poirot brings him closer to discovering the truth behind the crime than a more surface-level investigation would. The novel's moralistic view is captured when Poirot discovers that Ratchett's killer is actually a group of people driven by a sense of moral obligation rather than an individual plagued by evil. Each of the passengers admits to their real identities as members of the Armstrong household, and they collectively express their desperation to punish Ratchett for his brutal murder of an innocent girl. Since the truth that Poirot finds is nowhere near the result he expected from his investigation, the subsequent step of ensuring justice becomes even more complex.

The kidnapping case of Daisy Armstrong is the initiative point of revenge in the novel. Then death of Susanne left a big wound for her loved ones including Pierre Michel her father and Cyrus Hardman her lover. This further leads to the expiration of Daisy Armstrong's mother, Sonia Armstrong and her unborn child who passed away in shock following the suicide of Daisy's father, Colonel Armstrong. The sense of revenge arises from power, hurt and anger. "Revenge is a kind of wild justice; " (19) says Francis Bacon. According to Bacon revenge turns a man into an unconstrained human being, who takes up the law in his own hands. The term wild is often connected with beastly behaviour. What differentiates humans from beasts is the conscience but in the novel these characters lose their humane side and expose their animalistic nature by killing a human being. During the first glance at the restaurant before boarding the train, Poirot comments on Ratchett's character as a savage and a wild animal. Poirot tells that: "It was as though a wild animal— an animal savage, but savage! You understand—had passed

me by The body the cage—is everything of the most respectable—but through the bars, the wild animal looks out.” (17-18). The term wild is connected with justice to define the cruel method used to attain justice. In the novel, the murder of Ratchett is considered as a wild form of justice because it compromises the conscience and morals to achieve a cruel goal.

The motive behind the crime of Ratchett is not lust or greed or anger but is a sense of retributive justice. The characters and decisions made in the novel revolve around a corrupt theme of justice that the passengers were clinging on it and this makes their actions morally acceptable. Agatha Christie introduced the concept of justice with its two types: legal and moral. Legal justice is depicted in Ratchett’s non executed imprisonment in regard to the Armstrong’s kidnapping case. As for moral justice, it is presented in the plotting and killing of Ratchett by the twelve passengers.

The passengers were on a mission to serve retributive justice to the man who caused their sufferings and miseries, as suggested in a journal by Kevin M.Carlsmith and John M.Darley: “Retributive justice is a system by which offenders are punished in proportion to the moral magnitude of their intentionally committed harms.” (194). In the novel, a group of people assume themselves to be the jury members as to carry out the justice that was denied long ago for the kidnapping and murdering of Daisy Armstrong. Jury refers to a group of citizens usually of twelve members who hear a case in court and decide whether the defendant is innocent or guilty. The people in the train acknowledge the crime as a form of justice. In a way, the twelve people on the train seem to be justified in Ratchett’s murder because the family is seen as getting some kind of justice as the law has failed to apprehend the killer.

Poirot sympathizes with the twelve passengers notwithstanding his profound and unbending aversion to the crime, for he believes that injustice has befallen the Armstrong family by law and the court system and justice has been served in unconventional manner through this self-appointed jury of twelve. The desire to exact justice with their own hands gave the murderers permission to plot the vengeful murder of a terrible killer. The last line of the novel expresses that, Poirot favours to pursue what is

morally justifiable over what is legally correct. He concludes that “. . . having placed my solutions before you, I have the honour to retire from the case . . .” (174). In a way it dismisses the executioners and condemns Ratchett for the monster of a man he is. By this Agatha Christie recognizes that justice does not always bring justice to the oppressed, but it is them who have to prove themselves justified. The novel successfully blurs the line between justice and revenge.

Poirot's two possible solutions; the real one and a false one, expresses the social concern of Poirot towards the people. He can either deliver the real solution to the police and to condemn the passengers to jail, or he can lie and protect them knowing that their actions restored the social order that Ratchett's crime destroyed. Poirot and M. Bouc's final decision to lie to the police highlights Christie's argument about the validity of moral acts of justice, even when those acts lead to a distortion of the truth. Through the novel, Christie tends to embrace morality as another aspect of justice, which is moral justice. She expresses that in certain circumstances morality foregoes legal justice and that moral fairness is an essential component in determining whether a murder is just or not.

The characters in the novel experience the dominance of trauma and the human psyche. The background of the murder on the train is a revenge taken for a child's death. The main motive of revenge is that, the murderers do not get a true justice for the previously done crime of Ratchett. With the gruesome murder of a child, the lives of twelve people are shattered. This proceeds to concealed motives, desires, loss and pain that are expressed in the forms of emotions, aggression and leads to revenge. Due to the character's loss and pain, revenge takes place. As a result, the novel deals with the psychological trauma. Agatha Christie demonstrates through her books, how characters may experience shame and anxiety as a result of the deceitful truth and superego breach. In the novel, the character's psychic structure of personality interacts with each other and the effects of one's emotions, motives and adjustment leads to anxiety and fear.

The emotional trauma that the characters go through the novel is the result of the emotional upsurge adversely affecting the process of reasoning and thinking powers, thus

leading to crime. The characters affected by trauma in the novel are Mrs.Hubbard, Greta Ohlsson, Antonio Fascarelli, Hector McQueen and Mary Debenham. Countess Andrenyi has symptoms of trauma as she stands alone and not wanted to get disturbed by other people. The loss of Sussane cultivated trauma in Pierre Michel, her father and Cyrus Hardman, who loved her dearly.

The characters in the novel, evolve into criminals because of the sociological factors, unconscious inhibition or psychic personalities. Based on Sigmund Freud's psychoanalytic approach, the three components of personality theory that is: the id, ego, and superego can be used to analyze the crimes. Different types of psychological anxiety are caused by Freud's theory of personality, which influences an individual's motivations, needs, wants, and adjustment. All the twelve passengers of the Orient Express have a dominant Id showed by their determination to plan the revenge. They have a dominant Id because they only follow their own desire even though it is not morally acceptable in society.

Freud's theory of personality traits highlights the id-ego conflicts that arise in characters. The verbal conduct towards aggression, the sense of satisfaction that is received after Cassetti's murder, and the reaction of the characters reveal the suppressed anger they had for Cassetti. It is evidenced through the characters of MacQueen, Princess Dragomiroff, Colonel Arbuthnot, Colonel Andrenyi, and Mary Debenham. "If ever a man deserved what he got, Ratchett or Cassetti is the man. I'm rejoiced at his end. Such a man wasn't fit to live!" (85). "Princess Dragomiroff drew herself a little more erect. 'In my view, then, this murder is an entirely admirable happening! You will pardon my slightly biased point of view'." (119)

The violent behaviour exhibited by the characters results in representing the patterns modelled by real-life events. Violent criminal behaviour is an outcome of people's aggression. The complex relationship of the id, ego, and superego influences how individuals think about the world and approach problems. A rise in hostility makes it unquestionably possible for them to damage or kill anything that comes their way. The outpouring of emotional experiences can also take the form of verbal exchanges.



In view, the paper finds that the motive behind Cassetti's murder at the hands of the twelve passengers is a mixture of drives for both justice and self-retribution which can be served as a justified revenge. The fundamentals to explore the themes of revenge and justice in the novel is followed by the characters psychic zones that is the id, ego and superego, their feelings of anxiety, anger and fear, and essentially their aggressive behaviour. Psychoanalytic approach is used to identify the unconscious motives behind the characters thoughts and actions and to identify the real motive, justice or revenge, behind the twelve passenger's crime. It also expresses the incapacity to adapt to a given circumstance manifests itself in the forms of emotion, fear, anxiety, and aggression, and how these elements set the stage for the deceit that the characters in the novel employ.

Works Cited

- Bacon, Francis. "The Essays of Francis Bacon". Edited by Mary Augusta Scott, Charles Scriber's Sons, 1908.
- Carlsmith, Kevin.M and John M.Darley. "Psychological Aspects of Retributive Justice Advances in Experimental Social Psychology", vol. 40, 2008.
- Christie, Agatha. *Agatha Christie, An Autobiography*. E-book ed., Harper Collins Publishers, 2010.
- Christie, Agatha. *Murder on the Orient Express*. Harper Collins Publishers, 2013.



Resilience and Resistance of Women in Isabel Allende's *The Japanese Lover*

Karputha Selvi K.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

Isabel Allende is a Chilean-American writer known for her works of magical realism and historical fiction. Her novel *The Japanese Lover* provides a compelling portrayal of female characters navigating love, societal expectations, and personal hardships across several decades. This paper examines how Allende's feminist perspective and personal experiences shape her depiction of women, particularly through the protagonist, Alma Belasco. Set against the backdrop of World War II and the incarceration of Japanese Americans, the novel highlights themes of love, exile, identity, and aging. Through the experiences of Alma, Irina Bazili, and Lillian Belasco, Allende sheds light on the oppression women faced due to rigid gender norms, economic hardships, racial discrimination, and wartime displacement.

Keywords: Gender Roles, Historical Trauma, Love, Marginalized Women, Resilience

Literature has been a powerful medium for exploring the roles, struggles and resilience of women across different historical and cultural settings. The novel *The Japanese Lover* present a compelling portrayal of women navigating love, social expectations and personal hardships over several decades. As a feminism-focused writer, Allende frequently depicts women as tenacious, self-sufficient, and formed by personal and historical conflicts. Through Alma Belasco, the protagonist of *The Japanese Lover*, she tackles themes of love, exile, aging, and identity. The novel is set during World War II and the incarceration of Japanese Americans in the United States. This illustrates Allende's interest in forgotten or disadvantaged histories, particularly how they affected women. Allende has stated in interviews that several of her writings are inspired by chats with others who have gone through comparable circumstances. In an article titled "The Japanese Lover by Isabel Allende," *The Harvard Crimson* commended Allende's handling of complex themes, stating that she "handles such weighty themes with an experienced hand," delivering "difficult moments with a quiet resonance that permeates the novel's nuanced relationships."

The novel takes place predominantly between the 1930s and the present, when

women's duties were largely determined by patriarchal organizations. In the early twentieth century, women were expected to marry well, be dutiful spouses, and prioritize family life. They had little flexibility to make personal decisions, and society frequently evaluated them based on their marital status and behaviour. Traditional gender roles were firmly established during this time. Women were supposed to be loving moms, obedient daughters, and loyal spouses. Their main responsibilities were to support their spouses, run the home, and raise the kids. There were few options for education and employment, and anyone who wanted to work outside the house sometimes encountered discrimination. The capacity of a woman to get married successfully and have a decent family life was a major factor in determining her value.

Women suffered greatly during World War II and other battles during that era. Due to war, many were compelled to flee their homes and sought refuge in other countries, where they battled for survival. In areas devastated by conflict, women had to deal with malnutrition, violence, and the ongoing threat of losing their family. Furthermore, because of their race or ethnicity, some women were sent to detention camps or compelled to work. They endured difficult living circumstances, being away from their loved ones, and lifelong emotional damage.

Women were paid far less than men and frequently put in low-status positions like caregiving, manufacturing work, or household chores. Many women managed domestic duties while working long hours in unfavorable conditions. In order to survive, people without financial support frequently had to put up with severe treatment from their employers or resort to drastic means. It was difficult for women to overcome poverty because they were sometimes humiliated or shunned when they desired independence. Although sexual abuse and domestic violence were common, they were rarely openly discussed. Because it was socially unacceptable to leave an abusive marriage or to speak out against strong individuals, many women endured in silence. Victims have few options and scant legal protections. Many were forced into unsatisfactory and even dangerous partnerships because divorce was frequently out of the question. People who disobeyed these norms ran the risk of facing punishment from their communities or disownment from their relatives.

For women, the early to mid-20th century was a very difficult period. Many were compelled to suffer quietly, while others were able to escape social restraints. Economic hardship, war, racial prejudice, brutality, and rigid gender norms were all forms of oppression

they had to deal with. Women showed incredible fortitude in the face of these obstacles, setting the groundwork for later generations to struggle for freedom and equality. At the heart of the novel *The Japanese Lover* had a strong female characters who navigate complex personal and historical challenges. The three main women Alma Belasco, Irina Bazili, and Lillian Belasco have distinct journeys that explore themes of love, sacrifice, survival, and self-discovery. Their stories show women's problems and talents, contributing much to the novel's emotional depth.

Alma Belasco is the main female character in the novel. Born in Poland, she is sent to San Francisco as a kid to avoid the horrors of World War II. She grows up in the wealthy Belasco family, where she enjoys a life of privilege while simultaneously feeling like an outsider. Despite her guarded demeanor, Alma is passionate and independent, willing to forge her own path rather than submit to societal expectations. Her romantic relationship with Ichimei Fukuda, the son of a Japanese gardener, becomes a defining feature of her life. Their relationship is characterized by great affection, but it is tested by society conventions and historical events, particularly the internment of Japanese Americans during World War II. Even though Alma marries Nathaniel Belasco, her feelings for Ichimei never diminish. She chooses to keep their relationship a secret, violating social standards in her own manner. Alma's character portrays a woman who makes difficult decisions, balancing love and duty while being loyal to herself. She is also a successful artist and businesswoman, demonstrating her perseverance and capacity to survive independently. Even in her old age, she refuses to rely on her family, opting instead to live in Lark House, a senior facility.

Irina Bazili, a young Moldovan immigrant, is another important female character. She works as a caregiver at Lark House and establishes a close friendship with Alma and her grandson, Seth. Irina is sweet, diligent, and dedicated, yet she has unpleasant memories of her past. As the narrative progresses, it becomes clear that she was a victim of human trafficking and abuse during her childhood. These horrific experiences have made her wary and scared of emotional closeness. Despite this, Irina establishes a new life for herself in San Francisco, seeking stability and security. Seth falls in love with her and attempts to help her open her heart, but Irina is unable to let go of her old anxieties. Allende uses Irina's trip to examine themes of pain and healing. Although Lillian is a member of the affluent class, she is conscious of societal disparities and strives to assist Alma in making her own decisions. She exemplifies a generation of women who navigated stringent social constraints while yet

finding methods to advise and protect their families.

Alma's journey reflects the challenges of balancing passion and duty, self-expression and societal expectations, making her one of Allende's most compelling female protagonists. Born into a wealthy Jewish family in Poland, she is sent to San Francisco as a child to escape the dangers of World War II, and she grows up in the Belasco household, a prestigious and privileged environment that offers her security but also imposes certain expectations. While Alma appreciates the love and care of her relatives, she never fully conforms to the traditional roles assigned to women of her time. She is independent in her thoughts and actions, refusing to be defined by marriage or societal approval. "She learned to bear her troubles alone and with dignity, convinced no one was interested in other people's problems, and that pain borne in silence eventually evaporated" (40).

One of the defining aspects of Alma's life is her relationship with Ichimei Fukuda, the son of the family's Japanese gardener. "She was eight she had fallen in love with ichimei with all the intensity of childhood passions" (132). Their love story is passionate but forbidden due to racial and social barriers. During World War II, Ichimei and his family are sent to an internment camp, a cruel reality that separates them. Although Alma deeply loves Ichimei, she does not choose to marry him, understanding the limitations society places on their relationship. Instead, she enters a marriage of convenience with Nathaniel Belasco, her childhood friend. Their marriage is based on mutual respect and companionship rather than romantic love, as Nathaniel is secretly homosexual. This unconventional arrangement reflects Alma's independent mindset, she refuses to be controlled by emotions alone and makes choices that allow her to live life on her own terms.

Despite her marriage, Alma continues her secret affair with Ichimei throughout her life. Their love remains strong, "She was ten when they where separated, promising to stay together in their thoughts and by writing; eleven when his letters started drying up; and twelve when the distance between them became insuperable and she resigned herself to losing Ichimei" (131). "Our relationship is still secret" (172) but Alma insists on keeping it hidden. This decision shows the contradictions in her character. While she defies conventions in many ways, she also adheres to certain social norms, choosing secrecy over open rebellion. She values her independence and does not want to be bound by expectations, yet she also fears losing the life she has built. This internal conflict makes her a deeply human and complex character. "Alma showed herself to be an imaginative storyteller; (73)

Alma's independence extends beyond her romantic life. She is a talented artist and later becomes a successful businesswoman, proving her ability to stand on her own. She does not rely on anyone for financial security, which was unusual for women of her time. Even in old age, she chooses to live at Lark House, a senior residence, rather than depend on her family. Her decision symbolizes her lifelong commitment to self-sufficiency and personal freedom. She is a woman who makes difficult choices, sometimes sacrificing personal happiness for practicality and independence. She is passionate yet restrained, rebellious yet cautious. Through her character, Allende explores the complexities of love, duty, and identity. Alma's life is a testament to the strength of women who carve their own paths in a world that often seeks to confine them. Her character remains unforgettable as she embodies the struggles and triumphs of a woman determined to live life on her own terms.

Throughout the novel, Alma's choices challenge traditional gender roles, making her a symbol of autonomy and self-determination. Despite experiencing love, loss, and the constraints of societal expectations, she remains steadfast in her pursuit of personal freedom. Her story ultimately underscores the novel's themes of love, identity, and the passage of time, reinforcing her legacy as a woman who lived life on her own terms. Through Alma Belasco, Allende offers a compelling portrait of a woman whose complexity and independence make her unforgettable.

Irina Bazili is introduced as a hardworking and dedicated young woman who works at Lark House, a retirement home. "Irina Bazili began working at Lark House in 2010, she was twenty three years old" (1). She is kind, efficient, and well-liked by the residents, especially Alma Belasco and her grandson, Seth. Despite her cheerful personality, Irina keeps her past a secret. She avoids close relationships and is afraid of love and intimacy. Her independence is one of her strongest qualities. Unlike Seth, who comes from a privileged background, Irina has had to struggle for everything she has. She works multiple jobs and refuses to rely on others for financial support. This reflects the reality of many women in society who must work hard to survive, often without help.

"Irina's secret was in fact more complicated: to her each one of the Lark House residents was a replica of her grandparents" (103). Irina's determination to create a better life for herself, despite her past trauma, shows her strength. She represents women who refuse to be defined by their past and instead fight for a future on their own terms. One of the central themes in *The Japanese Lover* is how women often suffer in silence. Irina's past is filled with

pain she was a victim of abuse and human trafficking. These experiences have shaped her fear of men and her reluctance to trust others.

“‘One girl threw herself out of a third – floor window and was left half paralyzed, but she still had to keep working,’ Radmila told Irina in the half-melodramatic, half-didactic tone she used to refer to this wretched episode in her life” (106). Irina’s story highlights the harsh realities faced by many women around the world. Abuse, violence, and exploitation are problems that women often experience, but society does not always acknowledge them. By keeping her past hidden, Irina represents the countless women who suffer alone, afraid of judgment or rejection. However, the novel also shows that healing is possible. Through her friendship with Alma and her growing relationship with Seth, Irina slowly learns to trust again. “As time went by, the relationship between Alma and Irina became increasingly like that of aunt and niece” (59). This suggests that while women face great challenges, they can find support and strength in their relationships with others.

Throughout history, women have been expected to marry and dedicate their lives to their husbands and families. In *The Japanese Lover*, Irina challenges these expectations. She refuses to rush into a relationship with Seth, even though he loves her deeply. Her past trauma makes her hesitant, but she also values her independence and fears losing control over her life. Irina’s reluctance to commit immediately to a romantic relationship is important because it highlights a modern perspective on women’s roles. Many women today are choosing careers, self-growth, and personal happiness over traditional expectations of marriage. Irina, like Alma, shows that women can live fulfilling lives without being defined by their relationships with men.

Irina’s journey is about breaking free from the chains of her past. For years, she has lived in fear, believing that her history will always define her. However, as she opens up to Alma and Seth, she realizes that she has the power to change her life. Her growth represents the resilience of women who have faced hardships but refuse to be defeated by them. She chooses to embrace her future rather than let her past control her. This message is important in the context of women’s roles in society—Irina proves that women are not victims of their circumstances but survivors who can shape their own destinies. Irina’s journey shows that women can overcome even the most painful pasts and build their own futures. Her independence, resilience, and eventual acceptance of love and trust make her an inspiring character. The novel emphasizes that while women often face difficult challenges, they also

have the strength to rise above them and create their own paths. Ultimately, Irina Bazili is not just a survivor—she is a symbol of hope, proving that women have the power to define their own lives, regardless of the obstacles they face.

When Alma forms a marriage of convenience with Nathaniel Belasco, whom she admires but does not romantically adore. Their marriage gives stability and safety, allowing Alma to preserve her social status. Nathaniel, who is secretly homosexual, also benefits from the arrangement because it helps him to avoid social stigma. Their relationship is founded on companionship rather than passion, demonstrating how marriage can often be more about stability than love. Alma's decision underscores the constraints that women frequently experience to obey social norms rather than their feelings. While she maintains her secret love with Ichimei, she lives within societal norms, demonstrating the delicate balance between passion and duty.

Irina Bazili's relationship with love is completely different from Alma's. Alma embraces her secret passion, whilst Irina is afraid of love due to past tragedy. She comes from a past of violence and human trafficking, which has severely harmed her capacity to trust and build meaningful relationships. Even when Alma's grandson, Seth, falls in love with her and offers her a stable and caring future, she is hesitant. Unlike Alma, who risked everything for love, Irina avoids it, believing that it will only cause her sorrow. Her struggle symbolizes the long-term impact of trauma and the difficulties of accepting love after enduring pain.

Despite their differing backgrounds, Alma and Irina demonstrate that love is not always simple. Society frequently specifies who women should love and marry, but personal experiences and feelings may not always follow these guidelines. Alma chooses to live a double life, meeting social expectations through marriage while concealing her genuine desire. Irina, on the other hand, defends herself by avoiding love completely. Both women make decisions based on their circumstances, demonstrating that love is influenced by both external pressures and internal feelings. Similarly, Irina gradually learns to accept love despite her tragic history, demonstrating that healing is achievable with time. The novel challenges the notion that love must adhere to standard schedules or expectations. Instead, it portrays love as something fluid, capable of lasting beyond the constraints that society imposes.

Isabel Allende portrays women's love and marriage decisions as deeply personal

while impacted by external forces. Alma's decision to marry Nathaniel is influenced by social norms, familial pressure, and time constraints. Her secret affair with Ichimei is an act of rebellion, a method for her to regain her right to love despite the restrictions imposed on her. Irina's first rejection of love was a sort of self-protection, but as she recovers, she understands she has the ability to choose love on her terms. Through these characters, Allende indicates that, while society may attempt to dictate women's love and marriage decisions, women ultimately have the right to define love for themselves.

In *The Japanese Lover*, love is depicted as a source of both joy and agony, freedom and constraint. Women in the novel must balance following their hearts and satisfying society's expectations. Alma and Irina's experiences show the challenges that women encounter when deciding between passion and security, trust and fear, tradition and personal independence. Allende's work argues that, while external factors shape love, it remains a very personal experience, demonstrating that women, despite cultural pressures, can determine their own pathways in love and life.

Works Cited

Allende, Isabel. *The Japanese Lover*. Translated by Nick Caistor and Amanda Hopkinson, Atria Books, 2015.

"The Japanese Lover by Isabel Allende." *The Harvard Crimson*, 6 Nov. 2015, www.thecrimson.com/article/2015/11/6/allende-japanese-lover-review/. Accessed 2 Mar. 2025.

Trauma and Human existence in Elif Shafak's 10 minutes 38 Seconds in This Strange World
Lourde Tatina

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

The paper examines the trauma and human existence in Elif Shafak's novel *10 Minutes 38 Seconds in This Strange World*, analyzing how personal and collective trauma shapes identity, memory, and social marginalization. The novel follows the postmortem consciousness of Tequila Leila, a murdered sex worker in Istanbul, as she recalls pivotal moments of her life. Through her fragmented memories, Shafak portrays the long-lasting effects of childhood abuse, gender-based violence, and societal exclusion. The paper also examines the psychological and existential dimensions of trauma in the novel, focusing on Leila's resilience and her deep connections with a chosen family of outcasts. By situating Leila's experiences within a broader socio-political context, the paper highlights the intersections of gender, oppression, and memory. The paper underscores how Shafak challenges the dominant narratives of suffering and survival. The paper explores that *10 Minutes 38 Seconds in This Strange World* is not just a story of trauma but also a testament to resilience, friendship, and the enduring search for dignity in an unjust world.

Keywords: Identity, Memory, Marginalization, Resilience, Gender-based violence, Societal exclusion, Oppression, Dignity, Survival.

Elif Shafak's eleventh novel *10 minutes 38 seconds in This Strange world* (2019), it is a psychological fiction that mainly discusses the interior characterization and motivation through the emotional and mental states of the characters. Shafak's main idea to write this novel was related to a place, an actual place that exists in Istanbul, a graveyard, which has no surnames, mostly just numbers, called Companionless Cemetery. The buried people are the ones who are shunned, rejected, by their families. Shafak is curious to know their stories, their actual individualistic traits, so she took a specific number and named her in her fiction and created her own story of that person. The people among them are mostly AIDs patients, sex workers, abandoned babies, LGBTQ members, and refugees.

Shafak paid attention to that specific societal issue, because she felt that the novelist should be equally interested in science, silenced people, whose stories have been erased, forgotten, or pushed to the margins, she also felt that their untold stories should be told. This book relates to the recollections of an Iranian sex worker Tequila Leila after her brutal death. She was killed and tossed in a dumpster, Leila's heart stops but her mind continues for 10 minutes and 38 seconds. Oscar Wilde states that, memory is the diary that we all carry about with us.

The novel *10 minutes 38 seconds in This Strange world* compiles the dying memories of Tequila Leila as a predominant part and traces the impact of her death on a group of friends introduced in the first section. As she lies in the bin, she knows that she is dead, her brain experiences a last paroxysm of activities like episodes from her past flooding back to her expiring consciousness on the back of startlingly vivid sense memories. Leila experiences dilation of time in this state, with memories that span long periods of life.

The initial chapters of the novel talk about the upbringings of her childhood. Life was always hard for her even from her childhood. She was born to her father's second wife, but raised by his first wife. Her father was a typical religious man with a sworn opposition to anything he considered to be western. He increasingly restricts the women of his family by enforcing the life of pious severity. The worst of all is that Leila begins to be sexually abused by her uncle when she is just six years old. He chooses her of all the girls of the family he tells her that "You have always been my favourite" (65). But her family's horrific response is to betroth her to the son of the uncle who abused her. To escape this situation, Leila, the young woman runs off to Istanbul. And there Leila ends up being sold into prostitution at one of the government-sanctioned brothels of 1960s in Turkey. She ended up as a prostitute unwillingly.

Hermann Hesse states that, if I know what love is, it is because of you. The only man who saw Leila as a human and the only one who didn't want her body but he made her to feel herself is D/Ali. The whole worth of Leila was brought to light by D/Ali. From the brothel she was released by D/Ali, who has sincere love towards Leila. D/Ali was a socialist and he was shot dead in the riot and this leads Leila to become a prostitute again. But Leila's life was the happiest when she was with her only love D/Ali.

After Leila's death, she was buried in the Companionless Cemetery in Turkey. It will be a deposition in to an unnamed and just numbered, It is a grave used for the bodies of social cast-offs, and then the novel moves the readers to follow the misadventures of "the five" they are Nalan, Sinan, Jameelah , Zaynab, Humeyra. The people over there refused to give Leila's body to her friends saying that they are supposed to give the body only to her family. So one of Leila friend's Sinan says in a trembled voice that "we are closer to her than family" (195). The deep friendship was expressed by Shafak as emotionally and comically in the last part of the novel. Her friends conspire to retrieve her body from its ignominious resting place in order to give her a proper burial. They encounter several obstacles in their quest for Leila's body.

The structure of this novel is actually divided into three parts such as mind, body, and soul. The first part deals with her last minute memory which is associated with a particular taste or smell like lemon, cardamom, wedding cake, sulfuric acid which are deeply linked to a transformation in her life. Then the later part deals with her friends who try to free her soul like the blue betta fish in the ocean befitting Leila's wish.

Elif Shafak ends the novel with the new beginning by sending Leila's soul along with the blue betta fish. It conveys the readers that there is always a new beginning to start again. Istanbul was referred by Shafak as illusion, "Istanbul was an illusion" (202). In this novel Shafak weaves intricate details, juxtaposing the changes in Turkey's societal circumstances. Shafak leavens her story with wordplay that "If Paris was the city of love, Jerusalem the city of God, and Las Vegas is the city of sin, Istanbul was the city of multitasking"(249 -50).

Shafak highlights the multitasking throughout the novel. Ultimately the novel is not really about death, but the persistence of love. Without ever losing her grip on the tragedy of Leila's experience and the experiences of so many Turkish women like her Shafak also celebrates Leila's brave and compassionate life.

Shafak leavens a drastic importance for the women who face psychological violence due to the male domination of men, the gender discrimination. The memory is heightened throughout the novel. All the female characters, Leila's mother Binnaz, and even her friends are forced to suffer, deprived of their rights, prejudiced, discriminated

and oppressed by the male dominant norms of the society. Shafak in an interview says that:

We women sometimes play a role of continuity of patriarchy, because patriarchy is not a black and white system in which men oppress women. It's much more complicated. I think we need to go back to the basics. Remember the solidarity. The sisterhood. And expand it. (2021)

Simon de Beauvoir states in *The Second Sex* that humanity is male, define women, not in herself, but in relation to himself. The young woman named Binnaz was just nineteen years old when she got married to Haroun in a kind of religious ceremony. Her husband Haroun was a man of scintillating opposites. He wanted a son more than anything in the world. His long years of marriage with Susan, his first wife has yielded no offspring. But Binnaz was pregnant for the seventh time, she had six severe miscarriages. When she was pregnant with Leila, Binnaz was so careful and conscious and believed in a lot of superstitions and even followed it. Simon de Beauvoir's states that:

She had not touched a single peach so the baby wouldn't be covered in fuzz; she had not used to any spices and herbs in her cooking so the baby wouldn't have freckles or moles; she has not smelled roses so the baby wouldn't have port-wine birthmarks . . . and secretly after every summer, she had collected hairs from Suzan's hairbrush and burned them into fireplace so as to reduce the power of her husband's first wife. (14-15)

Shafak points out the strong male domination that happens after the childbirth. The baby was named as Leyla Afife Kamile, which means full of virtue and high in merit. Even motherhood was denied to Binnaz by her husband as he wanted his daughter to be known as the daughter of his first wife and asked her to accept that she will be rewarded again from Allah. Binnaz would have been felt, as the situation is out of her hands. She has only one option that is to give her own child to Suzan, the struggles she had gone through the six severe miscarriages and inspite of the birth of the child she has not been granted the status of the mother her husband who said "Susan can be Mummy. You'll be Auntie." (22)

Leyla's rights were just taken away from her. Even her motherhood was usurped from her as she has no other choice and the only choice that was left was to cry

and accept. Motherhood of a woman was not respected, her pain and sufferings were not heard by anyone even though it was so loud. The younger child in her was weeping and craving to get back her daughter in her arms to kiss and cuddle her. “Thus the subject was closed, then and there – though, in truth, it would always open, this wound in the mist of their lives that would never heal” (25). Binnaz state was 37 strongly reflecting all women in the male dominated society. Matriarchy was wounded and helpless.

The protagonist of this novel, Leila was actually a girl baby born to a family on 6 January 1947, in the city of Van “the pearl of east” (27). She was named by her father as Leyla Afife Kamile. Her father named her like this so that she should be chaste, untainted and should always remain perfect. He remarks: “You’ll be modest, respectable, pure as water . . .” (26). But unfortunately it did not happen to be true in her future. She came out of her home and was forced to become a prostitute. She had undergone a lot of struggles in Istanbul and met her five loyal friends. The end was actually the beginning of the novel, she was found dead in the outskirts of Istanbul in a dumpster:

Tequila Leila would have given anything to be in her apartment now. Instead she was here, somewhere on the outskirts of Istanbul, across from the dark, damp football field, inside a metal rubbish bin with rusty handles and flaking paint. It was a wheelie bin; at least four feet high and half as wide. Leila herself was five foot seven – plus the eight inches of her purple slingback stilettos, still on her feet. (1-2)

Her father wants her to be like a woman who takes good care of her husband and her children. But even from her childhood she faced all kinds of abuse. Once when she was only six years old Leila’s uncle who was trim, tall and handsome, with hair shaved closed to the scalp and bluish-grey eyes with long lashes that curled at the ends, abused her. He was the prominent reason for Leila to move out of her home and end up as a prostitute. He chose her because she was innocent and selfless. “Because you are not selfish like the others. A smart, sweet girl. Don’t ever change. Promise me you won’t change” (65)

The femininity was not respected, because when Leila openly voiced about her uncle’s misbehaviour towards her at the age of six, nobody accepted if even though they all knew the cause of her pregnancy. They took a bad decision to marry her to the

uncle's son. Everyone noticed Leila's pregnancy by seeing her eating soil. "Are you eating soil? My God, why would you do such a thing?" (105). Later, after growing she asked herself several times. Here, the innocent small girl was facing these struggles and broken into pieces by her own family. And this made Leila open up about the abuse by her uncle, but the family members and her father were not bothered about that and they refused to believe in Leila. She sensed that they all have already known this. "I don't think so. I think you are trying to save Uncle" (109). But even though they all know the truth they wanted her to get married to that uncle's son to hide this situation from the society. Leila's father was accusing her close friend from the school and she shouted back not to involve him into this:

You mean Sabotage . . . Sinan? Leave him out of this. He's my friend. My only friend. He's a kind boy. Uncle is lying! And she was just informed that she'll get engaged. And Leila felt so unhappy and asked that why they are not ready to believe her even she is their own daughter. "Why don't you ever believe me – your own daughter?. (107-8)

That really shattered Leila and so she decided to move out from her home and her city Van. She went to Istanbul where everything was new and she was unaware of it. Two of them sold her to a brothel inspite of her unwillingness. This changed her life drastically. Society and even her own family blamed her, she was not the reason for the cruelty that was thrust on her.

So the woman, the girl child was not even considered by man in the family. Shafak reflects women's life through the mirror of Leila, the mental tortures she had undergone to prove her virginity even among her own family was intolerable. Leila felt that she was "like a trapped butterfly" (110). This disbelief of her father towards her leads her to suffer throughout her life.

Nalan was a friend of Leila in Istanbul. Nalan was called Osman, the youngest son of the farming family in Anatolia. Nalan was an assertive, bravest friend of Leila, one of the five. The mental tortures that she had been affected with through her surroundings made her move to Istanbul. She was bullied by the boys in his school. His feelings were not considered by her family.

In the stories he invented, he would always take the main role – a Persian poetess, Chinese princess or a Russian empress; the characters

wildly, but one thing remained the same; in his mind, he was always a girl never a boy. At school things have been more different. It wasn't a place for stories. (58)

Nalan always felt the femininity in him. He wished to be a girl not as a boy even once in his lifetime. Even though he went for the military training he returned to his home as the same person, always a girl. But his parents ignored his feelings and wanted him to marry a girl. He was not able to do it and his explanations were not heard by any single soul in his family. So he came out of his house and went to Istanbul. He felt "Yet he was not the same. He had always known he was a female inside, but the ordeal of the army had flattened his soul to such a degree that, strangely, he felt emboldened to live his own truth." (59)

He stayed in Istanbul, because only that he could outwardly transform himself in to the person he really was inside. "Osman was no more. There was only Nalan, and no going back" (60). Nalan leaves her home on her wedding night forcefully fixed by her mother and moves to Istanbul where she gets her gender changed; from a boy to a girl though it had never been accepted by the society. Everywhere she was insulted, abused, and humiliated by the people. The society never accepted her, it was not her mistake that she was shunned away and ill-treated by everyone. She never led a happy life.

Jameelah, the death of her mother whom she adored died of cancer, her life has totally changed. Jameelah's family members forced her father to marry again and want him to live a happy life. So her father decided to marry a widow. Because of her step-mother Jameelah lost her education and she forced herself to move to Istanbul:

Jameelah's stepmother, a widow herself, was jealous of a ghost, determined to erase all traces of the woman she felt she was there to replace. Soon Jameelah – the eldest daughter – was clashing with her stepmother on nearly everything, from what she wore to what she ate and how she spoke. (118-19)

Jameelah failed to maintain her relationship with her stepmother which makes her skip her education. Her peaceful life was taken by her stepmother. So she decided to move to Istanbul just to have a peaceful life but she also ended up as a prostitute unknowingly, along with forty people mostly women she made a journey to Istanbul there she was later understood that it was a sham. "By the time she understood it was a

sham – a pretext to bring people in as cheap labour and for sexual exploitation – it was too late for her to escape” (120). A young woman was pulled in to a situation where no one wants to settle, because of her step mother she was undergoing all these peaceless situations. The girl moves to Istanbul only to have a peaceful life.

Zaynab, the friend of Leila, was physically unattractive short and uneducated because her physical stature restricted her position in the society. She was not responsible for her height, she was always avoided by the people in the society for the way she looked. But that does not define a person. The ignorance by the society leads her to face a lot of mental tortures because she was not allowed to study, she was not given a proper job, she was not respected equally as other human beings in the society. But she always got her father’s support at all time, he wants her to get married to a man who is similar to her, unfortunately it never happened.

Zaynab left her place and moved to Istanbul to seek a job for herself. “Finding a job in Istanbul, however, was not easy. No one wanted to hire her” (131). But she ended up as a cleaner in the brothel where Leila was working. The birth is something which one person cannot decide. The society treats people well or badly based on their appearance. So Zaynab who came from high mountain ended up in Istanbul. The depression she faces was miserable, these lines shows that:

Depression was common among the woman on this street, tearing into their souls as fire tears into wood. No one used the word though. Miserable, was what they said. Not about themselves, but about everyone and everything else. The food is miserable. The payment is miserable. My feet hurt, these shoes are miserable. (125)

Zaynab was the face given by Shafak for those kinds of people who don’t look physically attractive. She flashlights the way how society treats them. Shafak portrays the society’s inhuman ways of belittling such different people and how it affects them psychologically in a realistic way. Humeyra, was another friend of Leila, she turned fifteen, was instantly pulled out of the school and married to a man, whom her father has been doing business with.

Her husband was an unambitious man, taciturn and easily frightened. Humeyra knowing he had not wanted this marriage, suspected he had a sweetheart somewhere whom he could not forget. Time and again, she

caught him watching her with resentment, as though he blamed her for his own regrets. (158)

She was working in her in-law's house as a servant. She was treated like a servant without a name. Going back to her parents house was out of the question, so unwillingly she stayed in the place of misery. Even though she worked harder for everyone in that house she was beaten by her husband. The gender domination forced her to endure psychological violence:

Still she might have endured it all if it hadn't been for the beatings. Once her husband broke a wooden coat hanger on her back. Another time he hit her on the legs with a pair of iron tongs that left a claret- coloured mark on the side of her left knee. (158-59)

She escaped from her in-law's home to enjoy her freedom, and she lived near the streets of brothel where she met Leila. She was often afraid that she might become a victim of an honour killing. She always imagined about her murder. "Women accused of indecency weren't always killed, She knew; sometimes they were just persuaded to kill themselves" (159). Shafak strongly states that the education which was prohibited to her, the way she was treated as a servant in her in-law's house are the main factors that affected psychologically which leads her to develop suicidal thoughts and depressed life. He not only focuses on the physical tortures and beatings she had undergone but also the mental tortures that leads her to move out from her husband's home and the thoughts which always force her to kill herself. Shafak concludes:

Men have greater social and physical power than women and, relatedly, that women's beliefs and reactions are shaped by the constant threat of male violence with which women live . . . for instance, behaviour that men see as merely flirtatious may be experienced by women as offensive or even threatening. (Whisnant, 173)

In other words, power is an instrumental concept in Leila's society that never inspects the paradoxical nature of itself. This notion is reflected in each part of the story to provide a proper context of a protagonist who is searching for individual socialization.



Works Cited

Elif, Shafak. *10 Minutes 38 Seconds in This Strange World*. Viking Press, 2019. Krause, Mine. *The Cemetery of the Companionless: Elif Shafak's Novel 10 Minutes 38 Seconds in This Strange World*. Wordpress, 2020.

Mills, Lia. "Wanting All the Words: Elif Shafak in Conversation with Emma Graham-Harrison (A Guardian Live Event)." WordPress, 2020.

<https://libranwriter.wordpress.com/tag/cemetery-of-the-companionless/>.

<https://turkishliteratureblog.wordpress.com/2020/02/16/the-cemetery-of-the-companionless-elif-shafaks-novel-10-minutes-38-seconds-in-this-strange-world/>.

**Echoes of Oppression: A Patriarchal Analysis of Shashi Deshpande's
The Dark Holds No Terrors
Maria Kate Winslet V.**

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

Shashi Deshpande's *The Dark Holds No Terrors* provides a compelling examination of patriarchy and its impact on women in Indian society. The novel follows Sarita, a highly educated and independent woman, as she struggles against gender discrimination both within her family and her marriage. Through Sarita's journey, the novel highlights the psychological and emotional trauma inflicted upon women due to societal expectations and patriarchal oppression. The novel also delves into significant themes such as the marginalisation of women within family structures, the mother-daughter conflict, gender bias in education, and the struggles of professional women in a male-dominated society. Deshpande effectively critiques patriarchy, revealing how it operates through both men and women, shaping societal norms and restricting women's autonomy. The research paper examines the portrayal of patriarchy, gender discrimination and psychological trauma in *The Dark Holds No Terrors*, analysing Sarita's struggle for autonomy and self-identity within a patriarchal society.

Keywords: Patriarchy, Identity crisis, Marginalisation, Psychological trauma, Emotional drama.

Literature serves as a powerful lens to examine patriarchy, as seen in the works of both male and female authors. The silence of women in Indian fiction reflects the deeply entrenched patriarchal nature of Indian culture, which has historically restricted women's freedom of expression. Cultural norms have shaped women's identities, reinforcing gender-based roles and expectations. Patriarchy, a system of male authority, domination and power, functions as a pervasive social institution that influences every aspect of human existence, keeping women in a subordinate position. Writers such as Arundhati Roy, Kamala Suraiya Das, Kamla Bhasin, Shashi Deshpande, Ismat Chughtai, Amrita Pritam and Tarabai Shinde have explored patriarchy's role in maintaining women's subordination across social, economic, religious, political, artistic and existential realms, highlighting how it is often implicitly regarded as belonging to the male domain.

According to the feminists, the term patriarchy is used to describe the power relationship between men and women. Anita Desai's *Fasting Feasting* explores the

victimisation of women characters in the backdrop of oppressive Hindu patriarchal ideology. In the words of Desai “Anamika was beaten regularly by her mother-in-law while her husband stood by and approved-or at least, did not object” (71). The novel reconnoitres the helplessness of females and their submissive nature in the patriarchal society. The birth of a male child is to be feasted whereas the birth of a female child is believed to be a bad omen and spells misery. Nayantara Sahgal in her novel, *Rich Like Us* is a complex novel with multiple voices and enigmatic ending. Sahgal writes: “Men made the decision, and women follow them. That was the order of things, and it was best not to question it” (154). She talks about patriarchal power and arbitrary power and displays how Rose faced so many problems and limitations in Indian society. This research paper critically examines the way in which *The Dark Holds No Terrors* portrays gender discrimination, psychological trauma and the on going struggle of women for autonomy and self-identity.

In *The Dark Holds No Terrors* Shashi Deshpande deals with patriarchy as one of the central themes. It tells the story of Sarita, a highly educated and independent woman on a quest to discover her own identity. It explores the traumatic experiences she endures from birth, largely due to the discrimination she faces as a woman. Gender bias plays a significant role in diminishing her opportunities for happiness and fulfilment. The novelist poignantly captures the pain and suffering inflicted upon Sarita, particularly by her own family members effectively highlighting the challenges she faces in a patriarchal society.

Sarita, the protagonist of Shashi Deshpande’s *The Dark Holds No Terrors*, comes from a traditional Brahmin family and serves as the central figure of the novel. The narrative unfolds through a dual perspective, alternating between Saru’s life before and after her marriage, constantly weaving together her past and present experiences. To fully comprehend her character, it is crucial to examine the psychological dimensions of her journey.

The novel reveals that Sarita lives in a patriarchal society where sons are preferred to daughters. Her father’s disappointment in her for not being born as a boy and his frequent undermining of her intelligence and capabilities have a lasting impact. He dismisses her education, viewing it as unnecessary for a woman, further reinforcing the societal norms that confine her.

The patriarchal pressures profoundly affect Sarita’s development. She finds it

difficult to assert her independence in a world that constantly seeks to control her. Through Saru's experiences, the novel explores the challenges women face in a male dominated society and the psychological toll these experiences take on family members, effectively highlighting the challenges she faces in a patriarchal society.

The Dark Holds No Terrors offers a nuanced delineation of Sarita's life, particularly through her relationships with her parents, her husband and herself. From birth, Sarita, nicknamed Saru, becomes a victim of gender discrimination within her own family. In Shashi Deshpande's works, the marginalisation of women is not solely perpetrated by men, but also by women themselves, particularly in the roles of mothers and mothers-in-law. In Deshpande's novels, female protagonists experience discrimination from these matriarchal figures and their only escape often lies in seeking refuge away from the oppressive environment.

In *The Dark Holds No Terrors*, the mother-daughter relationship is shaped by gender bias and a deep sense of emotional neglect. From an early age, Saru is made to feel inferior, unimportant and secondary to her brother Dhruva, reflecting the ingrained patriarchal values within her family. Her mother considers her an unwanted child solely because she is a girl. As a child, Sarita desperately longs for her mother's love but, instead, receives curses and resentment. Deshpande portrays the mother as an enforcer of traditional gender roles, conditioning her daughter to accept inferiority and her son to assert dominance. Sarita's mother regards her as a burden and intends to get rid of her as soon as possible.

Sarita is constantly neglected and ignored by her parents, whose focus and affection are reserved for her younger brother, Dhruva, the apple of their eyes. Being three years older than Dhruva, Sarita often asserts her superiority over him. However, tragedy strikes when Dhruva drowns at the age of seven, an event that Sarita passively witnesses. Although she tries to save him, her efforts are in vain. This tragedy becomes the source of her mother's deepest anger and blame on her. Her mother accuses her directly, saying, "You killed him. Why didn't you die? Why are you alive, when he is dead?" (191). Sarita is left with a profound sense of guilt, haunted throughout her life by her mother's harsh words: "You did it, you did this, you killed him" (191). This reflects the depth of Sarita's mother's grief and her need to assign the blame on Sarita for Dhruva's death.

Sarita's mother adopts an authoritarian attitude, suppressing her daughter's will and desires under the guise of tradition and convention. The mother-daughter relationship presented in the novel reflects a deeply entrenched patriarchal mindset, with the mother acting as an agent of patriarchy, enforcing societal norms and values that favour men. Sarita painfully recalls that her brother Dhruva's birthday was always celebrated with a special puja, while her own birthday passed unnoticed. The hypocrisy of Indian society is laid bare through this instance, where Sarita is treated as a non- entity. Her mother's rejection of her identity is captured in her cruel remark: "Daughter? I don't have any daughter. I had a son and he died. Now I am childless" (196). Her mother's indifference to her existence reach its peak when she cruelly declares that, having lost her son; she is now childless, completely rejecting Sarita's identity.

The unequal treatment of Saru in comparison to her brother leads to feelings of insecurity and animosity towards her parents, particularly her mother who is mostly accountable for her rebellious behaviour. Asha Choubby in her research article "Mother and Daughter: A Comparative study of Fasting Feasting and Difficult Daughters" writes:

Mothers, being women, were themselves conditioned by their mothers first and the society at large next. Mothers take it as their duty to condition their girl child into the norms of the patriarchal society. The sooner the process is begun, the better it is for the daughter. (113)

Saru's hatred towards her mother is so intense that she rebels against her just to cause her pain: "I hated her. I wanted to hurt her, wound her, make her suffer" (142). Deprived of love throughout her life, she yearns to be cherished and valued, which becomes evident when she receives attention from Manu, a college mate. She wonders: "How could I be anyone's beloved? I was the redundant, the unwanted, an appendage one could do without" (66). Her Self-perception, shaped by years of neglect, drives her need for acceptance and emotional security.

Determined to assert her individuality and prove her worth, Sarita turns to education. She works diligently, secures high marks in her intermediate examinations, and gains direct admission to a medical college. Her decision to study medicine is met with fierce opposition

from her mother, who considers Sarita's education a waste of resources. When her attempts to dissuade Sarita fail, she tries to persuade her husband to prevent Sarita from pursuing her studies. Her mother's practical opinion is that instead of investing money in Sarita's education, they should focus on marrying her off within two years. To her mother, Sarita remains nothing more than a liability.

Sarita deeply feels the pain of being a woman, as her dreams and aspirations are consistently dismissed by her unsympathetic mother, a staunch supporter of patriarchal values. This rejection further underscores the struggles faced by Sarita in her search for identity and independence. The next phase of Sarita's life begins when she falls in love with Manohar and decides to marry him, defying her mother's wishes. She marries Manohar for love, hoping to lead a fulfilled life and escape the regrets and traumas of her past. Against her parents' wishes, Saru married a boy from a lower caste. Her marriage to Manu is a sign of her turning away from the traditional ways and values that her mother adhered to. She married to attain the autonomy of the self and to secure the love lost in the parental home.

The reality of her married life becomes far from the liberation she sought. The marital bed becomes the only place where Manohar asserts his dominance, reducing the relationship to an arena for the display of his physical and emotional power. This dynamic reveals the darker aspects of their marriage, where love and autonomy are overshadowed by control and subjugation. Manohar initially appeared to be Sarita's saviour someone she believed would heal her bruised heart with his boundless love. However, life once again betrayed her expectations and all her hopes for happiness were shattered by the harsh and brutal realities of life.

Sarita reflects deeply and poignantly on the reasons behind the collapse of her idealised castle of love, offering a profound analysis of the disillusionment in her marriage. "The next evening, I had scarcely got home when there was a knock at the door. Manu opened it. I heard him ask, 'Yes?' A woman's voice replied, 'Is the doctor at home? There was a pause, and Manu called out, Saru, someone wants you'" (41). This incident underscores the reality that many men struggle to accept being perceived as inferior to women. Therefore, nowadays, it is no longer women's fight for their rights or against gender discrimination or

bias, rather it, “stands for seeing the world through a woman’s eyes and from a woman’s perspective” (Hans). Burdened by an inflated male ego, they often feel shattered when their sense of superiority is challenged.

Sarita, despite being a woman, achieved remarkable success in her professional life, which led to an imbalance in the distribution of respect, power, and financial stability within her marriage. This disparity ultimately resulted in a profound and destructive disharmony in their relationship. she says,

The human personality has an infinite capacity for growth. And so, the esteem with which I was surrounded made me inches taller. But perhaps, the same thing that made me inches taller, made him inches shorter. He had been the young man and I his bride. Now I was the lady doctor and he was my husband. (42)

The situation takes an ugly turn as Manohar’s inferiority complex becomes overwhelming, causing him to cease being the loving husband Sarita once knew. “Day and night, women must be kept in subordination to the males of the family: in childhood to the father, in youth to her husband, in old age to her sons” (148). Saru pays a heavy price for her independent social status, which directly challenges the core values of a patriarchal society.

Haunted by the nightmares of her husband’s brutal handling of her physical and emotional self, Saru comes to recognise the deep-rooted power imbalance in her marriage. Saru remarks, A wife must always be a few feet behind her husband. “If he’s an M.A you should be a B.A. If he’s 5’4’ tall, you shouldn’t be more than 5’3’ tall...” (137). These feelings resonate with the expectations that patriarchal society imposes upon women, underscoring the systemic inequality she faces as a woman.

Shashi Deshpande illustrates the fact that within the institution of marriage, even an economically independent woman remains constrained, often forced to navigate the fragile ego of her husband. Judith Hole writes: “Feminism, by definition, challenges the status of woman. It questions the political, social and cultural institution, ways of thinking and the very articulations of thought” (41). Over time, Saru’s dedication to her profession, the growing lack of communication between her and Manu and the disparities in their social and

financial statuses create a rift between them. Manu, unable to accept her rising prominence and the attention she receives while he is overlooked, becomes increasingly resentful. This transformation turns the once- loving husband into a sadist, further deepening the emotional divide in their relationship.

Saru's misery deepens as she comes to the painful realisation that women can never truly escape the consequences of being born female. Her wretchedness stems from the gender discrimination perpetuated by the patriarchal structure of Indian society. Feeling lonely, dejected, and depressed, Saru reaches a point where she contemplates abandoning everything. These complex situations highlight the struggles faced by middle-class, working women in India. Through Saru's narrative, Shashi Deshpande compels readers to reflect on whether employment truly shields women from exploitation. The novel makes it clear that both working and non-working women endure similar hardships. Professional success does not elevate a woman's status to that of a man; rather, it often exacerbates her struggles.

In Saru's case, her superior income enables her family to enjoy a higher standard of living, yet her contributions remain unacknowledged. This underscores the persistent gender imbalance, aligning with Simone de Beauvoir's observations on the man- woman relationship in her seminal work, *The Second Sex*:

Man thinks himself without woman. Woman does not think herself without man. And she is nothing other than what man decides; she is thus called the sex meaning that the male sees her essentially as a sexed being; for him she is sex, so she is it in the absolute...He is the Subject; he is the Absolute. She is the Other. (26)

Man represents both the positive and the neutral, as is indicated by the common use of man to designate human beings in general, whereas woman represents only the negative, defined by limiting criteria without reciprocity. She appears essentially to the male as a sexual being. For him she is sex, absolute sex, no less. She is defined and differentiated with reference to the man and not the man with reference to his woman. She is the incidental, the inessential as opposed to the essential.

Saru plays different roles at different times – a successful doctor in white coat by

day and a trapped animal by night. She is always depressed in her mind. Even though she is a doctor, in the eyes of her husband, she is just a slave. When she has been ill- treated and victimised by her husband, she wants to escape from her house. This is her difficult time when she has to face the inner crisis and conflict.

In *The Dark Holds No Terror*, Shashi Deshpande explores human life through the lens of two key relationships: the parent child relationship and the man-woman relationship. Through these relationships, Deshpande contrasts traditional and modern lives within a patriarchal framework. The novel highlights issues particularly affecting women, such as education, marriage and profession which are influenced by societal norms. Education plays a crucial role in the parent child dynamic, as parents are the primary source of education. In traditional settings, there is a marked gender disparity in how education is provided, with sons often receiving more opportunities than daughters. Marriage is another critical aspect of human life, where women typically seek emotional connection, while men tend to focus on asserting power and authority.

This research paper explores the concept of patriarchy in the male-dominated society of India. Shashi Deshpande highlights the theme of gender consciousness, focusing on women's journey toward self-realization. Through her novels, Deshpande reveals the struggles of the modern, enlightened and independent woman one who is fully aware of her capabilities yet finds herself burdened by the dual responsibilities of being a good housewife and a successful professional. Such women are often torn between fulfilling their personal aspirations and conforming to societal norms, leaving them morally and emotionally conflicted. *The Dark Holds No Terrors*, vividly portrays the plight of women as they endure the invisible shackles of patriarchy, effectively shedding light on their pain, struggles and resilience in a society that continues to restrict their autonomy and identity.

Works Cited

- Beauvoir, Simone de. *The Second Sex*. Translated by Constance Borde and Sheila Malovany Chevallier, Vintage Books, 2011.
- Choubbey, Asha. "Mother and Daughter: A Comparative study of Fasting Feasting and Difficult Daughters." *Indian Writing in English*. Ed. Rama Kundu. Vol 1. Atlantic, 2003.



- Deshpande, Shashi. *The Dark Holds No Terrors*. Penguin Books, 1990. Desai, Anita. *Fasting Feasting*. Houghton Mifflin, 1999.
- Hans, Anjali. “Feminism as a Literary Movement in India.” *International Research Journal of Applied and Basics Sciences*, 1762- 1767.
- Hole, Judith. *Rebirth of Feminism*. Quadrangle Books.1975.
- Sahgal, Nayantara. *Rich Like Us*. Harper Collins, 2003.



Culture Alienation in Anita Desai's *Bye-Bye Blackbird*

Maria Thrace Blesida J.

PG and Research Department of English St. Mary's college (Autonomous), Thoothukudi
Affiliated to ManonmaniamSundaranar University, Tirunelveli, Tamilnadu, India.

Anita Desai's *Bye-Bye Blackbird* explores the themes of exile, cultural alienation and identity crises through the experiences of Indian immigrants in England. The novel outlines the problems and hardships of exiled and diasporic people caught in the crises of a shifting society. It attempts to convey the confusion and difficulties of the exiles through Desai's inventive method, captivating drama, and impeccable style. The novel *Bye-Bye Blackbird* simultaneously presents a comprehensive view of both Indian diasporic literature and exile literature. The novel critiques the racial prejudices and social barriers that immigrants face, emphasizing the alienation that leads to psychological turmoil. Through the contrasting perspectives of Dev and Adit, Desai portrays the complexities of migration, where nostalgia for one's homeland clashes with the desire for assimilation.

Key words: Diaspora, Exile, immigrants, cultural, Alienation

The concept of cultural identity is associated with belonging to a group. It addresses the elements of a group. It addresses the facets of a person's vision and conception of themselves. The representation of any social group with a unique culture that makes up the cultural identity, including religion, race, country, generation, socioeconomic class, geography, and so on. *Bye-Bye Blackbird*, written by Anita Desai in 1971, is an example of how cultural interactions can represent cultural identity.

The story revolves around Dev and Adit, two close friends in London. Adit married Sarah, an English woman, and lived in London for a longer time. The study of cultural identity examines the various viewpoints and aspects associated with methods for examining the differences in societies with unusual social values and beliefs. Culture is dynamic and adapts to society's demands.

Additionally, it can be used to characterise our way of life and the values, beliefs, and attitudes we employ on a daily basis. The cultural aspect emphasises religious and artistic values in different ways depending on the situation. Cultural identity has taken on a completely different form in the modern day, encompassing the assessment of a variety of factors, including race, beliefs, language, religion, and lifestyle, as well as concerns of gender identity, national identification, ethnicity, and aesthetics. By using social and psychological burdens, the novelist posed the subject of cultural identity while representing the deepest thoughts of the human psyche. The meeting of the west and the east yielded fresh insights on cultural conflicts.

The novel *Bye-Bye Blackbird* by Anita Desai ventures out into uncharted territory. After Adit and Dev, two educated Bengali immigrants, choose to adopt English beliefs and mannerisms, the novel presents cultural questions. People frequently encounter environmental changes when they relocate, which frequently results in ongoing difficulties acclimating to the new cultural norms and beliefs. Through cultural contacts, the shifts in cultural practices also cause perplexity, anxiety, anguish, and irritation. Regardless of the language in which they were composed, the great legends bear witness to this through their profound ideas about humanity and how it can benefit the sick aliens and exiles.

The intense emotions and passions of men and women worldwide, regardless of their differences in race, religion, nationality, government, or colour, are the subject of and foundation for literature worldwide. The literary landscape of the twentieth century is where the issue of cultural estrangement and exile is most prevalent. In the rapid technological advancement and international communication, the roving characters in front of us and their robotic march serve as a reminder that true relationships are lacking.

The phenomena of cultural alienation and exile have spread throughout the world. The exile and alienation of displaced people are vividly shown by Anita Desai in her novels. Desai has the ability to read people's thoughts and recognises

that they are feeling alienated. In *Bye-Bye Blackbird*, these emotions turn her characters into victims.

Culture shock, which is a depressive state that overtakes a person when they recognise the difference between their normal way of life and their new surroundings, is the root cause of cultural conflict. All of the characters are extremely alienated from one another, which is a result of Desai's preoccupation as an author. One or more enduring characters who occupy distinct places in our hearts are featured in each of her novels. Once more, she makes the projection of female protagonists living in a closed, secluded, and distinct world away from issues involving passion, love, and hate the main focus of her character representation. Desai portrays each of her characters as an unsolved and challenging enigma, which sets her apart from other Indo-English novels.

Anita Desai provides an unexpected window into the deeper psychological states of her protagonists because she is concerned about the isolation of the characters. In her interview Desai states that:

I am interested in characters who are not average but have retreated, or been driven into some extremity of despair and so turned against, or made a stand against, the general current. It is easy to flow with the current, it makes no demands, and it costs no effort. But those who cannot follow it, whose heart cries out "the great No," who fight the current and struggle against it, they know what the demands are and what it costs to meet them (1).

Anita Desai's novel *Bye-Bye Blackbird*, captures the confusions and conflicts of another set of alienated persons. It has rightly been maintained that in the novel "the tension between the local and the immigrant blackbird involves issues of alienation and accommodation that the immigrant has to confront in an alien and yet familiar world."

Desai addresses the intricacies of alienated immigration in this book by emphasising both its allure and a strong sense of disdain or distaste. Prejudice

against foreigners is disliked in the book. The novel's origins are undeniable, and it is not a replica of real connections that pose ongoing and significant problems for exiles and cross-cultural interactions. According to Desai, "*Bye-Bye Blackbird* is the closest book to the reality of all; almost everything in it is taken straight from the experience of living with the Indian immigrants in London" (31).

Dev, who comes to London to further his education, is the main subject of *Bye-Bye Blackbird*. As the story progresses, it is possible to observe him evolving into a fully realised individual who has let someone down. Both Indians and Englishmen make him feel isolated in London. English guys are quite insensitive; they treat Indians as though they are outsiders and do not acknowledge that they are their neighbours. Dev finds the complete quiet in London to be unsettling and uncomfortable.

Dev understands how strangers in their community view him. He observes that Indian immigrants are rushing westward and that they are severely missing their homeland. He feels incredibly suffocated in the tube station and thinks of himself as a stranger wandering around in a pitch-black prison: Dev contact starts to blossom from Adit, who has moved to London with his wife, who was born and raised in England. As Dev leaves to look for work at random, he is surrounded by issues. He finds it too hard to cope with the intense silence in the nearby blocks where people don't care about one another. Dev, who is feeling lonely and alienated, is called a fool by Adit for trying to find his identity in a foreign country.

Dev is a victim of estrangement and accumulates a lot of experiences. He makes comparisons between India and London. Dev is neurotic as a result of his time in England since he cannot give his experience and final decision any significance. He is conscious of the confusion and confession that the external pressure has generated in him. Dev makes the ultimate decision not to go back to India and not to guide the people there. He begins to gradually acclimatise to the

new surrounding environment. His friend Adit Sen, a young Indian man, and his English wife reside in England. Adit first worked as a teacher in England before accepting a small position at the huge Blue Skies. But for him, the intimacy does not negate his sense of cultural identification. England became wealthy, fertile, and successful; even when he considers traveling to India, he is mostly reminded of Indian cuisine, attire, and music. Adit recognises that she is separated from the English people and feels like a stranger in England. He describes himself as an outsider who doesn't belong in England.

The novel *Bye-Bye Blackbird* has an international theme since Adit marries Sarah, an English girl, and becomes the target of white society's ire. Ironically, Sarah, Adit's subservient wife, is the one who suffers. She has violated the social code of England by marrying a brown Asian, and she is constantly being made fun of and insulted by both her co-workers and the students at the school where she works as a clerk. Although her friends are interested in asking inquiries about her husband and family, she always steers clear of them.

Sarah responds to many inquiries from Julia, a teacher at her school, with strange remarks like, "she was still breathing very hard at having so narrowly escaped having to answer all the personal questions" (11). They would have been more than willing to believe her, but the letters from India about her Indian husband would have made her stand out like someone who poses as someone else and makes life claims that she didn't feel were her own. The younger generation was likewise following the older generation, and they were enraged and provoked to hurt some of the others. Once she crossed the street, she heard them yell, "Hurry, hurry, Mrs. Scurry, and Where's the fire, Pussy cat?" (35). They pretended not to see her at all as she old-fashioned her way through a crowded mob of people and animals. The awful experience she had at work at the hands of her co-workers and students is discussed here. However, her marriage has a significant impact on her that permeates all aspects of her life. She stays away from the shops on Laurel Lane, where she resides when she goes shopping because she fears that doing so will

compromise her relationship with India. Despite taking every precaution, she is unable to escape the predicament that has become a part of her life; therefore, she prefers to travel to the large department store where she would stay an unknown customer and no one would know she has Asian credentials.

The constant conflict between her real life and her guilt about attempting to impress others, reality, and appearance speaks volumes about her and can lead to a long term mental illness of a kind that involves a relationship breakup. She is tired of changing her identity and is unsure of her place in the world. She wants individuals who will be faithful and devoted to her, and that will only happen when she finally leaves England at the end of the book. Finding peace in England does not make her happy or comfortable.

Throughout the novel, she experiences estrangement on multiple occasions, which leaves her feeling alone and raises the question, “Who is she?” After getting married to Sarah, the Diaspora person in the quest finds herself in a circumstance where she feels alienated; she loses her identity and her name, and she becomes dispersed while seeing people vanish. The intelligent Adit imagined that only a stranger would discover her and that she had lost her identity in England after marriage, with a sudden silver dropping on the light of glamour. It is simpler for a lady to fit in with her new family and friends if she marries someone from the same culture. However, intercultural marriage creates adjustment issues that are difficult to overcome and deal with in society. The issue in Sarah’s case is difficult because she married someone whose race was once subjugated by her own. The greatest irony is that Sarah is homeless in her own country.

Whether Sarah is Indian or English, she aspires to be a true person. She has had enough of being in the middle without a real identity. She does her best to maintain her integrity as a wife by making sure that her marriage is not ruined. Though not as deliberately as she did, her husband Adit had also been experimenting with his ridiculous appearance to give the impression that he was charming. However, he also acknowledges that his existence in England is wrong, and Sarah is

well aware of this as well: “His whole personality seems to her to have cracked apart into an unbearable number of disjointed pieces, rattling together nosily and disharmoniously” (200).

Adit is considering leaving England permanently after the Indo-Pak War in 1965, and Sarah is well aware of this. Adit is unstable at this point and requires a supportive, understanding wife, and Sarah is a decent, responsible wife. She understands and supports her husband better than any other wife in Anita Desai’s novels. She would give up anything to keep her home and her connection with him disciplined. She is aware of how to respond to her spouse in the aforementioned situation:

She could not tell what effect the smaller refusal or contradiction might have on him - ...Rather she would sacrifice anything at all, in order to maintain, however superficially, a semblance of order and discipline in her house, in her relationship with him. His whole personality seemed to her to have cracked apart ... if she allowed this chaos to reflect upon their marriage, she knew its fragments would not remain jangling together but would scatter, drift and crumble. (200)

Adit Sen’s English wife, Sarah, shares her husband’s sense of alienation. The two social worlds that she lives in do not intersect with the two irreconcilable cultures that divide her. Her marriage causes her to become estranged from her community. Because she is English, she continues to be an outsider in the Indian community. She is not a person who has been physically uprooted; she does not belong anywhere. However, she is in a vulnerable state. Finding new roots is not Sarah’s problem; rather, it is one of uprootedness and, consequently, depth. She discovers that she is an outsider and unfamiliar with the world she is a part of. Sarah feels reluctant to leave her home at the time of her departure, “it was her English self that was receding and fading and dying, she knew, it was her English self to which she must say good-bye” (200).

Anita Desai's vivid, rich imagination is only seen to be at its peak. Since the Indian characters define themselves by their responses to the foreign surroundings, the establishment of the physical environment is crucial to the novel's success. Portobello Road symbolises urban England, while the picturesque and romantic countryside of England is depicted with all the attention to detail and love that one expects from Anita Desai's writing. All of the figures in London are given an appearance of unreality and free copying of people due to the city's densely packed bazaars and crowds. Indians are volatile and act in a manner typical of East Asians. White people's awareness of their race is in line with how English people act.

Sarah, Dev Adit, and the other three main characters all act in too predictable ways. They are trying to figure out who they are. Adit's abrupt decision to return to India, Dev's shifting views towards England, the tension, and the hatred are all accurately depicted. Sarah faces the most difficult decision of her life when she must decide whether to accompany Adit to India and raise her child with yet another uninteresting identity or to stay in England and enjoy her promoted job as long as her child has an English identity. Through the three major characters in *Bye-Bye Blackbird*, Anita Desai effectively exposes the issue of identity crisis and provides a piece of in-depth information and insight on the subject.

For many exiled or immigrant writers, writing novels about their home nation based on memory has proven to be a formidable undertaking. She addresses the issue of adjustment that Black immigrants in England experience in the novel. She brings up this issue by depicting the circumstances of three distinct persons. The three main characters in the novel Dev, Adit, and Sarah all deal with identity quests by examining the impact of racial hatred on their sensibilities. In order to comply with societal expectations, the characters are compelled to practice manipulation.

Desai starts her characters with thoughts of self-analysis after placing them in particular delicate human situations. The story progresses as people adopt new

perspectives, realise who they are, and frequently experience alienation. Many times, in order to accept the truth of the situation, one must enter a realm of imagination. Adit's nostalgia takes on the horrifying aspect of a disease or pain within himself. It starts off suffocating and eventually gets him tired of being in England. He thinks of himself as stronger and wins. In a sort of aberrant dimension of disease, he wanders around London in quest of a sense of belonging, but the city seems completely different; he just cannot recognise his workday, exhausted London as his former golden Mecca. The main characters' identity quest remains ongoing, and they are unable to make a snap decision about what to do. Desai portrays the Indian immigrants' anguish, sorrow, and hopelessness. Similar to this, Jhabvala uses the multicultural and multifocal interactions of the European migrants in her book *Heat and Dust* to explore the cross-cultural encounter and identity crisis. Jhabvala and Desai both do a good job of exposing the sociocultural sterility of Europe and India, respectively.

The difficult situation of these outsiders in an alien Indian and European culture was beautifully observed by Desai and Jhabvala through a number of uprooted and alienated characters from their homeland. Desai's attempt to visualise the differences on the social, political, and cultural fronts where they wanted to be merged with Europe and India but their European and Indian thoughts never left them ultimately led to their characters being in a crisis in an alien culture.

A number of Indian authors have written about cultural struggle, exile, expertise, and man-woman relationships. Due to the abundance of the West, many educated Indians have migrated to postcolonial India. In this book, Sarah is the most attractive character. Both at home and work, she is a dedicated and selfless lady. She is so spiritually aware that she asks herself too many questions about her life, some of which she finds difficult to comprehend. She separated from her parents after being married in order to fulfil the new duties that come with being a wife. She is prepared to travel to India and let go of all she has ever loved.

In the novel, *Bye-Bye Blackbird* the ontological instability, alienation,



cultural struggle, and misery of uprooted individuals are depicted by Anita Desai, a specialist in explaining the action of criticising the psyche. Through her works, Anita Desai has eloquently captured the predicament of those who have been uprooted. Her works clearly address the experience of exile, cultural conflict, human relationships, and existential issues that are prevalent in the literary scene of the twentieth century, and the readers are able to obtain a quick study of these issues.

Despite her social dissatisfaction due to racial prejudice and her separation from her people, the novel's analyses how shrewdly Sarah handles her responsibilities as a wife. While most of Anita Desai's couples struggle in their marriages, and are fortunate to have a kind and understanding wife in Sarah. She might not be pleased and satisfied as a social creature. Once in India, we would all like to commend this foreign woman for understanding her husband, his family, and his nation. In *Bye-Bye Blackbird*, Anita Desai has masterfully highlighted the isolation and self-alienation of these three characters. Throughout the novel, the uprooted characters Adit, Dev, and Sarah experience exile, and cultural and social alienation, and they are plagued by ongoing identity crises. With particular reference to Anita Desai's novel *Bye-Bye Blackbird*, this essay has attempted to illustrate the development of exile literature from its modest beginnings to its current position. Since this paper aims to produce many more, this is just the beginning. Interested in studying literature from exiles.

Works Cited

- Dalmia, Yashodara, "An interview with Anita Desai", Times of India, April 29, 1979.
- Desai, Anita. *Bye-Bye Blackbird*. Orient Paperbacks, 1984.
- _____. "The Book I Enjoyed Writing Most." *Contemporary Indian Literature*, XIII, 1973.
- Ram, Atma. "Anita Desai: The Novelist who writes for Herself." *The Journal of Indian Writing in English*, vol. 5, no. 2, July, 1977.
- Sharma, Ram Sharan. "Alienation, Accommodation and the Local in Anita Desai's *Bye- Bye, Blackbird*." *The Literary Criterion*, vol. 14, no. 4, 1979.

Redefining Disability: Confronting Stereotypes and Ethical Dilemmas in Jojo Moyes’***Me Before You*****Pavithra E.**

PG and Research Department of English, St. Mary’s College (Autonomous), Thoothukudi.

Affiliated to ManonmaniamSundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

Jojo Moyes’ novel *Me Before You*, explores disability representation and ethical dilemmas surrounding assisted suicide. Through diverse literary theories, the paper analyses how the novel challenges stereotypes, delves into multidimensional portrayals of disabled characters and fosters broader conversations about disability in contemporary literature. Disability studies lens reveals Will Traynor as a complex individual beyond his physical limitations, while Louisa Clark’s evolving perceptions challenge societal stigmas around disability. A feminist perspective uncovers gender dynamics in caregiving, highlighting the importance of agency for women beyond traditional roles. Postcolonial power dynamics subtly intersect with disability representation, adding depth to character interactions. Analysis of narrative techniques in the novel demonstrates how dual perspectives humanize characters and subvert one- dimensional portrayals of disability. Ethical criticism engages with assisted suicide dilemmas, exploring autonomy and end-of-life decisions. The concept of intersectionality underscores how multiple identities influence characters’ experiences. In conclusion, *Me Before You* becomes a powerful work that fosters empathy, challenges stereotypes, and raises ethical questions. The incorporation of literary theories enriches disability representation, contributing to wider societal dialogue about inclusivity and compassion.

Keywords: Disability representation, narrative techniques, intersectionality, stereotypes, caregiving, assisted suicide, autonomy.

Jojo Moyes is known for her ability to craft compelling and emotionally resonant stories. She often delves into complex themes such as love, loss, personal growth, and the intricacies of human relationships. Moyes’ writing style is characterized by its warmth, wit, and keen understanding of human emotions, which allows her to connect deeply with her

readers. *Me Before You* is a contemporary romance novel published in 2012. The story is set in the small English town of Stortford, where Louisa Clark, a quirky and ordinary young woman in her mid-twenties, finds herself unemployed after the local cafe where she worked closes down. Desperate for a job, she takes on the role of a caregiver for Will Traynor, a wealthy and adventurous young man who was left paralyzed from the neck down following a tragic accident two years prior. Will's disability has left him bitter and disenchanted with life, leading him to contemplate assisted suicide.

The novel presents a thought-provoking narrative that intertwines disability representation and ethical dilemmas surrounding assisted suicide. While the novel has garnered both acclaim and controversy, its portrayal of disability and its exploration of the right to make end-of-life decisions necessitate further critical examination. The research problem centres on understanding how the novel challenges disability stereotypes and addresses ethical considerations related to assisted suicide, seeking to explore the broader implications of disability representation in contemporary literature.

This paper aims to analyse the representations of disability in *Me Before You* and evaluate how the novel portrays the experiences and complexities of the disabled characters, particularly focusing on the character of Will Traynor, one of two protagonists in the novel as a multidimensional individual. To investigate Louisa Clark's evolving perceptions of disability and her caregiving role, exploring how gender dynamics intersect with disability representation in the novel. It will examine the postcolonial power dynamics between characters of different socioeconomic backgrounds assess how these dynamics shape the novel's commentary on privilege and disability representation and analyse the narrative techniques employed in the novel and their impact on readers' perceptions of disability, considering how storytelling influences the interpretation of disabled characters

At the beginning of the novel, Louisa Clark's perceptions about disability are limited by societal stereotypes and misconceptions. She feels uncomfortable and somewhat awkward in her role as Will's caregiver, unsure of how to interact with him and navigate his disability. As Louisa spends more time with Will, her perspective on disability evolves. She begins to see him not solely as a disabled individual but as a person with hopes, dreams, and

emotions. Their growing relationship challenges her preconceived notions, fostering a deeper understanding of disability and empathy for Will's struggles.

Through Will's interactions with others, the novel sheds light on ableist assumptions and the limitations placed upon individuals with disabilities by society. It opens up discussions about inclusivity, accessibility, and the importance of breaking down barriers for disabled individuals. The novel prompts readers to reflect on the limitations imposed by ableist assumptions and how they can perpetuate stigmas surrounding disability. Will's interactions with others shed light on the importance of creating a more inclusive and accessible society that accommodates the needs of disabled individuals. By humanizing the experiences of disabled characters, the novel encourages readers to empathize and advocate for a more understanding and supportive environment, fostering meaningful dialogue about the value of inclusivity and the significance of removing barriers for disabled individuals.

The novel also delves into the emotional and psychological impact of disability on both the individual and their loved ones. Will's character illustrates the struggle with depression and feelings of loss, which are common experiences for people living with disabilities. The exploration of Will's emotional journey humanizes him and challenges the notion that physical limitations define one's happiness and worth. Will's body is explained by Will himself to Louisa Clark when they are having a conversation at the beach of Mauritius Island. The conversation situation starts with Louisa as the main point of view:

And if you do love me, Clark, as you say you do, the thing that would make me happier than anything is if you would come with me.'

My head whipped back. 'What?'

It's not going to get any better than this. The odds are I'm only going to get increasingly unwell and my life, reduced as it is, is going to get smaller. The doctors have said as much. There are a host of conditions encroaching on me. I can feel it. I don't want to be in pain anymore, or trapped in this thing, or dependent on everyone, or afraid. So I'm asking you – if you feel the things you say you feel – then do it. Be with me. Give me the end I'm hoping for. (353)

The novel shows that disability involves complex emotional dimensions that require

understanding and support. Through Will's character, *Me Before You* challenges stereotypes that portray disabled individuals as helpless or devoid of agency. Will's intelligence, wit, and assertiveness challenge these assumptions and portray disabled characters as capable and deserving of respect. The novel empowers disabled characters by showcasing their resilience and determination to live life on their terms, asserting their right to make choices and decisions, even if they involve complex ethical dilemmas. By exploring these subunits of disability representation, *Me Before You* provides a rich and multifaceted portrayal of disability.

The novel challenges stereotypes, fosters empathy, and encourages readers to reflect on their own perceptions and attitudes toward disability and the value of life. It also provides a compelling platform to explore the intersection of disability and caregiving from a feminist perspective. The novel delves into the complex dynamics between Louisa Clark, the female protagonist, and Will Traynor, her disabled employer, shedding light on gendered roles and societal expectations in the context of disability.

Louisa Clark assumes the role of a caregiver for Will Traynor, reflecting the historical association of caregiving with women in society. This portrayal underscores the unequal distribution of caregiving responsibilities based on gender. Louisa's role as a caregiver also intersects with her position as a woman in a patriarchal society. Her dedication to her caregiving responsibilities reflects the selflessness often expected of women in traditional caregiving roles, and the novel explores how this selflessness may impact her own desires and aspirations.

Me Before You delves into the challenges and complexities of caregiving for a disabled person. Louisa faces various emotional and practical challenges, grappling with her feelings of inadequacy, and navigating the power dynamics inherent in her relationship with Will. The novel highlights the power imbalance between Louisa and Will, with Will initially possessing economic privilege and authority as her employer. This power dynamic adds complexity to their relationship, and it is further complicated by Will's disability, which creates dependency on Louisa's care.

The exploration on the caregiving impacts Louisa's identity and sense of agency. Her identity becomes intertwined with her role as a caregiver, raising questions about the importance of self-fulfilment and personal growth outside of her caregiving responsibilities. Louisa's journey involves redefining her sense of agency and asserting her desires beyond the confines of societal expectations.

Louisa's evolving understanding of disability challenges her preconceived notions and leads to a feminist re-evaluation of her role as a caregiver. Through Louisa's character, the novel also showcases her journey of empowerment and self-discovery. Louisa challenges patriarchal norms that limit women to traditional caregiving roles and discovers her own worth beyond her caregiving duties. Will's character, in turn, confronts his assumptions about women and caregiving. His interactions with Louisa challenge his preconceived notions and reveal the complexity of women's lives, strengths, and desires beyond societal expectations. Louisa says, "I could well imagine Will pushing her away. But surely if you loved someone it was your job to stick with him? To help him through the depression? In sickness and in health, and all that?" (78).

Feminist questions about autonomy and personal choices are examined in the novel *Me Before You*. It engages with debates about women's agency in making decisions, including Will's desire for assisted suicide, and how societal norms may influence or limit these choices. Within this contemplation of autonomy, the narrative resonates with a nuanced feminist lens. Louisa's introspections regarding her caregiving role further enrich the broader discourse on feminism. The novel intertwines her grappling with societal expectations, caregiving responsibilities, and women's rights, amplifying the complexities inherent in choices and roles.

The novel challenges traditional gendered roles and expectations, highlighting the complexities and power dynamics inherent in caregiving relationships. The characters in the novel encourage readers to question patriarchal norms, re-evaluate personal agency, and advocate for greater gender equality within the context of caregiving and disability representation. The dynamic between characters Will Traynor and Louisa Clark serves as a canvas for exploring feminist and postcolonial themes. As Louisa grapples with her

caregiving role and contemplates her commitment to Will, the novel subtly raises feminist questions regarding autonomy and societal expectations placed on women's roles. This sentiment is encapsulated in Louisa's reflection: "But surely if you loved someone it was your job to stick with him? To help him through the depression? In sickness and in health, and all that?" (243).

This introspection underscores the gendered complexities of caregiving and personal agency within relationships. Moreover, delving into the narrative from a postcolonial lens unveils intricate power dynamics. Homi K. Bhabha's concepts of 'hybridity' and 'third space' provide a lens through which the interactions between characters of varying socio-economic backgrounds can be analysed. The contrasting worlds of the affluent Will and the workingclass Louisa become spaces for exploring how individuals navigate their identities within contexts marred by power imbalances, contributing to the depth of their relationship.

Me Before You also delves into the concept of intersectionality, recognizing that individuals possess multiple identities that interact and influence their experiences. Intersectionality considers how various social categories, such as disability, gender, race, and class, intersect and shape an individual's lived reality. Scholars like Kimberlé Crenshaw, who coined the term 'intersectionality,' have contributed significantly to this field. Crenshaw's work emphasizes the importance of understanding how overlapping identities can create unique and compounded forms of discrimination and privilege. In the novel, intersectionality is evident through the complex identities of the characters.

Will Traynor's disability intersect with his privileged background, influencing his experiences and societal perceptions. Louisa Clark's gender, class, and caregiving role intersect with her understanding of disability and caregiving. The novel invites readers to recognize how these multiple identities shape the characters' lives and experiences. By acknowledging intersectionality, the novel encourages a more nuanced understanding of disability representation, challenging simplistic and one-dimensional portrayals of disabled individuals and emphasizing the significance of considering the interconnectedness of social identities.

The novel's multidimensional representation of disability, nuanced exploration of



caregiving dynamics, and ethical dilemmas surrounding assisted suicide contribute to its enduring impact on readers. The incorporation of postcolonial perspectives, narrative techniques, and ethical considerations elevates the novel's thematic depth, making it a significant work in contemporary Literature.

Works Cited

- Bhabha, Homi K. *The Location of Culture*. Routledge, 1994.
- Booth, Wayne C. *The Rhetoric of Fiction*. U of Chicago P, 1983.
- Garland-Thomson, Rosemarie. "Integrating Disability, Transforming Feminist Theory." *Feminist Disability Studies*, edited by Kim Q. Hall, Indiana UP, 2011, pp. 13-47.
- Jung, Karen E. "Chronic Illness and Educational Equity: The Politics of Visibility." *Feminist Disability Studies*, edited by Kim Q. Hall, Indiana UP, 2011, pp 263-286.
- Kafer, Alison and Eunjung Kim. "Disability and the Edges of Intersectionality." *The Cambridge Companion to Literature and Disability*, edited by Clare Barker and Stuart Murray, Cambridge UP, 2017, pp 123-138.
- Moyes, Jojo. *Me Before You*. Penguin Random House, 2022.

PANIYAS OF KARIKKAMUNDU IN GUDALUR NILGIRIS DISTRICT

Ms. K. Rosy

Department of History, St. Mary's College (Autonomous) Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

Paniyas are one among the Primitive Tribal Groups (PTG's) in Tamil Nadu. The Paniyans or Paniyas are found in the Southern part of the India in the states of Tamil Nadu, Kerala and Karnataka. They are concentrated mainly in the Gudalur and Pandalur taluks of the Nilgiris district of Tamil Nadu. The paniya have historically worked as agriculture laborer's. They are believed to have been brought to Wayanad by the king of Malabar, and there after tilled the land as serfs. They used to hunt for food from the woods and Kabani River. Fresh fish, crab and tapioca mainly constituted their cuisine. The Paniya language is a Dravidian language spoken by the Paniya people, an indigenous tribe in India. It is also known as Pania, Paniyan, Panyah.

KEY WORDS

Agriculture, Food gathering, Language, Education and Healthcare, Ornaments, Festivals.

INTRODUCTION

Tribal people form a major segment of the world population. They are found all over the world. They were called by different names such as 'primitive', 'tribal', 'indigenous', 'aboriginal', 'native', and so on. India has a large number of tribe people; they live in different regions in the forest as well as in urban areas, and mostly speak their own languages. The major tribes in TamilNadu are Malayali, Toda, Kurumba, Paniya, Irular, Kattunayakkan, Kani, Palliyan, Sholagar, Kadar and Veddar. Most of the Tribal communities are small in size and the exceptions are Malayali and Irular tribes. Only two Taluks in TamilNadu, i.e., Devakottai Taluk in Sivagangai district and Thiruchuli Taluk in Virudhunagar district do not have any tribal population.

LOCATION

Karikkamundu is 40 kilometers away from Gudalur towards Sulthan Bathery and 18 kilometers from Bathery. It is a part of Erumadu village called Kuyyunni, under the jurisdiction of Cherangodu Panchayat. This comes under Gudalur taluk of Nilgirs District in Tamil Nadu. The road to Paniyan Farm Colony (PFC) is metaled. Karikkamundu is a part of the PRF colony, the latter comprising of the Paniyan settlement, the tea plantation, dispensary

and the Balvadi. The houses are tiled, five in a line built by NAWA with the help of the Government of Tamil Nadu in 1965.

FLORA

The surrounding region of the hamlet is enriched with innumerable plant species. Apart from tea, coffee and pepper there are jack fruit trees, as well as rose wood, pine, bamboo, chilly and a variety of greens are also found. Being a rainy region, the vegetation is rich with bryophytes like mosses, liverworts, etc.

FAUNA

Except the domestic animals (two calves and four goats), the fauna found here are rabbit, centipede, spiders and common species of bird like, crow, sparrow, and fowls.

ETYMOLOGY

The name, “Paniyan” appears to have evolved from Pani, which in Malayalam mean ‘work’. Thus, Paniyan is a worker or labourer. Luiz considers “the name Paniyan is modified form of a Malayalam word Paniker (Laborers). They are addressed and referred to as Paniyan (male) and Panichi or Paniyathy (female) by other. The plural term is Paniyar. The word ‘tribe’ is derived from the Latin term ‘tribus’ which was applied to the three divisions of the early people of Rome. The term however has gone through a lot of changes. It meant a political unit consisting of a number of clans. A tribe occupied a definite, geographical area. Permanent settlement gave a geographical identity to a tribe. For that reason, tribes were often named after the area. Our country is named after a tribe called ‘Bharata’. A common definition for a tribe is a group of people that all have common ancestry, or a common ancestor, a common culture, and live in their own enclosed society.

RACIAL FEATURES

Paniyans are dark skinned, short statured persons with broad noses and curly or wavy hair. They are Negroid types. They have straight eyes, thick averted lips with slight facial prognathism. Paniyans are said to be the descendant of Africans.

DRESS PATTERN

The traditional dress is simple. Men’s dress is consisted of a mundu (dhoti) and a towel. Today they are dressed normally in mundu and shirt. The dress of the Paniyan women is unique. It consists of two mundus, one bigger than the other one. The bigger one is wrapped on the loins and the smaller one is wrapped above the bosom through the armpits leaving the shoulders bare. Few women use bigger mundu to serve both the purposes, in which case, the bigger mundu is wrapped above the bosom. The women keep bobbed hair or occasionally grow them long, but in either case a few locks at the forehead are trimmed so as

to avoid them from falling on the face while at work. The younger generation has a different style altogether.

ORNAMENTS

The Paniyans, both male and female, use a few cheap ornaments, which are purchased from the market or made by them. The urge for wearing ornaments is very much in them, particularly among the females. Their economic conditions, as they put it, do not permit them this 'luxury'. Below are given the most important ornaments worn usually by the women folk. The other ornaments used by them are mala, mothuram, vala, kammel, kolusu, mookkuthy, thandavala, etc.

LANGUAGE

Paniyan language is dialect of Malayalam, replete with Tamil and Kannada word (Thurston). It belongs to Dravidian family of language. They usually speak both Malayalam and Tamil.

AGE, SEX AND MARITAL STATUS

Total population of the Karikkamundu Paniyan settlement is 121, including 61 males and 60 females. Family types such as Nuclear family. Sup-nuclear family, supplemented family, lineal collateral family and lineal joint family are found in this settlement.

MARRIAGE

The age at marriage for Paniya boy is fall in the rank of 18 to 24 and that of girls from 16 to 20. The average age for boy is thus 21.5 and that of a girl is 18. The village council called "Kuttuam" regularizes the marriage, the act of the couple is looked down upon as shameful, immoral, and disgraceful and the marriage is not viewed as auspicious as the formal marriage.

FESTIVALS

The only festivals that they celebrate are Onam and Vishu. They do not have any other local festival. Leisure and recreation, in the true sense of the term, is unknown to the Paniyans. She/he has to toil from dawn to dusk to make his or her both ends to meet, by way of daily labour. The women have the additional burden of cooking food, and rearing children. They dance only on festive occasions like Vishu, marriage etc. accompanied by musical instruments like Tudi and Kuzhal.

EDUCATION

As far as Krikkamundu is concerned, education seems to be no interest for them. There are two schools exclusively for the Paniyans, one at Pothukolly, up to class V, and the other at Kappala, up to class VII. There is a government school, up to class X at Kayyunni

and another at Erumadu, up to +2 where both Malayalam and Tamil are taught. There are two English medium schools within the reach of 5 kilometers namely, St. Thomas Matriculation Higher Secondary School at Ayyankolly, and Sacred Heart Matriculation Higher Secondary at Kayyunni. But Paniyan student is found here.

HEALTH

Vegetables and Roots

The paniyans, unlike in the past, do not ample vegetables. They lack cultivatable land. In the kitchen gardens they cultivate Chempu (yam), Kanchil (a type of yam), Mathunga (pumpkin), Amarakai (beans), Cheera (greens), poosani (ash-gourd) and brinjal. Since there is no forest nearby, they do not go for collecting wild roots. These people buy vegetables from the nearby markets.

MILK AND DAITY PRODUCTS:

A decade ago, the people consumed milk, and today only countable households have cows, and goats. There is a big cattle shed in the settlement, which presently stands empty. The reason is lack of grazing ground. Due to poor economic conditions, they do not buy milk. The cost of milk per litter is Rs.14/ which is remarkably high for them.

HONEY

Honey is also considered as one of the important products. It is consumed depending upon the availability. It remains their favorite food.

FISH AND SEA FOOD

Paniyas eat all types of fish. Variety of dry fish is available in the nearby markets. Fresh fish is also available in abundance. They also eat crabs.

FOOD AND NUTRITION

A grave health problem of Paniyans is malnutrition and the related disease, scabies, due to deficiency of vitamins.

USE OF TOBACCO

Both men and women in different forms use tobacco. Men smoke 'beedi', and now cigarettes. Both men and women have the habit of chewing tobacco, either along with betel-leaves, or arecanut. Extensive use of tobacco causes inflammation of mouth, esophagus and other parts of respiratory tract and food tracts. Most of the people's teeth have become permanently brown in colour. It is unfortunate that even children are encouraged to chew betel leaves, arecaunut and tobacco. Many of the people in the settlement smoke ganja (India hemp), whenever it is made available by the other Paniyan settlement.

EXTERNAL APPEARANCE

The women folk and the girls look cleaner and well-dressed than men and boys. But on the whole the entire Paniyans look dirty and unclean. Very few use hair oil, and do not cut their nails. The younger generation, both boys and girls, use modern dress when they go out, either to the market or elsewhere.

DEATH

The dead among the Paniyans is usually buried except the persons like the Chetti, Koima and the elder members of the family who are cremated. The corpse is laid on a bier prepared out of bamboo poles. The dead body is carried to the Chudukadu (burial ground). The women and children do not accompany the procession. Before leaving the burial ground betel leaves and arecanuts are shared. Everyone is expected to take a purificatory bath before reaching the house. Pollution lasts for seven days. On the seventh day special celebration is held. They sing for the whole night.

CONCLUSION

The Paniyans of Karikkamundu are innocent, friendly, cordial and of inviting nature. The fine cool weather, the kindness and hospitality of these people make life more thrilling. Basic health of the Paniyans is relatively poor. Malnutrition and poor hygienic condition are two main vulnerable aspects. Scabies and anemia are rampant disease found among them.

REFERENCES

Books

1. A.R. Basu, Tribal Programmes and Administration National Book Organization, New Delhi, 2001.
2. A. Rangarajan, The Vanishing Sholas and the Vanquished Grassland, New Delhi, 2003.
3. D. Kapp, and P. Hockings, The Paniyas Tribes in Blue Mountains the Ethnography and Biography of A South India Region, Oxford University Press, New Delhi, 1989.
4. D.N. Thakur, Tribal Women, Deep and Deep publication, New Delhi, 1994.
5. E. Thurston, Caste and Tribes and south India, Cosmo Publication, New Delhi, 1913.
6. Jakka Parthasarathy, Paniyans of Nilgiris District, TRC & HADP, Udthagamandalam, 2003.
7. Jakka Parthasarathy, Tribes and Inter Ethnic Relationship in the Nilgiris District, TRC and HADP, Nilgiris, 2007.
8. James Wilkinson Breeks, Primitive Tribes and Monuments of the Nilgiris District, Tamil Nadu Government, Chennai, 1998.
9. R.C. Varma, Indian Tribes Though the Ages, Government of India, New Delhi, 2002.

CRAFTING CULTURE: TERRACOTTA ART OF THE INDUS VALLEY CIVILIZATION

J. Lisha

Department of History, St. Mary's College (Autonomous) Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

Terracotta figures from the Indus Valley Civilization (3300-1300BCE) offer a fascinating glimpse into the lives of ancient south Asians. These intricately crafted figurines, often depicting humans and animals, showcase the artistic prowess and cultural richness of this enigmatic civilization. Indus terracotta figures narrate stories of a bygone era, frozen in time. These small, yet expressive, figurines reveals the daily lives, rituals, and myths of the Indus people. Each figure, a tangible connection to the past, invites us to decipher the secrets of this ancient culture. The terracotta figures of the Indus Valley civilization demonstrate exceptional artistic skill and attention to detail. With their simplified forms, expressive faces, and intricate adornments, these figurines exemplify the aesthetic sensibilities of the Indus people, highlighting their unique contribution to the evolution of ancient art.

KEY WORDS

Toys, Whistles, Clay, Rattles, Dice, Wheels, Balls, Marbles.

INTRODUCTION

The word Terracotta stands for figurines of clay usually baked or burnt clay. It is one of the most ancient forms of plastic art clay, the medium of Terracotta is one of the easily obtainable and beautiful gift of nature to mankind. It is very handy and cheap. So man at the very thresh hold of civilization began to make ceramics dolls and deities in clay. This art became famous in the ancient worlds. The history of terracotta figurines in India extend over a period of 3000 years. At Harappa, Mohenjadar and other chalcolithic sites, terracotta have been found in large number. Among the most original products of the Indus Civilization are the lively and exuberant terracotta statuettes. The subjects most often represented, on seals of steatite in particular, include animals such as tigers, buffalo, and oxen, which are shown either alone or yoked to small carts. A continuous stream of terracotta figurines are witnessed through all the different ages is seen in India. They have their peculiar local characteristics. They were made entirely with the help of hands and moulds. Paint was applied in most of the terracotta figurines, generally of red, pink, light yellow or black colour.

MATERIAL AND MANUFACTURING TECHNIQUES

Terracotta figurines from the Indus Valley Civilization were crafted using specific clay compositions and techniques. The clay typically contained sand, shell fragments, mica particles, and vegetable material. These inclusions likely enhanced the clay's workability and durability.

In terms of manufacturing techniques, the figurines were predominantly hand-modeled using methods such as pinching to create facial features, applique to attach clay shapes like eyes and jewellery, and incision to carve designs into wet clay. Notably, the figurines were often made by joining two vertically split halves, possibly reflecting symbolic meanings related to dualism or self-integration.

TYPES OF TERRACOTTA FIGURES

HUMAN FIGURES

Human figurines are produced using a standard procedure. Figurines are not made in moulds, a technique known from other crafts. They are hand-built and either solid or hollow. Human figurines are made from two pieces joined together or vertically rolled pieces of clay that make up the head, upper and lower body, and legs. It is not certain whether the figure should be classed as a toy, but the once movable arms certainly suggest it. On the other hand, the figure is represented as pregnant and the extreme exaggeration of the buttocks suggests steatopygy. It is hardly likely, therefore, that the figure was the work of a child. The height of the figure is 3.8 inches, and a hole in the soles of the feet suggests that it was carried on a thin stick. This model is of well-burnt clay of a light-red colour and uncoated with a slip.

ANIMAL FIGURES

The most common terracotta figurines represent domesticated animals, especially zebu (bulls), water buffalo, and caprids (sheep and goat). Other representations include dogs, deer, rhinoceros, elephants, large felines, rabbits, turtles, bears, monkeys, gharials (a fish-eating alligator), and birds, which are less frequent. Animal figurines consist of quadruped and bipedal forms (the legs are joined in the back and front) with few details. The pottery animal is of a composite nature. It has the head and horns of a ram, and the body and tail of a bird. It measures 4.5 inches in length, is hollow, and made of a light-red ware liberally coated with a deep red wash. There are two opposite holes in the animal's sides, through which a stick was probably once passed, either to swing the animal upon, or, as seems more likely, to accommodate a pair of wheels. A smaller hole through the neck was probably intended to take a cord by which this bird-chariot could be pulled along. The figure, which is entirely

hand-made, is too good to have been the work of a child, though in all probability it was made for one.

TOYS

WHISTLES

Toys of this kind are common at Mohenjadaró and are invariably in the form of a bird, hollow within and with a small hole in the back near the tail, which when blown into produces a shrill whistle. It is not easy to recognize the species of bird, but it is likely that a dove is intended. The pedestal – like bases with which the birds are provided permit of their standing easily on a flat surface, and make them convenient to hold. It is possible that various modulations could be produced from such whistles and especially the call of a dove.

RATTLES

Round pottery rattles with small pellets of clay inside are well known at Mohenjadaró. It is 2.55 inches in diameter and light-red ware decorated with parallel circles in red paint. The rattles found vary in size from 1.5 inches to 2.6 inches in diameter, and are all made of light-red ware. Some are plain and others decorated with thick lines, always of red and arranged either laterally or vertically. These rattles were probably made by wrapping the clay round a combustible core, in the centre of which the roughly made baked clay pellets were placed to produce the sound. In every case they are hand- made, not moulded, and they are invariably well finished, but without a slip.

BALLS AND MARBLES

A number of small balls, averaging 0.48 inch in diameter, were made of agate, slate, veined onyx, and some kind of red and white breccia. The ball made of this last material is not perfectly round, and is also only semi-polished. These marbles, were all found together at level of 2 feet below the surface. There is only one way of making stone marbles of this kind, and that is by continually rolling them in a pan in water mixed with an abrasive. Together with a stone marbles were two measuring 0.4 inch in diameter made of white paste and faience respectively. On the latter an equator was painted in manganese. Marbles are known from many ancient sites, but they were uncommon in early summer, possibly for the reason that knuckle-bones took their place.

CHILDREN'S TOYS

The remains of sun dried or baked mud bricks imply on a monotonous architectural style. Buildings perhaps included elaborated wood carvings or decoration with other materials as preserved evidence. Insight into Indus Valley Civilization arts and culture provide only various sculptures, pottery, jewellery, and terra-cotta, gold and stone figures.

This is amongst the oldest and most widespread form of handicrafts. Historical records of prehistoric era have been found in the remains of pottery. It is believed to have existed since 7000 BC in the Neolithic period. Apart from the popular terracotta or fired clay products, other products are the stoneware which are fired at over 1150 degree Celsius. The translucent form, also known as porcelain is also very popular. The raw material for this craft is ordinary clay, derived from the beds of water bodies like river, lakes and ponds. The clay is cleaned, mixed and then shaped either by hand, wheel or moulded into desired object. The items are dried, fired and glazed as per the requirements. The clay or terracotta products are graded according to their colour, strength and water absorption capacity.

ICONOGRAPHY AND SYMBOLISM

ARTISTIC FEATURES AND AESTHETICS

A study of the Harappan terracotta's by Alexandra Ardeleanu-Jansen (2002) has undetailed the great variety in the form of female figurines. The type which is frequently interpreted as having a religious significance is a slim female figure with a distinctive fan-shaped headdress, wearing a short skirt. She is heavily ornamented with necklaces, armlets, bangles, anklets, and earrings. Some of the figurines have cup-like attachments and flowers on either side of the head. In certain cases, the cup-like attachments have traces of black residue, suggesting that they were used to burn oil or some sort of essence. Such figurines may have been religious images worshipped in households, votive offerings made to a deity, or part of the paraphernalia of domestic rituals. It is interesting to note that such figures do not appear on Harappan seals and tablets or in stone or metal sculptures.

There is also a matronly, pot-bellied type of female figurine who may represent either a pregnant woman or a prosperous woman. She is naked and sometimes wear some jewellery and a turban or headdress. Both the 'matronly type' and the 'slim type' of female figurines may hold a baby in their arms. The 'matronly type' can stand without support, while the youthful, 'slim type' needs support. It is interesting to note that female figurines including those with possible religious significance are found in large numbers at sites such as Mohenjodaro, Harappa, and Banawali, but not at sites such as Kalibangan, Lothal, Surkotada or Mitathal.

REPRESENTATION OF DAILY LIFE

DICE

Dicing was a common game at Mohenjodaro and it is proved by the number of pieces that have been found. In all cases they are made of pottery and are usually cubical, ranging in size from 1.2 by 1.2 by 1.2 inches to 1.5 by 1.5 by 1.5 inches. One die, however, is

rectangular, measuring 1.6 by 1.4 by 1.1 inches. The dice of Mohenjadaró are not marked in the same way as to-day, i.e., so that the sum of the points on any two opposite sides amounts to seven. Instead of that, 1 is opposite 2, 3 opposite 4, and 5 opposite 6. These dice must have been thrown on a soft surface, such as a piece of cloth, or on dusty ground, for their edges show little evidence of wear. Dice have been found at levels ranging from 1 foot to 15 feet below the surface of the ground, and must, therefore, have been used in the Late and Intermediate Periods at least, if not in the Early Period as well. It is quite possible that dice were used in conjunction with board-games.

WHEELS

A considerable number of pottery wheels have been found in various parts of Mohenjadaró. At first sight they might be mistaken for spindle-whorls, but that they are the wheels of carts and other toys seems beyond a doubt. Some pottery chariot wheels found at Kish are very like those found at Mohenjadaró, the only difference being that the Sumerians wheels have a raised hub on both sides of the wheels instead of a hub on one side only, as was the rule in ancient Sind. The wheels of Sumerians vehicles were build up from more than one piece of wood, and very much the same form of construction must be imagined for the wheels of the vehicles used by the Indus Valley Civilization, especially as the wheels of the modern Sind cart closely resemble those of Sumer, and like them were fixed to an axle that revolved with them.

GAMESMEN AND AMULETS

Some form of game or games played with pieces was common at Mohenjadaró is proved by the great number of gamesmen that have been found. The materials of which these pieces are made are comparatively few. In order of popularity they are faience, pottery, shell, marbles, agate, slate, and steatite. The poorer people used gamesmen made of pieces of potsherd roughly rubbed into a suitable shape. The board on which these pieces were used was probably roughly marked on the ground, either in the form of squares or small holes scooped out in the dust. With such a board and pieces a game could be played almost anywhere, as the materials for it were always to hand. As, however, not more than three gamesmen of identical form and material have as yet been found together, there is reason to think that comparatively used, unless, like chessmen, the pieces differed slightly to show their rank. Gamesmen of this kind are found at all levels, except those of tetrahedral shape which are of very early date. The evidence at present is insufficient to conclude that certain shapes were confined to certain periods.

RITUALISTIC SIGNIFICANCE

CLAY BAKING PANS

The two clay dishes were evidently made by children. The first is 2.7 inches long and appears to represent a pan with a saddle-quern in its middle, on which rests a muller. Something has evidently been broken off the end of the pan possibly the figure of a woman engaged in grinding corn. Despite the very rough workmanship of these pottery objects, it is possible that they were intended to be placed in graves, just as similar figures of women kneading bread were placed in some of the earlier tombs of Egypt.

CONCLUSION

Most of the terracotta figures were found broken and discarded in secondary locations. None were found in a context that could be interpreted as a temple. This was one of the reasons why Marshall suggest that they were votive offerings rather than cult images. The fact that so many of them were broken suggests that they may have been part of a ritual cycle and were made for short-term use for certain specific occasions. The relationship between the female figurines and the male and animal figurines with which they are associated needs to be explored.

REFERENCES

BOOKS

1. Basham, A.L., A Cultural History of India, Oxford University Press, Delhi, 1975.
2. Bhandhari, N.K., Cultural Heritage of India, Aavishkar Publishers, Jaipur, India, 2007.
3. Biswal, S.K., Chakraborty A., History of Ancient India, Arise Publishers and Distributors, New Delhi, 2007.
4. John Marshall, Mohenjo-daro and the Indus Civilization, Arthur Probsthain Condoni, London, 1931.
5. Piyush Chauhan, Indian Heritage of India, Wisdom Press, New Delhi, 2010.
6. Revathy Girish, Cultural Heritage of India, Wisdom Press, New Delhi, 2010.
7. Rita P. Wright., The Ancient Indus Urbanism, Economy and Society, Cambridge University Press, New York, 2010.
8. Sankalia, H.D., Pre-historic Art in India, Vikas Publishing House Private Limited, New Delhi, 1978.
9. Upinder Singh, A History of Ancient and Early Medieval India, Library of Congress cataloguing publications, India, 2008.

IMAGES



HUAMN FIGURES



ANIMAL FIGURES



CHILDREN'S TOYS



WHEEL



DICE

GAUSSIAN TRIBONACCI r -GRACEFUL AND TRIBONACCI PRODUCT CORDIAL LABELING OF PATH RELATED GRAPHS

A. Swetha Theres

Department of Mathematics, St. Mary's College (Autonomous) Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract: A Gaussian Tribonacci r -graceful labeling is a specific type of graph labeling where the vertex labels are derived from the Gaussian Tribonacci sequence. Let r be any natural number. An injective function $\phi : V(G) \rightarrow \{0, ki, 1, 1 + ki, 2, 2 + ki, \dots, GT_{q+r-1}\}$ for all k , where GT_{q+r-1} is the $(q + r - 1)^{th}$ Gaussian Tribonacci number in the Gaussian Tribonacci sequence is said to be Gaussian Tribonacci r -graceful if the induced edge labeling $\phi^* : E(G) \rightarrow \{GT_r, GT_{r+1}, \dots, GT_{q+r-1}\}$ such that $\phi^*(uv) = |\phi(u) - \phi(v)|$ is bijective. If a graph G admits Gaussian Tribonacci r -graceful labeling, then G is called a Gaussian Tribonacci r -graceful graph. An injective function $\delta : R(G) \rightarrow T_1, T_2, \dots, T_m$ is said to be Tribonacci product cordial labeling if the induced function $\delta^* : B(G) \rightarrow \{0, 1\}$ defined by , $\delta^*(r_i r_j) = ((\delta(r_i) - \delta(r_j)) \pmod{2})$ satisfies the condition $|b\delta^*(0) - b\delta^*(1)| \leq 1$. A graph which admits Tribonacci Product cordial labelling is called Tribonacci product cordial graph.

Keywords: Gaussian Tribonacci r -graceful labeling graph, Tribonacci Product Cordial graph, Star graph, Twig graph, Fork graph, Eiffel tower graph, Tribonacci Sequence.

1 INTRODUCTION

Graph labeling is an important area in discrete mathematics and combinatorial graph theory, where numbers are assigned to the vertices or edges of a graph according to specific mathematical rules. The concept of graceful labeling, introduced by Rosa in 1967, plays a fundamental role in various applications, including network topology, communication design, circuit layouts, and cryptography. Graceful labeling ensures that the absolute differences between vertex labels along the edges form a unique set, often making it useful for constructing efficient network structures. The Gaussian Tribonacci r -graceful labeling of a graph is an injective assignment of Gaussian Tribonacci numbers to its vertices such that the absolute differences of adjacent vertex labels form a bijective mapping to a set of Tribonacci derived edge labels. If a graph maintains this property for all values of r , it is called Gaussian Tribonacci arbitrarily graceful. The concept of graph labeling was introduced by Rosa in 1967.

Bala et.al., discussed the concept of Tribonacci Product Cordial labeling. An injective function

$\delta : R(G) \rightarrow T_1, T_2, \dots, T_m$ is said to be Tribonacci product cordial labeling if the induced function $\delta^* : B(G) \rightarrow \{0,1\}$ defined by $\delta^*(r_i r_j) = ((\delta(r_i) \delta(r_j)) \pmod{2})$ satisfies the condition

$|b\delta^*(0) - b\delta^*(1)| \leq 1$. A graph which admits Tribonacci Product cordial labelling is called Tribonacci product cordial graph.

II PRELIMINARIES

In this section, we recall some basic definitions related to this paper.

Definition 2.1: A Graph G consists of a pair $(V(G), X(G))$ where $V(G)$ is a non-empty finite set whose elements are called points or vertices and $X(G)$ is a set of unordered pairs of distinct elements of $V(G)$. The elements of $X(G)$ are called lines or edges of the Graph G .

Definition 2.2: A Path is a sequence of vertices where each consecutive pair of vertices is connected by an edge in the Graph.

Definition 2.3: G is called a labeled graph if each edge $e = uv$ is given the value $f(uv) = f(u) * f(v)$, where $*$ is a binary operation.

Definition 2.4: A Star graph S_n is a tree where one vertex is connected to all other vertices.

Definition 2.5: A Twig graph T_n is obtained from P_n by attaching exactly two pendent edges to each internal vertices of P_n .

Definition 2.6: The Fork graph, sometimes also called the chair graph, is the 5 vertex and 4 edges is also known as 'h graph'.

Definition 2.7: The Eiffel Tower graph is the graph on 7 vertices and 7 edges.

Definition 2.8: If we define, for any edge $e = \{u, v\} \in E(G)$, the value $\varphi^*(e) = |\varphi(u) - \varphi(v)|$ then φ^* is a one-to-one mapping of the set $E(G)$ onto the set $\{1, 2, \dots, n\}$. A graph is called graceful if it has a graceful labeling.

Definition 2.9 : The Tribonacci sequence is defined by each term is the sum of the three preceding terms. In other words, The sequence T_n of Tribonacci numbers is defined by third order linear recurrence relation $(n \geq 0) : T_{n+3} = T_n + T_{n+1} + T_{n+2}; T_0 = 0, T_1 + T_2 = 1$ i.e) $\{0, 1, 1, 2, 4, 7, 13, 24, 44, 81, \dots\}$ is the Tribonacci sequence.

Definition 2.10: An injective $\phi : V(G) \rightarrow \{0, 1, 2, \dots, T_{q+r-1}\}$ where T_{q+r-1} is the $(q+r-1)^{th}$ Tribonacci number in the Tribonacci sequence is said to be Tribonacci r -graceful if the induced edge labeling $\phi^* : E(G) \rightarrow T_r, T_{r+1}, T_{q+r-1}$ such that

$\phi^*(uv) \rightarrow |\phi(u) - \phi(v)|$ is bijective. if a graph G admits Tribonacci r -graceful labeling, then G is called a **Tribonacci r -graceful graph**.

Definition 2.11: Let G be a graph with p vertices and q edges. Let r be any natural number.

An injective function $\phi : V(G) \rightarrow \{0, ki, 1, 1 + ki, 2, 2 + ki, \dots, GT_{q+r-1}\}$ for all k , where GT_{q+r-1} is the $(q + r - 1)^{th}$ Gaussian Tribonacci number in the Gaussian Tribonacci sequence is said to be Gaussian Tribonacci r -graceful if the induced edge labeling

$\phi^*: E(G) \rightarrow \{GT_r, GT_{r+1}, \dots, GT_{q+r-1}\}$ such that $\phi^*(uv) = |\phi(u) - \phi(v)|$ is bijective.

If a graph G admits Gaussian Tribonacci r -graceful labeling, then G is called a **Gaussian Tribonacci r -graceful graph**.

Definition 2.12 : A binary operation on a graph is called a graph **Product** it is an operation that takes two graphs, G_1 and G_2 , and creates a graph H .

Definition 2.13 : A graph G is said to be a **Product Cordial graph** if there exists a function $f: V \rightarrow \{0,1\}$ with each edge assign the label $f(u)f(v)$, such that $|v_f(0) - v_f(1)| \leq 1$ and $|e_f(0) - e_f(1)| \leq 1$ where $v_f(i)$ and $e_f(i)$ denote the number of vertices and edges respectively labelled with i ($i = 0,1$).

Definition 2.14 : A function $f: V(G) \rightarrow \{0,1\}$ is said to be **Cordial Labeling** if the induced function $f^*: E(G) \rightarrow \{0,1\}$ defined by $f^*(uv) \rightarrow |f(u) - f(v)|$ satisfies the conditions $|v_f(0) - v_f(1)| \leq 1$, as well as $|e_f(0) - e_f(1)| \leq 1$, where

$v_f(0) :=$ number of vertices with label 0,

$v_f(1) :=$ number of vertices with label 1,

$e_f(0) :=$ number of edges with label 0,

$e_f(1) :=$ number of edges with label 1.

Definition 2.15 : An injective function $f: V(G) \rightarrow \{T_0, T_1, \dots, T_n\}$ is said to be

Tribonacci Cordial labeling if the induced function $f^*: E(G) \rightarrow \{0,1\}$ defined by $f^*(uv) = (f(u) + f(v)) \pmod{2}$ satisfies the condition $|e_f(0) - e_f(1)| \leq 1$. A graph which admits Tribonacci cordial labeling is called Tribonacci cordial graph.

Definition 2.16: An injective function $\delta: R(G) \rightarrow \{T_1, T_2, T_3, \dots, T_n\}$ is said to be Tribonacci product cordial labelling if the induced function $\delta^*: B \rightarrow \{0,1\}$ defined by

$\delta^*(r_i r_j) = (\delta(r_i) \delta(r_j)) \pmod{2}$ satisfies the condition $|B_{\delta^*}(0) - B_{\delta^*}(1)| \leq 1$. A graph which admits Tribonacci Product cordial labelling is called **Tribonacci Product Cordial graph**.

III GAUSSIAN TRIBONACCI r -GRACEFUL LABELING

Theorem 3.1: The Star graph S_n is Gaussian Tribonacci r -graceful graph for all $n \geq 3$.

Proof: A star graph is a tree with one internal node and multiple leaves.

Let v be the central vertex.

Let $\{v_1, v_2, \dots, v_n\}$ be the pendant vertices adjacent to v .

The resultant graph is S_n with

$$V(S_n) = \{v\} \cup \{v_i / 1 \leq i \leq n-1\} \text{ and}$$

$$E(S_n) = \{vv_i / 1 \leq i \leq n-1\}.$$

$$|V(S_n)| = p = 3n - 4 \text{ and } |E(S_n)| = q = 3n - 5$$

Define a function $\phi : V(G) \rightarrow \{0, ki, 1, 1 + ki, 2, 2 + ki, \dots, GT_{q+r-1}\}$ by

$$\phi(v) = GT_{q+r-1}$$

$$\phi(v_1) = GT_0$$

$$\phi(v_i) = \phi(v) - GT_{q+r-1-(i-1)}, 2 \leq i \leq n.$$

$$\phi^*(uv) = |\phi(u) - \phi(v)|$$

Hence the condition $|e_f(0) - e_f(1)| \leq 1$ is satisfied.

Example for Gaussian Tribonacci r -graceful labeling for the graph S_8 is given in the

Figure 3.1. Edge label calculation for S_8 is given by the following equations,

$$\phi^*(uv) = |\phi(u) - \phi(v)|$$

$$\phi^*(vv_1) = |\phi(v) - \phi(v_1)| = |(81 + 44i) - 0| = |81 + 44i| = 81 + 44i$$

$$\phi^*(vv_2) = |\phi(v) - \phi(v_2)| = |(81 + 44i) - (37 + 20i)| = |44 + 24i| = 44 + 24i$$

$$\phi^*(vv_3) = |\phi(v) - \phi(v_3)| = |(81 + 44i) - (57 + 31i)| = |24 + 13i| = 24 + 13i$$

$$\phi^*(vv_4) = |\phi(v) - \phi(v_4)| = |(81 + 44i) - (68 + 37i)| = |13 + 7i| = 13 + 7i$$

$$\phi^*(vv_5) = |\phi(v) - \phi(v_5)| = |(81 + 44i) - (74 + 40i)| = |7 + 4i| = 7 + 4i$$

$$\phi^*(vv_6) = |\phi(v) - \phi(v_6)| = |(81 + 44i) - (77 + 42i)| = |4 + 2i| = 4 + 2i$$

$$\phi^*(vv_7) = |\phi(v) - \phi(v_7)| = |(81 + 44i) - (79 + 43i)| = |2 + i| = 2 + i$$

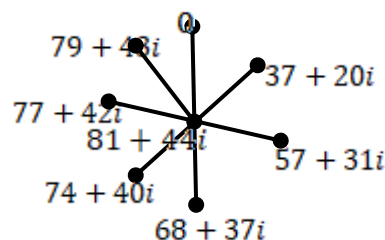


Figure 3.1

Therefore, Star graph S_n admits Gaussian Tribonacci r -graceful labeling for all $n \geq 3$.

Theorem 3.2: The Twig graph T_n is Gaussian Tribonacci r -graceful graph for all $n \geq 3, r \geq 2$.

Proof: Let $v_i, 1 \leq i \leq n$ be the vertices of the path P_n .

Let $u_i^j, 1 \leq i \leq n, j = 1, 2$ be the vertices which are attached to the internal vertices of the path P_n .

The resultant graph is T_n with

$$V(T_n) = \{v_i / 1 \leq i \leq n\} \cup \{u_i^1, u_i^2 / 2 \leq i \leq n-1\} \text{ and}$$

$$E(T_n) = \{v_i u_i^1, v_i u_i^2 / 2 \leq i \leq n-1\} \cup \{v_i v_{i+1} / 1 \leq i \leq n-1\} \text{ such that}$$

$$|V(T_n)| = p = 3n - 4 \text{ and } |E(T_n)| = q = 3n - 5$$

Define a function $\phi : V(G) \rightarrow \{0, ki, 1, 1 + ki, 2, 2 + ki, \dots, GT_{q+r-1}\}$ by

$$\phi(v_1) = GT_0$$

$$\phi(v_i) = \phi(v_{i-1}) + (-1)^i GT_{q+r-1-3(i-2)}, 2 \leq i \leq n, r \geq 2$$

$$\phi(u_i^j) = \phi(v_i) - GT_{q+r-1-(3i-j-3)}, 2 \leq i \leq n, j = 1, 2, r \geq 2$$

$$\phi^*(uv) = |\phi(u) - \phi(v)|$$

Hence the condition $|e_f(0) - e_f(1)| \leq 1$ is satisfied.

Hence the Twig graph T_n is Gaussian Tribonacci r -graceful for all $n \geq 3, r \geq 2$.

Example for the Gaussian Tribonacci 5-graceful labeling for the graph T_{11} is shown in Figure 3.2.

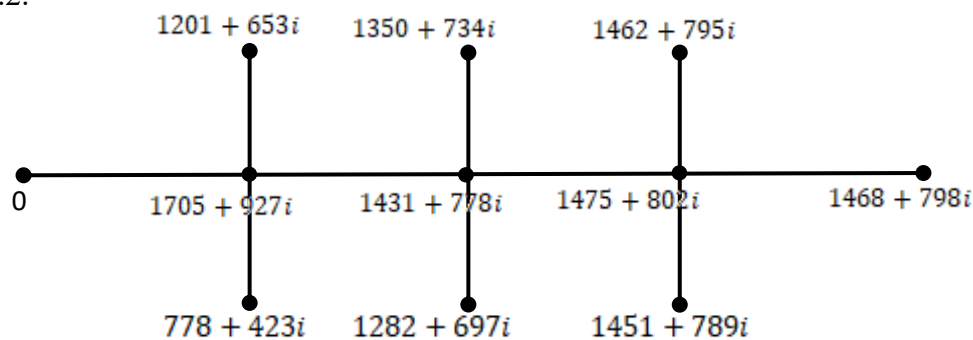


Figure 3.2

Edge label calculation is given by the following equations

$$\phi^*(uv) = |\phi(u) - \phi(v)|$$

$$\phi^*(v_1 v_2) = |\phi(v_1) - \phi(v_2)| = |0 - (1705 + 927i)| = |-1705 - 927i| = 1705 + 927i$$

$$\begin{aligned} \phi^*(v_2 v_3) &= |\phi(v_2) - \phi(v_3)| = |(1705 + 927i) - (1431 + 778i)| = |274 + 149i| \\ &= 274 + 149i \end{aligned}$$

$$\begin{aligned}
\phi^*(v_3v_4) &= |\phi(v_3) - \phi(v_4)| = |(1431 + 778i) - (1475 + 802i)| &= |-44 - 24i| \\
& &= 44 + 24i \\
\phi^*(v_4v_5) &= |\phi(v_4) - \phi(v_5)| = |(1475 + 802i) - (1468 + 798i)| &= |7 + 4i| \\
& &= 7 + 4i \\
\phi^*(v_2u_2^1) &= |\phi(v_2) - \phi(u_2^1)| = |(1705 + 927i) - (1201 + 653i)| &= |504 + 274i| \\
& &= 504 + 274i \\
\phi^*(v_3u_3^1) &= |\phi(v_3) - \phi(u_3^1)| = |(1431 + 778i) - (1350 + 734i)| &= |81 + 44i| \\
& &= 81 + 44i \\
\phi^*(v_4u_4^1) &= |\phi(v_4) - \phi(u_4^1)| = |(1475 + 802i) - (1462 + 795i)| &= |13 + 7i| \\
& &= 13 + 7i \\
\phi^*(v_2u_2^2) &= |\phi(v_2) - \phi(u_2^2)| = |(1705 + 927i) - (778 + 423i)| &= |927 + 504i| \\
& &= 927 + 504i \\
\phi^*(v_3u_3^2) &= |\phi(v_3) - \phi(u_3^2)| = |(1431 + 778i) - (1282 + 697i)| &= |149 + 81i| \\
& &= 149 + 81i \\
\phi^*(v_4u_4^2) &= |\phi(v_4) - \phi(u_4^2)| = |(1475 + 802i) - (1451 + 789i)| &= |24 + 13i| \\
& &= 24 + 13i.
\end{aligned}$$

Therefore, Twig graph T_n admits Gaussian Tribonacci r -graceful labeling for all $n \geq 3, r \geq 2$.

Thus ϕ admits Gaussian Tribonacci r -graceful labelling.

Theorem 3.3: The Fork graph is Gaussian Tribonacci r -graceful labeling for all $r \geq 1$.

Proof: Let $V(G) = \{v_i/1 \leq i \leq 5\}$

Let $E(G) = \{e_i/1 \leq i \leq 4\}$.

Define a function $\phi : V(G) \rightarrow \{0, ki, 1, 1 + ki, 2, 2 + ki, \dots, GT_{q+r-1}\}$ by

$$\begin{aligned}
\phi(v_1) &= GT_0 \\
\phi(v_2) &= GT_{r+1} \\
\phi(v_3) &= GT_{q+r-1} \\
\phi(v_4) &= \phi(v_2) - GT_r \\
\phi(v_5) &= \phi(v_2) + GT_{r+2} \\
\phi^*(uv) &= |\phi(u) - \phi(v)|
\end{aligned}$$

Hence the condition $|e_f(0) - e_f(1)| \leq 1$ is satisfied.

Thus ϕ admits Tribonacci graceful labelling for all r .

The Gaussian Tribonacci r –graceful labeling for the Fork graph is given in the Figure 3.3.

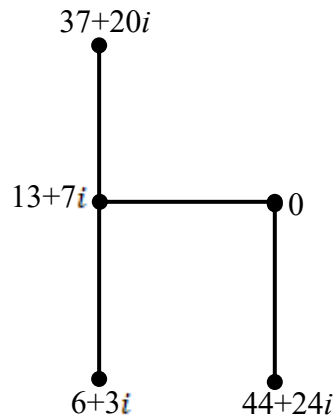


Figure 3.3

Therefore, Fork graph admits Gaussian Tribonacci r -graceful labeling for all $r \geq 1$.

IV TRIBONACCI PRODUCT CORDIAL LABELING

Theorem 4.1: The Star graph S_n is Tribonacci product cordial graph.

Proof: Define the function $\delta: R \rightarrow \{T_1, T_2, T_3, \dots, T_n\}$ to label the vertex as follows:

$$\delta(v_1) = T_1$$

$$\delta(v_i) = T_{i+1}, 1 \leq i \leq n.$$

To obtain the edge labels, define the induced function $\delta^*: B \rightarrow \{0,1\}$ defined by

$$\delta^*(r_i r_j) = (\delta(r_i) \delta(r_j)) \pmod{2}.$$

Thus using the induced function the edges receive the labels as follows:

$$\delta^*(r_i r_{i+1}) = 1, i = 1, 2$$

$$\delta^*(r_i r_{i+2}) = 0, i = 2$$

$$\delta^*(r_i r_{i+1}) = 1, i = 4$$

Hence the condition $|B_{\delta^*}(0) - B_{\delta^*}(1)| \leq 1$ is satisfied.

Example for the Tribonacci product cordial labeling for the graph S_5 is shown in the Figure 4.1.

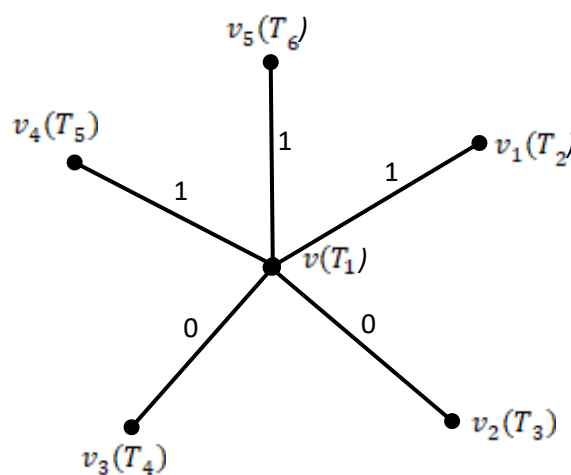


Figure 4.1

Therefore, the Fork graph admits Tribonacci product cordial labelling.

Theorem 4.2: The Eiffel tower graph is Tribonacci product cordial graph.

Proof: From the structure of Eiffel tower graph it is clear that it has 7 vertices and 7 edges.

Define the function $\delta: R \rightarrow \{T_1, T_2, T_3, \dots, T_n\}$ to label the vertex as follows:

$$\delta(v_i) = T_{i+3}, \quad 1 \leq i \leq 3$$

$$\delta(v_4) = T_3$$

$$\delta(v_5) = T_7$$

$$\delta(v_i) = T_{i-5}, \quad i = 6, 7$$

To obtain the edge labels, define the induced function $\delta^*: E \rightarrow \{0, 1\}$ defined by

$$\delta^*(r_i r_j) = (\delta(r_i) \delta(r_j)) \pmod{2}.$$

Thus using the induced function the edges receive the labels as follows:

$$\delta^*(r_i r_{i+1}) = 1, \quad i = 1, 2$$

$$\delta^*(r_i r_{i+2}) = 0, \quad i = 2$$

$$\delta^*(r_i r_{i+1}) = 1, \quad i = 4$$

Hence the condition $|B_{\delta^*}(0) - B_{\delta^*}(1)| \leq 1$ is satisfied.

The Tribonacci product cordial labeling of Eiffel Tower graph is shown in the Figure 4.2.

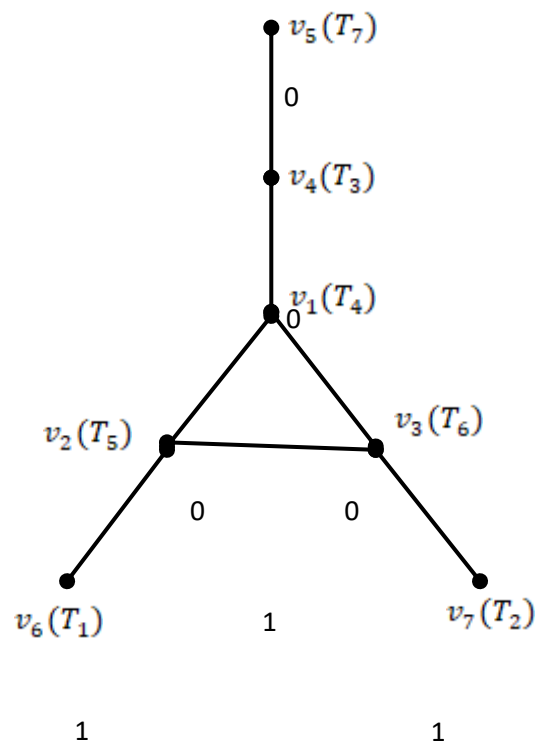


Figure 4.2

Therefore, the Eiffel tower graph admits Tribonacci product cordial labelling.

Theorem 4.3: The Fork graph is Tribonacci product cordial labeling.

Proof: From the structure of Fork graph it is clear that it has 5 vertices and 4 edges.

Define the function $\delta: R \rightarrow \{T_1, T_2, T_3, \dots, T_n\}$ to label the vertex as follows:

$$\delta(v_i) = T_i, i = 1, 2$$

$$\delta(v_i) = T_{i+2}, i = 3$$

$$\delta(v_i) = T_{i-1}, i = 4, 5$$

To obtain the edge labels, define the induced function $\delta^*: B \rightarrow \{0, 1\}$ defined by

$\delta^*(r_i r_j) = (\delta(r_i) \delta(r_j)) \pmod{2}$. Thus using the induced function the edges receive the labels as follows:

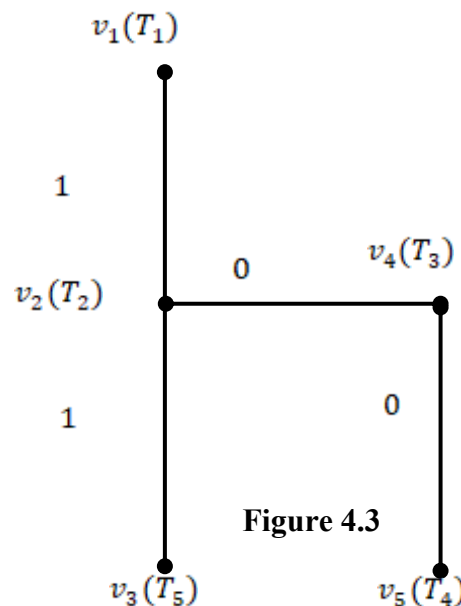
$$\delta^*(r_i r_{i+1}) = 1, i = 1, 2$$

$$\delta^*(r_i r_{i+2}) = 0, i = 2$$

$$\delta^*(r_i r_{i+1}) = 1, i = 4$$

Hence the condition $|B_{\delta^*}(0) - B_{\delta^*}(1)| \leq 1$ is satisfied.

The Tribonacci product cordial labeling of Fork graph is shown in the Figure 4.3.



Therefore, the Fork graph admits Tribonacci product cordial labelling.

CONCLUSION

In this paper Gaussian Tribonacci r-Graceful Labeling and Tribonacci Product Cordial Labeling, both extending classical labeling contribute to the understanding of balance and symmetry in graphs, with potential applications in network theory, coding, and optimization. Our results showed that Gaussian Tribonacci r-Graceful Labeling successfully

extends r -graceful labeling to Tribonacci-based graphs, while Tribonacci Product Cordial Labeling offers a balanced approach for labeling graphs based on the product of adjacent labels. These findings deepen our understanding of graph labelings and open up avenues for future research in graph theory and applied fields. Future work could include investigating these labelings in more complex graph classes and developing efficient algorithms for large-scale networks. Overall, this research enhances the theoretical framework for Tribonacci-based labelings and suggests new possibilities for their application in various domains.

REFERENCES

- [1] Bala.S, Suganya.V, Thirusangu.K, Tribonacci product cordial labelling on some basic labelling on some basic graphs.
- [2] Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition), Vol: 43 Issue: 12-2024, ISSN: 1671-5497.
- [3] Kourosh Eshghi and Parham Azimi, Applications Of Mathematical Programming in Graceful Labeling of Graphs, Hindawi Publishing Corporation Journal of Applied Mathematics, 2003.
- [4] N. Murugesan and R. Uma, Super vertex Gracefulness of Some Special Graphs, IQSR Journal of Mathematics ver. 11(3) (2015), 07-15.
- [5] P. Lalitha, Application of Graceful Labeling in Dental Arch, Drug Invention Today , Vol 11 , Issue 3 , 2019.
- [6] P. Prathan and Kamesh Kumar, On k -Graceful Labeling of some graphs, Journal of Applied Mathematics 34(1-2) (2016), 09-17.
- [7] Rokad, A.H. and Ghodasara, G.V. (2016) Fibonacci Cordial Labeling of Some Special Graphs.
- [8] Rodrigo Ming Zhou, Graceful Labeling of Graphs, 2016.
- [9] S. K. Vaidya, N. A. Dani, K. K. Kanani, and P. L. Vihol, Cordial and 3-Equitable Labeling for Some Shell Related Graphs, 438 449(2009).
- [10] Uma. R and Amuthavalli. D, “Fibonacci graceful labeling of some star related graphs”, International Journal of Computer Applications (0975-8887) Vol.134, No.15, January 2016.
- [11] W.David Bange and Anthoney E. Barakaukas, Fibonacci Graceful Graphs, University of Wisconsin-La Crosse, La Crosse, WI 53601.
- [12] Yuksel Soykan, Ekan Tasdemir, Inci Okumus, Melih Gocen,” Gaussian Generalized Tribonacci Numbers”, Journal of Progressive Research in Mathematics (JPRM), Vol.14, Issue:2.

Contra $\mathfrak{M}\alpha^*$ -Continuous and Contra $\mathfrak{M}\alpha^*$ -Irresolute Functions in Micro Topoigical Spaces

S. Sefri Dalmi

Department of Mathematics, St. Mary's College (Autonomous) Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract: The aim of this paper is to introduce and investigate the notion of contra $\mathfrak{M}\alpha^*$ -continuous and contra $\mathfrak{M}\alpha^*$ -irresolute functions. We also examine some of their properties and relations of other such functions.

Keywords: Micro α^* - open maps, Micro α^* - closed maps, Micro α^* - open sets, Micro α^* -closed sets, Micro α - continuous, Micro α^* - continuous, Micro α - irresolute, Micro α^* - irresolute.

I. INTRODUCTION

The concept of Nano topology was introduced by Thivagar et al which is defined in terms of the lower and upper approximation and the boundary region of a subset of an universe. The notion of approximations and boundary region of a set was originally proposed by Pawlak [7] in order to introduce the concept of rough set theory. In 2019, [3] Chandraseker introduced the concept of micro topology which is a simple extension of nano topology and so studied the concepts of Micro pre-open and Micro semi-open sets.[4] K. Chandraseker introduced the concept of micro topology which is a simple extension of Nano topology and so studied the concepts of Micro pre - open and Micro semi - open sets. [4] K. Chandrasekar and swathi introduced Micro α –open in micro topological space. P. Anbarasi Rodrigo[1] introduced $\mathfrak{M}\alpha^*$ open sets and studied their properties. Dontchev [5] introduced the notions of contra continuity in topological spaces.

II. PRELIMINARIES

Definition 2.1[3]

Let U be a nonempty finite set of objects called the universe and R be an equivalence relation on U named as the indiscernibility relation. Then U is divided into disjoint equivalence classes. Elements belonging to the same equivalence class are said to be indiscernible with one another. The pair (U, R) is said to be the approximation space.

Let $X \subseteq U$

1. The **lower approximation of X** with respect to R is the set of all objects, which can be for certain classified as X with respect to R and it is denoted by $L_R(X)$. That is $L_R(X) = U_{(x \in U)} \{R(x) : R(x) \subseteq X\}$ where $R(x)$ denotes the equivalence class determined by $x \in U$.

2. The **upper approximation of X** with respect to R is the set of all objects, which can be possibly classified as X with respect to R and it is denoted by $U_R(X)$. That is $U_R(X) = U_{(x \in U)} \{R(x) : R(x) \cap X \neq \emptyset\}$ $x \in U$.

3. The **boundary region of X** with respect to R is the set of all objects, which can be classified neither as X nor as not- X with respect to R and it is denoted by $B_R(X)$. That is $B_R(X) = U_R(X) - L_R(X)$.

Definition: 2.2[3]

Let U be an universe, R be an equivalence relation on U and $\tau_R(X) = \{U, \emptyset, L_R(X), R(X), B_R(X)\}$ where $X \subseteq U$ satisfies the following axioms.

1. $U, \emptyset \in \tau_R(X)$
2. The union of the elements of any sub collection of $\tau_R(X)$ is in $\tau_R(X)$.
3. The intersection of the elements of any finite sub collection of $\tau_R(X)$ is in $\tau_R(X)$. Then $\tau_R(X)$ is called the **Nano topology** on U with respect to X . The space $(U, \tau_R(X))$ is the Nano topological space. The elements are called Nano open sets.

Definition: 2.3[3]

$(U, \tau_R(X))$ is a nano topological space here $\mu_R(X) = \{N \cup (N' \cap \mu)\} / N, N' \in \tau_R(X)$ and it is called **Micro topology** of $\tau_R(X)$ by μ where $\mu \in \tau_R(X)$. The micro topology $\mu_R(X)$ satisfies the following axioms.

1. $U, \emptyset \in \mu_R(X)$
2. The union of the elements of any subcollection of $\mu_R(X)$ is in $\mu_R(X)$.
3. The intersection of the elements of any finite sub collection of $\mu_R(X)$ is in $\mu_R(X)$.

Then $\mu_R(X)$ is called the micro topology on U with respect to X . The triplet $(U, \tau_R(X), \mu_R(X))$ is called micro topological spaces and the elements of $\mu_R(X)$ are called micro open sets and the complement of a micro open set is called a micro closed set.

Example: 1

Let $U = \{p, q, r, s, \}$ and $U / R = \{\{p\}, \{q, r, s\}, \{t\}\}$ and let $X = \{q, r\} \subseteq U$. Then $N\tau_R(X) = \{U, \emptyset, \{q, r, s\}\}$ and $\mu = \{p\}$. $\mathfrak{M}$ - open, $\mu_R(X) = \{u, \emptyset, \{p\}, \{p, q, r, s\}, \{q, r, s\}\}$.

Definition: 2.4[3]

The **micro closure** of a set A is denoted by $\mathfrak{M} - \text{cl}(A)$ and is defined as $\mathfrak{M} - \text{cl}(A) = \cap \{B: B \text{ is micro closed and } A \subseteq B\}$.

Definition: 2.5[3]

The **micro interior** of a set A is denoted by $\mathfrak{M} - \text{int}(A)$ and is defined as $\mathfrak{M} - \text{int}(A) = \cup \{B: B \text{ is micro open and } A \supseteq B\}$.

Definition: 2.6[4]

Let $(U, \tau_R(X), \mu_R(X))$ be a micro topological space. A set A is called an $\mathfrak{M}\alpha$ - open set if $A \subseteq \mathfrak{M} - \text{int}(\mathfrak{M} - \text{cl}(\mathfrak{M} - \text{int}(A)))$, The complement of a $\mathfrak{M}\alpha$ - open set is called an $\mathfrak{M}\alpha$ - closed set.

Definition : 2.7[4]

Let $(U, \tau_R(X), \mu_R(X))$ and $(V, \tau_R'(Y), \mu_R'(Y))$ be two Micro topological spaces. A function $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y))$ is called **Micro - continuous function** if $f^{-1}(H)$ is Micro open in U for every Micro - open H in V .

Definition : 2.8[2]

Let $(U, \tau_R(X), \mu_R(X))$ and $(V, \tau_R'(Y), \mu_R'(Y))$ be two Micro topological spaces. A function $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y))$ is called **Micro α - continuous function** if $f^{-1}(H)$ is Micro α open in U for every Micro - open H in V .

Definition : 2.9[2]

Let $(U, \tau_R(X), \mu_R(X))$ and $(V, \tau_R'(Y), \mu_R'(Y))$ be two Micro topological spaces. A function $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y))$ is called **Micro α^* - continuous function** if $f^{-1}(H)$ is Micro α^* open in U for every Micro - open H in V .

III. Contra $\mathfrak{M}\alpha^*$ – Continuous Functions.

Definition : 3.1

A function $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y))$ is contra $\mathfrak{M}$ - continuous if $f^{-1}(O)$ is $\mathfrak{M}$ - closed in $(U, \tau_R(X), \mu_R(X))$ for every $\mathfrak{M}$ - open set O in $(V, \tau_R'(Y), \mu_R'(Y))$.

Definition: 3.2

A function $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ is contra $\mathfrak{M}\alpha^*$ - continuous if $f^{-1}(O)$ is $\mathfrak{M}\alpha^*$ - closed in $(U, \tau_R(X), \mu_R(X))$ for every $\mathfrak{M}$ - open set in $(V, \tau'_R(Y), \mu'_R(Y))$.

Example : 3.3

Let $U = V = \{a, b, c\}$ with $U/R = \{\{a, b\}, \{b\}\}$ and
 $X = \{a, c\} \subseteq U$ and $\mu = \{b\} \notin \tau_R(X)$. Then $\tau_R(X) = \{U, \emptyset, \{a, c\}\}$ and $\mu_R(X) = \{U, \emptyset, \{a, c\}, \{b\}\}$ then $\mu_R^c(X) = \{U, \emptyset, \{b\}, \{a, c\}\}$. Let $Y = \{c\} \subseteq V$ with $V/R = \{\{c\}, \{a, b\}\}$.
Then $\mu = \{a\} \notin \tau_R(Y)$ and $\tau'_R(Y) = \{U, \emptyset, c\}$ and
 $\mu'_R(Y) = \{U, \emptyset, \{a\}, \{c\}, \{a, c\}\}$. Then $\mathfrak{M}\alpha^*(X) = \{U, \emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}\}$. And
 $\mathfrak{M}\alpha^{*c}(X) = \{U, \emptyset, \{b, c\}, \{a, c\}, \{a, b\}, \{c\}, \{b\}, \{a\}\}$. Define
by $f(a) = a, f(b) = b, f(c) = c$. Hence f is contra $\mathfrak{M}\alpha^*$ - continuous functions.

Theorem : 3.4

Every contra $\mathfrak{M}$ - continuous is contra $\mathfrak{M}\alpha^*$ - continuous functions.

Proof :

Let $f: ((U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y)))$ be a contra $\mathfrak{M}$ - continuous. $\Rightarrow f^{-1}(O)$ is $\mathfrak{M}$ - closed in $\tau_R(X)$ for every $\mathfrak{M}$ open set O in $\tau_R(Y)$. Since every $\mathfrak{M}$ closed set is $\mathfrak{M}\alpha^*$ - closed. $\Rightarrow f^{-1}(O)$ is $\mathfrak{M}\alpha^*$ - closed in $\tau_R(X)$ for every $\mathfrak{M}$ - open set O in $\tau'_R(Y)$. $\Rightarrow f$ is contra $\mathfrak{M}\alpha^*$ - continuous functions.

Theorem :3.5

The converse of the above theorem need not true as shown in the following example

Remark :3.6

Let $U = V = \{a, b, c\}$ and $X = \{b, c\} \subseteq U$ with $U/R = \{\{a\}, \{b\}, \{c\}\}$ and
 $\mu = \{a\} \notin \tau_R(X)$. Let $\tau_R(X) = \{U, \emptyset, \{b, c\}\}$ and $\mu_R(X) = \{U, \emptyset, \{b, c\}, \{a\}\}$ then $\mu_R^c(X) = \{U, \emptyset, \{b, c\}, \{a\}\}$. Let $\tau'_R(Y) = \{U, \emptyset, \{a\}, \{b, c\}\}$ and $Y = \{a, c\} \subseteq V$ then
 $V/R = \{\{a\}, \{c\}, \{b, d\}\}$ and $\mu = \{a, c\} \notin \tau_R(Y)$. Let $\mu'_R(Y) = \{U, \emptyset, \{a, c\}, \{a, b\}, \{a\}, \{a, b, c\}\}$. Let $\mathfrak{M}\alpha^*(X) = \{U, \emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{b, c\}, \{a, c\}\}$ then $\mathfrak{M}\alpha^{*c}(X) = \{U, \emptyset, \{b, c\}, \{a, c\}, \{a, b\}, \{c\}, \{a\}, \{b\}\}$. Define
 $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ by $f(a) = a, f(b) = b, f(c) = c$. Then f is contra $\mathfrak{M}\alpha^*$ continuous functions but not $\mathfrak{M}$ continuous functions. Since for the micro open set $\{\{a, b\}, \{a, c\}\}$ are not $\mathfrak{M}$ continuous functions in $(V, \tau'_R(Y), \mu'_R(Y))$.

Theorem : 3.7

Every contra - $\mathfrak{M}\alpha$ continuous functions is contra - $\mathfrak{M}\alpha^*$ continuous functions.

Proof: Let $f: ((U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y)))$ be a contra $\mathfrak{M}\alpha$ - continuous functions. $\Rightarrow f^{-1}(O)$ is $\mathfrak{M}\alpha$ - closed in $\tau_R(X)$ for every $\mathfrak{M}\alpha$ open set O in $\tau_R(Y)$. Since every $\mathfrak{M}\alpha$ closed is $\mathfrak{M}\alpha^*$ -closed. $\Rightarrow f^{-1}(O)$ is $\mathfrak{M}\alpha^*$ - closed in $\tau_R(X)$ for every $\mathfrak{M}\alpha$ - open set O in $\tau_R(Y)$. $\Rightarrow f$ is contra $\mathfrak{M}\alpha^*$ - continuous functions.

Remark : 3.8

The converse of the above theorem is need not true as shown in the following example.

Example 3.9

Let $U = V = \{a, b, c, d\}$ and $X = \{b, d\}$ with $U/R = \{\{a\}, \{b, c\}, \{d\}\}$ and $\mu = \{a\} \notin \tau_R(X)$. Let $\tau_R(X) = \{U, \emptyset, \{d\}, \{b, c, d\}, \{b, c\}\}$ and $\mu_R(X) = \{U, \emptyset, \{d\}, \{b, c, d\}, \{b, c\}, \{a\}, \{a, d\}, \{a, b, c\}\}$. Let $\tau_R'(Y) = \{U, \emptyset, \{b\}, \{c, d\}, \{b, c, d\}\}$ and $Y = \{b, d\} \subseteq V$ then $V/R = \{\{a\}, \{b\}, \{c, d\}\}$ and $\mu = \{a, b\} \notin \tau_R(Y)$ then $\mu_R'(Y) = \{U, \emptyset, \{a, c\}, \{a, b\}, \{a\}, \{a, b, c\}\}$. Let $\mathfrak{M}_{\alpha}^*(X) = \{U, \emptyset, \{a\}, \{b\}, \{c\}, \{d\}, \{a, b\}, \{a, c\}, \{a, d\}, \{c, b\}, \{b, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}\}$ then $\mathfrak{M}\alpha^{*c}(X) = \{U, \emptyset, \{b, c, d\}, \{a, c, d\}, \{a, b, d\}, \{a, b, c\}, \{c, d\}, \{b, d\}, \{b, c\}, \{a, d\}, \{a, c\}, \{d\}, \{c\}, \{b\}, \{a\}\}$. Let $\mathfrak{M}\alpha(X) = \{\{a\}, \{d\}, \{a, d\}, \{b, c\}, \{a, b, c\}, \{b, c, d\}, U, \emptyset\}$ then $\mathfrak{M}\alpha^c(X) = \{U, \emptyset, \{b, c, d\}, \{a, b, c\}, \{b, c\}, \{a, d\}, \{d\}, \{a\}\}$. Define $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y))$ by $f(a) = b, f(b) = c, f(c) = d, f(d) = a$. Then f is contra $\mathfrak{M}\alpha^*$ - continuous functions but not $\mathfrak{M}\alpha$ - continuous functions. Since for the micro open set $\{a, b, d\}$ is not $\mathfrak{M}\alpha$ - closed in $(V, \tau_R'(Y), \mu_R'(Y))$.

Theorem :3.10

Let arbitrary union of $\mathfrak{M}\alpha^*$ - open Set be micro $\mathfrak{M}\alpha^*$ - open. Then the following statement for a map $f: ((U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y)))$.

1) f is contra $\mathfrak{M}\alpha^*$ - continuous.

2) For every $\mathfrak{M}$ - closed set F of V $f^{-1}(F)$ is $\mathfrak{M}\alpha^*$ - open in U .

3) For each $x \in X$ and each micro closed set B of V containing $f(x)$, there exist a that $f(A) \subseteq F$.

4) For each $x \in X$ and each open set B of V not containing x , there exist $\mathfrak{M}\alpha^*$ - closed set K containing x such that $f^{-1}(B) \subseteq K$.

Proof:

(1) $\Leftrightarrow$ (2) obvious.

(2) $\Rightarrow$ (3) Let F be micro closed in V containing $f(x)$. Hence $x \in f^{-1}(F)$. By (2) $f^{-1}(F)$ is $\mathfrak{M}\alpha^*$ in U containing x . Let $A = f^{-1}(F)$. This implies A is $\mathfrak{M}\alpha^*$ open in U containing x and $f(A) \subseteq F$. So (3) holds.

(3) $\Rightarrow$ (2) Let F be micro closed of V containing $f(x)$. So $x \in f^{-1}(F)$. By (3), there exist $\mathfrak{M}\alpha^*$ open set A_x of U containing x such that $f(A_x) \subseteq F$. So $x \in f^{-1}(F) = U\{A_x : x \in f^{-1}(F)\}$. This is a union of $\mathfrak{M}\alpha^*$ - open sets and hence it is $\mathfrak{M}\alpha^*$ - open. Hence (2) holds.

(3) $\Rightarrow$ (4) Let B be micro open in V not containing $f(x)$. Then $V - B$ is micro closed in V containing $f(x)$. By (3), there exists $\mathfrak{M}\alpha^*$ - open set A in U containing x such that $f(A) \subseteq V - B$. This implies $A \subseteq f^{-1}(V - B) = U - f^{-1}(B)$. Hence $f^{-1}(B) \subseteq U - A$. Let $K = X - A$. K is $\mathfrak{M}\alpha^*$ -closed in U not containing x such that $f^{-1}(B) \subseteq K$. Hence (4) holds.

(4) $\Rightarrow$ (3) Let F be micro closed in V containing $f(x)$. Then $V - F$ is micro open in V not containing $f(x)$. From (4), there exists $\mathfrak{M}\alpha^*$ -closed K in U not containing x such that $f^{-1}(V - F) \subseteq K$. This implies $U - f^{-1}(F) \subseteq K$. Hence $U - K \subseteq f^{-1}(F)$. That is $f(U - K) \subseteq F$. Let $A = U - K$. Then A is $\mathfrak{M}\alpha^*$ -open in U containing x such that $f(A) \subseteq F$. So (3) holds.

Theorem : 3.11

If $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y))$ is $\mathfrak{M}\alpha^*$ continuous and $g : (V, \tau_R'(Y), \mu_R'(Y)) \rightarrow (W, \tau_R''(Z), \mu_R''(Z))$ is contra micro continuous then $g \circ f : (U, \tau_R(X), \mu_R(X)) \rightarrow (W, \tau_R''(Z), \mu_R''(Z))$ is contra $\mathfrak{M}\alpha^*$ - continuous.

Proof :

Let S be a micro open set in $(W, \tau_R''(Z), \mu_R''(Z))$. Since g is contra micro continuous we have, $g^{-1}(S)$ is micro closed in $(V, \tau_R'(Y), \mu_R'(Y))$. Since f is $\mathfrak{M}\alpha^*$ continuous and

$g^{-1}(S)$ is micro closed in $(V, \tau_R'(Y), \mu_R'(Y))$ then $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $\mathfrak{M}\alpha^*$ - closed in $(U, \tau_R(X), \mu_R(X))$. Therefore $g \circ f$ is contra $\mathfrak{M}\alpha^*$ - continuous.

Theorem : 3.12

If $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y))$ is contra $\mathfrak{M}\alpha^*$ continuous and $g: (V, \tau_R'(Y), \mu_R'(Y)) \rightarrow (W, \tau_R''(Z), \mu_R''(Z))$ is micro continuous then $g \circ f: (U, \tau_R(X), \mu_R(X)) \rightarrow (W, \tau_R''(Z), \mu_R''(Z))$ is contra $\mathfrak{M}\alpha^*$ - continuous.

Proof :

Let S be a micro open set in $(W, \tau_R''(Z), \mu_R''(Z))$. Since g is micro continuous then $g^{-1}(S)$ is micro open in $(V, \tau_R'(Y), \mu_R'(Y))$.

Since f is contra $\mathfrak{M}\alpha^*$ continuous and we have $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $\mathfrak{M}\alpha^*$ closed in $(U, \tau_R(X), \mu_R(X))$. Therefore $g \circ f$ is contra $\mathfrak{M}\alpha^*$ - continuous.

IV-Contra $\mathfrak{M}\alpha^*$ - Irresolute Functions

Definition 4.1

A function $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y))$ is called contra $\mathfrak{M}$ - irresolute function if $f^{-1}(S)$ is $\mathfrak{M}$ - closed in $(U, \tau_R(X), \mu_R(X))$ for every $\mathfrak{M}$ - open set S in $(V, \tau_R'(Y), \mu_R'(Y))$.

Definition 4.2

A function $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y))$ is called contra $\mathfrak{M}\alpha^*$ - irresolute function if $f^{-1}(S)$ is $\mathfrak{M}\alpha^*$ closed in $(U, \tau_R(X), \mu_R(X))$ for every $\mathfrak{M}\alpha^*$ - open set S in $(V, \tau_R'(Y), \mu_R'(Y))$.

Example 4.3

Let $U = V = \{a, b, c, d\}$ with $U/R = \{\{a\}, \{d\}, \{b, c\}\}$ and $X = \{b, d\} \subseteq U$ then $\mu = \{\{a\}, \{b, c\}, \{d\}\}$. Let $\tau_R(X) = \{U, \emptyset, \{d\}, \{b, c, d\}, \{b, c\}\}$ and $\mu_R(X) = \{U, \emptyset, \{d\}, \{b, c, d\}, \{b, c\}, \{a\}, \{a, d\}, \{a, b, c\}\}$. Let $Y = \{a, c\} \subseteq V$ with $V/R = \{\{b\}, \{c\}, \{a, d\}\}$, $\mu = \{a, b\} \notin \tau_R(Y)$ then $\mu_R'(Y) = \{U, \emptyset, \{a, c\}, \{a, b\}, \{a\}, \{a, b, c\}, \{a, c, d\}, \{a, d\}\}$ and $\tau_R'(Y) = \{U, \emptyset, \{c\}, \{a, c, d\}, \{a, d\}\}$. Let $\mathfrak{M}\alpha^*(X) = \{U, \emptyset, \{a\}, \{d\}, \{a, d\}, \{b, c\}, \{a, b, c\}, \{b, c, d\}\}$. Then $\mathfrak{M}\alpha^{*c}(X) = U, \emptyset, \{b, c, d\}, \{a, c, d\}, \{a, b, d\}, \{a, b, c\}, \{c, d\}, \{b, d\}, \{b, c\}, \{a, d\}, \{a, c\}, \{a\}$.

$\{b\}, \{c\}, \{d\}$ and $\mathfrak{M}\alpha^*(Y) = \{U, \emptyset, \{a\}, \{c\}, \{a, b\}, \{a, c\}, \{a, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}\}$. Define $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y))$ by $f(a) = c, f(b) = b, f(c) = d, f(d) = a$. Hence f is contra $\mathfrak{M}\alpha^*$ -Irresolute functions.

Theorem 4.4

Every contra $\mathfrak{M}$ irresolute function is contra $\mathfrak{M}\alpha^*$ - irresolute functions.

Proof :

Let $f: ((U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y)))$ be a contra $\mathfrak{M}$ - irresolute functions. $\Rightarrow f^{-1}(S)$ is $\mathfrak{M}$ - closed in $\tau_R(X)$ for every $\mathfrak{M}$ open set S in $\tau_R'(Y)$. Since every $\mathfrak{M}$ closed is $\mathfrak{M}\alpha^*$ closed. $\Rightarrow f^{-1}(S)$ is $\mathfrak{M}\alpha^*$ - closed in $\tau_R(X)$ for every $\mathfrak{M}\alpha^*$ - open set S in $\tau_R(Y)$. $\Rightarrow f$ is contra $\mathfrak{M}\alpha^*$ - irresolute functions.

Remark :4.5

The converse of the above theorem is need not true as shown in the following example.

Example :4.6

Let $U = V = \{a, b, c, d\}$ with $U/R = \{\{a\}, \{b, c\}, \{d\}\}$ and $X = \{b, d\} \subseteq U$, $\mu = \{a\} \notin \tau_R(X)$. Let $\tau_R(X) = \{U, \emptyset, \{d\}, \{b, c, d\}, \{b, c\}\}$ and $\mu_R(X) = \{U, \emptyset, \{d\}, \{b, c, d\}, \{b, c\}, \{a\}, \{a, d\}, \{a, b, c\}\}$. Let $Y = \{a, b\} \subseteq V$ with $V/R = \{\{a, b\}, \{c\}, \{d\}\}$ $\mu = \{a, b, c\} \notin \tau_R(Y)$ then $\tau_R'(Y) = \{U, \emptyset, \{a, b\}\}$ and $\mu_R'(Y) = \{U, \emptyset, \{a, b\}, \{a, b, c\}\}$. Let $\mathfrak{M}^c(X) = \{U, \emptyset, \{b, c, d\}, \{a, b, c\}, \{b, c\}, \{a, d\}, \{d\}, \{a\}\}$ and $\mathfrak{M}(Y) = U, \emptyset, \{a, b\}, \{a, b, c\}$. Define $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \sigma_R(Y), \mu_R'(Y))$ by $f(a) = c, f(b) = b, f(c) = d, f(d) = a$. Since for the $\mathfrak{M}$ open set $\{\{a, b\}, \{a, b, c\}\}$ the inverse image is not in $\mathfrak{M}$ closed sets in X . Therefore f is not $\mathfrak{M}$ irresolute.

Theorem 4.7

Every contra $\mathfrak{M}\alpha$ - irresolute function is contra $\mathfrak{M}\alpha^*$ - irresolute functions.

Proof :

Let $f: ((U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y)))$ be a contra $\mathfrak{M}\alpha$ - irresolute functions. $\Rightarrow f^{-1}(S)$ is $\mathfrak{M}\alpha$ - closed in $\tau_R(X)$ for every $\mathfrak{M}\alpha$ open set S in $\tau_R'(Y)$. Since every $\mathfrak{M}\alpha$ - closed is $\mathfrak{M}\alpha^*$ open and $\mathfrak{M}\alpha$ - open is $\mathfrak{M}\alpha^*$ - open. $\Rightarrow f^{-1}(S)$ is $\mathfrak{M}\alpha^*$ - closed in $\tau_R(X)$ for every $\mathfrak{M}\alpha^*$ - open set S in $\tau_R'(Y)$. $\Rightarrow f$ is contra $\mathfrak{M}\alpha^*$ - irresolute functions.

Remark :4.8

The converse of the above theorem is need not true as shown in the following example.

Example : 4.9

Let $U = V = \{a, b, c\}$ with $U/R = \{\{a\}, \{b\}, \{c\}\}$ and $X = \{b, c\} \subseteq U, \mu = \{a\} \notin \tau_R(X)$.
Let $\tau_R(X) = \{U, \emptyset, \{b, c\}\}$ and $\mu_R(X) = \{U, \emptyset, \{b, c\}, \{a\}\}$ $\mathfrak{M}\alpha^{*c}(X) = \{U, \emptyset, \{b, c\}, \{a, c\}, \{a, b\}, \{c\}, \{a\}, \{b\}\}$. Let $Y = \{a, b\} \subseteq V$, $V/R = \{\{a\}, \{b, c\}\}$ and $\mu = \{b\} \notin \tau_R(Y)$ $\mu_R'(Y) = \{U, \emptyset, \{a\}, \{b, c\}, \{b\}, \{a, b\}\}$ and $\tau_R'(Y) = \{U, \emptyset, \{a\}, \{b, c\}\}$. Let $\mathfrak{M}_\alpha(X) = \{U, \emptyset, \{a\}, \{b, c\}\}$ then $\mathfrak{M}_\alpha^c(X) = \{U, \emptyset, \{b, c\}, \{a\}\}$ and $\mathfrak{M}^*(Y) = \{U, \emptyset, \{a\}, \{b\}, \{a, b\}, \{b, c\}\}$. Define $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y))$ by $f(a) = a, f(b) = b, f(c) = c$. Then f is contra $\mathfrak{M}\alpha^*$ irresolute function but not $\mathfrak{M}\alpha$ irresolute functions. Since for the micro α - open set $\{\{b\}, \{a, b\}\}$ is not $\mathfrak{M}\alpha$ irresolute functions in $(V, \tau_R'(Y), \mu_R'(Y))$.

Theorem : 4.10

Let $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau_R'(Y), \mu_R'(Y))$ and $g: (V, \tau_R'(Y), \mu_R'(Y)) \rightarrow (W, \tau_R''(Z), \mu_R''(Z))$ be to functions.

- 1) If f is contra $\mathfrak{M}\alpha^*$ irresolute and g is $\mathfrak{M}\alpha^*$ irresolute then $g \circ f$ is contra $\mathfrak{M}\alpha^*$ irresolute.
- 2) If f is contra $\mathfrak{M}\alpha^*$ irresolute and g is $\mathfrak{M}\alpha^*$ continuous then $g \circ f$ is contra $\mathfrak{M}\alpha^*$ continuous.
- 3) If f is contra $\mathfrak{M}\alpha^*$ irresolute and g is $\mathfrak{M}$ continuous then $g \circ f$ is contra $\mathfrak{M}\alpha^*$ continuous.
- 4) If f is contra $\mathfrak{M}\alpha^*$ irresolute and g is $\mathfrak{M}\alpha$ continuous then $g \circ f$ is contra $\mathfrak{M}\alpha^*$ - continuous.

Proof :

1) Let S be a $\mathfrak{M}\alpha^*$ open set in $(W, \tau_R''(Z), \mu_R''(Z))$. Since g is $\mathfrak{M}\alpha^*$ irresolute and S is $\mathfrak{M}\alpha^*$ open set, $g^{-1}(S)$ is $\mathfrak{M}\alpha^*$ open in $(V, \tau_R'(Y), \mu_R'(Y))$. Since f is contra $\mathfrak{M}\alpha^*$ irresolute and $g^{-1}(S)$ is $\mathfrak{M}\alpha^*$ open in $(V, \tau_R'(Y), \mu_R'(Y))$, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $\mathfrak{M}\alpha^*$ closed in $(U, \tau_R(X), \mu_R(X))$. Therefore $g \circ f$ is contra $\mathfrak{M}\alpha^*$ - irresolute functions.

2) Let S be micro open set in $(W, \tau_R''(Z), \mu_R''(Z))$. Since g is $\mathfrak{M}\alpha^*$ continuous and S is micro open set, $g^{-1}(S)$ is $\mathfrak{M}\alpha^*$ open in $(V, \tau_R'(Y), \mu_R'(Y))$. Since f is contra $\mathfrak{M}\alpha^*$ irresolute

and $g^{-1}(S)$ is $\mathfrak{M}\alpha^*$ open in $(V, \tau_R'(Y), \mu_R'(Y))$, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $\mathfrak{M}\alpha^*$ closed in $(U, \tau_R(X))$. Therefore $g \circ f$ is contra $\mathfrak{M}\alpha^*$ continuous functions.

3) Let S be micro open set in $(W, \tau_R''(Z), \mu_R''(Z))$. Since g is $\mathfrak{M}$ continuous and S is micro open set $g^{-1}(S)$ is micro open in $(V, \tau_R'(Y), \mu_R'(Y)) \Rightarrow g^{-1}(S)$ is $\mathfrak{M}\alpha^*$ open in $(V, \tau_R'(Y), \mu_R'(Y))$. since every micro open set is $\mathfrak{M}\alpha^*$ is open. Since f is contra $\mathfrak{M}\alpha^*$ irresolute and $g^{-1}(S)$ is $\mathfrak{M}\alpha^*$ open in $(V, \tau_R'(Y), \mu_R'(Y))$, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $\mathfrak{M}\alpha^*$ closed in $(U, \tau_R(X), \mu_R(X))$. Therefore $g \circ f$ is contra $\mathfrak{M}\alpha^*$ continuous functions.

4) Let S be micro open set in $(W, \tau_R''(Z), \mu_R''(Z))$. Since g is $\mathfrak{M}\alpha$ continuous and S is micro open set $g^{-1}(S)$ is $\mathfrak{M}\alpha$ open in $(V, \tau_R'(Y), \mu_R'(Y)) \Rightarrow g^{-1}(S)$ is $\mathfrak{M}\alpha^*$ open in $(V, \tau_R'(Y), \mu_R'(Y))$. since every micro open set is $\mathfrak{M}\alpha^*$ is open. Since f is contra $\mathfrak{M}\alpha^*$ irresolute and $g^{-1}(S)$ is $\mathfrak{M}\alpha^*$ open in $(V, \tau_R'(Y), \mu_R'(Y))$, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $\mathfrak{M}\alpha^*$ closed in $(U, \tau_R(X), \mu_R(X))$. Therefore $g \circ f$ is contra $\mathfrak{M}\alpha^*$ continuous functions.

CONCLUSION

In this paper, we have introduced Contra Micro α^* - continuous functions and Contra Micro α^* - Irresolute functions and explored their fundamental properties. We have examined their relationships with varies existing Micro Continuous and Micro Irresolute functions. Furthermore, several compositions of these functions have been investigated, provided deeper insights into their structural behaviour. These findings contribute to the ongoing study of function spaces in Micro topological settings.

REFERENCES

- [1].P.Anbarasi Rodrigo, A New Class Of Micro Open Set in Micro Topology. Vol.8, Issue 9 (2022) pp:38-43.
- [2].R.Bhavani, On Strong Forms of Generalized Closed Sets in Micro Topological Spaces, Turkish Journal of Computer And Mathematics Education, Vol.12, No.11 (2021), 2772-2777.
- [3].S.Chandrasekar, on Micro Topological Spaces, Journal of New Theory, 26 (2019), 23-31.
- [4].S.Chandraseker, G.Swathi, Micro- α -Open Sets in Micro Topological Spaces, International Journal Of Research in Advent Technology, Vol.6, No.10. October 2018, 2633-2637.
- [5].Dontchev J. Contra Continuous Functions And Strongly S-Closed Spaces. Int J Math Sci 1996; 19(2):303-10.
- [6].H.Z.Ibrahim, Micro β -Open Sets in Micro Topology, Gen. Lett. Math., 8(1) (2020), 8-15.

- [7]. Pawlak,Z.,Some Issues on Rough Sets,J.F.Peters et al.(Eds.):Transactions on Rough Sets I,2004.LNCS 3100:p.1-58.
- [8].S.Pious Missier,P.Anbarasi Rodrigo,Some Notions of Nearly Open Sets in Topological Spaces,J.Math.Archive,Vol.4,Issue.12,2013,12-18.
- [9].Taha H.Jasmin, Sajis S.Mohsen, Kanayo S.Eke, on Micro - Generalised Closed sets and Micro Generalized Continuity in Micro Topological Spaces,European Journal Of Pure And Applied Mathematics,Vol.14,No.4,2021,1507-1516.

CONTRA FUNCTIONS USING NANO $g\alpha^*$ - CLOSED SETS IN NANO TOPOLOGICAL SPACES

K. Gomathi Ambigai

Department of Mathematics, St. Mary's College (Autonomous) Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract: The aim of this paper is to introduce and study the concept of new class of functions called Contra Nano $g\alpha^*$ -continuous function and Contra Nano $g\alpha^*$ -irresolute function in Nano topological spaces.

Keywords : Nga^* - open, Nga^* - closed , contra Nga^* -continuous functions, contra Nga^* - irresolute functions.

I. INTRODUCTION

Continuity and irresoluteness are fundamental concepts in topology, playing a crucial role in understanding the behaviour of functions between topological spaces. Several generalized forms of continuity have been introduced to study various properties of topological functions. The concept of Nano topology was first introduced by M. Lellis Thivagar [5] and Carmel Richard, defining topological structures in terms of approximations and boundary regions using equivalence relations. They introduced key notions such as Nano closed sets, Nano interior, Nano closure, Nano continuous functions, Nano open mappings, Nano closed mappings and Nano homeomorphisms. K. Bhuvaneswari.K [3] and Mythili Gnanapriya.K introduced Nano g -closed. Later Bhuvaneshwari.K [4] and Ezhilarasi.K introduced Nano semi-generalized and Nano generalized semi- closed sets. P. Subithra [1]and P. Anbarasi Rodrigo introduced Nga^* -closed sets in Nano topological spaces. Later P. Subithra [2]and P. Anbarasi Rodrigo introduced Nga^* -continuous and Nga^* - irresolute in nano topological spaces. This paper aims to introduce and investigate a new class of functions called contra Nga^* continuous functions and contra Nga^* irresolute functions in Nano topological spaces. The fundamental properties and characterizations of these functions are analyzed, establishing their significance in the broader framework of Nano topology.

II. PRELIMINARIES

In this section, we recall some basic definitions and results in Nano topological spaces which are useful in the sequel.

Definition 2.1 :[5] Let U be a non-empty finite set of objects called the universe and R be an equivalence relation on U named as the indiscernibility relation. Elements belonging to the

same equivalence class are said to be indiscernible with one another. The pair (U, R) is said to be the approximation space. Let $X \subseteq_N U$. Then

1) **The lower approximation of X** with respect to R is the set of all objects, which can be for certain classified as X with respect to R and it is denoted by $L_R(X)$.

$$L_R(X) = \bigcup_{x \in U} \{R(x) : R(x) \subseteq_N X\}$$

2) **The upper approximation of X** with respect to R is the set of all objects, which can be possibly classified as X with respect to R and it is denoted by $U_R(X)$

$$U_R(X) = \bigcup_{x \in U} \{R(x) : R(x) \cap X \neq \emptyset\}$$

3) **The boundary region of X** with respect to R is the set of all objects, which can be classified neither as X nor as not $-X$ with respect to R and it is denoted by $B_R(X)$.

$$B_R(X) = U_R(X) - L_R(X).$$

Definition 2.2 :[5] Let U be the universe, R be an equivalence relation on U and

$\tau_R(X) = \{U, \emptyset, U_R(X), L_R(X), B_R(X)\}$ where $X \subseteq_N U$. Then $\tau_R(X)$ satisfies the following axioms:

- 1) U and $\emptyset \in \tau_R(X)$
- 2) The union of the elements of any sub collection of $\tau_R(X)$ is in $\tau_R(X)$,
- 3) The intersection of the elements of any finite sub collection of $\tau_R(X)$ is in $\tau_R(X)$.

That is $\tau_R(X)$ is a topology on U called the Nano topology on U with respect to X . We call $(U, \tau_R(X))$ as the **Nano topological space(NTS)**. The elements of $\tau_R(X)$ are called as **Nano open sets**. The complement of Nano-open sets is called **Nano closed sets**.

Definition 2.3 :[5] If $(U, \tau_R(X))$ is a NTS with respect to X and if $S \subseteq_N U$, then

- The **Nano interior** of S is defined as the union of all Nano open subsets of S and it is denoted by $Nint(S)$. That is, $Nint(S)$ is the largest open subset of S .
- The **Nano closure** of S is defines as the intersection of all Nano closed sets containing S it is denoted by $Ncl(S)$. That is, $Ncl(S)$ is the smallest nano closed set containing S .

Definition 2.4 :[1] A **Nano generalized α^* ($Ng\alpha^*$) closed** set is a subset S of a NTS $(U, \tau_R(X))$ if $N\alpha cl(S) \subseteq_N Nint^*(F)$ whenever $S \subseteq_N F$ and F is Ng -open in U .

Definition 2.5 : Let $(U, \tau_R(X))$ and $(V, \sigma_R(Y))$ be Nano topological spaces, then the mapping $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is called **Nano contra continuous function** if $f^{-1}(S)$ is nano closed in $(U, \tau_R(X))$ for every nano open set S in $(V, \sigma_R(Y))$.

Definition 2.6 :[2] A function $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is called **Nano generalized α^* ($Ng\alpha^*$) continuous function** if $f^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$ for every nano closed set S in $(V, \sigma_R(Y))$.

Definition 2.7 :[6] Let $(U, \tau_R(X))$ and $(V, \sigma_R(Y))$ be Nano topological spaces, then the mapping $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is called **Nano continuous function** if $f^{-1}(S)$ is nano open in $(U, \tau_R(X))$ for every nano open set S in $(V, \sigma_R(Y))$.

Definition 2.8 :[2] A function $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is called **Nano generalized α^* ($Ng\alpha^*$) irresolute function** if $f^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$ for every $Ng\alpha^*$ closed set S in $(V, \sigma_R(Y))$.

Result 2.9:[1]

1. Every nano closed set is $Ng\alpha^*$ - closed.
2. Every nano open set is $Ng\alpha^*$ - open.
3. Every Ng^* -open set is $Ng\alpha^*$ - open.
4. Arbitrary union of $Ng\alpha^*$ open sets are $Ng\alpha^*$ open

Definition 2.10: A subset S of a NTS $(U, \tau_R(X))$ is called

1. Ng -closed[2] if $Ncl(S) \subseteq_N F$, whenever $S \subseteq_N F$ and F is Nano open in U .
2. Ng^* -closed[1] if $Ncl(S) \subseteq_N F$, whenever $S \subseteq_N F$ and F is Ng -open in U .

The complements of the above-mentioned sets are called their respective closed sets.

Definition 2.11 : Let $(U, \tau_R(X))$ and $(V, \sigma_R(Y))$ be Nano topological spaces, then the mapping $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is called **Ng^* -continuous** if $f^{-1}(S)$ is Ng^* -closed in $(U, \tau_R(X))$ for every nano closed set S in $(V, \sigma_R(Y))$.

Definition 2.12 : For every set $A \subseteq U$, the **Nano generalized closure of A** is defined as the intersection of all Ng - closed sets containing A and is denoted by $Ncl^*(A)$.

Definition 2.13 : For every set $A \subseteq U$, the **Nano generalized interior of A** is defined as the union of all Ng - open sets contained in A and is denoted by $Nint^*(A)$.

III. CONTRA $Ng\alpha^*$ CONTINUOUS FUNCTIONS

Definition 3.1 : A function $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is called **contra nano generalized α^* (contra $Ng\alpha^*$) continuous function** if $f^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$ for every nano open set S in $(V, \sigma_R(Y))$.

Example 3.2 :

Let $U = \{p, q, r, s\}$ with $U/R = \{\{p\}, \{r\}, \{q, s\}\}$. Let $X = \{p, q\} \subseteq_N U$. Then $\tau_R(X) = \{U, \emptyset, \{p\},$

$\{q,s\}, \{p,q,s\}\}$. Here $Ng\alpha^*$ closed sets are $\{U, \emptyset, \{r\}, \{p,r\}, \{q,r\}, \{r,s\}, \{p,q,r\}, \{p,r,s\}, \{q,r,s\}\}$. Let $V = \{p,q,r,s\}$ with $V/R = \{\{r\}, \{p,q,s\}\}$. Let $Y = \{q,s\} \subseteq_N V$. Then $\sigma_R(Y) = \{U, \emptyset, \{p,q,s\}\}$. Here $Ng\alpha^*$ closed sets = $\{U, \emptyset, \{r\}, \{p,r\}, \{q,r\}, \{r,s\}, \{p,q,r\}, \{p,r,s\}, \{q,r,s\}\}$. Let $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be defined by $f(p)=q, f(q) = p, f(r) = s, f(s)=r$. Then $f^{-1}(p) = q, f^{-1}(q) = p, f^{-1}(r) = s, f^{-1}(s) = r, f^{-1}(\{p,q,s\}) = \{p,q,r\} \in Ng\alpha^*$ closed in $(U, \tau_R(X))$ were $\{p,q,s\}$ is nano open in $(V, \sigma_R(Y))$. Therefore f is contra $Ng\alpha^*$ continuous function.

Theorem 3.3 : Every nano contra continuous function is contra $Ng\alpha^*$ continuous function.

Proof: Let $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be nano contra continuous function. Let S be nano open set in $(V, \sigma_R(Y))$. Since f is nano contra continuous function, $f^{-1}(S)$ nano closed in $(U, \tau_R(X))$. By Result 2.9(1), $f^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$. Therefore f is contra $Ng\alpha^*$ continuous function.

Remark 3.4 : The converse of the above theorem is not true. This is proved by following example.

Example 3.5 :

Let $U = \{a,b,c,d\}$ with $U/R = \{\{a\}, \{c\}, \{b,d\}\}$. Let $X = \{a,b\} \subseteq_N U$. Then $\tau_R(X) = \{U, \emptyset, \{a\}, \{b,d\}, \{a,b,d\}\}$. Nano closed sets are $\{U, \emptyset, \{b,c,d\}, \{a,c\}, \{c\}\}$. Here $Ng\alpha^*$ closed sets are $\{U, \emptyset, \{c\}, \{a,c\}, \{b,c\}, \{c,d\}, \{a,b,c\}, \{a,c,d\}, \{b,c,d\}\}$. Let $V = \{a,b,c,d\}$ with $V/R = \{\{c\}, \{a,b,d\}\}$. Let $Y = \{b,d\} \subseteq_N V$. Then $\sigma_R(Y) = \{U, \emptyset, \{a,b,d\}\}$. Here $Ng\alpha^*$ closed sets are $\{U, \emptyset, \{c\}, \{a,c\}, \{b,c\}, \{c,d\}, \{a,b,c\}, \{a,c,d\}, \{b,c,d\}\}$. Let $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be defined by $f(a)=b, f(b) = a, f(c) = d, f(d)=c$. Then $f^{-1}(a) = b, f^{-1}(b) = a, f^{-1}(c) = d, f^{-1}(d) = c, f^{-1}(\{a,b,d\}) = \{a,b,c\} \in Ng\alpha^*$ closed in $(U, \tau_R(X))$ were $\{a,b,d\}$ is nano open in $(V, \sigma_R(Y))$. Therefore f is contra $Ng\alpha^*$ continuous function. Since $f^{-1}(\{a,b,d\}) = \{b,a,c\}$ is not nano closed in $(U, \tau_R(X))$ were $\{a,b,d\}$ is nano open in $(V, \sigma_R(Y))$, f is not nano contra continuous.

Theorem 3.6 : For a function $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$, the following are equivalent.

- 1) f is contra $Ng\alpha^*$ continuous.
- 2) For each $x \in U$ and each nano closed set F in $(V, \sigma_R(Y))$ containing $f(x)$, there exists a $Ng\alpha^*$ open set J in $(U, \tau_R(X))$ containing x such that $f(J) \subseteq F$

3) The inverse image of each nano closed set in $(V, \sigma_R(Y))$ is $Ng\alpha^*$ open in $(U, \tau_R(X))$.

Proof:

1) $\Rightarrow$ 2)

Let $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra $Ng\alpha^*$ continuous. Let $x \in U$ and F be nano closed set in $(V, \sigma_R(Y))$ containing $f(x)$. Let $S = V/F$ be an nano open set in $(V, \sigma_R(Y))$ and $f(x) \notin V/F = S$. Since f is contra $Ng\alpha^*$ continuous, $f^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$ and $x \notin f^{-1}(S)$ then $f^{-1}(S) = f^{-1}(V/F) = U/f^{-1}(F)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$ and $x \notin U/f^{-1}(F)$. Since $U/f^{-1}(F)$ is $Ng\alpha^*$ closed and $x \notin U/f^{-1}(F)$, $f^{-1}(F)$ is $Ng\alpha^*$ open and $x \in f^{-1}(F)$. Let $J = f^{-1}(F)$ be $Ng\alpha^*$ open in U and $x \in J$ such that $f(J) \subseteq F$

2) $\Rightarrow$ 3)

Let F be a nano closed set in $(V, \sigma_R(Y))$. Let $x \in f^{-1}(F)$ then $f(x) \in F$. Then by our assumption there exists a $Ng\alpha^*$ open set U_x in $(U, \tau_R(X))$ containing x such that $f(x) \in f(U_x) \subseteq F$. Then $f^{-1}(f(x)) \in f^{-1}(f(U_x)) \subseteq f^{-1}(F)$. So $x \in U_x \subseteq f^{-1}(F)$. Therefore $f^{-1}(F) = \bigcup \{U_x : x \in f^{-1}(F)\}$. Then by Result 2.9 (4), $f^{-1}(F)$ is $Ng\alpha^*$ open in $(U, \tau_R(X))$.

3) $\Rightarrow$ 1)

Let F be nano open set in $(V, \sigma_R(Y))$ which implies V/F is nano closed in $(V, \sigma_R(Y))$. Then by our assumption, $f^{-1}(V/F) = U/f^{-1}(F)$ is $Ng\alpha^*$ open in $(U, \tau_R(X))$. Then $f^{-1}(F)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$. Therefore f is contra $Ng\alpha^*$ continuous.

Theorem 3.7 : If $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is $Ng\alpha^*$ continuous and $g : (V, \sigma_R(Y)) \rightarrow (W, \gamma_R(Z))$ is nano contra continuous then $g \circ f : (U, \tau_R(X)) \rightarrow (W, \gamma_R(Z))$ is contra $Ng\alpha^*$ continuous.

Proof: Let S be a nano open set in $(W, \gamma_R(Z))$. Since g is nano contra continuous, $g^{-1}(S)$ is nano closed in $(V, \sigma_R(Y))$. Since f is $Ng\alpha^*$ continuous, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$. Therefore $g \circ f$ is contra $Ng\alpha^*$ continuous.

Theorem 3.8 : If $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is contra $Ng\alpha^*$ continuous and $g : (V, \sigma_R(Y)) \rightarrow (W, \gamma_R(Z))$ is nano continuous then $g \circ f : (U, \tau_R(X)) \rightarrow (W, \gamma_R(Z))$ is contra $Ng\alpha^*$ continuous.

Proof: Let S be a nano open set in $(W, \gamma_R(Z))$. Since g is nano continuous, $g^{-1}(S)$ is nano open in $(V, \sigma_R(Y))$. Since f is contra $Ng\alpha^*$ continuous, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$. Therefore $g \circ f$ is contra $Ng\alpha^*$ continuous.

Theorem 3.9 : If $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is contra $Ng\alpha^*$ continuous and $g : (V, \sigma_R(Y)) \rightarrow (W, \gamma_R(Z))$ is nano contra continuous then $g \circ f : (U, \tau_R(X)) \rightarrow (W, \gamma_R(Z))$ is $Ng\alpha^*$ continuous.

Proof: Let S be a nano open set in $(W, \gamma_R(Z))$. Since g is nano contra continuous, $g^{-1}(S)$ is nano closed in $(V, \sigma_R(Y))$. Since f is contra $Ng\alpha^*$ continuous, By Theorem 3.6, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $Ng\alpha^*$ open in $(U, \tau_R(X))$. Since $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is $Ng\alpha^*$ continuous iff the inverse image of every nano open set in $(V, \sigma_R(Y))$ is $Ng\alpha^*$ open in $(U, \tau_R(X))$, we have $g \circ f$ is $Ng\alpha^*$ continuous.

IV. CONTRA $Ng\alpha^*$ IRRESOLUTE FUNCTION

Definition 4.1 : A function $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is called contra nano generalized α^* (contra $Ng\alpha^*$) irresolute function if $f^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$ for every $Ng\alpha^*$ open set S in $(V, \sigma_R(Y))$.

Example 4.2 :

Let $U = \{p, q, r\}$ with $U/R = \{\{p\}, \{q, r\}\}$. Let $X = \{p\} \subseteq_N U$. Then $\tau_R(X) = \{U, \emptyset, \{p\}\}$. Here $Ng\alpha^*$ closed sets = $\{U, \emptyset, \{r\}, \{q\}, \{q, r\}\}$. Let $V = \{p, q, r\}$ with $V/R = \{\{p\}, \{q\}, \{r\}\}$. Let $Y = \{p, q\} \subseteq_N V$. Then $\sigma_R(Y) = \{U, \emptyset, \{p, q\}\}$. Here $Ng\alpha^*$ open sets = $\{V, \emptyset, \{p\}, \{q\}, \{p, q\}\}$. Let $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be defined by $f(p) = r, f(q) = p, f(r) = q$ then $f^{-1}(p) = q, f^{-1}(q) = r, f^{-1}(r) = p$. $f^{-1}(\{p, q\}) = \{q, r\}$, $f^{-1}(\{p\}) = q$, $f^{-1}(\{q\}) = \{r\}$ then $f^{-1}(\{p, q\}), f^{-1}(\{p\}), f^{-1}(\{q\}) \in Ng\alpha^*$ closed in $(U, \tau_R(X))$ were $\{p, q\}, \{p\}, \{q\}$ is $Ng\alpha^*$ open set in $(V, \sigma_R(Y))$. Since $f^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$ for every $Ng\alpha^*$ open set S in $(V, \sigma_R(Y))$, We have f is contra $Ng\alpha^*$ irresolute function.

Theorem 4.3: If $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is $Ng\alpha^*$ irresolute and $g : (V, \sigma_R(Y)) \rightarrow (W, \gamma_R(Z))$ is contra $Ng\alpha^*$ irresolute then $g \circ f : (U, \tau_R(X)) \rightarrow (W, \gamma_R(Z))$ is contra $Ng\alpha^*$ irresolute.

Proof: Let S be a $Ng\alpha^*$ open set in $(W, \gamma_R(Z))$. Since g is contra $Ng\alpha^*$ irresolute, $g^{-1}(S)$ is in $Ng\alpha^*$ closed $(V, \sigma_R(Y))$. Since f is $Ng\alpha^*$ irresolute, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$. Therefore $g \circ f$ is contra $Ng\alpha^*$ irresolute.

Theorem 4.4 : For a function $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$, the following are equivalent.

- 1) f is contra $Ng\alpha^*$ irresolute.
- 2) For each $x \in U$ and each $Ng\alpha^*$ closed set F in $(V, \sigma_R(Y))$ containing $f(x)$, there exists a $Ng\alpha^*$ open set J in $(U, \tau_R(X))$ containing x such that $f(J) \subseteq F$
- 3) The inverse image of each $Ng\alpha^*$ closed set in $(V, \sigma_R(Y))$ is $Ng\alpha^*$ open in $(U, \tau_R(X))$.

Proof :

1) $\Rightarrow$ 2)

Let $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra $Ng\alpha^*$ irresolute. Let $x \in U$ and F be $Ng\alpha^*$ closed set in $(V, \sigma_R(Y))$ containing $f(x)$. Let $S = V/F$ be an $Ng\alpha^*$ open set in $(V, \sigma_R(Y))$ and $f(x) \notin V/F = S$. Since f is contra $Ng\alpha^*$ irresolute, $f^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$ and $x \notin f^{-1}(S)$. Then $f^{-1}(S) = f^{-1}(V/F) = U/f^{-1}(F)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$ and $x \notin U/f^{-1}(F)$. Since $U/f^{-1}(F)$ is $Ng\alpha^*$ closed, $f^{-1}(F)$ is $Ng\alpha^*$ open. Let $J = f^{-1}(F)$ be $Ng\alpha^*$ open in $(U, \tau_R(X))$ then $x \in J$ such that $f(J) \subseteq F$

2) $\Rightarrow$ 3)

Let F be a $Ng\alpha^*$ closed set in $(V, \sigma_R(Y))$. Let $x \in f^{-1}(F)$ then $f(x) \in F$. Then by our assumption there exists a $Ng\alpha^*$ open set U_x in $(U, \tau_R(X))$ containing x such that $f(x) \in f(U_x) \subseteq F$. Then $f^{-1}(f(x)) \in f^{-1}(f(U_x)) \subseteq f^{-1}(F)$ which implies $x \in U_x \subseteq f^{-1}(F)$. Therefore $f^{-1}(F) = \bigcup \{U_x : x \in f^{-1}(F)\}$. Then by Result 2.9 (4), $f^{-1}(F)$ is $Ng\alpha^*$ open in $(U, \tau_R(X))$.

3) $\Rightarrow$ 1)

Let F be $Ng\alpha^*$ open set in $(V, \sigma_R(Y))$. Since F is $Ng\alpha^*$ open set in $(V, \sigma_R(Y))$, V/F is $Ng\alpha^*$ closed in $(V, \sigma_R(Y))$. Then by our assumption, $f^{-1}(V/F) = U/f^{-1}(F)$ is $Ng\alpha^*$ open in $(U, \tau_R(X))$. Then $f^{-1}(F)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$. Therefore f is contra $Ng\alpha^*$ irresolute.

Theorem 4.5 : If $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is contra $Ng\alpha^*$ irresolute and $g : (V, \sigma_R(Y)) \rightarrow (W, \gamma_R(Z))$ is contra $Ng\alpha^*$ irresolute then $g \circ f : (U, \tau_R(X)) \rightarrow (W, \gamma_R(Z))$ is $Ng\alpha^*$ irresolute.

Proof: Let S be a $Ng\alpha^*$ open set in $(W, \gamma_R(Z))$. Since g is contra $Ng\alpha^*$ irresolute, $g^{-1}(S)$ is in $Ng\alpha^*$ closed $(V, \sigma_R(Y))$. Since f is contra $Ng\alpha^*$ irresolute, By Theorem 4.4, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $Ng\alpha^*$ open in $(U, \tau_R(X))$. Since f is $Ng\alpha^*$ irresolute iff the inverse image of each $Ng\alpha^*$ open set in $(V, \sigma_R(Y))$ is $Ng\alpha^*$ open in $(U, \tau_R(X))$, we have $g \circ f$ is $Ng\alpha^*$ irresolute.

Theorem 4.6 : Every contra $Ng\alpha^*$ irresolute function is contra $Ng\alpha^*$ continuous function.

Proof: Let $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra $Ng\alpha^*$ irresolute function. Let S be nano open set in $(V, \sigma_R(Y))$. By Result 2.9(2), we have S is $Ng\alpha^*$ open set in $(V, \sigma_R(Y))$. Since f is contra $Ng\alpha^*$ irresolute function, $f^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$. Therefore f is contra $Ng\alpha^*$ continuous function.

Remark 4.7 : The converse of the above theorem is not true. This is proved by following example.

Example 4.8 :

Let $U = \{a, b, c, d\}$ with $U/R = \{\{a\}, \{c\}, \{b, d\}\}$. Let $X = \{a, b\} \subseteq_N U$. Then $\tau_R(X) = \{U, \emptyset, \{a\}, \{b, d\}, \{a, b, d\}\}$. Here $Ng\alpha^*$ closed sets = $\{U, \emptyset, \{c\}, \{a, c\}, \{b, c\}, \{c, d\}, \{a, b, c\}, \{a, c, d\}, \{b, c, d\}\}$. Let $V = \{a, b, c, d\}$ with $V/R = \{\{c\}, \{a, b, d\}\}$. Let $Y = \{b, d\} \subseteq_N V$. Then $\sigma_R(Y) = \{U, \emptyset, \{a, b, d\}\}$. $Ng\alpha^*$ open sets = $\{U, \emptyset, \{a, b, d\}, \{b, d\}, \{a, d\}, \{a, b\}, \{d\}, \{b\}, \{a\}\}$. Here $Ng\alpha^*$ closed sets = $\{U, \emptyset, \{c\}, \{a, c\}, \{b, c\}, \{c, d\}, \{a, b, c\}, \{a, c, d\}, \{b, c, d\}\}$. Let $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be defined by $f(a) = b, f(b) = a, f(c) = d, f(d) = c$. Then $f^{-1}(a) = b, f^{-1}(b) = a, f^{-1}(c) = d, f^{-1}(d) = c$. $f^{-1}(\{a, b, d\}) = \{a, b, c\} \in Ng\alpha^*$ closed in $(U, \tau_R(X))$ were $\{a, b, d\}$ is nano open in $(V, \sigma_R(Y))$. Therefore f is contra $Ng\alpha^*$ continuous function. Since $f^{-1}(\{a, b\}) = \{b, a\}$ is not $Ng\alpha^*$ closed in $(U, \tau_R(X))$ were $\{a, b\}$ is $Ng\alpha^*$ open in $(V, \sigma_R(Y))$, f is not contra $Ng\alpha^*$ irresolute function.

Theorem 4.9 : Let $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ and $g : (V, \sigma_R(Y)) \rightarrow (W, \gamma_R(Z))$ be two functions

1. If f is contra $Ng\alpha^*$ irresolute and g is $Ng\alpha^*$ irresolute then $g \circ f$ is contra $Ng\alpha^*$ irresolute.
2. If f is contra $Ng\alpha^*$ irresolute. and g is $Ng\alpha^*$ continuous then $g \circ f$ is contra $Ng\alpha^*$ continuous.

3. If f is contra $Ng\alpha^*$ irresolute and g is nano continuous then $g \circ f$ is contra $Ng\alpha^*$ continuous.
4. If f is contra $Ng\alpha^*$ irresolute and g is Ng^* continuous then $g \circ f$ is contra $Ng\alpha^*$ continuous.

Proof :

1) Let S be a $Ng\alpha^*$ open set in $(W, \gamma_R(Z))$. Since g is $Ng\alpha^*$ irresolute, $g^{-1}(S)$ is $Ng\alpha^*$ open in $(V, \sigma_R(Y))$. Since f is contra $Ng\alpha^*$ irresolute, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$. Therefore $g \circ f$ is contra $Ng\alpha^*$ irresolute.

2) Let S be a nano open set in $(W, \gamma_R(Z))$. Since g is $Ng\alpha^*$ continuous, $g^{-1}(S)$ is $Ng\alpha^*$ open in $(V, \sigma_R(Y))$. Since f is contra $Ng\alpha^*$ irresolute, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$. Therefore $g \circ f$ is contra $Ng\alpha^*$ continuous.

3) Let S be a nano open set in $(W, \gamma_R(Z))$. Since g is nano continuous, $g^{-1}(S)$ is nano open in $(V, \sigma_R(Y))$. By Result 2.9(2), we have $g^{-1}(S)$ is $Ng\alpha^*$ open in $(V, \sigma_R(Y))$. Since f is contra $Ng\alpha^*$ irresolute, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$. Therefore $g \circ f$ is contra $Ng\alpha^*$ continuous.

4) Let S be a nano open set in $(W, \gamma_R(Z))$. Since g is Ng^* continuous, $g^{-1}(S)$ is Ng^* open in $(V, \sigma_R(Y))$. By Result 2.9(3), we have $g^{-1}(S)$ is $Ng\alpha^*$ open in $(V, \sigma_R(Y))$. Since f is contra $Ng\alpha^*$ irresolute, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is $Ng\alpha^*$ closed in $(U, \tau_R(X))$. Therefore $g \circ f$ is contra $Ng\alpha^*$ continuous.

V. CONCLUSION

In this paper, we have introduced Contra Nano $g\alpha^*$ continuous functions and Contra Nano $g\alpha^*$ - irresolute functions and explored their fundamental properties. We have examined their relationships with various existing Nano continuous and Nano irresolute functions. Furthermore, several compositions of these functions have been investigated, providing deeper insights into their structural behaviour. These findings contribute to the ongoing study of function spaces in Nano topological settings.

REFERENCES

- [1] Anbarasi Rodrigo P, Subithra P. On A New Class of Nano Generalized Closed Sets in Nano Topological Spaces, presented in International Conference On Advances In Science And Engineering (ICASE-2022), (communicated).
- [2] Anbarasi Rodrigo P, Subithra P. Nano ga^* -continuous functions in Nano topological spaces, presented in Journal of Research in Applied Mathematics Volume 8 – Issue 11 (2022) p: 01-07.
- [3] Bhuvaneshwari K, Mythili Gnanapriya K. On Nano Generalized closed sets, International Journal of Scientific and Research Publications, 2014, 4(5): p.1-3.
- [4] Bhuvaneshwari K, Ezhilarasi K. On Nano semi-generalized and Nano generalizedsemi- closed sets, International Journal of Mathematics and Computer Applications Research, 2014, 4(3): p. 117-124.
- [5] LellisThivagar M, Carmel Richard. On Nano forms of weakly open sets, International Journal of Mathematical and Statistics Invention.,2012,1(1):p.31- 37.
- [6] LellisThivagar M and Carmel Richard. On Nano continuity, Mathematical Theory Model, 2013, 3(7): p. 32-37.

CONTRA CONTINUOUS AND CONTRA IRRESOLUTE FUNCTIONS VIA NANO PRE*- OPEN SETS

S. Jinimol

Department of Mathematics, St. Mary's College (Autonomous) Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT: The purpose of this paper is to introduce and study a new class of functions called contra nano pre*- continuous and contra nano pre*- irresolute functions in nano topological spaces and investigate some of its properties.

KEY WORDS: Nano Pre*- Open, Nano Pre*- Closed, Contra Nano Pre*- Continuous, Contra Nano Pre*- Irresolute.

I INTRODUCTION

Lellis Thivagar et al. [2] introduced nano topological space with respect to a subset X of an universe which is defined in terms of lower and upper approximations of X . The elements of a nano topological space are called the nano open sets. He also introduced the weak forms of nano open sets namely nano α - open sets, nano semi -open sets, nano regular - open sets and nano pre - open sets. In 2014, K. Bhuvaneswari and K. Mythili Gnanapriya[1] introduced Nano Generalised Closed Sets in Nano Topological Space. Recently, the authors C. Reena and R.Raxi and S. Bhuvaneswari [3] introduced a new class of nano sets namely, nano pre*- open sets in nano topological spaces. This paper analyzes nano pre*- open sets to introduce and examine the ideas of contra nano pre*- continuous and contra nano pre*- irresolute functions in nano topological spaces.

II PRELIMINARIES

Throughout this paper $(U, \tau_R(X)), (V, \sigma_R(Y)), (W, \eta_R(Z))$ represent non empty nano topological spaces on which no separation axioms are assumed unless otherwise mentioned.

Definition 2.1[1]: Let $(U, \tau_R(X))$ be a Nano topological space. A subset A of $(U, \tau_R(X))$ is called *Nano generalized - closed set* if $Ncl(A) \subseteq V$ where $A \subseteq V$ and V is Nano - open.

The complement of Nano generalized - closed set is called as *Nano generalized - open set*.

Definition 2.2[1]: For every set $A \subseteq U$,

(i) the *Nano generalized closure of A* is defined as the intersection of all Ng - closed sets containing A and is denoted by $Ncl^*(A)$.

(ii) the *Nano generalized interior of A* is defined as the union of all Ng - open sets contained in A and is denoted by $Nint^*(A)$.

Definition 2.3[3]: A subset A of a Nano topological space $(U, \tau_R(X))$ is called a *Nano pre*-open set* if $A \subseteq Nint^*(Ncl(A))$.

Definition 2.4[3]: The complement of a Nano pre*-open set is called *Nano pre*-closed*.

Theorem 2.5[3]: (i) Every nano - closed set is nano pre*- closed.

(ii) Every nano pre - closed set is nano pre*- closed.

(iii) Every nano α - closed set is nano pre*- closed.

(iv) Every nano regular - closed set is nano pre*- closed.

(v) Every nano g - closed set is nano pre*- closed.

Definition 2.7: A function $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is said to be

(i) contra nano continuous if $f^{-1}(V)$ is nano closed in $(U, \tau_R(X))$ for every nano open set V in $(Y, \sigma_R(Y))$.

(ii) contra nano regular*- continuous if $f^{-1}(V)$ is nano regular*- closed in $(U, \tau_R(X))$ for every nano open set V in $(Y, \sigma_R(Y))$.

(iii) contra nano regular - continuous if $f^{-1}(V)$ is nano regular - closed in $(U, \tau_R(X))$ for every nano open set V in $(Y, \sigma_R(Y))$.

(iv) contra nano α - continuous if $f^{-1}(V)$ is nano α - closed in $(U, \tau_R(X))$ for every nano open set V in $(Y, \sigma_R(Y))$.

(v) contra nano semi*- continuous if $f^{-1}(V)$ is nano semi*- closed in $(U, \tau_R(X))$ for every nano open set V in $(Y, \sigma_R(Y))$.

III CONTRA NANO PRE*-CONTINUOUS FUNCTIONS

Definition 3.1: A function $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is said to be **Contra Nano Pre*-Continuous** if $f^{-1}(V)$ is Nano Pre*- closed in $(U, \tau_R(X))$ for every nano open set V in $(V, \sigma_R(Y))$.

Example 3.2 : Let $U = \{a, b, c, d\}$, $U/R = \{\{a, b\}, \{c, d\}\}$ and $X = \{a, c, d\}$. Then $\tau_R(X) = \{U, \emptyset, \{a, b\}, \{c, d\}\}$, $NP^*O(U, \tau_R(X)) = \{U, \emptyset, \{a\}, \{b\}, \{c\}, \{d\}, \{a, b\}, \{a, c\}, \{a, d\}, \{b, c\}, \{b, d\}, \{c, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}\}$, $NP^*C(U, \tau_R(X)) = \{\emptyset, U, \{b, c, d\}, \{a, c, d\}, \{a, b, d\}, \{a, b, c\}, \{c, d\}, \{b, d\}, \{b, c\}, \{a, d\}, \{a, c\}, \{a, b\}, \{d\}, \{c\}, \{b\}, \{a\}\}$. Let $V = \{a, b, c, d\}$, $V/R = \{\{b\}, \{c\}, \{d\}\}$ and $Y = \{a, b, c\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{b, c\}\}$. Define $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = b; f(b) = c; f(c) = d; f(d) = a$. Then $f^{-1}\{b, c\} = \{a, b\}$ is contra nano pre*- closed in $(U, \tau_R(X))$. Hence f is contra nano pre*- continuous.

Theorem 3.3: Every contra nano continuous function is contra nano pre*- continuous.

Proof: Let $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano continuous. Let V be any nano open set in $(V, \sigma_R(Y))$. Then $f^{-1}(V)$ is nano closed in $(U, \tau_R(X))$. Hence by theorem 2.5(i), $f^{-1}(V)$ is nano pre*- closed in $(U, \tau_R(X))$. Therefore f is contra nano pre*- continuous.

Remark 3.4: The converse of the above theorem is not true as shown in the following example.

Example 3.5: Let $U = \{a, b, c\}$, $U/R = \{\{a\}, \{b\}, \{c\}\}$ and $X = \{b, c\}$. Then $\tau_R(X) = \{U, \emptyset, \{b, c\}\}$, $NC(U, \tau_R(X)) = \{U, \emptyset, \{a\}\}$, $NP^*O(U, \tau_R(X)) = \{U, \emptyset, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}\}$, $NP^*C(U, \tau_R(X)) = \{U, \emptyset, \{a, c\}, \{a, b\}, \{c\}, \{b\}, \{a\}\}$. Let $V = \{a, b, c, d\}$, $V/R = \{\{a\}, \{b\}\}$ and $Y = \{a, c\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{a\}\}$. Define $f : (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = b; f(b) = a; f(c) = c$. Then f is contra nano pre*- continuous but not contra nano continuous. Since for the nano open set $\{b, c\}$ in $(V, \sigma_R(Y))$, $f^{-1}\{a\} = \{b\}$ is nano pre*- closed but not nano closed in $(U, \tau_R(X))$.

Theorem 3.6: Every contra nano pre-continuous function is contra nano pre*-continuous.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano pre - continuous. Let V be any nano open set in $(V, \sigma_R(Y))$. Then $f^{-1}(V)$ is nano pre - closed in $(U, \tau_R(X))$. Hence by theorem 2.5(ii), $f^{-1}(V)$ is nano pre*- closed in $(U, \tau_R(X))$. Therefore f is contra nano pre*-continuous.

Remark 3.7: The converse of the above theorem is not true as shown in the following example.

Example 3.8: Let $U = \{a, b, c, d\}$, $U/R = \{\{a\}, \{b\}\}$ and $X = \{a, c, d\}$. Then $\tau_R(X) = \{U, \emptyset, \{a\}\}$, $NPO((U, \tau_R(X))) = \{U, \emptyset, \{a\}, \{a, b\}, \{a, c\}, \{a, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}\}$, $NPC((U, \tau_R(X))) = \{U, \emptyset, \{b, c, d\}, \{c, d\}, \{b, d\}, \{b, c\}, \{d\}, \{c\}, \{b\}\}$, $NP^*O(U, \tau_R(X)) = \{U, \emptyset, \{a\}, \{b\}, \{c\}, \{d\}, \{a, b\}, \{a, c\}, \{a, d\}, \{b, c\}, \{b, d\}, \{c, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}\}$, $NP^*C(U, \tau_R(X)) = \{U, \emptyset, \{b, c, d\}, \{a, c, d\}, \{a, b, d\}, \{a, b, c\}, \{c, d\}, \{b, d\}, \{b, c\}, \{a, d\}, \{a, c\}, \{a, b\}, \{d\}, \{c\}, \{b\}, \{a\}\}$. Let $V = \{a, b, c, d\}$, $V/R = \{\{b\}, \{c\}, \{d\}\}$ and $Y = \{a, b, c\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{b, c\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = b$; $f(b) = c$; $f(c) = d$; $f(d) = a$. Then f is contra nano pre*- continuous but not contra nano pre - continuous. Since for the nano open set $\{b, c\}$ in $(V, \sigma_R(Y))$, $f^{-1}\{b, c\} = \{a, b\}$ is nano pre*-closed but not nano pre - closed in $(U, \tau_R(X))$.

Theorem 3.9: Every contra nano α - continuous function is contra nano pre*-continuous.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano α - continuous. Let V be any nano open set in $(V, \sigma_R(Y))$. Then $f^{-1}(V)$ is nano α - closed in $(U, \tau_R(X))$. Hence by theorem 2.5(iii), $f^{-1}(V)$ is nano pre*- closed in $(U, \tau_R(X))$. Therefore f is contra nano pre*-continuous.

Remark 3.10: The converse of the above theorem is not true as shown in the following example.

Example 3.11: Let $U = \{a, b, c, d\}$, $U/R = \{\{a\}, \{b\}, \{c\}, \{d\}\}$ and $X = \{a, b, c\}$. Then $\tau_R(X) = \{U, \emptyset, \{a, b, c\}\}$, $N\alpha O(U, \tau_R(X)) = \{U, \emptyset, \{a, b, c\}\}$, $N\alpha C(U, \tau_R(X)) = \{U, \emptyset, \{d\}\}$, $NP^*O(U, \tau_R(X)) = \{U, \emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{a, d\}, \{b, c\}, \{b, d\}, \{c, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}\}$, $NP^*C(U, \tau_R(X)) = \{U, \emptyset, \{b, c, d\}, \{a, c, d\}, \{a, b, d\}, \{c, d\}, \{b, d\}, \{b, c\}, \{a, d\}, \{a, c\}, \{a, b\}, \{d\}, \{c\}, \{b\}, \{a\}\}$. Let $V = \{a, b, c, d\}$, $V/R = \{\{b\}, \{c\}, \{d\}\}$ and $Y = \{a, b, c\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{b, c\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = b$; $f(b) = c$; $f(c) = d$; $f(d) = a$. Then f is contra nano pre*-continuous but not contra nano α -continuous. Since for the nano open set $\{b, c\}$ in $(V, \sigma_R(Y))$, $f^{-1}\{b, c\} = \{a, b\}$ is nano pre*-closed but not nano α -closed in $(U, \tau_R(X))$.

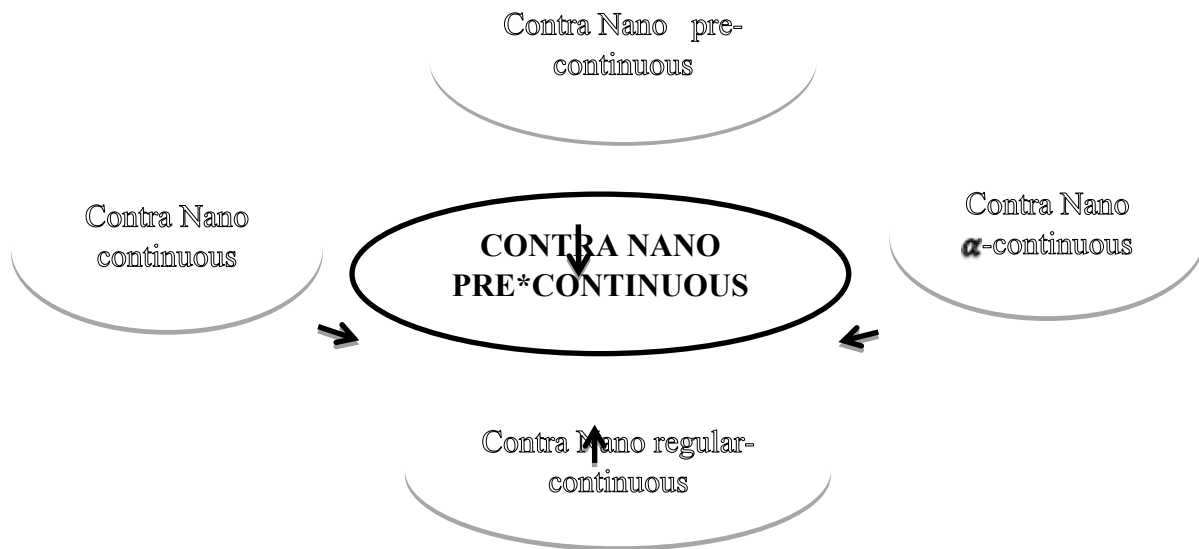
Theorem 3.12: Every contra nano regular - continuous function is contra nano pre*-continuous.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano regular - continuous. Let V be any nano open set in $(V, \sigma_R(Y))$. Then $f^{-1}(V)$ is nano regular - closed in $(U, \tau_R(X))$. Hence by theorem 2.5(iv), $f^{-1}(V)$ is nano pre*-closed in $(U, \tau_R(X))$. Therefore f is contra nano pre*-continuous.

Remark 3.13: The converse of the above theorem is not true as shown in the following example.

Example 3.14: Let $U = \{a, b, c, d\}$, $U/R = \{\{a, b\}, \{c, d\}\}$ and $X = \{a, c, d\}$. Then $\tau_R(X) = \{U, \emptyset, \{c, d\}, \{a, b\}\}$, $NRO(U, \tau_R(X)) = \{U, \emptyset, \{a, b\}, \{c, d\}\}$, $NRC(U, \tau_R(X)) = \{U, \emptyset, \{c, d\}, \{a, b\}\}$, $NP^*O(U, \tau_R(X)) = \{U, \emptyset, \{a\}, \{b\}, \{c\}, \{d\}, \{a, b\}, \{a, c\}, \{a, d\}, \{b, c\}, \{b, d\}, \{c, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}\}$, $NP^*C(U, \tau_R(X)) = \{U, \emptyset, \{b, c, d\}, \{a, c, d\}, \{a, b, d\}, \{a, b, c\}, \{c, d\}, \{b, d\}, \{b, c\}, \{a, d\}, \{a, c\}, \{a, b\}, \{d\}, \{c\}, \{b\}, \{a\}\}$. Let $V = \{a, b, c, d\}$, $V/R = \{\{b\}, \{c\}, \{d\}\}$ and $Y = \{a, b, c\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{b, c\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = d$; $f(b) = b$; $f(c) = a$; $f(d) = c$. Then f is contra nano pre*-continuous but not nano regular - continuous. Since for the nano open set $\{b, c\}$ in $(V, \sigma_R(Y))$, $f^{-1}\{b, c\} = \{b, d\}$ is nano pre*-closed but not nano regular - closed in $(U, \tau_R(X))$.

From the above discussion we have the following diagram:



Theorem 3.15: Let $(U, \tau_R(X))$ and $(V, \sigma_R(Y))$ be two nano topological spaces. Then $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is contra nano pre*- continuous if and only if the inverse image of every nano closed set in V is nano pre*- open in U .

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be a contra nano pre*- continuous and S be a nano closed set in $(V, \sigma_R(Y))$. Since f is contra nano pre*- continuous function, $f^{-1}(S^c) = (f^{-1}(S))^c$ is nano pre*-closed in $(U, \tau_R(X))$. Hence $f^{-1}(S)$ is nano pre*- open set in $(U, \tau_R(X))$. Conversely, suppose the inverse image of every nano closed set in $(V, \sigma_R(Y))$ is nano pre*- open in $(U, \tau_R(X))$. Let S be a nano open set in $(V, \sigma_R(Y))$. Then S^c is nano closed in $(V, \sigma_R(Y))$. By assumption, $f^{-1}(S^c) = (f^{-1}(S))^c$ is nano pre*- open in $(U, \tau_R(X))$. Hence f is contra nano pre*- continuous.

Definition 3.16: A nano topological space $(U, \tau_R(X))$ is said to be a nano T_p^* -space if every nano pre*- open set is nano open.

Theorem 3.17: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be a contra nano pre*- continuous function and $(U, \tau_R(X))$ be a nano T_p^* -space. Then f is contra nano continuous.

Proof: Let S be a nano closed set in $(V, \sigma_R(Y))$. Since f is contra nano pre*-continuous, $f^{-1}(S)$ is nano pre*- open set in $(U, \tau_R(X))$. Now since $(U, \tau_R(X))$ is nano T_p^* -space, $f^{-1}(S)$ is nano open in $(U, \tau_R(X))$. Therefore f is contra nano continuous.

Theorem 3.18: If a function $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is nano pre*- continuous and if $(V, \sigma_R(Y))$ is locally indiscrete, then f is contra nano pre*- continuous.

Proof: Let G be an nano open set $(V, \sigma_R(Y))$. Since $(V, \sigma_R(Y))$ is locally indiscrete, G is nano closed in $(V, \sigma_R(Y))$. Since f is nano pre*- continuous, $f^{-1}(G)$ is nano pre*-closed in $(U, \tau_R(X))$. Therefore f is contra nano pre*- continuous.

Remark 3.19: The composition of two contra nano pre*- continuous functions need not be contra nano pre*- continuous as seen from the following example.

Example 3.20: Let $U = \{a, b, c, d\}$, $U/R = \{\{a\}, \{b\}\}$ and $X = \{a, c, d\}$. Then

$\tau_R(X) = \{U, \phi, \{a\}\}$, $NP^*O(U, \tau_R(X)) = \{U, \phi, \{a\}, \{a, b\}, \{a, c\}, \{a, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, NP^*C(U, \tau_R(X)) = \{U, \phi, \{b, c, d\}, \{c, d\}, \{b, d\}, \{b, c\}, \{d\}, \{c\}, \{a\}\}$. Let $V = \{a, b, c, d\}$, $V/R = \{\{b\}, \{c\}, \{d\}\}$ and $Y = \{a, b, c\}$. Then $\sigma_R(Y) = \{V, \phi, \{b, c\}\}$, $NP^*O(V, \sigma_R(Y)) = \{V, \phi, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{a, d\}, \{b, c\}, \{b, d\}, \{c, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}\}$, $NP^*C(V, \sigma_R(Y)) = \{V, \phi, \{b, c, d\}, \{a, c, d\}, \{a, b, d\}, \{c, d\}, \{b, d\}, \{b, c\}, \{a, d\}, \{a, c\}, \{a, b\}, \{d\}, \{c\}, \{b\}, \{a\}\}$. Let $W = \{a, b, c, d\}$, $W/R = \{\{a\}, \{b\}\}$ and $Z = \{a, c, d\}$. Then $\eta_R(Z) = \{W, \phi, \{a\}\}$, $NP^*O(W, \eta_R(Z)) = \{W, \phi, \{a\}, \{b\}, \{c\}, \{d\}, \{a, b\}, \{a, c\}, \{a, d\}, \{b, c\}, \{b, d\}, \{c, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}\}$, $NP^*C(W, \eta_R(Z)) = \{W, \phi, \{b, c, d\}, \{a, c, d\}, \{a, b, d\}, \{a, b, c\}, \{c, d\}, \{b, d\}, \{b, c\}, \{a, d\}, \{a, c\}, \{a, b\}, \{d\}, \{c\}, \{b\}, \{a\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = a$; $f(b) = c$; $f(c) = b$; $f(d) = d$ and define $g: (V, \sigma_R(Y)) \rightarrow (W, \eta_R(Z))$ by $g(a) = a$; $g(b) = b$; $g(c) = c$; $g(d) = d$. Then f and g are contra nano pre*- continuous but $g \circ f$ is not contra nano pre*- continuous. Since $\{a\}$ is nano open in $(W, \eta_R(Z))$ but $(g \circ f)^{-1}(\{a\}) = f^{-1}(g^{-1}\{a\}) = f^{-1}(\{a\}) = \{a\}$ which is not nano pre*- closed in $(U, \tau_R(X))$.

Theorem 3.21: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be nano pre*- continuous and $g: (V, \sigma_R(Y)) \rightarrow (W, \eta_R(Z))$ be contra nano pre*- continuous function and let $(V, \sigma_R(Y))$ be a T_p^* space. Then $(g \circ f): (U, \tau_R(X)) \rightarrow (W, \eta_R(Z))$ is contra nano pre*-continuous.

Proof: Let S be nano closed set in $(W, \eta_R(Z))$. Since g is contra nano pre*- continuous, $g^{-1}(S)$ is nano pre*- open in $(V, \sigma_R(Y))$. Now since $(V, \sigma_R(Y))$ is a T_p^* space, $g^{-1}(S)$ is nano open in $(V, \sigma_R(Y))$. Also f is nano pre*- continuous, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is nano pre*- open in $(U, \tau_R(X))$. Hence by theorem 3.15, $g \circ f$ is contra nano pre*- continuous.

Theorem 3.22: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be nano pre*- irresolute and $g: (V, \sigma_R(Y)) \rightarrow (W, \eta_R(Z))$ be contra nano pre*- continuous function. Then $g \circ f: (U, \tau_R(X)) \rightarrow (W, \eta_R(Z))$ is contra nano pre*- continuous.

Proof: Let G be nano open set in $(W, \eta_R(Z))$. Since g is contra nano pre*-continuous, $g^{-1}(G)$ is nano pre*- closed in $(V, \sigma_R(Y))$. Also, since f is nano pre*-irresolute, $f^{-1}(g^{-1}(G)) = (g \circ f)^{-1}(G)$ is nano pre*- closed in $(U, \tau_R(X))$. Hence $g \circ f$ is contra nano pre*- continuous.

IV CONTRA NANO PRE*-IRRESOLUTE FUNCTION

Definition 4.1: Let $(U, \tau_R(X))$ and $(V, \sigma_R(Y))$ be two nano topological spaces. A function $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is said to be *contra nano pre*- irresolute* if $f^{-1}(V)$ is nano pre*- closed in $(U, \tau_R(X))$ for every nano pre*- open set V in $(V, \sigma_R(Y))$.

Example 4.2: Let $U = \{a, b, c\}$, $U/R = \{\{c\}, \{a, b\}\}$ and $X = \{a, b, c\}$. Then $\tau_R(X) = \{U, \emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}\}$, $NP^*O(U, \tau_R(X)) = \{U, \emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}\}$, $NP^*C(U, \tau_R(X)) = \{U, \emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}\}$. Let $V = \{a, b, c\}$, $V/R = \{\{a\}, \{c\}\}$ and $Y = \{a, b, c\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{a, c\}\}$, $NP^*O(V, \sigma_R(Y)) = \{V, \emptyset, \{a\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = c; f(b) = a; f(c) = b$. Then $f^{-1}\{a\} = \{b\}$, $f^{-1}\{b\} = \{c\}$, $f^{-1}\{c\} = \{a\}$, $f^{-1}\{a, b\} = \{b, c\}$, $f^{-1}\{a, c\} = \{a, b\}$, $f^{-1}\{b, c\} = \{a, c\}$ are nano pre*- closed in $(U, \tau_R(X))$. Hence f is contra nano pre*- irresolute function.

Theorem 4.3: A function $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is contra nano pre*- irresolute if and only if the inverse image of every nano pre*- closed set in $(V, \sigma_R(Y))$ is nano pre*-open in $(U, \tau_R(X))$.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be a contra nano pre*-irresolute and S be nano pre*-closed set in $(V, \sigma_R(Y))$. Since f is contra nano pre*-irresolute function, $f^{-1}(S^c) = (f^{-1}(S))^c$ is nano pre*- closed in $(U, \tau_R(X))$. Hence $f^{-1}(S)$ is nano pre*-open set in $(U, \tau_R(X))$. Conversely, suppose the inverse image of every nano pre*-closed set in $(V, \sigma_R(Y))$ is nano pre*- open in $(U, \tau_R(X))$. Let S be a nano pre*- open set in $(V, \sigma_R(Y))$. Then S^c is nano pre*- closed in $(V, \sigma_R(Y))$. By assumption, $f^{-1}(S^c) = (f^{-1}(S))^c$ is nano pre*- open in $(U, \tau_R(X))$. Hence f is contra nano pre*- irresolute.

Theorem 4.4: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be nano pre*- irresolute and $g: (V, \sigma_R(Y)) \rightarrow (W, \eta_R(Z))$ be contra nano pre*- irresolute. Then $(g \circ f): (U, \tau_R(X)) \rightarrow (W, \eta_R(Z))$ is contra nano pre*- irresolute.

Proof: Let G be nano pre*-open set in $(W, \eta_R(Z))$. Since g is contra nano pre*- irresolute, $g^{-1}(G)$ is nano pre*- closed in $(V, \sigma_R(Y))$. Since f is nano pre*- irresolute, $(g \circ f)^{-1}(G) = f^{-1}(g^{-1}(G))$ is nano pre*- closed in $(U, \tau_R(X))$. Hence $g \circ f$ is contra nano pre*- irresolute.

Theorem 4.5: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano pre*-irresolute and $g: (V, \sigma_R(Y)) \rightarrow (W, \eta_R(Z))$ be nano pre*- irresolute. Then $(g \circ f): (U, \tau_R(X)) \rightarrow (W, \eta_R(Z))$ is contra nano pre*- irresolute.

Proof: Let G be a nano pre*- open set in $(W, \eta_R(Z))$. Since g is nano pre*- irresolute, $g^{-1}(G)$ is nano pre*- open in $(V, \sigma_R(Y))$. Since f is contra nano pre*- irresolute, $(g \circ f)^{-1}(G) = f^{-1}(g^{-1}(G))$ is nano pre*- closed in $(U, \tau_R(X))$. Hence $g \circ f$ is contra nano pre*- irresolute.

Theorem 4.6: If $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ and $g: (V, \sigma_R(Y)) \rightarrow (W, \eta_R(Z))$ are contra nano pre*- irresolute functions, then $g \circ f: (U, \tau_R(X)) \rightarrow (W, \eta_R(Z))$ is nano pre*- irresolute.

Proof: Let G be nano pre*- open set in Z . Since g is contra nano pre*- irresolute, $g^{-1}(G)$ is nano pre*- closed in $(V, \sigma_R(Y))$. Also, since f is contra nano pre*- irresolute, by theorem 4.3, $(g \circ f)^{-1}(G) = f^{-1}(g^{-1}(G))$ is nano pre*- open in $(U, \tau_R(X))$. Hence $g \circ f$ is nano pre*- irresolute.

V CONCLUSION

In this paper, we have introduced contra nano pre*- continuous and contra nano pre*- irresolute functions and investigated their fundamental properties. Also we have examined their relationships with other existing nano continuous and nano irresolute functions.

REFERENCES

- [1] Bhuvaneshwari. K., Mythili Gnanapriya. K., On nano generalized closed sets in nano topological space. *International Journal of Scientific and Research Publications*, Volume 4, Issues 5, My 2014. ISSN 2250-3153
- [2] Lellis Thivager. M., Carmel Richard., On Nano Continuity, *Mathematical Theory and Modelling*, 3(7):32,2013
- [3] Reena C, Raxi R, Bhuvaneshwari S. “Nano Pre*-Open Sets”, *Proceedings of International Conference on Analysis and Applied Mathematics-2022 Organized by Department of Mathematics, Ayya Nadar Janaki Ammal College (Autonomous) (Sivakasi)*.

ON MICRO α^* -HOMEOMORPHISM IN MICRO TOPOLOGICAL SPACES

A.Anisha Briskillal

Department of Mathematics, St. Mary's College (Autonomous) Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract: The aim of this paper is to introduce and study the concept of Micro α^* -homeomorphism in Micro topological spaces.

Keywords: Micro α^* -open, Micro α^* -continuous, Micro α^* -open map and Micro α^* -homeomorphism.

I. INTRODUCTION

Nano Topology was introduced by Lellis Thivagar[6] in the year 2013. This topology is based on the concept of lower approximation, upper approximation and boundary region. It has maximum five open sets and minimum three open sets including universal & empty set. Every Nano Topology is Micro Topology. Micro Topology was introduced by Sakkraveeranan Chandrasekar[3] in 2019. Micro topology was the extension of Nano Topology. In this paper, we introduced Micro α^* -homeomorphism in Micro Topological Space.

II. PRELIMINARIES

Definition 2.1 [3]:

Let U be a non-empty finite set of objects called the universe and R be an equivalence relation on U named as the indiscernibility relation. Then U is divided into disjoint equivalence classes. Elements belonging to the same equivalence class are said to be indiscernible with one another. The pair (U, R) is said to be the approximation space. Let $X \subseteq U$.

1) **The lower approximation of X** with respect to R is the set of all objects, which can be for certain classified as X with respect to R and it is denoted by $L_R(X)$. That is

$L_R(X) = \bigcup_{x \in U} \{R(x) : R(x) \subseteq X\}$ where $R(x)$ denotes the equivalence class determined by $x \in U$.

2) **The upper approximation of X** with respect to R is the set of all objects, which can be possibly classified as X with respect to R and it is denoted by $U_R(X)$. That is

$U_R(X) = \bigcup_{x \in U} \{R(x) : R(x) \cap X \neq \emptyset\}$

3) **The boundary region of X** with respect to R is the set of all objects, which can be classified neither as X nor as not $-X$ with respect to R and it is denoted by $B_R(X)$. That is

$$B_R(X) = U_R(X) - L_R(X).$$

Definition 2.2 [3]:

Let U be an universe, R be an equivalence relation on U and

$\tau_R(X) = \{U, \emptyset, U_R(X), L_R(X), B_R(X)\}$ where $X \subseteq U$ satisfies the following axioms:

- 1) U and $\emptyset \in \tau_R(X)$
- 2) The union of the elements of any sub collection of $\tau_R(X)$ is in $\tau_R(X)$,
- 3) The intersection of the elements of any finite sub collection of $\tau_R(X)$ is in $\tau_R(X)$.

That is $\tau_R(X)$ is a topology on U called the nano topology on U with respect to X . We call $(U, \tau_R(X))$ as the **nano topological space(NTS)**. The elements are called as **nano open Sets**. The complement of nano-open sets is called **nano closed sets**.

Definition 2.3 [3]:

$(U, \tau_R(X))$ is a nano topological space here $\mu_R(X) = \{N \cup (N' \cap \mu)\} / N, N' \in \tau_R(X)$ and it is called micro topology of $\tau_R(X)$ by μ where $\mu \notin \tau_R(X)$. The micro topology $\mu_R(X)$ satisfies the following axioms:

- 1) U and $\emptyset \in \mu_R(X)$
- 2) The union of the elements of any sub collection of $\mu_R(X)$ is in $\mu_R(X)$,
- 3) The intersection of the elements of any finite sub collection of $\mu_R(X)$ is in $\mu_R(X)$.

Then $\mu_R(X)$ is called the micro topology on U with respect to X . The triplet $(U, \tau_R(X), \mu_R(X))$ is called **micro topological spaces** and the elements of $\mu_R(X)$ are called **micro open set** and the complement of micro open set is called a **micro closed set**.

Definition 2.4 [3]:

The **micro closure** of a set A is denoted by $M-cl(A)$ and is defined as $M-cl(A) = \cap \{B : B \text{ is micro closed and } A \subseteq B\}$.

Definition 2.5 [3]:

The **micro interior** of a set A is denoted by $M-int(A)$ and is defined as $M-int(A) = \cup \{B : B \text{ is micro open and } A \supseteq B\}$.

Definition 2.6 [6]:

Let $(U, \tau_R(X), \mu_R(X))$ be a micro topological space. A subset A of U is said to be **micro generalized closed set** if $Mcl(A) \subseteq U$, Whenever $A \subseteq U$ and U is micro open in U . The complement of micro generalized Closed set is **micro generalized open set**.

Definition 2.7 [4]:

Let $(U, \tau_R(X), \mu_R(X))$ be a micro topological space. A set A is called an **$M\alpha$ -open set** if $A \subseteq M\text{-int}(M\text{-cl}(M\text{-int}(A)))$.

Let $(U, \tau_R(X), \mu_R(X))$ be a micro topological space. Then the complement of a **$M\alpha$ -open set** is called **$M\alpha$ -closed set**.

Definition 2.8 [2]:

Let $(U, \tau_R(X), \mu_R(X))$ be a micro topological space. A set A is called an **$M\alpha g$ -open set** if $M\text{-}\alpha\text{cl}(A) \subseteq U$ whenever $A \subseteq U$ and U is micro-open in U .

Let $(U, \tau_R(X), \mu_R(X))$ be a micro topological space. Then the complement of a **$M\alpha g$ -open set** is called **$M\alpha g$ -closed set**.

Definition 2.9 [1]:

Let $(U, \tau_R(X), \mu_R(X))$ be a micro topological space. A set A is called an **$M\alpha^*$ -open set** if $A \subseteq M\text{-int}^*(M\text{-cl}(M\text{-int}^*(A)))$.

Let $(U, \tau_R(X), \mu_R(X))$ be a micro topological space. Then the complement of a **$M\alpha^*$ -open set** is called **$M\alpha^*$ -closed set**.

Result 2.10 [1]:

- (i) Every micro-open set is micro α^* - open.
- (ii) Every micro α -open set is micro α^* - open.
- (iii) Every micro g -open set is micro α^* - open.
- (iv) Every micro αg -open set is micro α^* - open.

Definition 2.11 [5]:

A bijective function $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ is called **micro homeomorphism** if f is both micro continuous and micro open map.

Definition 2.12:

A function $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ is called **micro α^* -continuous** if $f^{-1}(S)$ is micro α^* -open in $(U, \tau_R(X), \mu_R(X))$ for every micro open set S in $(V, \tau'_R(Y), \mu'_R(Y))$.

Definition 2.13:

A function $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ is called **micro α^* -open map** if for any micro open set S in $(U, \tau_R(X), \mu_R(X))$, the image $f(S)$ is micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$. Then the complement of a **$M\alpha^*$ -open map** is called **micro α^* -closed map**.

Definition 2.14:

A bijective function $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ is called **micro α -homeomorphism** if f is both micro α -continuous and micro α -open map.

Definition 2.15 [5]:

A bijective function $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ is called **micro αg -homeomorphism** if f is both micro αg -continuous and micro αg -open map.

Definition 2.16:

A bijective function $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ is called **micro g -homeomorphism** if f is both micro g -continuous and micro g -open map.

III. MICRO α^* -HOMEOMORPHISM

In this section we introduce the concept of Micro α^* -homeomorphism and some of their properties are discussed below.

Definition3.1:

A bijective function $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ is called **micro α^* -homeomorphism** if f is both micro α^* -continuous and micro α^* -open map.

Example 3.2:

Let $U = \{a, b, c, d\}$ with $U/R = \{\{a, b\}, \{c, d\}\}$ and $X = \{a, b\} \subseteq U$. Then $\tau_R(X) = \{U, \phi, \{a, b\}\}$ and then $\mu = \{a, b, c\} \notin \tau_R(X)$, $\mu_R(X) = \{U, \emptyset, \{a, b\}, \{a, b, c\}\}$. Micro α^* -open sets are $\{U, \phi, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{a, d\}, \{b, c\}, \{b, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}\}$. Let $V = \{a, b, c, d\}$ with $V/R = \{\{a, b\}, \{c, d\}\}$ and $Y = \{b, d\} \subseteq V$. Then $\tau'_R(Y) = \{U, \phi, \{b\}, \{c, d\}, \{b, c, d\}\}$ and then $\mu' = \{a, b\} \notin \tau'_R(Y)$, $\mu'_R(Y) = \{V, \phi, \{b\}, \{c, d\}, \{b, c, d\}, \{a, b\}\}$. Micro α^* -open sets are $\{V, \emptyset, \{b\}, \{c\}, \{d\}, \{a, b\}, \{b, c\}, \{b, d\}, \{c, d\}, \{a, b, c\}, \{a, b, d\}, \{b, c, d\}\}$.

Let $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ be a function defined by $f(a) = d, f(b) = b, f(c) = c, f(d) = a$. Then

$f^{-1}(a) = d, f^{-1}(b) = b, f^{-1}(c) = c, f^{-1}(d) = a$. Since

$f^{-1}(\{b\}) = \{b\}, f^{-1}(\{c, d\}) = \{a, c\}, f^{-1}(\{b, c, d\}) = \{a, b, c\}, f^{-1}(\{a, b\}) =$

$\{b, d\}$ are micro α^* -open in $(U, \tau_R(X), \mu_R(X))$ were $\{b\}, \{c, d\}, \{b, c, d\}, \{a, b\}$ are Micro open in $(V, \tau'_R(Y), \mu'_R(Y))$. Therefore f is micro α^* -continuous. Since $f(\{a, b\}) = \{b, d\}$

and $f(\{a, b, c\}) = \{b, c, d\}$ are Micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$ were $\{a, b\}$ and $\{a, b, c\}$ are Micro open in $(U, \tau_R(X), \mu_R(X))$. Hence f is micro α^* -open map. Therefore f is micro α^* -homeomorphism.

Theorem3.3:

Every micro homeomorphism is a micro α^* -homeomorphism.

Proof:

Let f be micro homeomorphism. Then f is micro continuous and micro open map. Let S be micro open in $(V, \tau'_R(Y), \mu'_R(Y))$. Since f is micro continuous, $f^{-1}(S)$ is micro open in $(U, \tau_R(X), \mu_R(X))$. Since every micro open set is micro α^* open. $f^{-1}(S)$ is micro α^* -open in $(U, \tau_R(X), \mu_R(X))$. Therefore f is micro α^* -continuous. Let A be micro open in $(U, \tau_R(X), \mu_R(X))$. Since f is micro open map, $f(S)$ is micro open in $(V, \tau'_R(Y), \mu'_R(Y))$. Therefore $f(S)$ is micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$. Therefore f is micro α^* -open map. Since f is micro α^* -continuous and micro α^* -open map, f is micro α^* -homeomorphism.

Remark3.4:

The converse of the above theorem need not to be true. This is proved by the following example.

Example3.5:

Let $U = \{p, q, r, s\}$ with $U/R = \{\{p, q\}, \{r, s\}\}$ and $X = \{p, q\} \subseteq U$. Then $\tau_R(X) = \{U, \phi, \{p, q\}\}$ and $\mu = \{p, q, r\} \notin \tau_R(X)$, $\mu_R(X) = \{U, \phi, \{p, q\}, \{p, q, r\}\}$, Micro α^* -open sets are $\{U, \phi, \{p\}, \{q\}, \{r\}, \{p, q\}, \{p, r\}, \{p, s\}, \{q, r\}, \{q, s\}, \{p, q, r\}, \{p, q, s\}, \{p, r, s\}, \{q, r, s\}\}$. Let $V = \{p, q, r, s\}$ with $V/R = \{p, q, \{r, s\}\}$ and $Y = \{q, s\} \subseteq V$. Then $\tau'_R(Y) = \{V, \phi, \{q\}, \{r, s\}, \{q, r, s\}\}$ and $\mu' = \{p, q\} \notin \tau'_R(Y)$, $\mu'_R(Y) = \{V, \phi, \{q\}, \{r, s\}, \{q, r, s\}, \{p, q\}\}$, Micro α^* -open sets are $\{V, \phi, \{q\}, \{r\}, \{s\}, \{p, q\}, \{q, r\}, \{q, s\}, \{r, s\}, \{p, q, r\}, \{p, q, s\}, \{q, r, s\}\}$. Let $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ be a function defined by $f(p) = s, f(q) = q, f(r) = r, f(s) = p$. Then $f^{-1}(p) = s, f^{-1}(q) = q, f^{-1}(r) = r, f^{-1}(s) = p$. Clearly f is micro α^* -homeomorphism. But $f^{-1}(\{q\}) = \{q\}, f^{-1}(\{r, s\}) = \{r, p\}$ are not micro open in $(U, \tau_R(X), \mu_R(X))$ were $\{q\}$ and $\{r, s\}$ are micro open in $(V, \tau'_R(Y), \mu'_R(Y))$, f is not micro continuous. Since $f(\{p, q\}) = \{s, q\}$ is not micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$ were $\{p, q\}$ is micro open in $(U, \tau_R(X), \mu_R(X))$, f is not micro open map. Therefore f is not micro homeomorphism.

Theorem 3.6:

Every micro α -homeomorphism is micro α^* -homeomorphism.

Proof:

Let $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ be an micro α -homeomorphism, then f is bijective, micro α -continuous and micro α -open map. Let V be an micro open set in $(V, \tau'_R(Y), \mu'_R(Y))$. Since f is micro α -continuous, $f^{-1}(V)$ is micro α -open in $(U, \tau_R(X), \mu_R(X))$. Since every micro α -open set is micro α^* -open, $f^{-1}(V)$ is micro α^* -open in $(U, \tau_R(X), \mu_R(X))$ which implies f is micro α^* -continuous. Let S be an micro open set in $(U, \tau_R(X), \mu_R(X))$. Since f is micro α -open map, $f(S)$ is micro α -open in $(V, \tau'_R(Y), \mu'_R(Y))$. Since every micro α -open set is micro α^* -open, $f(S)$ is micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$ which implies f is micro α^* -open map. Thus f is micro α^* -homeomorphism.

Remark 3.7:

The converse of the above theorem need not be true. This is proved by the following example.

Example 3.8:

Let $U = \{a, b, c, d\}$ with $U/R = \{\{a\}, \{b\}, \{c\}, \{d\}\}$ and $X = \{b, d\} \subseteq U$. Then $\tau_R(X) = \{U, \phi, \{b, d\}\}$ and then $\mu = \{c\} \notin \tau_R(X)$, $\mu_R(X) = \{U, \phi, \{a\}, \{b, d\}, \{a, b, d\}\}$, Micro α^* -open sets are $\{U, \phi, \{a\}, \{b\}, \{d\}, \{a, b\}, \{a, d\}, \{b, d\}, \{b, c\}, \{c, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}$. Then Micro α -open sets are $\{U, \phi, \{a\}, \{b, d\}, \{a, b, d\}$. Let $V = \{a, b, c, d\}$ with $V/R = \{\{a\}, \{d\}\}$ and $Y = \{a, d\} \subseteq V$. Then $\tau'_R(Y) = \{V, \phi, \{a, b\}, \{d\}, \{a, b, d\}\}$ and $\mu' = \{c\} \notin \tau'_R(Y)$, $\mu'_R(Y) = \{V, \phi, \{c\}, \{d\}, \{c, d\}, \{a, b\}, \{a, b, c\}, \{a, b, d\}\}$, Micro α^* -open sets are $\{V, \phi, \{a\}, \{b\}, \{c\}, \{d\}, \{a, b\}, \{a, c\}, \{a, d\}, \{b, c\}, \{b, d\}, \{c, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}\}$. Let $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ be a function defined by $f(a) = d, f(b) = c, f(c) = b, f(d) = a$. Then $f^{-1}(a) = d, f^{-1}(b) = c, f^{-1}(c) = b, f^{-1}(d) = a$. Since $f^{-1}(\{c\}) = \{b\}$, $f^{-1}(\{d\}) = \{a\}, f^{-1}(\{c, d\}) = \{a, b\}, f^{-1}(\{a, b\}) = \{c, d\}, f^{-1}(\{a, b, c\}) = \{b, c, d\}, f^{-1}(\{a, b, d\}) = \{a, c, d\}$ are micro α^* -open in $(U, \tau_R(X), \mu_R(X))$ were $\{c\}, \{d\}, \{c, d\}, \{a, b\}, \{a, b, c\}, \{a, b, d\}$ are micro-open in $(V, \tau'_R(Y), \mu'_R(Y))$. Thus f is micro α^* -continuous. Since $f(\{a\}) = \{d\}, f(\{b, d\}) = \{a, c\}, f(\{a, b, d\}) = \{a, c, d\}$ are micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$.

$\mu'_R(Y))$, where $\{a\}, \{b, d\}, \{a, b, d\}$ are micro-open in $(U, \tau_R(X), \mu_R(X))$. Hence f is micro α^* -open map. Therefore f is micro α^* -homeomorphism. Since $f^{-1}(\{c, d\}) = \{a, b\}$ is not micro α -open in $(U, \tau_R(X), \mu_R(X))$, where $\{c, d\}$ is Micro-open in $(V, \tau'_R(Y), \mu'_R(Y))$. Therefore f is not micro α -continuous and hence f is not micro α -homeomorphism.

Theorem 3.9:

Every micro g -homeomorphism is micro α^* -homeomorphism

Proof:

Let $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ be an micro g -homeomorphism, then f is bijective, micro g -continuous and micro g -open map. Let V be an micro open set in $(V, \tau'_R(Y), \mu'_R(Y))$. Since f is micro g -continuous, $f^{-1}(V)$ is micro g -open in $(U, \tau_R(X), \mu_R(X))$. Since every micro g -open set is micro α^* -open, $f^{-1}(V)$ is micro α^* -open in $(U, \tau_R(X), \mu_R(X))$ which implies f is micro α^* -continuous. Let S be an micro open set in $(U, \tau_R(X), \mu_R(X))$. Since f is micro g -open map, $f(S)$ is micro g -open in $(V, \tau'_R(Y), \mu'_R(Y))$. Since every micro g -open set is micro α^* -open, $f(S)$ is micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$ which implies f is micro α^* -open map. Thus f is micro α^* -homeomorphism.

Remark 3.10:

The converse of the above theorem need not be true. This is proved by the following example.

Example 3.11:

Let $U = \{p, q, r, s\}$ with $U/R = \{\{p\}, \{q\}, \{r\}, \{s\}\}$ and $X = \{q, s\} \subseteq U$. Then $\tau_R(X) = \{U, \phi, \{q, s\}\}$ and then $\mu = \{r\} \notin \tau_R(X)$, $\mu_R(X) = \{U, \phi, \{p\}, \{q, s\}, \{p, q, s\}\}$, Micro α^* -open sets are $\{U, \phi, \{p\}, \{q\}, \{s\}, \{p, q\}, \{p, s\}, \{q, s\}, \{q, r\}, \{r, s\}, \{p, q, r\}, \{p, q, s\}, \{p, r, s\}, \{q, r, s\}$. Then Micro g -open sets are $\{U, \phi, \{p\}, \{q\}, \{s\}, \{p, q\}, \{p, s\}, \{q, s\}, \{p, q, s\}\}$. Let $V = \{p, q, r, s\}$ with $V/R = \{\{p\}, \{s\}\}$ and $Y = \{\{p\}, \{s\}\} \subseteq V$. Then $\tau'_R(Y) = \{V, \phi, \{p, q\}, \{s\}, \{p, q, s\}\}$ and $\mu' = \{r\} \notin \tau'_R(Y)$, $\mu'_R(Y) = \{V, \phi, \{r\}, \{s\}, \{r, s\}, \{p, q\}, \{p, q, r\}, \{p, q, s\}\}$, Micro α^* -open sets are $\{V, \phi, \{p\}, \{q\}, \{r\}, \{s\}, \{p, q\}, \{p, r\}, \{p, s\}, \{q, r\}, \{q, s\}, \{r, s\}, \{p, q, r\}, \{p, q, s\}, \{p, r, s\}, \{q, r, s\}\}$. Let $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ be a function defined by $f(p) = s, f(q) = r, f(r) = q, f(s) = p$. Then $f^{-1}(p) = s, f^{-1}(q) = r, f^{-1}(r) = q, f^{-1}(s) = p$. Since

$$f^{-1}(\{r\}) = \{q\},$$

$$f^{-1}(\{s\}) = \{p\}, f^{-1}(\{r,s\}) = \{p,q\}, f^{-1}(\{p,q\}) = \{r,s\}, f^{-1}(\{p,q,r\}) = \{q,r,s\}, f^{-1}(\{p,q,s\}) = \{p,r,s\}$$

are

micro α^* -open in $(U, \tau_R(X), \mu_R(X))$ were $\{r\}, \{s\}, \{r,s\}, \{p,q\}, \{p,q,r\}, \{p,q,s\}$ are micro-open in $(V, \tau'_R(Y), \mu'_R(Y))$. Thus f is micro α^* -continuous. Since $f(\{p\}) = \{s\}, f(\{q,s\}) = \{p,r\}, f(\{p,q,s\}) = \{p,r,s\}$ are micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$, were $\{p\}, \{q,s\}, \{p,q,s\}$ are micro-open in $(U, \tau_R(X), \mu_R(X))$. Hence f is micro α^* -open map. Therefore f is micro α^* -homeomorphism. Since $f^{-1}(\{p,q\}) = \{r,s\}$ is not micro g -open in $(U, \tau_R(X), \mu_R(X))$, were $\{p,q\}$ is micro-open in $(V, \tau'_R(Y), \mu'_R(Y))$. Therefore f is not micro g -continuous and hence f is not micro g -homeomorphism.

Theorem 3.12:

Every micro αg -homeomorphism is micro α^* -homeomorphism.

Proof:

Let $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ be an micro αg -homeomorphism, then f is bijective, micro αg -continuous and micro αg -open map. Let V be an micro open set in $(V, \tau'_R(Y), \mu'_R(Y))$. Since f is micro αg -continuous, $f^{-1}(V)$ is micro αg -open in $(U, \tau_R(X), \mu_R(X))$. Since every micro αg -open set is micro α^* -open, $f^{-1}(V)$ is micro α^* -open in $(U, \tau_R(X), \mu_R(X))$ which implies f is micro α^* -continuous. Let S be an micro open set in $(U, \tau_R(X), \mu_R(X))$. Since f is micro αg -open map, $f(S)$ is micro αg -open in $(V, \tau'_R(Y), \mu'_R(Y))$. Since every micro αg -open set is micro α^* -open, $f(S)$ is micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$ which implies f is micro α^* -open map. Thus f is micro α^* -homeomorphism.

Remark 3.13:

The converse of the above theorem need not be true. This is proved by the following example.

Example 3.14:

Let $U = \{a, b, c, d\}$ with $U/R = \{\{a, b\}, \{c, d\}\}$ and $X = \{a, b\} \subseteq U$. Then $\tau_R(X) = \{U, \emptyset, \{a, b\}\}$ and then $\mu = \{a, b, c\} \notin \tau_R(X)$, $\mu_R(X) = \{U, \emptyset, \{a, b\}, \{a, b, c\}\}$, Micro α^* -open sets are $\{U, \emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{a, d\}, \{b, c\}, \{b, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}\}$. Then Micro αg -open sets are $\{U, \emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}\}$.

Let $V = \{a, b, c, d\}$ with $V/R = \{\{a, b\}, \{c\}\}$ and $Y = \{b, c\} \subseteq V$. Then $\tau'_R(Y) = \{V, \emptyset, \{c\}, \{a, b\}, \{a, b, c\}\}$ and $\mu' = \{a\} \notin \tau'_R(Y)$, $\mu'_R(Y) = \{V, \emptyset, \{a\}, \{c\}, \{a, c\}, \{a, b\}, \{a, b, c\}\}$, Micro α^* -open sets are $\{V, \emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}, \{a, c, d\}\}$. Let $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ be a function defined by $f(a) = c$, $f(b) = a, f(c) = d, f(d) = b$. Then $f^{-1}(a) = b, f^{-1}(b) = d, f^{-1}(c) = a, f^{-1}(d) = c$. Since $f^{-1}(\{a\}) = \{b\}$, $f^{-1}(\{c\}) = \{a\}, f^{-1}(\{a, c\}) = \{a, b\}, f^{-1}(\{a, b\}) = \{b, d\}, f^{-1}(\{a, b, c\}) = \{a, b, d\}$ are micro α^* -open in $(U, \tau_R(X), \mu_R(X))$ were $\{a\}, \{c\}, \{a, c\}, \{a, b\}, \{a, b, c\}$ are micro-open in $(V, \tau'_R(Y), \mu'_R(Y))$. Thus f is micro α^* -continuous. Since $f(\{a, b\}) = \{a, c\}, f(\{a, b, c\}) = \{a, c, d\}$ are micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$ were $\{a, b\}, \{a, b, c\}$ are micro-open in $(U, \tau_R(X), \mu_R(X))$. Hence f is Micro α^* -open map. Therefore f is Micro α^* -homeomorphism. Since $f^{-1}(\{a, b\}) = \{b, d\}$ is not micro αg -open in $(U, \tau_R(X), \mu_R(X))$ were $\{a, b\}$ is micro-open in $(V, \tau'_R(Y), \mu'_R(Y))$. Therefore f is not micro αg -open map and hence f is not micro αg -homeomorphism.

Remark 3.15:

The composition of two micro α^* -homeomorphism need not be a micro α^* -homeomorphism.

Example 3.16:

Let $U = \{a, b, c, d\}$ with $U/R = \{\{a\}, \{b\}, \{c\}, \{d\}\}$ and $X = \{b, d\} \subseteq U$. Then $\tau_R(X) = \{U, \emptyset, \{b, d\}\}$ and then $\mu = \{c\} \notin \tau_R(X)$, $\mu_R(X) = \{U, \emptyset, \{a\}, \{b, d\}, \{a, b, d\}\}$, Micro α^* -open sets are $\{U, \emptyset, \{a\}, \{b\}, \{d\}, \{a, b\}, \{a, d\}, \{b, d\}, \{b, c\}, \{c, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}\}$. Let $V = \{a, b, c, d\}$ with $V/R = \{\{a\}, \{d\}\}$ and $Y = \{\{a\}, \{d\}\} \subseteq V$. Then $\tau'_R(Y) = \{V, \emptyset, \{a, b\}, \{d\}, \{a, b, d\}\}$ and $\mu' = \{c\} \notin \tau'_R(Y)$, $\mu'_R(Y) = \{V, \emptyset, \{c\}, \{d\}, \{c, d\}, \{a, b\}, \{a, b, c\}, \{a, b, d\}\}$, Micro α^* -open sets are $\{V, \emptyset, \{a\}, \{b\}, \{c\}, \{d\}, \{a, b\}, \{a, c\}, \{a, d\}, \{b, c\}, \{b, d\}, \{c, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}\}$. Let $W = \{a, b, c, d\}$ with $W/R = \{\{a\}, \{c\}, \{b, d\}\}$ and $Z = \{c\} \subseteq W$. Then $\tau''_R(Z) = \{W, \emptyset, \{a, c\}\}$ and $\mu'' = \{a, d\} \notin \tau''_R(Z)$, $\mu''_R(Z) = \{W, \emptyset, \{a\}, \{a, d\}, \{a, c\}, \{a, c, d\}\}$, Micro α^* -open sets are $\{W, \emptyset, \{a\}, \{c\}, \{d\}, \{a, b\}, \{a, c\}, \{a, d\}, \{c, d\}, \{a, b, c\},$

$\{a, c, d\}, \{a, b, d\}\}$. Let $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ be a function defined by $f(a) = d, f(b) = c, f(c) = b, f(d) = a$. Clearly f is micro α^* -homeomorphism. Let $g: (V, \tau'_R(Y), \mu'_R(Y)) \rightarrow (W, \tau''_R(Z), \mu''_R(Z))$ be a function defined by $g(a) = b, g(b) = a, g(c) = d, g(d) = c$. Clearly g is micro α^* -homeomorphism. Here f and g are micro α^* -homeomorphism. But $g \circ f: (U, \tau_R(X), \mu_R(X)) \rightarrow (W, \tau''_R(Z), \mu''_R(Z))$ is not micro α^* -homeomorphism. Since $(g \circ f)^{-1}\{a, c\} = g^{-1}(f^{-1}(\{a, c\})) = g^{-1}\{b, d\} = \{a, c\}$ is not micro α^* open in $(U, \tau_R(X), \mu_R(X))$. Therefore $(g \circ f)$ is not Micro α^* -homeomorphism.

Theorem3.17:

Let $f: (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ be bijective and micro α^* -continuous. Then the followings are equivalent:

- (i) f is micro α^* -open map.
- (ii) f is micro α^* -homeomorphism.
- (iii) f is micro α^* -closed map.

Proof:

(i) $\Rightarrow$ (ii)

Let f be micro α^* -open map. By hypothesis, f is micro α^* -homeomorphism.

(ii) $\Rightarrow$ (iii)

Let f be micro α^* -homeomorphism. Let S be micro closed in $(U, \tau_R(X), \mu_R(X))$. Then $U-S$ is micro open in $(U, \tau_R(X), \mu_R(X))$. Since f is micro α^* -homeomorphism, $f(U-S)$ is micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$ which implies $f(U)-f(S)$ is micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$ then $V-f(S)$ is micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$ which implies $f(S)$ is micro α^* -closed in $(V, \tau'_R(Y), \mu'_R(Y))$. Hence f is micro α^* -closed map.

(iii) $\Rightarrow$ (i)

Let f be micro α^* -closed map. Let S be micro open in $(U, \tau_R(X), \mu_R(X))$. Then $U-S$ is micro closed in $(U, \tau_R(X), \mu_R(X))$. Since f is micro α^* -closed, $f(U-S)$ is micro α^* -closed in $(V, \tau'_R(Y), \mu'_R(Y))$ which implies $f(U)-f(S)$ is micro α^* -closed in $(V, \tau'_R(Y), \mu'_R(Y))$ which implies $V-f(S)$ is micro α^* -closed in $(V, \tau'_R(Y), \mu'_R(Y))$. which implies $f(S)$ is micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$. Hence f is micro α^* -open map.

Theorem3.18:

Let $f : (U, \tau_R(X), \mu_R(X)) \rightarrow (V, \tau'_R(Y), \mu'_R(Y))$ be bijection then the following statements are equivalent:

- (i) f is micro α^* -homeomorphism
- (ii) f is micro α^* -continuous and micro α^* -open map
- (iii) f is micro α^* -continuous and micro α^* -closed map.

Proof:

(i) $\Rightarrow$ (ii)

Let f be bijection and micro α^* -homeomorphism. Then f is micro α^* -continuous and micro α^* -open map.

(ii) $\Rightarrow$ (iii)

Let f be micro α^* -continuous and micro α^* -open map. Let S be micro closed in $(U, \tau_R(X), \mu_R(X))$ then $U-S$ is micro open in $(U, \tau_R(X), \mu_R(X))$. Since f is micro α^* -open map, $f(U-S)$ is micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$ which implies $V-f(S)$ is micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$ then $f(S)$ is micro α^* -closed in $(V, \tau'_R(Y), \mu'_R(Y))$. Thus f is micro α^* -closed map. Hence f is micro α^* -continuous and micro α^* -closed map.

(iii) $\Rightarrow$ (i)

Let f be micro α^* -continuous and micro α^* -closed map. Let S be micro open in $(U, \tau_R(X), \mu_R(X))$ then $U-S$ is micro closed in $(U, \tau_R(X), \mu_R(X))$. Since f is micro α^* -closed map then $f(U-S)$ is micro α^* -closed in $(V, \tau'_R(Y), \mu'_R(Y))$ which implies $V-f(S)$ is micro α^* -closed in $(V, \tau'_R(Y), \mu'_R(Y))$. Hence $f(S)$ is micro α^* -open in $(V, \tau'_R(Y), \mu'_R(Y))$. Therefore f is micro α^* -homeomorphism.

IV. CONCLUSION

In this paper, I have introduced Micro α^* - homeomorphism in Micro Topological Spaces with suitable examples. Then I have given some comparison theorems. Also I have discussed some of the properties of Micro α^* - homeomorphism. I hope that this paper is just beginning of a new structure. It will inspire many to contribute to the growth of micro topological spaces in the field of Mathematics. This shall be extended in the future research with some applications.

REFERENCES

- [1] Dr. P. Anbarasi Rodrigo, A New class of micro open set in Micro Topology, Journal of Research in Applied Mathematics, Volume 8 ~ Issue 9 (2022) pp: 38-43

- [2] R. Bhavani, On Strong Forms of Generalized Closed Sets in Micro Topological Spaces, Turkish Journal of Computer and Mathematics Education, Vol. 12, No.11(2021), 2772-2777.
- [3] S.Chandrasekar, On micro topological spaces, Journal of New Theory,26(2019),23-31.
- [4] S.Chandrasekar, G. Swathi, Micro- α -open Sets in Micro Topological Spaces, International Journal of Research in Advent Technology, Vol.6, No.10. October 2018, 2633-2637.
- [5] Rangasamy Anandhi and Natraj Balamani, On Micro αg -irresolute maps in Micro Topological Spaces, Sahand Communications in Mathematical Analysis (SCMA) Vol. 22 No. 1 (2025), 75-92.
- [6] Taha H. Jasim, Saja S. Mohsen, Kanayo S. Eke, On Micro-Generalized Closed Sets and Micro-Generalized Continuity in Micro Topological Spaces, European Journal of Pure and Applied Mathematics, Vol.14, no.4, 2021, 1507-1516.

STRUCTURAL AND OPTICAL CHARACTERIZATION CuO THIN FILMS BY SILAR METHOD

S.V. Abi Nivetha, A.Nirmala Shirley

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT:

Copper oxide (CuO) thin films were synthesized and characterized for their structural, optical properties. In this study, CuO thin films were deposited using SILAR Method on glass slide . X-ray diffraction (XRD) analysis confirmed the monoclinic phase of CuO with well-defined peaks, indicating good crystallinity. The average crystallite size was estimated using the Scherrer equation. UV-Visible spectroscopy revealed a strong absorption in the visible region, with a calculated optical bandgap in the range of 1.3 eV, confirming the semiconductor nature of the films. The combination of structural, optical, and electrochemical properties suggests that CuO thin films have significant potential Mainly in supercapacitor applications.

KEY WORDS: CuO, Thin Film, XRD, UV-vis, Characterization techniques.

INTRODUCTION :

Copper Oxide (CuO) is a p-type semiconductor with a narrow band gap, good electrical conductivity and excellent optical properties. It has promising applications in gas sensors , solar cells , supercapacitor and photocatalysis. The structural, morphological and electrical properties of CuO Thin Films make them suitable for various optoelectronic and energy applications. [10] The aim of the project is to synthesize and characterize CuO Thin Films, to analyse the crystallinity and phase composition using X-ray diffraction (XRD) and to examine the Absorption Bandgap Using UV-Visible Spectroscopy.

MATERIALS AND METHODS :

Substrate : Glass slides

Precursors :

[Cu(NH₃)₄]²⁺ (Copper-Ammonia complex as Cationic solution)

Hot Distilled water as Anionic solution

Solvent : Deionized water for solution preparation.

Characterization Tools :

- X-Ray Diffraction(XRD) for structural analysis.
- UV-Vis Spectroscopy for Optical analysis and Bandgap Energy.

METHODOLOGY :

Substrate Preparation:

Clean the substrate ultrasonically for 15 minutes in dilute hydrochloric acid, acetone, and ethanol. Rinse the substrate in distilled water for 7 seconds and let it dry in air.

Cationic Solution Preparation:

Dissolve 0.1 M of $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$ in 100 ml of distilled water. Stir continuously to yield a homogeneous solution. Adjust the pH of the solution to 10 by adding Ammonia (NH_3 , 25-28%).

SILAR Deposition:

The substrate is dipped in the $[\text{Cu}(\text{NH}_3)_4]_2$ and solution for 30 seconds. The substrate is dipped in hot distilled water (80°C) for 30 seconds and Let the substrate dry in air for 7 seconds. Repeat the above steps for 20, 40, and 60 cycles.

RESULT AND DISCUSSION :

The principle of XRD is based on Bragg's Law, which states that:

$$n\lambda = 2d \sin(\theta)$$

where:

n is an integer

λ is the wavelength of the X-rays

d is the spacing between the crystal planes

θ is the angle of incidence and reflection

XRD is used to determine the crystallinity, phase composition, and grain size of the CuO thin films, using JCPDS file No 48-1548 for reference.

$$D = k\lambda / \beta \cos \theta$$

Where:

D = crystallite size (nm)

K = Scherrer constant

λ = X-ray wavelength

β = Full Width at Half Maximum (FWHM)

θ = Bragg's angle in degrees

The dislocation density has been calculated using crystallite size by the equation,

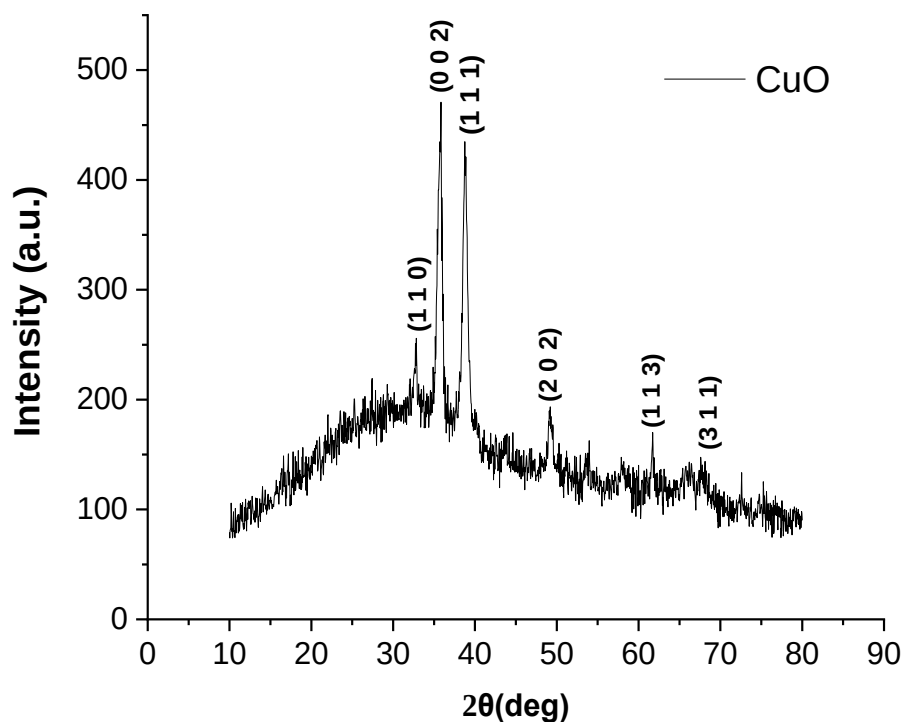
$$\text{Dislocation} = 1/D^2$$

The micro strain has been calculated by the given formula,

$$\text{Micro strain} = \beta \cos \theta / 4$$

The lattice parameter calculated for CuO by the given formula,

Deposition Cycle	h k l	2 θ (degree)	Grain size(nm)	Dislocation Density (lines/m ²)	Micro strain (10 ⁻⁴)	Lattice constant(Å)
60	1 1 0	32.7323	17.53	0.00325	0.00702	a = 4.683 Å
	0 0 2	35.7464	15.15	0.00436	0.00746	b = 3.422 Å
	1 1 1	38.7941	17.83	0.00314	0.00585	c = 5.132 Å
	2 0 2	49.2175	13.87	0.00520	0.00600	$\beta = 99.54^\circ$
	1 1 3	61.7228	19.59	0.00260	0.00345	
	3 1 1	66.7514	2.52	0.15776	0.02503	



XRD GRAPH

XRD CALCULATION TABLE

UV-Vis Spectroscopy :

The optical bandgap of CuO Thin Film was measured using Tauc's Plot:

$$(\alpha h\nu)^n = A (h\nu - E_g)$$

The bandgap was found to be ~1.4 eV Suitable for Solar and sensor applications.

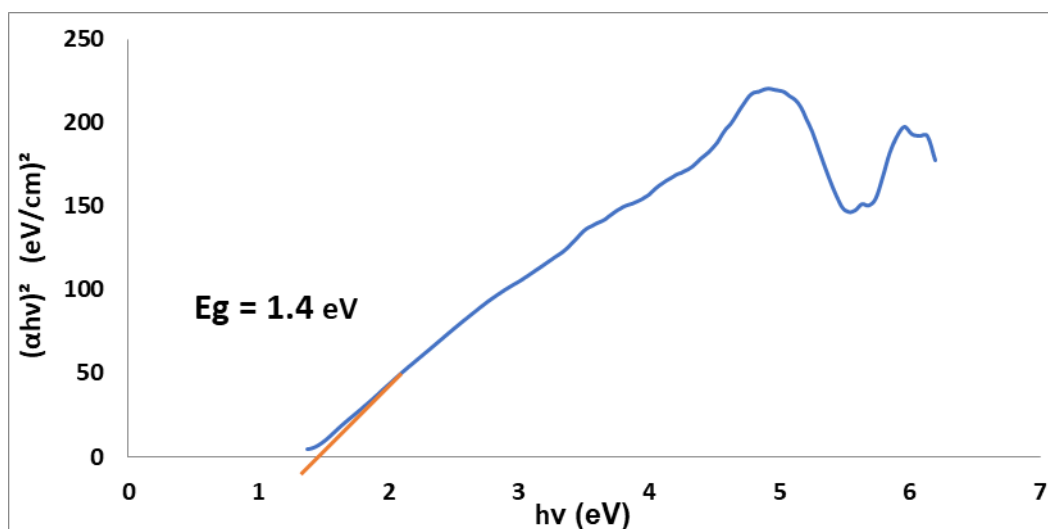
ELECTRICAL PROPERTY:

The film exhibited good p-type conductivity which is useful for electronic applications.

CONCLUSION :

- CuO Thin Films were successfully synthesized using SILAR Method.
- The films exhibit Monoclinic CuO structure, good crystallinity and uniform morphology.
- It is Suitable for Solar cells , sensors and electronic applications.

UV-VIS SPECTROSCOPY:



REFERENCES :

[1]

Abdel Rafea et al, (2009) , Determination Of The Optical Band Gap For Amorphous And Nanocrystalline Copper Oxide Thin Films Prepared By Silar Technique, Journal Of Physics D: Applied Physics, Volume 42, Number 1.

[2] **K. Mageshwari et al (2013)** Materials Science In Semiconductor Processing ,Volume 16, Issue 2,2013, Pages 337-343physical Properties Of Nanocrystalline CuO Thin Films Prepared By The Silar Method.

[3] **Rita K. Emumejaye et al ,(2015)** Comparative Studies on The Morphological and Structural Properties of Silar Deposited Copper Oxide Thin Film on Glass and Stainless-Steel Substrates , Vol. 2 No. 7 .

[4] **Soumyo Chatterjee et al (2016)** , Formation Of All-Oxide Solar Cells In Atmospheric Condition Based On Cu₂O Thin-Films Grown Through Silar Technique , Solar Energy Materials And Solar Cells , Volume 147, Pages 17-26.

[5] **R. Daniel-Umeri et al,(2016)** Synthesis and Characterisation of Copper Oxide Thin Films Using Successive Ionic Layer Adsorption Reaction (Silar) Method, Issn 2224-3224(Pdf) , Issn 2225- 0956 (Online) Vol.8 No.6.

[6] **S. Visalakshi et al , (2016),** Studies on Optical and Electrical Properties of Silar-Deposited CuO Thin Films, Materials Science and Engineering for Energy Systems , Volume 11,- Issue 1.

- [7] **Surendra K. Shinde et al (2016)** , Morphological Tuning Of CuO Nanostructures By Simple Preparative Parameters In Silar Method And Their Consequent Effect On Supercapacitors, Nano-Structures & Nano-Objects ,Volume 6, Pages 5-13.
- [8] **S.K. Shinde et al, (2017)** , High Electrochemical Performance Of Nanoflakes Like CuO Electrode By Successive Ionic Layer Adsorption And Reaction (Silar) Method, Journal Of Industrial And Engineering Chemistry, Volume 52, Pages 12-17.
- [9] **O. Gençyilmaz et al (2017)**, Effect Of pH On The Synthesis Of CuO Films By Silar Method. Volume 695, <https://doi.org/10.1016/j.jallcom.2016.10.247> , Journal Of Alloys And Compounds.
- [10] **A.S. Patil et al (2017)** , Supercapacitive Properties Of CuO Thin Films Using Modified Silar Method ,2016,Volume 23, Pages 1259–1266.

EFFICIENCY ENHANCEMENT AND CHARACTERIZATION OF IRON NANOPARTICLES SYNTHESIZED VIA ULTRASOUND-ASSISTED LEAF EXTRACT OF SOLANUM

S. Irudhaya Sahaya Lancy, A. Anto Snowlyn

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

Iron nanoparticles, have drawn a lot of attention because of their distinct physicochemical characteristics and wide range of uses in biomedicine, environmental remediation, and catalysis. The efficiency improvement and characterisation of Iron nanoparticles produced with an ultrasound-assisted green synthesis method and leaf extract from *Solanum trilobatum* as a stabilizing and reducing agent are the main objectives of this work. Ultrasound irradiation produces a consistent particle size distribution, increases nanoparticle yield, and improves reaction kinetics. To verify the structural, morphological, and chemical characteristics of the synthesized Iron nanoparticles, a variety of analytical methods were used. X-ray diffraction determines the grain size of the nanomaterial. Impurity peaks are absent, indicating that the iron nanoparticles are highly crystalline. The Debye-Scherrer formula suggests that the particle's average crystalline size is 47 nm and also it is discovered that their HCP structure is crystalline and the Anti bacterial activity gives the moderate antibacterial activity against *Staphylococcus aureus* and *Pseudomonas aeruginosa*., but no activity against *Escherichia coli* towards Iron nanoparticles. The results indicate that the ultrasound-assisted approach creates extremely stable, monodispersed Iron nanoparticles with higher surface activity and better catalytic efficiency. Additionally, the study assesses these Iron nanoparticles effectiveness in pollutant removal, dye degradation, and antibacterial activity, highlighting their potential for long-term industrial and environmental uses.

KEYWORDS: catalysis, grain size, green synthesis ,XRD, antibacterial activity.

INTRODUCTION

Nanoparticles are extremely small particles, usually ranging in size from 1 to 100 nanometers (nm). Because of their distinct size, nanoparticles can display distinct physical and chemical characteristics from bigger particles. Because of their high surface area-to-volume ratio, nanoparticles interact and react more readily with their surroundings. Quantum mechanics is important at the nanoscale, where it produces special optical, electrical, and magnetic characteristics. By using acoustic energy to cause the solvent to cavitate,

ultrasound-assisted extraction is a non-thermal method that speeds up the release and diffusion of target materials. Although conventional techniques have been used for many years to produce nanoparticles, research has shown that green ways are more successful because they are easier to describe, less costly, and less likely to fail. *Solanum Trilobatum*, Southern India has greater access to *linn* (Solanaceae), one of the important medicinal herbs. *Solanum trilobatum* is used extensively in Indian traditional medicine to treat a variety of human ailments. The objectives of the present research is, To prepare Ultrasound assisted extract of *Solanum Trilobatum* leaves. To synthesis Iron nanoparticles by using the extract of *Solanum Trilobatum* leaves and To study the structural, antibacterial and magnetic properties.

MATERIALS AND METHODS

Water molecules are included in the structure of ferric sulphate hydrate, which is a hydrated version of ferric sulphate ($\text{Fe}_2(\text{SO}_4)_3$). It is an inorganic substance that is frequently used as a coagulant, to clean water, and to make pigment. A hydrated salt of ferric sulphate ($\text{Fe}_2(\text{SO}_4)_3$), ferric sulfate hydrate has water molecules in its crystal structure. Iron(III) cations (Fe^{3+}) and sulphate anions (SO_4^{2-}) combine to form this ionic compound.

Leaves of *Solanum trilobatum* are gathered from nearby area and cleaned with purified water. Use Wattman filter paper to filter the leaves after grinding them. Ultrasonification is applied to the final extract. The extract is kept in sonicator about half an hour. 100 ml of leaf extract from *Solanum trilobatum* was mixed with 1 M of ferric sulphate hydrate. For approximately three hours, the mixture is agitated at 600 RPM using a magnetic stirrer. The residue undergoes many washings with ethanol and double-distilled water. It is dried for three hours at 100 degrees Celsius in a hot air oven. For five hours, the dried sample is heated to 600 degrees Celsius in a muffle furnace. The resulting precipitate has a fine power. The dried iron nanoparticles are characterized by XRD and Antibacterial activity.

RESULTS AND DISCUSSIONS

X- RAY DIFFRACTION (XRD)

The structural characterization of the iron nanoparticles is carried out by the XRD method. The X-ray diffraction experiments are carried out with the XPERTPRO diffraction system using the CuK α radiation of wavelength 1.5406Å. The type of the scan used is continuous and range from 10 to 80.

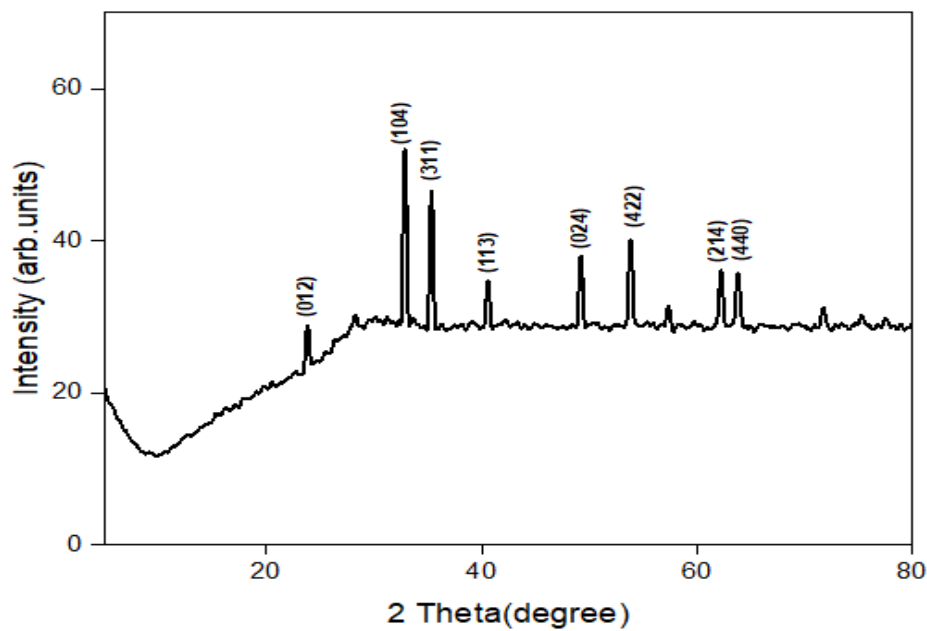


Fig 1 XRD pattern for Iron nanoparticles

The average grain size is calculated using Debye Scherrer formula,

$$D = K\lambda / \beta \cos\theta$$

λ - X-ray wavelength

β - line broadening at half the maximum intensity (FWHM)

θ - Bragg angle

The XRD results for the Iron nanoparticles exhibit strong peaks around $2\theta = 32.856$ and $2\theta = 35.338$ belongs to Iron Oxides. These peak values are in good agreement with the JCPDS cards. From the observation it is clearly indicates that the iron nanoparticles exhibit HCP structure as confirmed from the JCPDS file. The JCPDS card number for Fe_2O_3 is 96-900-0140. The absence of impurity peaks denotes the high crystalline nature of the Iron nanoparticles are shown in figure (1). The average crystalline size of the particle is **47 nm** which is calculated using Debye Scherrer formula are shown in table (1)

The dislocation density has been calculated using crystallite size, by the equation,

$$\text{Dislocation} = 1/D^2$$

The microstrain has been calculated by the given formula,

$$\text{Microstrain} = \beta \cos\theta / 4$$

h k l	Peak Positions 2θ (deg)	D(nm)	Dislocation density	Microstrain (10 ⁻²)
0 1 2	23.835	74.38728	0.000599	-3.92838
1 0 4	32.856	44.36163	0.000602	4.682303
3 1 1	35.338	44.88747	0.000596	-1.81697
1 1 3	40.573	37.48341	0.000882	0.682932
0 2 4	49.183	40.91941	0.000787	-10.2274
4 2 2	53.812	39.42622	0.000881	-1.38078
2 1 4	62.201	30.95915	0.001551	-23.7535
4 4 0	63.775	39.40366	0.000973	15.63281

Table 1 Calculation of size of iron nanoparticles from XRD pattern

ANTI BACTERIAL ACTIVITY

Microbial strains used

Utilized microbial strains, for antibacterial action, three bacterial strains *Escherichia coli*, *Staphylococcus aureus* and *Pseudomonas aeruginosa* were employed.

Bacterial inoculum preparation

The Nutrient broth was made and autoclaved for 15 minutes at 15 pounds of pressure to sterilize it. The sterilized marine broth was used to individually inoculate each of the three bacterial strains, which were then incubated for 24 hours at 37°C.

A sterile cotton swab was used to inoculate the petri plates with the 24-hour-old bacterial broth cultures of *Escherichia coli*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*.



a) *Pseudomonas aeruginosa* b) *Staphylococcus aureus* c) *Escherichia coli*

Fig 2 Antibacterial activity of acetic acid on Iron nanoparticles

Bacterial strains (mm)	200	300	400	PC	NC
<i>Staphylococcus aureus</i>	0	0	4	6	0
<i>Pseudomonas aeruginosa</i>	3	3.5	4	5	0
<i>Escherichia Coli</i>	0	0	0	7	0

Table 2 Bacterial strain for Iron nanoparticles

The Solanum trilobatum extract shows moderate antibacterial activity against *Staphylococcus aureus* and *Pseudomonas aeruginosa* but no activity against *Escherichia coli*. The antibacterial effect is dose-dependent, with higher concentrations (400 µg/ml) showing more inhibition.

The positive control (PC) consistently has stronger antibacterial effects, indicating that the extract is not as effective as the standard antibiotic used in the control. The negative control (NC) shows no inhibition, confirming that the observed antibacterial effects are due to the extract itself. The table presents the antibacterial activity of an acetic acid extract of *Solanum trilobatum* against three bacterial strains: *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Escherichia coli*. The results are given in millimeters (mm) as the zone of inhibition, indicating the effectiveness of the extract at different concentrations (200, 300, and 400 µg/ml).

Outcomes of table (2) Acetic acid extracts of different *Lagocephalus spadiceus* tissues have antibacterial action against bacterial strains, In *Staphylococcus aureus* the skin extract created zones of inhibition of 0 mm, 0 mm, and 4 mm at 200µl, 300 µl, and 400 µl, respectively. The zones of inhibition for *E. coli* were 0 mm, 0 mm, and 0 mm at doses of 200 µl, 300 ul, and 400 µl. In *Pseudomonas* the zone of inhibition reached 3 mm, 3.5mm, 4mm at a concentration of 200µl, 300 µl and 400 µl.

CONCLUSION

Nowadays, nanotechnology is a significant factor in every area of research and technology. The green method enables the most stable metal-based nanoparticles at a reasonable cost and without harming the environment. Therefore, the present work

incorporates the findings of a study that involved the synthesis and characterisation of iron nanoparticles employing *Solanum trilobatum* extract as stabilizing agents.

XRD examination indicates that the particle size is about 47 nm. The absence of impurity peaks denotes the high crystalline nature of the Iron nanoparticles. It is discovered that their Hexagonal closed packed structure is crystalline. The Iron nanoparticles has moderate antibacterial activity against *Staphylococcus aureus* and *Pseudomonas aeruginosa*., but no activity against *Escherichia coli*.

REFERENCE:

- [1] Jeevanandam, J., Barhoum, A., Chan, Y. S., Dufresne, A., & Danquah, M. K. (2018). "Review on nanoparticles and nanostructured materials: history, sources, toxicity and regulations." *Beilstein Journal of Nanotechnology*, Vol. 9, pp. 1050-1074.
- [2] Kumar, C. S. S. R. (2021). "Nanomaterials: Classification, properties, and environmental toxicities." *Environmental Technology & Innovation*, Vol. 20, Article 101067.
- [3] Takashi Hisatomi, Jun Kubotaa and Kazunari Domen. (2014), "Recent advances in semiconductors for photocatalytic and photoelectrochemical water splitting". *Chem. Soc. Rev.*, 2014,43, 7520-7535.
- [4] Herlekar, M., Barve, S., & Kumar, R. (2014). "Plant-Mediated Green Synthesis of Iron Nanoparticles." *Journal of Nanoparticles*, Vol. 2014, Article ID 140614.
- [5] Sebastian, A., Nangia, A., & Prasad, M. N. V. (2018). "Green Synthesis of Iron Nanoparticles from Selected Plant Materials of Peninsular India." *Proceedings of the National Academy of Sciences, India Section A: Physical Sciences*, Vol. 88, pp. 195–203.
- [6] Kumar, B. (2021). "Green Synthesis of Gold, Silver, and Iron Nanoparticles for the Degradation of Organic Pollutants in Wastewater." *Journal of Composites Science*, Vol. 5, No. 8, Article 219.
- [7] Taylor, E. N., & Webster, T. J. (2009). "The Use of Superparamagnetic Nanoparticles for Prosthetic Biofilm Prevention." *International Journal of Nanomedicine*, Vol. 4, pp. 145–152.
- [8] Erik C. Dreaden, Alaaldin M. Alkilany, Xiaohua Huang, (2012), The golden age: gold nanoparticles for biomedicine, *Chem. Soc. Rev.*, 2012,41, 2740-2779.

A BIOGENIC APPROACH FOR IRON OXIDE NANOPARTICLES: COCONUT WATER AS A SUSTAINABLE PRECURSOR

A. Evangelin , J. Kethzy Agnes

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

This study reports the green synthesis of Fe_2O_3 nanoparticles using coconut water as a natural reducing and stabilizing agent. X-ray diffraction (XRD) analysis confirms the formation of a highly crystalline cubic iron oxide structure with a crystallite size of 6 nm. Fourier-transform infrared (FTIR) spectroscopy identifies functional groups from coconut water that enhance nanoparticle stability. These Fe_2O_3 nanoparticles exhibit promising properties for photocatalytic degradation of pollutants, antibacterial coatings, and solar energy applications. The eco-friendly synthesis method highlights the potential of Fe_2O_3 nanoparticles for sustainable and multifunctional applications in environmental and biomedical fields.

KEYWORDS: Fe_2O_3 Nanoparticles, Coconut water, Green Synthesis, XRD, FTIR, Biomedical fields

INTRODUCTION

Iron oxide nanoparticles (IONPs) exhibit distinctive properties such as superparamagnetic, large surface-to-volume ratio, and tunable morphology, making them valuable in biomedicine, environmental remediation, and catalysis. Among these, Fe_2O_3 nanoparticles are favored for their biocompatibility, chemical stability, and cost-effectiveness. Conventional synthesis routes—co-precipitation, sol-gel, and thermal decomposition—often require toxic reagents and high energy input, raising environmental concerns. Green synthesis methods offer sustainable alternatives, using biological extracts rich in natural biomolecules as reducing, capping, and stabilizing agents. Coconut water, derived from *Cocos nucifera*, contains sugars, amino acids, vitamins, minerals, and phenolics, enabling it to function as a multifunctional medium for nanoparticle formation. Its use minimizes environmental toxicity while potentially enhancing nanoparticle stability and functionality. This study focuses on the eco-friendly synthesis of Fe_2O_3 nanoparticles using coconut water, aiming to develop a simple, low-cost, and scalable method aligned with green chemistry principles for potential biomedical and environmental applications. [1-10]

MATERIALS AND METHODS

10ml of coconut water was taken from the matured coconut and get filtered. 1M of ferric chloride is mixed with 100ml of distilled water and 90ml of this solution was used. 10ml of coconut water was mixed with 90ml of ferric chloride solution and get stirred. Sodium Hydroxide solution was added to adjust the pH of the solution. The solution was allowed to settled down and form a precipitate. Water was drained out from the precipitate and the nanoparticles were washed for several times with ethanol and distilled water. It was heated in hot air oven at 100° C for 4 hours and get powdered using Mortar and Pestel. It was then calcinated at 500° C in Muffle Furnace and get powdered using Mortar and Pestel. The synthesized nanoparticles were characterized by XRD and FTIR.

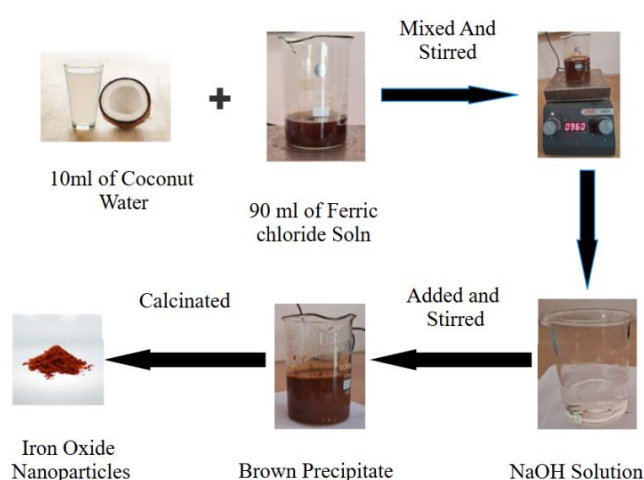


Fig 1. Flow chart for synthesizing Fe₂O₃ nanoparticles

RESULT & DISCUSSION

XRD was employed to analyze the crystalline phase of Fe₂O₃ nanoparticles. Fig 2 shows the X-ray diffraction patterns of Iron Oxide (Fe₂O₃). The primary peaks at 45.82°, 54.41°, 62.76° can be indexed to the cubic structure of metal Iron oxide. The parameters agree well with the JCPDS card #19-9629 with any impurity peaks.^[1] The average crystalline size of the Fe₂O₃ nanoparticles is found to be 5.9 nm.

Sample	FWHM	2 theta °	d-spacing Å	Crystalline Size	Average Crystalline size
	1.8893	11.19	7.9018	0.7	
	0.1181	32.01	2.7960	12.2	

Fe₂O₃	0.2362	33.54	2.6715	6.1	5.9 nm
	0.1968	36.06	2.4906	7.4	
	0.2362	45.82	1.9803	6.4	
	0.2362	54.41	1.6862	6.6	
	0.2362	62.76	1.4805	6.9	
	0.3149	64.40	1.4466	5.2	
	0.4723	66.44	1.4070	3.5	
	0.3936	75.67	1.2567	4.5	

Table 1. Structural Parameters of Fe₂O₃ nanoparticles

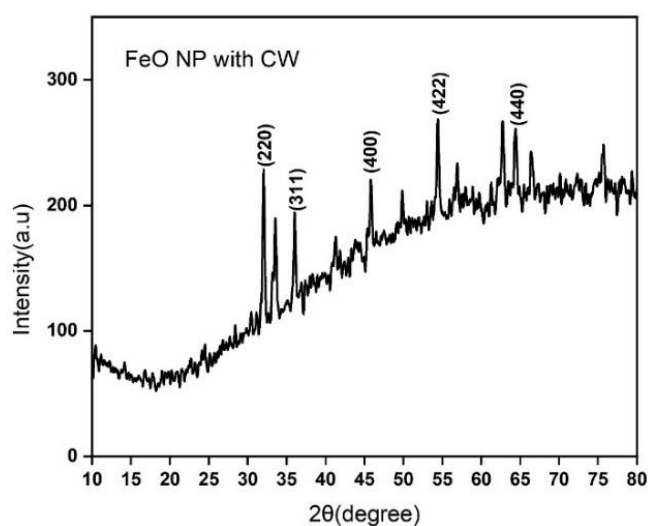


Fig 2. XRD pattern of Fe₂O₃

Figure 3 shows the FTIR spectrum of Iron Oxide taken between the range of 450 – 4000cm⁻¹. The broad absorption band centered at 725.23 cm⁻¹ corresponds to the stretching mode of the hydroxyls of the absorbed water. Very weak bending vibrations of water molecule appeared at 3657.90 cm⁻¹. Strong band position at 455.20 cm⁻¹ may be attributed to the stretching mode of the Fe-O.

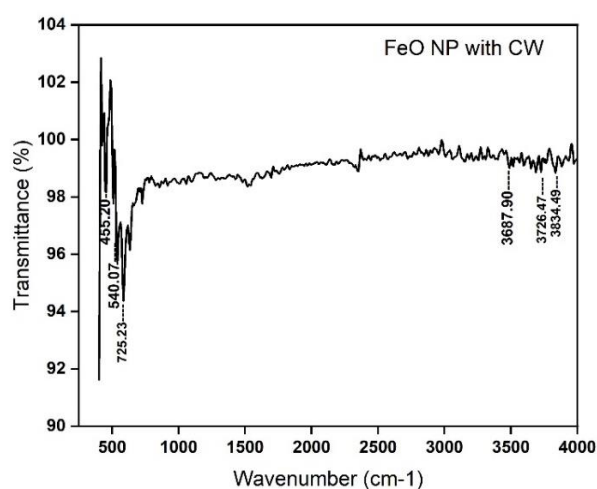


Fig 3.FT-IR Analysis of Fe₂O₃

CONCLUSION

Fe₂O₃ nanoparticles was synthesized using coconut water as a sustainable precursor. XRD confirms the crystalline nature of Fe₂O₃ nanoparticles with a crystallite size of 6 nm. FTIR spectroscopy identifies the functional groups present, indicating interactions between Fe₂O₃ and bioactive compounds from coconut water, which may enhance stability and surface properties. It is effective for environmental applications such as wastewater treatment and degradation of organic pollutants under visible light. The biofunctional properties from coconut water enhance their potential for antibacterial coatings, drug delivery, and biosensing. Their optical properties make them suitable for solar energy conversion, sensors, and magnetic applications.

REFERENCE

1. Ashlin Rose A et al. (2020) “Green Synthesis characterization & antimicrobial activity of Iron Oxide nanoparticles from leaf extract of *Cocos nucifera*”, ISSN-2394-5125
2. Shakeel Ahmed Ansari et al. (2017) “Antibacterial activity of iron oxide nanoparticles synthesized by co-precipitation technology against *Bacillus cereus* and *Klebsiella pneumoniae*”, PJCT-2017-0076
3. S. Kanagasubbulakshmi et al. (2017) “Green Synthesis of Iron Oxide nanoparticles using *Lagenaria siceraria* and evaluation of its antimicrobial activity”, DLSJ.2.12277
4. Elvan Ushtiin et al. (2021) “Green Synthesis of Iron Oxide nanoparticles by using *Ficus carica* leaf extract and its antioxidant activity”, BRIAC vol 12:2,2108-2116

5. Olga A. Shilova et al. (2020) “Aqueous chemical Co-precipitation of Iron Oxide magnetic properties for use in agricultural technologies”, LIANBS vol 10:2, 2215-2239
6. Sunday Adewale Akintelu et al. (2021): “Green Synthesis of Iron Oxide nanoparticles for biomedical application and environmental remediation: a review”, EQJ vol 46:4
7. Nhiem Tran et al. (2010) “Bactericidal effect of iron oxide nanoparticles on *Staphylococcus aureus*”, International Journal of medicine, 277-283, DOI:10.2147/IJN.59220
8. F. Buarki et al. (2022) “Green Synthesis of Iron Oxide Nnaoparticles using *Hibiscus rosa sinensis* flowers and their Antibacterial Activity”, Journal of Nanotechnology, 2022:5474645
9. Abinaya Rajendran et al. (2021) "Biogenic synthesis of husked rice-shaped iron oxide nanoparticles using coconut pulp (*Cocos nucifera L.*) extract for photocatalytic degradation of Rhodamine B dye and their in vitro antibacterial and anticancer activity", <https://doi.org/10.1016/j.jscs.2021.1013071319-6103>
10. Juliana Jesus et al. (2024) "Green Sol–Gel Synthesis of Iron Oxide Nanoparticles for Magnetic Hyperthermia Applications", Pharmaceutics 2024, 16,1578. <https://doi.org/10.3390/pharmaceutics16121578>

SUSTAINABLE SYNTHESIS OF SiO_2 – NiMoO_4 FROM PULVERISED FUEL ASH FOR ELECTROCHEMICAL ENERGY STORAGE

R. Geethapriya, C. Infant Francita Fonseka

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

This study presents the synthesis of a bifunctional octahedral SiO_2 – NiMoO_4 nanocomposite through co-precipitation method. The material was characterized using analytical techniques such as XRD, UV to examine its phase composition, optical properties and morphology. The average crystallite size of the characteristic peak was found to be 25.94nm. The bandgap of SiO_2 - NiMoO_4 was found to be 1.61eV. Therefore, these significant values making SiO_2 – NiMoO_4 a promising material for supercapacitor and photocatalyst applications.

KEYWORDS

Silicon dioxide (SiO_2), Nickel Molybdate (NiMoO_4), Pulverized Fuel Ash (PFA),

Supercapacitor, Photocatalyst.

1.INTRODUCTION

Supercapacitors represent the alternative to common electro chemical batteries, mainly to widely spread lithium-ion batteries. The most common type of supercapacitors is electrical double layer capacitor (EDLC). Other types of supercapacitors are lithium-ion hybrid supercapacitors and pseudo- supercapacitors. Supercapacitors operate with electrochemical redox reactions and the energy is stored in chemical bonds of chemical materials.[1] Transition metal oxides are compounds composed of oxygen atoms bound transition metals. They are commonly utilized for their catalytic activity and semiconducting properties. Transition metal oxides are also frequently used as pigments in paints and plastics. Spinel phase materials are involved in several technical areas such as magnetic recording, batteries, catalysis, biomedicine. The spinels are any of a class minerals of general formulation AB_2X_4 which crystallize in the cubic (isometric) crystal system, with the X anions (typically chalcogens, like oxygen and sulfur) arranged in a cubic close-packed lattice and the cations A and B occupying some or all of the octahedral and tetrahedral sites in the lattice.[2] In that,

Pseudo capacitors or faradaic supercapacitors are devices that are different from EDLCs. The electrodes of this capacitor include redox-active materials to store electrical energy. Supercapacitors, which can operate in harsh environments across a wide range of operating temperatures offering high-power density and high reliability, and are also ideal for use in Internet of Things (IoT), Sensor and communication designs

AIM OF THE STUDY

*To utilize the sol-gel process to synthesize SiO_2 nano matrix from pulverized fly ash and analyze it by different characterization methods.

*To synthesize $\text{SiO}_2 - \text{NiMoO}_4$ nanocomposites using co-precipitation route for supercapacitor applications.

*To investigate the structural, morphological and optical properties of $\text{SiO}_2 - \text{NiMoO}_4$ nanocomposites.

2.MATERIALS AND METHODS

2.1. Silicon dioxide (SiO_2)

Silicon dioxide, also known as silica, is an oxide of silicon with the chemical formula SiO_2 , commonly found in nature as quartz. In many parts of the world, silica is the major constituent of sand. Silica is one of the most complex and abundant families of materials, existing as a compound of several minerals and as a synthetic product. Examples include fused quartz, fumed silica, opal, and aerogels. It is used in structural materials, microelectronics, and as components in the food and pharmaceutical industries. All forms are white or colorless although impure samples can be colored.[3]

2.2. Nickel Molybdate (NiMoO_4)

Nickel Molybdate is a green, crystalline powder, slightly soluble in water until the addition of Ammonium Hydroxide which significantly increases the solubility. Nickel (II) Molybdate is generally immediately available in most volumes. High purity, submicron and nano powder forms may be considered.[4]

2.3. Pulverized fuel ash

Pulverized ash (PA) also known as pulverized fuel ash is a fine powder obtained from the combustion of powdered coal in an electricity generating plant. Temperature may exceed 1600 degree Celsius during the burning process and may melt most of the inorganic materials present in the coal. The inorganic matter present in it gets fused during the combustion of

coal. After combustion, mineral matters within the coal are excluded, liquefied, vaporized or condensed or agglomerated. PA is produced from thermal power plants in large quantities.[5]



Fig2.1 Pulverised fuel ash

2.4. Preparation of SiO_2 from Pulverized Fuel Ash

Fly ash collected from the Tuticorin Thermal Power Station was processed using the sol-gel method to synthesize SiO_2 nanoparticles. Initially, 50g of fly ash was washed with distilled water and the dried at 85°C for three hours. A mixture of 35g of pulverized ash and 80g of NaOH pellets was prepared in a 500ml beaker with 250ml of distilled water. This solution was stirred at 85°C for 2.5 hours, then cooled. The solution was centrifuged at 5000 rpm for five minutes using a REMI R-8C centrifuge. The clear Na_2SiO_3 solution obtained was treated with concentrated HCL and aged for 24 hours. The resulting gel was again centrifuged, washed with ethanol and distilled water, stirred for 30 minutes, and dried at 100°C . For two hours, calcination was carried out at 400°C in a muffle furnace



Fig: 2.2. Mixture of Pulverized Ash with NaoH Pellets

2.5. Preparation of Aloe vera solution

Fresh aloe vera leaves were collected and split into two sections. The inner gel was grinding into a fine paste, and the liquid extract was filtered using filter paper. A 10ml portion of the aloe vera extract was mixed with an equal amount of distilled water, and the solution was stirred for 30 minutes until it developed a pale-yellow color.

2.6. PREPARATION OF SiO_2 AND NiMoO_4 NANOCOMPOSITES

In a 250ml beaker, 0.1g of SiO₂ was mixed with 4g of sodium molybdate and 2g of nickel nitrate in a 2:1 molar ratio. The silica was dispersed in an aqueous solution, followed by the addition of 10ml of aloe vera extract. This mixture was stirred at 80°C for three hours and then centrifuged at 5000 rpm for five minutes. The precipitate obtained was washed with ethanol and distilled water, stirred for 30 minutes, and dried at 100°C for two hours. A final calcination step was inducted at 400°C in a muffle furnace for four hours.



Fig: 2.3. Mixture of Silica and Aloe vera Solution

3. Results and Discussions

3.1. Xray Diffraction

It is a rapid analytical technique primarily used for phase identification of a crystalline material. It is used to identify the crystalline structure of a nanomaterial.[6]

The average crystalline size of the material is calculated by Debye Scherrer equation,

$$D = \frac{k\lambda}{\beta \cos \theta} \text{ nm}$$

Where,

D is the crystallite size (nm)

K is the shape factor

λ is the wavelength

β is the Full Width Half Maximum.

θ is the Bragg's angle

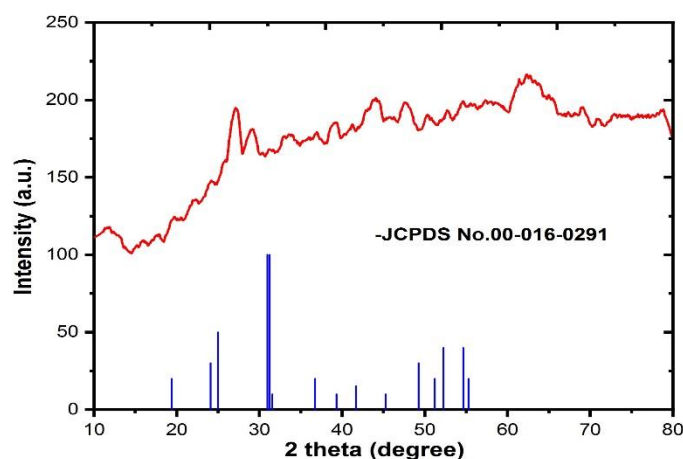


Fig: 3.1 XRD Patterns for SiO₂ – NiMoO₄ Nanocomposite

The structure of crystal and phase analysis of the sample were characterized by using X-ray diffraction. Powder. The average crystalline size of the particle is calculated for the largest peak and it was found to be 25.94nm. It shows that SiO₂ nanomatrix forms an amorphous nature. The calculated lattice parameters $a = 4.5800 \text{ \AA}$, $b = 5.6700 \text{ \AA}$, and $c = 4.8700 \text{ \AA}$, which are in good agreement with JCPDS file card No.00-016-0291

3.2. UV Visible

UV-Vis spectroscopy is a analytical technique that measures the amount of discrete wavelengths of UV or visible light that are absorbed by or transmitted through a sample.[7]

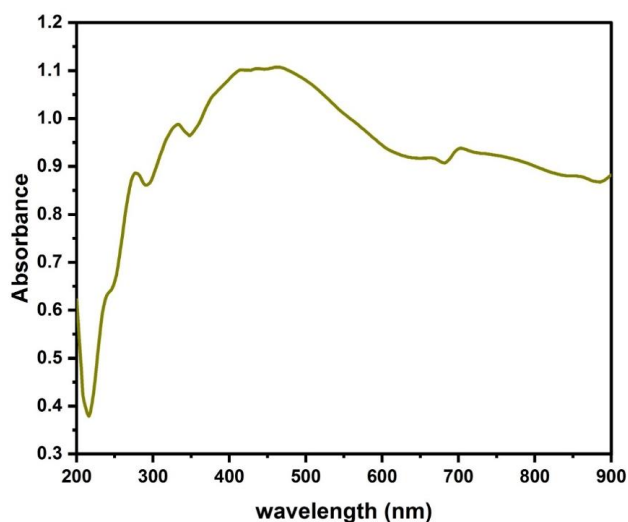


Fig.3.2. Absorbance as an ordinate and wavelength as abscissa for SiO₂-NiMoO₄

There is a strong absorption peak around 250-300nm followed by a relatively high absorbance across the visible range with a slow decline after 600nm. This indicates the presence of nanoparticles. The spectral shape suggests the presence of organic compounds, nanoparticles or dyes which absorb in the UV-Vis range.

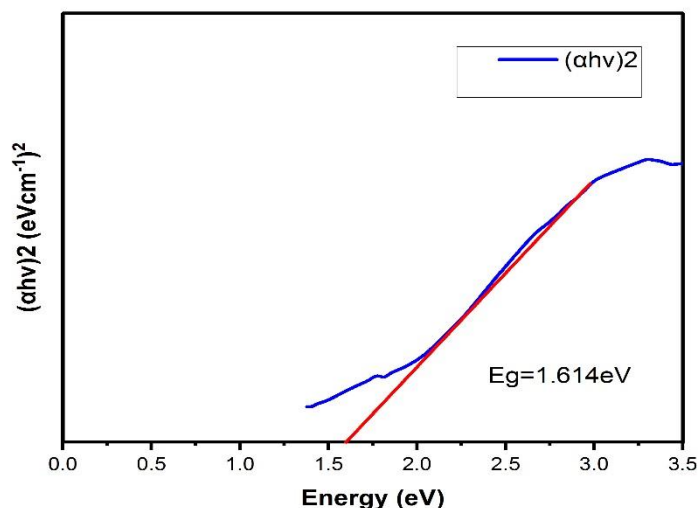


Fig 3.2.1. Bandgap of SiO₂-NiMoO₄

From fig.3.2.1, the bandgap energy of the prepared nanocomposite is determined as 1.61 eV.

4. Conclusion

In this study, a facile, self-template, co-precipitation technique is applied for the synthesis of NiMoO₄ and SiO₂ nanocomposites.

- The XRD results verify that the SiO₂ nano matrix forms an amorphous nature, whereas the NiMoO₄ nanocomposites exhibit a cubic phase structure.
- The average crystallite size of the particle was identified for the largest peak and was found to be 25.94 nm.
- From the UV-visible analysis, the prepared nanocomposites have higher optical absorption and obtained the bandgap values of 1.61 eV for SiO₂, NiMoO₄ and SiO₂ - NiMoO₄ nanocomposites.

5. References

[1] Lubitsch, et., al., (2018) – Supercapacitors: Properties and Applications Journal of Energy storage 2018, vol.17, pp.224-22.

- [2] Asma Mouthy, et., al., (2018) Highly efficient production of Mesoporous nano-silica from unconventional resource: Process optimization using a central composite nanoparticle. Microchemical Journal 145(2016) pp.139-145.
- [3] Robiansyah, et., al., (2024) Synthesis and characterization of Silicon Nanoparticles from coal fly ash using ultrasonication as a battery anode, vol.4No.2August2024, pp.23-32
- [4] Shebang Shukla., al., (2024) Highly efficient production of Mesoporous nano-silica from unconventional resource. Process optimization using a central composite Design Microchemical Journal 145(2019) pp. 139-145
- [5] Feng Yan, et., al., (2016) A green and Facile synthesis of ordered Mesoporous Nano silica using coal fly ash vol44654-4661
- [6] Libisch,et.,al (2018)- Supercapacitors: Properties and Applications Journal of Energy storage 2018, vol.17, pp.224-22
- [7] Neeraj Gupta, et., al., (2020) Enhanced thermophysical properties of Metal oxide nanoparticles for thermal energy storage application-Journal of Energy storage vol32(2020)10-177

**SACCHARUM OFFICINARUM DERIVED GRAPHENE OXIDE REDUCED BY
TAGETES ERECTA EXTRACT: A NOVEL APPROACH TO REDUCED
GRAPHENE OXIDE/COBALT OXIDE NANOCOMPOSITE**

A. Mary Miraculin, C. Infant Francita Fonseca

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

This study presents a novel method for synthesizing reduced graphene oxide (rGO) using Saccharum officinarum (sugarcane) derived graphene oxide (GO) and Tagetes erecta (marigold) extract. The investigation focuses on the development and characterization of rGO/CoO nanocomposites for super capacitor applications. The Tagetes erecta extract acts as a green reducing agent, offering an eco-friendly and cost-effective alternative to conventional chemical reducing agents. The synthesized nanocomposites were analysed using X-Ray Diffraction (XRD) and UV-Vis Spectroscopy to determine their structural and optical properties. The rGO/CoO nanocomposites exhibited impressive super capacitive behaviour, highlighting the potential of this novel approach in energy storage applications. This research contributes significantly to the advancement of sustainable materials.

KEYWORDS: Reduced graphene oxide, Cobalt oxide, Saccharum officinarum, Tagetes erecta, X-ray diffraction, UV-Vis spectroscopy.

INTRODUCTION:

The quest for renewable and efficient energy storage systems has driven significant research into the development of advanced materials. Graphene-based materials have garnered attention due to their exceptional electrical conductivity and surface area. In this manuscript, we explore a sustainable approach for producing reduced graphene oxide (rGO) using Saccharum officinarum derived graphene oxide (GO), reduced by Tagetes erecta extract. This green synthesis method aims to replace harmful chemical reductants with plant extracts, contributing to environmentally friendly manufacturing processes. The resulting rGO, when combined, with cobalt oxide (CoO), forms nanocomposites with enhanced electrochemical properties

AIM OF THE STUDY:

- ✓ To synthesize graphene oxide from saccharum officinarum, through oxidation process.
- ✓ To synthesize tagetes erecta extract.

- ✓ To synthesize reduced graphene oxide/cobalt oxide nanocomposite, using tagetes erecta extract as reducing agent, by thermal reduction process.
- ✓ To study the structural, optical properties and also to find band gap energy of rGO/CoO₃ using XRD and UV-Vis Spectroscopy.

MATERIALS AND METHODOLOGY:

Saccharum officinarum bagasse grinded well into fine powder + Ferrocene as Graphene Oxide, Tagetes erecta extract from the petals to reduce the graphene oxide, Cobaltous nitrate hexahydrate as a metallic salt to be anchored with rGO, Deionized water to prepare the solutions. The characterization techniques used were X-Ray Diffraction (XRD) for structural analysis, UV-Vis Spectroscopy for optical studies and band gap energy. 1 g of well ground sugarcane powder is mixed with 0.2 g of ferrocene and kept in muffle furnace directly. Graphene oxide is obtained through oxidation process and used for further analysis.



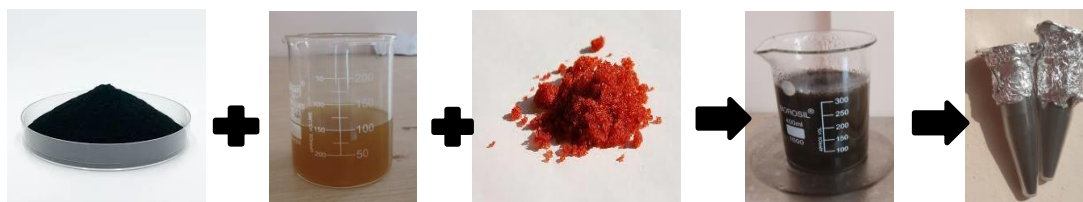
Petals of marigold are finely cut and dried under sunlight for 4-5 days. The dried petals are grinded well into fine powder. About 5 g of marigold powder is mixed in 100 mL of distilled water and heated for about 20 minutes. The extract is strained and is used as a reducing agent.



0.28 g of the synthesized GO is dispersed in 100 mL of distilled water and is stirred for about 30 minutes and then 8 g of cobaltous nitrate hexahydrate mixed in 100 mL of distilled water, and 100 mL of the marigold extract with 3 g of NaOH, are added with the GO dispersion and is stirred for about 3 hours at 95°C. In this process, the cobaltous nitrate is reduced to cobalt oxide using the marigold extract and the pH is maintained using the NaOH pellets. The mixture of Cobalt oxide and GO, is then centrifuged and then placed in a hot air oven for about 4 hours at 120°C. The dried mixture is then placed into muffle furnace for about 10 minutes at 450°C for calcination. A black product is obtained and is sent for further analysis.



The marigold extract is used to oxidize the cobaltous nitrate into cobalt oxide which is further used in the synthesis of rGO/cobalt oxide.



RESULT AND DISCUSSION:

XRD Analysis: This analysis is used to determine the crystalline size, structural properties and phase of the synthesized nanocomposite, using the JCPDS card number 078-0209 as reference. The average particle size of the nanocomposite is found by using the Debye-Scherrer formula:

$$D = \frac{K\lambda}{\beta \cos \theta} \text{ (nm)} \quad (1)$$

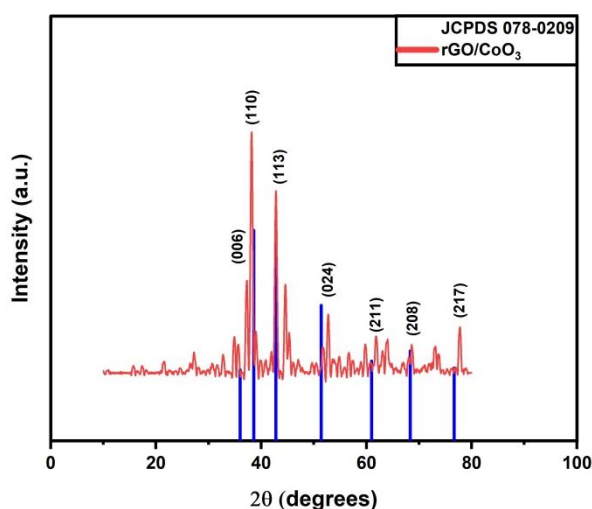
K –shape factor (approximately 0.9)

β – full width at half maximum (FWHM) of a diffraction peak

λ –wave length of the X-ray

θ -Bragg angle

The particle size is found to be 10.32 nm.



The XRD peaks for reduced graphene oxide/cobalt oxide exhibit strong peaks around $2\theta=25.04^\circ$, which indicates the reduction of GO to rGO, $2\theta=42.78^\circ$, $2\theta=60.99^\circ$ and $2\theta=76.67^\circ$ indicates the presence of CoO. The peak value of rGO, indicate the reduction of GO to rGO, by the marigold extract and the reduction of cobaltous nitrate into CoO.

UV-Vis Spectroscopy:

The band gap energy and the dielectric constant, are found through the following formulae:

$$E_g = \frac{1240}{A} \quad (2)$$

E_g -energy band gap

A-Absorbance

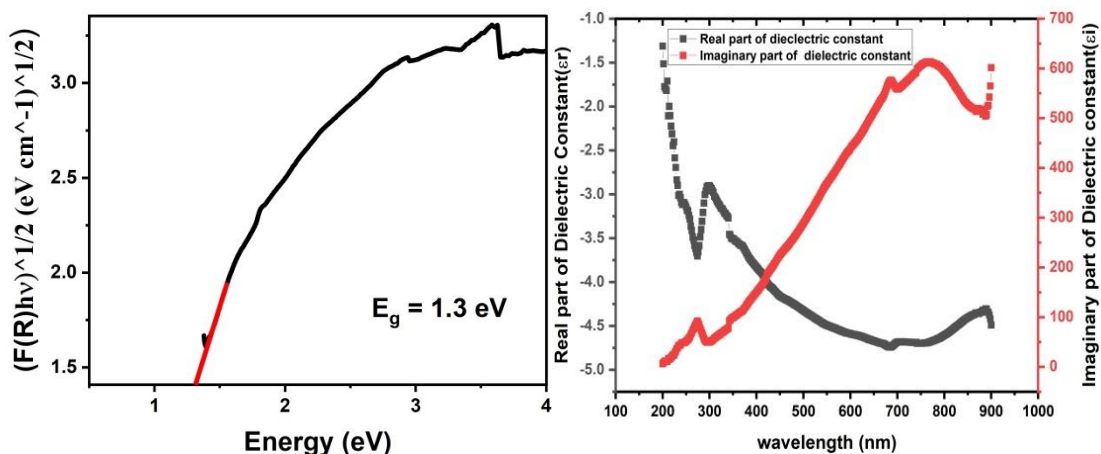
The number 1240, is a conversion factor.

$$\epsilon_r = n^2 - k^2 \text{ (real part of dielectric constant)} \quad (5)$$

$$\epsilon_i = 2*n*k \text{ (imaginary part of dielectric constant)} \quad (6)$$

n –refractive index

k -extinction coefficient



The band gap energy is observed as 1.31 eV. It is a crucial parameter to know about the electrical conductivity and optical properties of the synthesized nanocomposite. The dielectric constant is found to be 12.9 and is used to quantify the ability of the synthesized nanocomposite to store electrical energy, for supercapacitor applications.

CONCLUSION:

The rGO/CoO nanocomposite was successfully synthesized from the saccharum officinarum derived GO through thermal reduction process. The particle size of the synthesized nanoparticle, is found to be 10.32 nm, using the XRD analysis. The band gap energy of the synthesized nanoparticle, is found to be 1.31 eV, using the UV-Vis spectroscopy analysis. The synthesized nanocomposite is observed to have the characteristics of electric double

layer capacitors (EDLC). It can be used in memory backup, energy harvesting and hybrid vehicles.

REFERENCES:

1. Ikhwan Darmawan, Likkhasit Wannasen, Supree Pinitsoontorn (2024), *Synthesis, Characterization and Electrochemical Properties of Reduced Graphene Oxide Produced from Sugarcane Bagasse for Supercapacitor Applications*, *Journal of Biointerface Research in Applied Chemistry (BRIAC)*, Volume 14, pp 109 [1].
2. Baskar Thangaraj, Fathima Mumtaz, Yawar Abbas, Dalaver H.Anjum, Pravin Raj Solomon and Jamal Hassan (2023), *Synthesis of Graphene Oxide from Sugarcane dry leaves by two stage Pyrolysis*, *Journal of Molecules*, Volume 28, pp 3329-3338 [2].
3. Mirza Farrukh Waheed Baig, Syed Farhan Hasany and Muhammad Faizan Shirazi, (2023), *Green Synthesis of Nano Graphite Materials from Lemon and Orange Peel: A Sustainable Approach for Carbon-Based Materials*, *Journal of Engineering Proceedings*, Volume 46(1), pp 42 [3].
4. Sayantan Sinha, Kanhu Charan Andia, Naorem Aruna Devi and Bibhu Prasad Swain (2022), *Structural, Optical and Electrochemical Properties of Banana, Mango leaves and Potato Extracts reduced Graphene Oxide*, *Journal of Bulletin of Materials Science*, Volume 45(4), pp 226 [4].
5. S.Veeresh, H.Ganesha, Y.S.Nagaraju, H.Vijeth, M.Vandana, M.Basappa, H.Devendrappa (2022), *Graphene Oxide/Cobalt Oxide nanocomposite for high performance electrode for supercapacitor application*, *Journal of Energy Storage*, Volume 52, pp 104715 [5].
6. Yunfu Liu and Guo Lui (2022) *Green Synthesis and Electrochemical Performances* *Ionics*, Volume 28(7), pp 3547-3555 [6].
7. Taegun Kim, Edmund Samuel, Jaewoo Seol, Hae-Seok Lee, Sam S.Yoon (2022), *High energy density super capacitor using supersonically sprayed water-based precursors comprising cobalt-iron oxide and reduced graphene oxide nanosheets*, *International Journal of Energy Research*, Volume 46, pp 14305-14317 [7]
8. R.Kumar, R.Thangappan (2022), *Electrode material based on reduced graphene oxide (rGO)/transition metal oxide composites for super capacitor applications: A review*, *Journal of Emergent Materials*, Volume 5(6), pp 1881-1897 [8].
9. Dyah Ayu Fatmawati, Triyona, Wega Trisunaryanti and Uswatful Chasanah (2022), *Effects of Metal Concentration on Physiochemical Properties of Cobalt/Reduced*

- Graphene Oxide through one-pot greener thermal reduction using ultrasonic activation*, Rasayan Journal Chem., Volume 15 (No.4), pp 2969-2975 [9].
10. Nithin Joseph Panicker and Partha Pratim Sahu (2021), *Green Reduction of Graphene Oxide using Phytochemicals extracted from Pomelo Grandis and Tamarindus indica and its super capacitor applications*, Journal of Material Science: Material Electron, Volume 32, pp 15265-15278 [10]
 11. Murat Ates, Ozan Yoruk and Yuksel Bayrak (2021), *Binary Composites of Reduced Graphene Oxide and Cobalt(II,III) Oxide for Super capacitor devices*, Journal of Advanced Performance Materials, Volume 37, pp 1168-1182 [11].
 12. Jude N.Udeh, Raphel M.Obodo, Agnes G.Nkele, Assumpta C.Nwanya, Paul M.Ejikeme, Fabian I.Ezema (2021), *Recent Advances in Usage of Cobalt Oxide Nano materials Electrode Material for Super capacitors*, Journal of Electrode Materials for Energy Storage and Conversion, Volume 1, pp 141-170 [12].
 13. Veronica Deekala, Rathna Babu Guntur, Jyothsna Pragathi Yazala, Anitha Kowthalam, Ramesh Raju Rudra Raju (2021), *Cobalt Oxide Nanoparticles: Synthesis and Characterization*, Indo American Journal of Pharmaceutical Sciences, Volume 08(10), pp 22-28 [13].
 14. Sarika Jadhav, Ramchandra S. Kalubarme, Norihiro Suzuki, Chiaki Jerashima, Bharat Kale, Suresh W. Gosavi, Muthupandian Ashokkumar, Akira Fujishima (2021), *Probing Electrochemical Charge Storage of 3D Porous Hierarchical Cobalt Oxide decorated rGO in ultra-high-performance super capacitor*, Journal of Surface and Coatings Technology, Volume 419, pp 127287 [14]
 15. M.S.Amir Faiz, C.A. Che Azurahaman, S.A.Raba'ah, M.Z.Ruzniza (2020), *Low cost and Green Approach in Reduction of Graphene Oxide(GO), using Palm Oil Leaves Extract for Potential in Industrial Applications*, Journal of Environmental Chemical Engineering, Volume 16, pp 102954 [15].
 16. Mohd Asyadi Azam, Mohd Izham Radzi, Muazzin Mupit, Hissyamuddin Osman, Rose Farahiyan Munawar, Khairul Fadzil Samat, Mohd Shahadan Mohd Suan, Kazuki Isomura, Muhammad Remanul Islam (2020), *Cyclic Voltammetry and Galvanostatic Charge-Discharge Analyses of Polyaniline/Graphene Oxide Nanocomposite based Super capacitor*, Malaysian Journal on Composites Science and Manufacturing, Volume 3, pp 14-26 [16].

17. M.Iniya Pratheepa and M.Lawrence (2020), *Eco-Friendly Approach in Super capacitor Application: CuZnCdO nanosphere decorated in Reduced Graphene Oxide Nanosheets*, Journal of Springer Nature Applied Sciences, Volume 2, pp 318 [17].
18. Ghadah M. Al-Senani, Nasrallah M. Derazand Omar H. Abd-Elkader (2020), *Magnetic and Characterization Studies of CoO/Co₃O₄ Nano composite*, Journal of Processes, Volume 8(7), pp 844 [18].
19. Rouhollah Khani, Majid Irani (2020), *A Renewable Reduced Graphene Oxide/Cobalt Oxide Nanocomposite with excellent yield as adsorbent for determination trace-level of brilliant green in environmental water samples*, Journal of Research on Chemical Intermediates, Volume 46(4), pp 2137-2154[19].
20. Owolabi M. Bakole, Segun E. Olaseni, Moses A. Adeyemo and Adeniyi S.Ogunlaja (2020), *Microwave Assisted Synthesis of Cobalt Oxide/Reduced Graphene Oxide (Co₃O₄-rGO) Composite and its Sulfite Enhanced Photocatalytic Degradation of Organic Dyes*, from the Journal Zeitschrift fur Physikalische Chemie, Volume 234, pp 1681-1708[20].
21. R.Tamilselvi, M.Ramesh, G.S.Lekshmi, Olka Bazaka, Igor Levchenko, Kateryna Bazaka, M.Mandhakini (2020), *Graphene Oxide-based super capacitors from Agricultural Wastes: A step to mass production of Highly Efficient electrodes for Electrical Transportation Systems*, Journal of Renewable Energy, Volume 151, pp 731-739[21]
22. Gerardo Caldreron-Ayala, M.Cortez-Valadez, M.Acosta Elias, PG Mani-Gonzalez, Ma E Zayas, SJ Castillo, M.Flores Acosta (2019), *Graphite to Graphene: Green Synthesis using Opuntia ficus indica*, Journal of Electronic Materials, Volume 48, pp 1553-1561[22]
23. Prodyut Dhar, Bruna Pratto, Antonio Jose Goncalves Cruz and Sandip Bankar (2019), *Valorization of Sugarcane Straw to produce Highly Conductive Bacterial Cellulose/Graphene Nanocomposite Films through in situ Fermentation: Kinetic Analysis and Property Evaluation*, Journal of Cleaner Production, Volume 238, pp 1859[23]
24. E.L.Viljoen, P.M.Thabede, M.J.Moloto, K.P.Mubiayi, B.W.Dikiza (2019), *The Influence of Sodium Hydroxide Concentration on the Phase, Morphology and Agglomeration of Cobalt Oxide nanoparticles and Application as Fenton catalyst*, Digest Journal of Nanomaterials and Biostructures, Volume 14, pp 1131-1137[24]



25. Ella L. Dzidziguri, Elena N.Sidorova, Marzhan Inkar, Andrey G.Yudin, Elena V. Kostitsyna, Dmitry Yu Ozherelkov, Konstantin V. Slusarsky, Anton Yu Nalivaiko, Alexander A. Gromov (2019), *Cobalt Nanoparticles Synthesis by Cobalt nitrate solution*, Journal of Materials Research Express, Volume 6(10), pp 105081[25]

A NOVEL GREEN SYNTHESIS ROUTE TO ZnO NANOPARTICLES: RED BANANA PEEL-MEDIATED SYNTHESIS AND MULTIANALYTICAL CHARACTERIZATION

S. Sakthi Parkavi , J. Kethzy Agnes

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

This study presents the green synthesis of ZnO nanoparticles using Red Banana peel extract as a natural reducing and stabilizing agent. X-ray diffraction (XRD) confirms the formation of highly crystalline ZnO with a crystallite size of 32 nm. Fourier-transform infrared (FTIR) spectroscopy identifies functional groups from Red Banana peel, indicating enhanced stability and bioactivity. The synthesized ZnO nanoparticles demonstrate promising applications in photocatalysis for environmental remediation, antibacterial coatings, and solar energy conversion. This eco-friendly approach highlights the potential of ZnO nanoparticles for sustainable and multifunctional applications.

KEYWORDS: ZnO Nanoparticles, Red banana peel, green synthesis, XRD, FTIR.

INTRODUCTION:

Zinc oxide (ZnO) nanoparticles possess unique physicochemical properties, including strong UV absorption, high photocatalytic activity, chemical stability, and antimicrobial performance. These attributes make them useful in cosmetics, pharmaceuticals, ceramics, sensors, environmental remediation, and optoelectronic devices. Conventional synthesis methods such as sol-gel, precipitation, and hydrothermal techniques can produce high-quality ZnO nanoparticles but often involve toxic reagents, high temperatures, and energy-intensive processes, leading to environmental concerns. Green synthesis has emerged as a sustainable alternative, employing plant extracts and agricultural waste as natural reducing, capping, and stabilizing agents. Such materials contain bioactive compounds—polyphenols, flavonoids, proteins, and carbohydrates—that facilitate nanoparticle formation without harmful chemicals. Red banana peel, an abundant agro-waste, is rich in carbohydrates, amino acids, and antioxidants, making it an effective and eco-friendly synthesis medium. This study investigates the green synthesis of ZnO nanoparticles using red banana peel extract, aiming to develop a cost-effective, scalable, and environmentally safe production method.

MATERIALS AND METHODS:

Fresh red banana peel was taken, washed several times with tap water and Cut into many pieces. The cut Red Banana peel and distilled water were combined in 1:10 ratio For extraction process. This solution covered with aluminum foil and boiled at 70°C hot plate for 30 min and stirred at 1000 rpm. Light Brown banana peel extract was obtained and this extract was cooled At room temperature. This extract was filtered using filter paper and stored at 4°C. 21.95g of zinc acetate dihydrate mixed with 100 ml of distilled water. It was then stirred at room temperature about 45 min at 700 rpm. 10 ml of banana peel extract mixed with 90 ml of zinc acetate dihydrate. It is then stirred at room temperature about 1 hour 30 min at 700 rpm. The pH value of the solution is maintained at 12 by dropwise addition of NaOH. This solution was stirred at room temperature about 1 hour at 400 rpm. Next day, white precipitate was obtained. The precipitate was filtered and dried in hot air oven at 100°C for 2 hours. White colour ZnO nanoparticles was thus synthesized.

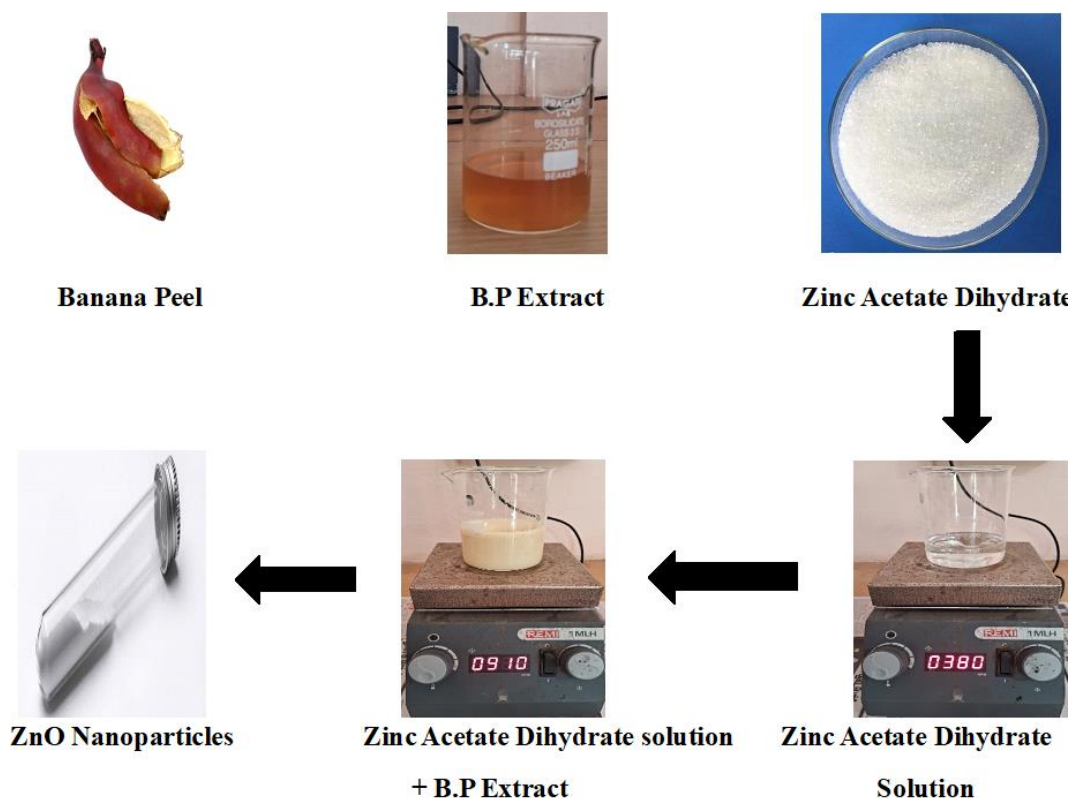


Fig: 1 Synthesis of ZnO Nanoparticles using Red Banana Peel

RESULT AND DISCUSSION:

The X - ray diffraction (XRD) pattern of the as-prepared sample was studied using X-ray diffractometer with Cu K α radiation of wavelength 1.5405Å. XRD diffraction graph for the as-synthesized sample is shown in the figure 2. Diffraction peaks at the positions of 31.7°, 34.4°, 36.2°, 47.5°, 56.6°, 62.8°, 66.3°, 67.9°, 69°, 72.5° and 76.9° correspond to (100), (002),

(101), (102), (110), (103), (200), (112), (201), (004), (202) planes, respectively, which are in good agreement with the standard JCPDS card no. #6-1451 for hexagonal wurtzite ZnO_[2]. The average crystalline Size D is 32 nm was calculated by the Debye Scherer equation. The calculated lattice constants were $a=b=3.242\text{\AA}$ and $c=5.205\text{\AA}$ _[3].

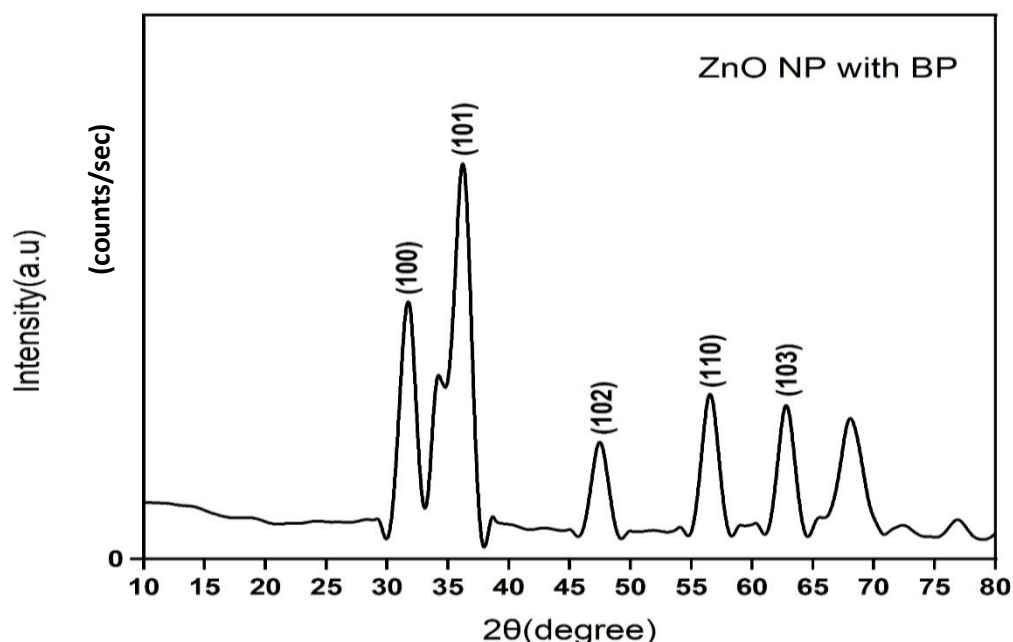


Fig: 2 XRD pattern of ZnO Nanoparticles

The Fourier Transform Infrared Spectroscopy was used to identify the functional groups of the active components. X-axis represent the vibrational modes of chemical bonds in the sample. The range is 4000 cm^{-1} to 400 cm^{-1} , which covers most functional group vibrations. The y-axis represents how much infrared light passes through the sample. Lower transmittance at a specific wavenumber indicates absorption due to molecular vibrations. The peak $460\text{--}750\text{ cm}^{-1}$ represent the Zn-O bond stretching vibrations, confirming the presence of ZnO nanoparticles. The peak $1141\text{--}1566\text{ cm}^{-1}$ represent C-H bending, C=C stretching, or other organic functional groups. The peak 2368 cm^{-1} represent CO_2 absorption from the atmosphere. The peak $3464\text{--}3873\text{ cm}^{-1}$ represent O-H stretching, indicating the presence of hydroxyl (-OH) groups, which could be due to adsorbed water or surface hydroxylation. The spectrum confirms the presence of ZnO nanoparticles due to the Zn-O vibrational peaks_[4].

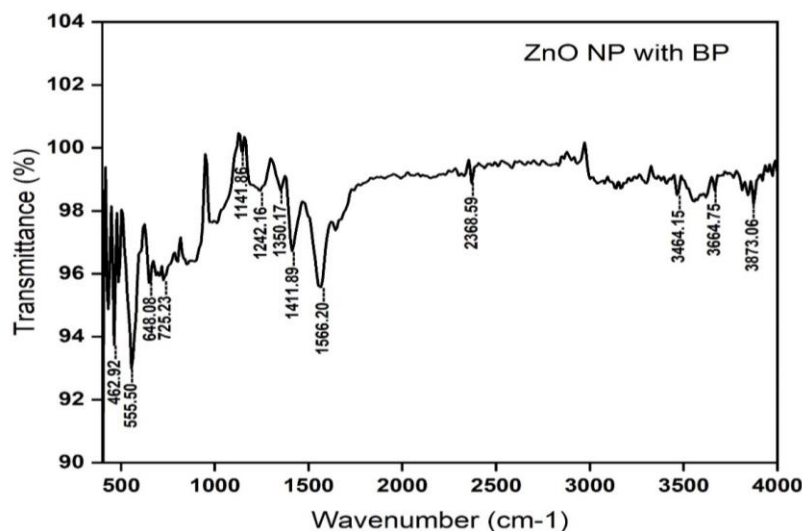


Fig: 3 FTIR spectra of ZnO Nanoparticles

CONCLUSION

XRD confirms the crystalline nature of ZnO nanoparticles with a crystallite size of 32 nm. FTIR spectroscopy identifies the functional groups present, indicating interactions between ZnO and bioactive compounds from Red Banana peel, which may enhance its stability and functionality. These are effective for environmental remediation, such as wastewater treatment and air purification. The biofunctional properties from Red Banana Peel make them promising for antibacterial coatings, wound healing, and drug delivery. Their optical properties make them suitable for solar cell enhancements and sensor technologies.

REFERENCE

- [1] Riya Chugh, Gurmeet Kaur, (2022), *A mini review on green synthesis of nanoparticles by utilization of Musa-balbisiana waste peel extract*, Journal of chemistry, vol.11, pp.1404.
- [2] OlviDyah Fernanda, Tasha FebriyaPutri, sitimarfua, AdilahAliyatulmuna, FauziatulFajarah, (2021), *Utilization of banana peels extracts in the synthesis of ZnO nanoparticles*, AIP publishing, vol.070004.
- [3] F.H. Abdullah, N.H.H. Abu Bakar, M. Abu Bakar, (2021), *Comparative study of chemically synthesized and low temperature bio-inspired Musa acuminata peel extract mediated zinc oxide nanoparticles for enhanced visible-photocatalytic degradation of organic contaminants in wastewater treatment*, Journal of hazardous material, vol.406, pp.124.
- [4] Waseem Ahmad, Sarfaraz Ahmed, Mahvish Shameem, Sanjay Kumar & amp Shoeb, Anwar Ansari (2025), *environmental monitoring and assessment*, vol.197.

ENHANCED OPTICAL CHARACTERIZATION OF CASSAVA STARCH MEDIATED CERIUM OXIDE NANOPARTICLES

R. Sankaraeswari, S. Irudaya Sahaya Lancy

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT:

Cerium oxide (CeO_2) nanoparticles have gained significant attention due to their unique optical and catalytic properties. This study explores the synthesis of CeO_2 nanoparticles using cassava starch as a natural mediator. The biosynthesis approach enhances particle stability, reduces aggregation, and provides an eco-friendly alternative to conventional chemical methods. The structural and optical properties of the synthesized nanoparticles were analysed using UV-Vis spectroscopy, with a Tauc plot employed to determine the optical band gap. The results indicate that cassava starch plays a crucial role in controlling nanoparticle size and enhancing optical performance. The synthesized CeO_2 nanoparticles exhibit promising potential for applications in catalysis, sensors, and biomedical fields.

KEYWORDS: CeO_2 (Cerium oxide), Cassava Starch, UV-VIS Spectroscopy.

1.INTRODUCTION

Cassava starch, obtained from the roots of *Manihot esculenta* Crantz, is a versatile natural polymer widely used in food, pharmaceutical, and cosmetic industries due to its biodegradability, renewability, and cost-effectiveness [1]. Beyond its conventional applications, cassava starch has recently attracted attention in nanotechnology as a green stabilizing and mediating agent for nanoparticle synthesis, offering an eco-friendly alternative to chemical stabilizers. Cerium, a rare earth metal belonging to the lanthanide series (atomic number 58), exists in +3 and +4 oxidation states and forms cerium oxide (CeO_2), a technologically significant material with unique optical and catalytic properties [2]. CeO_2 is extensively used as an ultraviolet absorber, catalyst, polishing agent, and gas sensor material, and plays a vital role in solid oxide fuel cells due to its excellent oxide ion conductivity [3]. In recent years, nanostructured CeO_2 has gained increasing importance in biomedical applications, demonstrating protective effects against radiation and oxidative stress, as well as therapeutic potential in conditions such as brain and cardiac ischemia, neurological disorders, and retinal neurodegeneration [4]. Considering these advantages, the present study focuses on developing an environmentally friendly method for CeO_2 nanoparticle synthesis using cassava starch as a natural mediator. The objectives of this work are to extract cassava

starch from tapioca roots, synthesize CeO_2 nanoparticles using cassava starch as a green reagent, investigate their structural properties, and analyze their optical characteristics through UV-Vis spectroscopy.



Fig:1 Cassava Starch

2.MATERIALS AND METHODS

Fresh cassava tubers (100 g) were thoroughly washed, peeled, and shredded, then liquefied with 200 ml of distilled water. The resulting mixture was screened using muslin cloth, and the filtrate was collected. The filtrate was allowed to settle, the supernatant was discarded, and the starch sediment was collected from the bottom of the beaker. For nanoparticle synthesis, 100 g of cassava root extract was prepared by grinding the tubers in a blender, and the resulting solution was mixed with 100 ml of 1 M cerium solution. The mixture was continuously stirred using a magnetic stirrer for approximately 4 hours to promote nanoparticle formation. The precipitate obtained was washed five times with ethanol and distilled water to remove impurities, then dried in a hot air oven and annealed at 300 °C for 2 hours. The synthesized cerium oxide nanoparticles were characterized using UV-Vis spectroscopy to analyse their optical properties.



Fig:2 Prepared CeO₂ Nanoparticles

3.RESULT AND DISCUSSION

V – VIS Spectroscopy

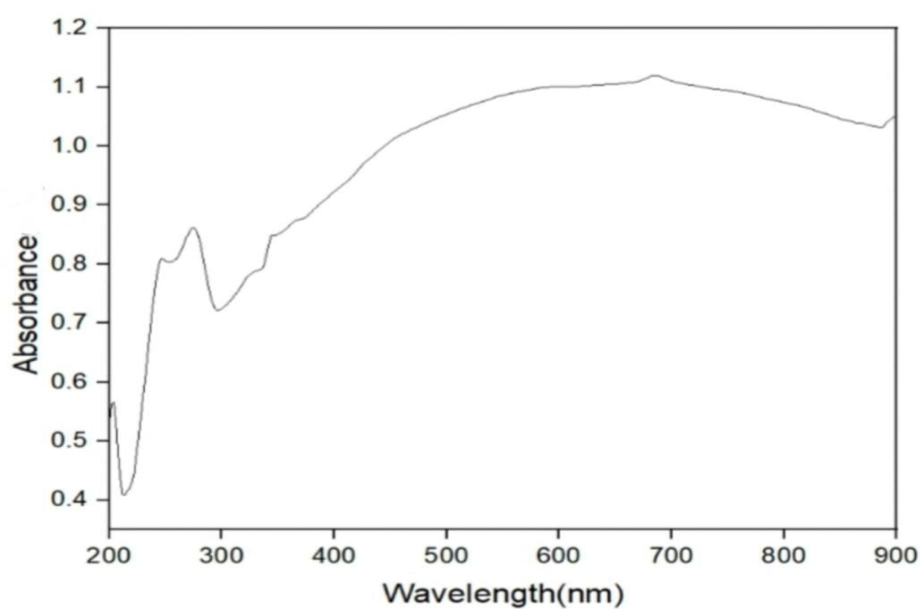


Fig:3 UV-VIS Spectra of the CeO₂ Nanoparticles

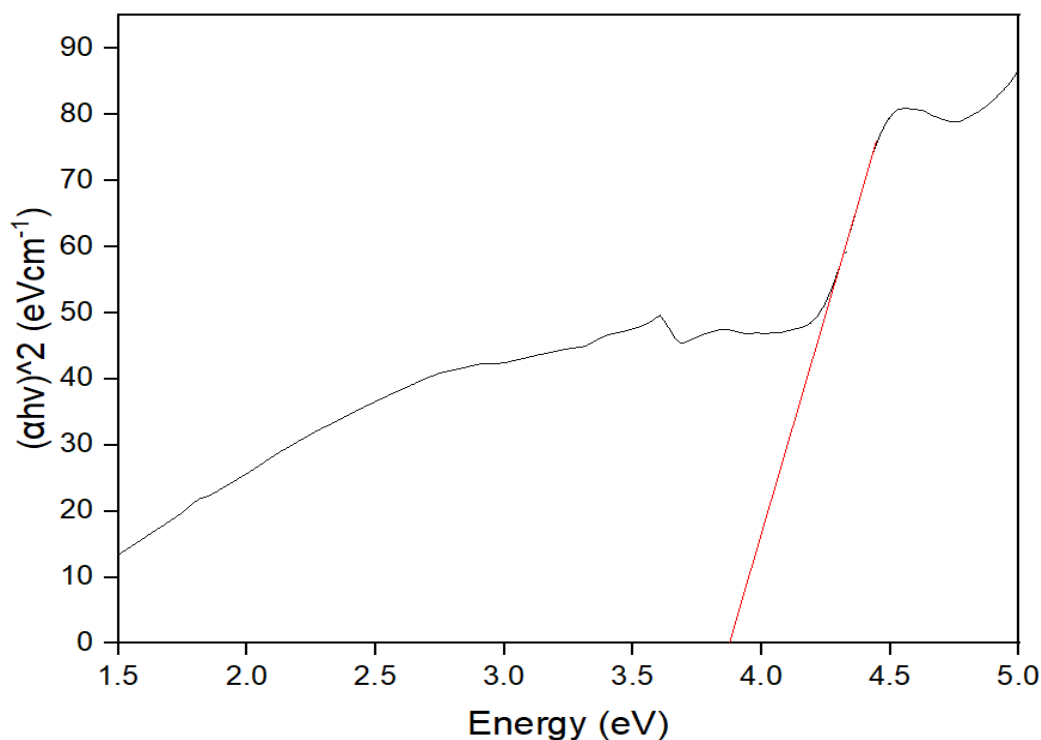


Fig:4 Tauc plot of CeO₂ Nanoparticles

Optical Band Gap Analysis of CeO₂ Nanoparticles: The optical properties of cerium oxide (CeO₂) nanoparticles synthesized using cassava starch were analysed using UV-Vis spectroscopy. The Tauc plot, derived from the absorbance spectrum, was used to estimate the optical band gap energy (E_g). The extrapolation of the linear region to the x-axis provides the optical band gap of the synthesized nanoparticles. From the graph, the estimated band gap energy was found to be 3.8 eV.

This value is higher than the reported band gap of CeO₂ (~3.2 eV), indicating the influence of quantum confinement effects due to the nanoscale dimensions of the synthesized nanoparticles. The increase in band gap suggests a reduction in particle size, which is consistent with previous studies on nanostructured CeO₂. Furthermore, the successful synthesis of CeO₂ nanoparticles using cassava starch as a green stabilizing agent demonstrates the potential of eco-friendly synthesis methods in nanomaterial production.

4.CONCLUSION

The successful synthesis of CeO₂ nanoparticles using cassava starch demonstrates the viability of a green and sustainable approach for nanomaterial production. The obtained nanoparticles exhibit a wide band gap of 3.8 eV, making them suitable for applications requiring high optical transparency and photocatalytic activity. The role of cassava starch in stabilizing and mediating the growth of nanoparticles highlights its potential as a cost-effective and biodegradable alternative to synthetic stabilizers. These findings pave the way for further exploration of biogenic synthesis routes for advanced nanomaterials with enhanced functionalities.

5.REFERENCE

- [1] K Sriroth, V Santisopasri, C Petchalanuwat, K Kurotjanawong, K Piyachomkwan, C.G Oates e (1999) Cassava starch granule structure–function properties: influence of time and conditions at harvest on four cultivars of cassava starch, Volume 38, Issue 2, pp.161-170.
- [2] Cassandra Korsvik, *et al.* Superoxide dismutase mimetic properties exhibited by vacancy engineered ceria nanoparticles Chem. Commun., 10 (2007), pp. 1056-1058
- [3] Jessica T. Dahle, Yuji Arai Environmental geochemistry of cerium: applications and toxicology of nanoceria Int. J. Environ. Res. Public Health, 12 (2) (2015), pp. 1253-1278
- [4] Marcel Culcasi, *et al.* EPR spin trapping evaluation of ROS production in human fibroblasts exposed to nanoceria: evidence for NADPH oxidase and mitochondrial stimulation Chem. Biol. Interact., 199 (3) (2012), pp. 161-176.

SELF-COMPASSION AND RESILIENCE AMONG POLICE OFFICERS AND ARMY PERSONNEL

Bhavani. K* and Rev.Fr. John Suresh

PG Department of Psychology, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

Self-compassion is a crucial psychological resource that promotes emotional well-being and resilience, particularly in high-stress professions such as the military and law enforcement. This study examines the role of self-compassion (independent variable) in predicting resilience (dependent variable) among army personnel and police officers. A total of 100 participants (50 army personnel and 50 police officers) were assessed using standardized measures of self-compassion and resilience. Pearson correlation was conducted using SPSS version 23.0 to determine the strength of self-compassion in fostering resilience. The findings revealed a strong positive correlation between self-compassion and resilience in both populations, with army personnel exhibiting a slightly stronger correlation compared to police officers. These results suggest that promoting self-compassion may enhance resilience, particularly among military personnel who face prolonged exposure to stress and adversity. The study underscores the need to integrate self-compassion training into resilience-building programs for individuals in demanding professional roles.

Keywords: self-compassion, resilience, army personnel, police officers, Pearson correlation.

INTRODUCTION

Aim

To assess the relationship between self-compassion and resilience among police officers and army personnel

Self-Compassion

Self-compassion, at the honest of mindfulness, has been defined as “an orientation of mind that recognizes pain and the universality of pain in human experience and the capacity to meet that pain with kindness, empathy, equanimity and patience.”

- Feldman and Kuyken, 2011

Kristin Neff conceptualizes self-compassion as composed of three mercurial subcomponents

Self-Kindness versus Self-Judgment

Self-kindness means treating oneself with care and understanding rather than harsh judgment. It involves soothing and comforting oneself, much like supporting a loved one in distress. It emphasizes emotional availability over self-criticism.

Common Humanity versus Isolation

Common humanity is recognizing struggles as part of the shared human experience rather than feeling alone in suffering. It fosters connection and belonging. Isolation, its opposite, creates a false belief that others are better off and cannot relate to one's difficulties.

Mindfulness versus Overidentification

Mindfulness is accepting the present with balanced awareness, neither avoiding nor exaggerating discomfort. Overidentification, in contrast, means becoming overly absorbed in negativity, distorting perception and emotions.

Resilience

Resilience is the buffer capacity or ability to absorb perturbation or the magnitude of the disturbance that can be absorbed before a system change its structure by changing the variables and processes that control behaviour

- **Pimm 1984**

The Resilience Building Theory

The resilience building theory was propounded by Yoesoep Edhie Rachmad in 2022. This theory was evolved to help individuals and organisations to establish their capacity to affront and conquer various hindrance. The basic notion of this theory encompasses developing emotional, mental, and social skills that permit individual or organisations to cope with stress and pressure effectively. This theory is feasible in various fields such as human resource management, psychology, education, and social communication.

Resilience building theory requires a holistic and structured approach for executing.

- To evaluate the needs of resilience and obstacles in building resilience.
- To develop training programs and ceaseless evaluation.
- To promote effective strategies include strengthening social support networks.

Resilience building theory gave prominence to the importance of developing the individual's capability to bounce back and adopt in the face of adversity. (Yoesoep Edhie Rachmad, 2022)

Need for study

Police and Army personnel work in highly stressful environments that demand emotional strength and mental resilience. They often face traumatic situations that can impact their well-being. Self-compassion helps manage stress, reduces anxiety, and enhances resilience, improving decision-making and work-life balance. Research on this can help develop training programs to support their mental health.

MATERIALS AND METHODS

Review of literature

Bag, S. D., Kilby, C. J., Kent, J. N., Brooker, J., & Sherman, K. A. (2022), conducted a study titled “Resilience, Self-Compassion, and Psychological Well-Being.” The study aimed to examine the relationship between resilience, self-compassion, and psychological well-being. Results indicated that both resilience and self-compassion positively correlated with optimism and life satisfaction while negatively correlating with depressive symptoms.^[1]

Janssens, K. M., van der Velden, P. G., Taris, R., & van Veldhoven, M. J. (2021), conducted a study titled “Resilience, Hardiness, and Psychological Capital Among Police Officers: A Systematic Review.” The study aimed to systematically review 22 studies on resilience, hardiness, and psychological capital among police officers. The results indicated weak to moderate associations with health variables but noted a lack of focus on professional functioning.^[2]

Chitra, T., & Karunanidhi, S. (2021), conducted a study titled “The Effectiveness of Resilience Training for Female Police Officers.” The study aimed to evaluate the effectiveness of resilience training in reducing stress and enhancing job satisfaction and well-being. The results indicated significant improvements in psychological well-being and job-related outcomes.^[3]

Khanjani, S., Asmari, Y., Mousavi Asl, E., & Ashouri, A. (2020), conducted a study titled “The Mediating Role of Self-Compassion in the Relationship Between Non-Suicidal Self-Injury and Mental Pain in Soldiers.” The study aimed to investigate the relationship

between NSSI and mental pain, with self-compassion as a mediating factor. Results indicated that self-compassion negatively correlated with mental pain and helped mitigate its effects. ^[4]

Hartley, T. D., & Baldwin, B. (2020), conducted a study title “Building Resilience in Law Enforcement: A Study of the Officer Resilience Training Program “. The study aims to Evaluate the Officer Resilience Training Program’s effectiveness in enhancing resilience. The sample of this study were 150 police officers. As a result, indicates that there was a significant improvement in resilience, emotional regulation, and overall well-being. ^[5]

Hypotheses

- H1-There will be a significant relationship between self-compassion and resilience among army personnel.
- H2-There will be a significant relationship between self-compassion and resilience among police officers.

Variables

- Independent Variable – Self Compassion
- Dependent Variable - Resilience

Sample Size

Data were collected using the snow ball sampling method from 50 police officers and 50 army personnel.

Measures

- Self-Compassion Scale Short Form. (Neff, K.D et al. 2011)
- Brief Resilience Scale. (Bruce W.S et al. 2008)

Statistical analysis

For the statistical analysis, SPSS 23 was used. A statistical indicator of the strength of the association between the variation of two variables is the correlation coefficient. The T-test, an inference statistic that is used to decide whether there is a significant variation in the

averages of two groups that may be related in some ways, was used to determine the variance between samples.

RESULT AND DISCUSSION

Table 1: Descriptive statistic of study variables for Army personnel

Variables	Mean	Standard deviation
Self-compassion	4.0700	3.63701
Resilience	3.3209	.48948

Table 1 shows the descriptive statistics of the measured variables scores. The mean and standard deviation obtained by the participants in the study were revealed.

Table 2: Descriptive statistics of study variables for Police personnel

Variables	Mean	Standard deviation
Self-compassion	3.4696	.39037
Resilience	3.3174	.38082

Table 2 shows the descriptive statistics of the measured variables scores. The mean and standard deviation obtained by the participants in the study were revealed.

Table 3: Relationship between self-compassion and resilience among Army personnel

Variable	N	“r” value
Self-compassion	48	
Resilience	48	.641**

$p < 0.01^{**}$

The result presented in table 3 shows that the relationship between self-compassion and resilience among army personnel. The result revealed that there is a positive and significant relationship between self-compassion and resilience with an “r” value of .641**, which is significant at the level of $^{**}p < 0.01$. This reveals the acceptance of directional hypothesis (H1) “there will be a significant positive relationship between self-compassion and resilience among army personnel”.

Table 4: Relationship between self-compassion and resilience among Police officers.

Variable	N	“r” value
Self-compassion	46	
Resilience	46	.375**

p<0.01*

The result presented in table 4 shows that the relationship between self-compassion and resilience among army personnel. The result revealed that there is a positive and significant relationship between self-compassion and resilience with an “r” value of .375*, which is significant at the level of *p<0.01. This reveals the acceptance of directional hypothesis (H2) “there will be a significant positive relationship between self-compassion and resilience among police officers”.

Discussion

The aim of the study is to assess the relationship between self-compassion and resilience among police and army personnel. The statistical techniques used for data analysis were Pearson's correlation to find the relationship between Self-compassion and resilience, regression analysis to find out the influence of Self-compassion and resilience among police and army personnel. The data were analyzed using the Statistical Package for Social Sciences (SPSS) for Windows version 23.0.

Table 3 indicates that there is a positive and significant correlation between self-compassion and resilience among army personnel ($r = 0.641^{**}$, $p < 0.01$). This research suggests that individuals who exhibit higher self-compassion are also likely to demonstrate greater resilience, which aligns with the alternate hypothesis (H1) that "There will be a significant positive relationship between self-compassion and resilience among army personnel." indicating that self-compassion plays a vital role in fostering resilience among army personnel. ^[6]

Table 4 illustrates the link between resilience and self-compassion among police officers. The findings confirmed the proposed hypothesis (H2) by revealing a positive and significant correlation between resilience and self-compassion ($r = .375^{*}$, $p < .01$). Consistent with earlier studies, this suggests that police officers with greater levels of self-compassion tend to exhibit higher resilience. Self-compassion enhances resilience by serving as a protective factor against the adverse effects of stress, ^[6] Resilience is crucial for effectively

addressing work-related challenges in high-pressure jobs such as law enforcement. Police officers frequently encounter stressful situations, emotional exhaustion, and traumatic experiences, all of which can affect their mental well-being.^[7]

CONCLUSION

Summary

This study examined the relationship between self-compassion on resilience among police officers and army personnel using a cross-sectional design. A total of 100 participants (50 police officers, 50 army personnel) were assessed using the Self-Compassion Scale and Brief Resilience Scale. Pearson's correlation analysis in SPSS 23.0 revealed a significant positive relationship between self-compassion and resilience in both groups, with a stronger correlation among army personnel. These findings suggest self-compassion plays a crucial role in fostering resilience, particularly in military settings, emphasizing its importance in high-stress occupations.

Conclusion

The study found a significant relationship between self-compassion and resilience in both police officers and army personnel, with a stronger correlation in army personnel. Self-compassion emerged as a key predictor of resilience, highlighting its role in psychological well-being and stress management. Future research and interventions on self-compassion training could enhance resilience and mental health in military and law enforcement sectors.

REFERENCES

1. Bag, S. D., Kilby, C. J., Kent, J. N., Brooker, J., & Sherman, K. A. (2022). Resilience, self-compassion, and indices of psychological wellbeing: A not so simple set of relationships. *Australian Psychologist*, 57(4), 249–257. DOI: 10.1080/00050067.2022.2089543.
2. Janssens KM, van der Velden PG, Taris R, van Veldhoven MJ, 2021. Resilience, hardiness, and psychological capital among police officers: A systematic review. *Policing: An International Journal*, 44(1): 1–17. DOI: 10.1108/PIJPSM-12-2019-0195
3. Chitra T, Karunanidhi S, 2021. The effectiveness of resilience training for female police officers. *Indian Journal of Health and Wellbeing*, 12(1): 52–57.
4. Khanjani S, Asmari Y, Mousavi Asl E, Ashouri A, 2020. The mediating role of self-compassion in the relationship between non-suicidal self-injury and mental pain in

soldiers. *Journal of Aggression, Maltreatment & Trauma*, 29(9): 1065–1078. DOI: 10.1080/10926771.2019.1661861

- 5 Hartley TD, Baldwin B, 2020. Building resilience in law enforcement: A study of the Officer Resilience Training Program. *Journal of Police and Criminal Psychology*, 35(2): 144–155. DOI: 10.1007/s11896-019-09348-1
- 6 Finlay-Jones A, 2017. The role of self-compassion in resilience and mental health. *Clinical Psychologist*, 21(2): 90-103. DOI: 10.1111/cp.12131.
- 7 Galatzer-Levy IR, 2013. The role of stress and resilience in law enforcement. *Journal of Traumatic Stress*, 26(2): 223-230. DOI: 10.1002/jts.21899; PMID: 23568477.

A STUDY ON PERCEIVED PARENTING, DOGMATISM AND OPENNESS TO EXPERIENCE AMONG SIBLING AND NON-SIBLING ADOLESCENTS

Kavya Meera. M* and Rev. Dr. Fr. John Suresh

PG Department of Psychology, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

Parenting plays a crucial role in shaping adolescents' cognitive and personality development. This study examines the relationship between perceived parenting, dogmatism, and openness to experience among adolescents, comparing differences between single children and those with siblings, as well as gender variations. A cross-sectional research design was used, and data were collected from 300 adolescents in Thoothukudi using standardized scales. The Perceived Parenting Style Scale, Dogmatism Scale, and Openness to Experience Scale were administered, and statistical analyses, including t-tests, were conducted using SPSS 23.0.

Findings indicate that Sibling adolescents reported higher authoritarian parenting, whereas non-siblings exhibited greater openness to experience. Gender differences were observed, with females scoring higher in openness and males experiencing more permissive parenting. These results emphasize the impact of parenting styles on adolescent belief systems, highlighting the need for balanced parenting approaches and cognitive flexibility training. The study suggests parenting interventions, educational programs, and further research on cultural and psychological influences to enhance adolescent adaptability and social development.

Key words: Perceived Parenting, Dogmatism, Openness to Experience, Adolescence, Cognitive Flexibility, Parenting Styles, Personality Development.

INTRODUCTION

Aim: This study aims to explore Perceived Parenting and Personality traits- Dogmatism and Openness to experience among sibling and non-sibling adolescents.

Parenting plays a fundamental role in shaping an individual's emotional, cognitive, and social development. Perceived parenting refers to how children interpret their parents' behaviours, which significantly influences their belief systems, personality traits, and adaptability. Parenting styles, as defined by Baumrind, fall into authoritative, authoritarian and permissive categories, each impacting adolescent development differently. Adolescence

is a critical period of identity formation where peer influence increases, and parental guidance plays a key role in shaping belief flexibility and openness to new experiences.

A key aspect of parenting is the presence or absence of siblings, which affects an adolescent's socialization, emotional intelligence, and independence. Single children often receive undivided parental attention, leading to potential overprotection and higher expectations, while children with siblings develop social negotiation skills through shared experiences.

Dogmatism refers to a rigid and closed belief system, where individuals resist change and reject differing viewpoints. In contrast, openness to experience is a personality trait associated with intellectual curiosity, creativity, and willingness to explore new ideas.

This study is grounded on the following theories,

- Rokeach's Dogmatism Theory (1960) explains how individuals with high dogmatism tend to resist alternative viewpoints, often influenced by rigid parental control.
- Baumrind's Parenting Styles (1966) Theory help explain how perceived parenting shapes an adolescent's cognitive flexibility, belief system, and openness to new experiences.
- Big Five Personality Theory (1997), This theory explains how openness varies among individuals and can be shaped by parenting styles and environmental influences.
- Attachment Theory (1969) suggests that early parent-child attachment influences later cognitive and emotional development. Secure attachment is linked to higher openness, while insecure attachment may lead to rigid thinking and dogmatism.

Need for the study

Understanding the influence of perceived parenting on adolescent cognitive and personality development is crucial in today's changing family structures. With the rise of nuclear families and single-child households, it is important to explore how parenting styles impact belief systems, adaptability, and decision-making in adolescents and increasing ideological rigidity, social media influence, and mental health concerns highlight the need to study how parenting affects cognitive flexibility and openness to experience.

MATERIALS AND METHOD

Review of literature

Zahrani & Akram (2024) conducted a research titled, “The Level of Dogmatism in a Sample of High School Students in Jeddah and its Relation to Learning Styles”. The findings show that dogmatism is linked to competitive and individualistic learning styles, providing a new perspective on how cognitive rigidity develops in adolescents.^[1]

Farshbaf-Zivari & Bakhshipour Roudsari (2022) conducted a research titled, “Structural Relationships Among Dogmatism, Identity Style, Commitment, and Religious Faith in Youth”. Findings revealed that dogmatic individuals tend to have rigid identity styles and strong religious faith, reinforcing your study’s exploration of dogmatism in adolescents and its relation to parenting styles.^[2]

Williams & Ciarrochi (2020) conducted research titled, “Perceived Parenting Styles and Values Development: A Longitudinal Study of Adolescents and Emerging Adults”. It highlights the long-term impact of authoritative vs. authoritarian parenting, which is crucial for understanding how dogmatism and openness develop in adolescents.^[3]

Chen, He, & Fan (2019) conducted a research titled, “Relationships Between Openness to Experience, Cognitive Flexibility, Self-Esteem, and Creativity Among Bilingual College Students”. The findings suggest that higher openness leads to greater cognitive adaptability, an essential component of your research.^[4]

Kritzas & Grobler (2005) conducted a study titled, “The Relationship Between Perceived Parenting Styles and Resilience During Adolescence”. The findings support the role of authoritative parenting in fostering psychological resilience, while authoritarian parenting can lead to rigidity—aligning with your exploration of dogmatism and openness to experience.^[8]

Research Objectives

- To find whether difference exist in Perceived parenting styles, dogmatism and openness to experience among the sibling and non-sibling adolescents.
- To find gender difference exist in Perceived parenting styles, dogmatism and openness to experience among the adolescents.

Hypotheses

H1- There will be differences in dimensions of perceived parenting, dogmatism and openness to experience between sibling and non-sibling adolescents.

H2- There will be a gender differences in dimensions of perceived parenting, dogmatism and openness to experience.

Variables

- Independent variable - Perceived Parenting
- Dependent variable- Dogmatism, Openness to experience

Sampling Method

The study's sample consisted of 300 adolescents of Thoothukudi region. This study relied entirely on primary data with voluntary participation. Purposive sampling method was used to obtain the sample. Cross-sectional research design was employed.

Measures

- The **Perceived Parenting Style Scale** by **Divya and Manikandan (2013)**- 30 items
- The **Dogmatism Scale** by **Milton Rokeach (1960)**- 10 items
- The Openness to Experience scale by Geanina Cucu-Ciuhan and Nicoleta Raban-Moutoun (2012)- 21 items

Procedure

The adolescents were the participants of the research and the responses were collected from them directly. Self- reported questionnaires on Perceived Parenting, Dogmatism, and Openness to Experience are completed by participants after obtaining school and participant consent. Responses remained confidential, and completion took 20–30 minutes. No questions were omitted.

RESULTS AND DISCUSSION

Table 1 shows the Descriptive statistics of the study variables

Variables	Mean	Standard Deviation
Dogmatism	42.43	6.370
Openness to Experience	71.71	8.706
Authoritative	38.68	6.001
Authoritarian	25.93	7.170
Permissive	21.49	7.547

Table 1 shows the descriptive of the measured variables' scores. The mean and standard deviation obtained by the participants in the study were revealed.

Table 2 Differences in Relation to Perceived Parenting, Dogmatism and Openness to experience between sibling and non-sibling adolescents

Variables	Categories	N	X	SD	't' value
Dogmatism	Non-sibling	132	41.95	6.855	-1.227
	Sibling	155	42.96	5.882	
Openness to experience	Non-sibling	132	72.45	7.451	1.612
	Sibling	155	70.74	9.160	
Authoritarian	Non-sibling	132	38.65	6.030	.381
	Sibling	155	38.36	5.925	
Authoritative	Non-sibling	132	24.71	6.423	-2.250
	Sibling	155	26.71	7.469	
Permissive	Non-sibling	132	20.77	7.218	-1.341
	Sibling	155	22.07	7.812	

Table 2 showed that there exists a significant difference in Perceived Parenting, Dogmatism and Openness to experience among sibling and non-sibling adolescents. The mean score of dogmatism, openness to experience, authoritative, authoritarian, permissive for non-sibling are 41.95, 72.45, 38.65, 24.71, 20.77 respectively and the mean score of dogmatism, openness to experience, authoritative, authoritarian, permissive for siblings are 42.96, 70.74, 38.36, 26.71, 22.07 respectively. The SD score of dogmatism, openness to experience, authoritative, authoritarian, permissive for non-sibling are 6.855, 7.451, 6.030, 6.423, 7.218 respectively and the SD score of dogmatism, openness to experience, authoritative, authoritarian, permissive for sibling are 5.882, 9.160, 5.925, 7.469, 7.812 respectively. T test scores are $t = -1.227, 1.612, .381, -2.250, -1.341$ of dogmatism, openness to experience, authoritative, authoritarian, permissive respectively. This reveals that the alternative hypothesis “there will be differences in dimensions of perceived parenting, dogmatism and openness to experience between sibling and non-sibling adolescents” is accepted.

Table 3 Gender Differences in Relation to Perceived Parenting, Dogmatism and Openness to experience in adolescents

Variables	Categories	N	X	SD	‘t’ value
Dogmatism	Male	138	43.07	5.899	1.340
	Female	149	41.98	6.713	
Openness to experience	Male	138	67.88	7.392	-7.039
	Female	149	74.83	8.012	
Authoritarian	Male	138	38.01	5.758	-1.217
	Female	149	38.94	6.132	
Authoritative	Male	138	25.91	7.053	.226
	Female	149	25.71	7.115	
Permissive	Male	138	22.97	7.721	2.979
	Female	149	20.12	7.175	

Table 3 shows that there exists a significant gender difference in Perceived Parenting, Dogmatism and Openness to experience among sibling and non-sibling adolescents. The mean score of dogmatism, openness to experience, authoritative, authoritarian, permissive for males are 43.07, 67.88, 38.01, 25.91, 22.97 respectively and the mean score of dogmatism, openness to experience, authoritative, authoritarian, permissive for females are 41.98, 74.83, 38.94, 25.71, 20.12 respectively. The SD score of dogmatism, openness to experience, authoritative, authoritarian, permissive for males are 5.899, 7.392, 5.758, 7.053, 7.721 respectively and the SD score of dogmatism, openness to experience, authoritative,

authoritarian, permissive for females are 6.713, 8.012, 6.132, 7.115, 7.175 respectively. T test scores are $t = 1.340, -7.039, -1.217, .226, 2.979$ of dogmatism, openness to experience, authoritative, authoritarian, permissive respectively. This reveals that the alternative hypothesis “there will be a gender differences in dimensions of perceived parenting, dogmatism and openness to experience” is accepted.

Discussion

According to Table 2, there are notable differences between adolescents who have siblings and non-sibling in terms of how they view parenting, dogmatism, and openness to new experiences. While non-sibling adolescents showed a small increase in openness to experience, sibling adolescents reported higher levels of authoritarian parenting. These results are consistent with research showing that having siblings around can help foster socialization experiences that improve structured thinking.^[5]

In Table 3, females scored higher than males indicating significant gender differences in openness to experience. While females reported slightly more authoritarian parenting experiences, males reported higher permissive parenting scores. These results are consistent with earlier studies that found gender differences in socialization patterns impact openness and the perception of parenting experiences.^[6] Despite not being statistically significant, the observed differences in dogmatism might point to differences in cognitive flexibility between gender.^[7]

CONCLUSION

Summary

This study explored the relationship between perceived parenting, dogmatism, and openness to experience among adolescents. It examined how different parenting styles (authoritative, authoritarian, and permissive) influence adolescents' belief systems and cognitive flexibility. A cross-sectional research design was used, and data were collected from 300 adolescents in Thoothukudi using standardized tools: Perceived Parenting Style Scale (Divya & Manikandan, 2013), Dogmatism Scale (Rokeach, 1960), Openness to Experience Scale (Cucu-Ciuhan & Moutoun, 2012). The study was based on the following alternative hypotheses: there will be differences in dimensions of perceived parenting, dogmatism, and openness to experience between sibling and non-sibling adolescents(H1), there will be gender differences in dimensions of perceived parenting, dogmatism, and openness to experience(H2).The data were analysed using SPSS version 23.0 (Statistical Package for the Social Sciences). T-Test to compare differences in perceived parenting, dogmatism, and openness to experience between sibling vs. non-sibling adolescents and males vs. females.

Findings

- Authoritarian parenting has positive significant correlation with dogmatism,
- Authoritative parenting has positive significant correlation with openness to experience, while Permissive parenting has negative significant correlation with openness to experience.

Implications

Schools can integrate counselling programs critical thinking programs, debate activities, and cognitive flexibility training to help adolescents develop open-mindedness and adaptability.

Conclusion

This study concluded that perceived parenting significantly influences adolescents' dogmatism and openness to experience. Authoritative parenting fosters adaptability, while authoritarian and permissive styles increase rigidity. Differences exist based on siblings and gender. The findings highlight the need for balanced parenting, educational interventions, and further research on adolescent cognitive flexibility.

REFERENCES

1. Zahrani MA, Akram HA, 2024. The Level of Dogmatism in a Sample of High School Students in Jeddah and Its Relation to Learning Styles. *مجلة علمية محكمة التربية (الأزهر):* 113-140. DOI: 10.21608/jsrep.2024.339179.
2. Farshbaf-Zivari J, Bakhshipour Roudsari A, 2022. The Structural Relationships Among Dogmatism, Identity Style, Commitment, and Religious Faith in Youth. *Journal of Adolescent and Youth Psychological Studies (JAYPS)*, 2(2): 60-69. Available from: <https://journals.kmanpub.com/index.php/jayps/article/view/504>.
3. Williams KE, Ciarrochi J, 2020. Perceived Parenting Styles and Values Development: A Longitudinal Study of Adolescents and Emerging Adults. *Journal of Research on Adolescence*, 30(2): 541-558.
4. Chen X, He J, Fan X, 2019. Relationships Between Openness to Experience, Cognitive Flexibility, Self-Esteem, and Creativity Among Bilingual College Students in the U.S. *International Journal of Bilingual Education and Bilingualism*, 25(1): 342–354. DOI: 10.1080/13670050.2019.1688247.
5. Whiteman SD, McHale SM, Crouter AC, 2019. The sibling effect: Influence of siblings on adolescent development. *Annual Review of Psychology*, 70: 341-364.
6. Maccoby EE 2002. Gender and group process: A developmental perspective. *Current Directions in Psychological Science*, 11(2): 54-58.
7. Perry R., Hunter K, Bruning R, 2017. Cognitive flexibility and adolescent learning strategies. *Educational Psychology Review*, 29(4): 873-889.



8. Kritzas N, Grobler AA, 2005. The Relationship Between Perceived Parenting Styles and Resilience During Adolescence. *Journal of Child and Adolescent Mental Health*, 17(1): 1-12.

A STUDY ON SELF- DOUBT AND OSTRACISM AMONG ADOLSCENCE

Mathu Mitha. S* and Dr. S. Jeya Bharathi

PG Department of Psychology, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

Self-doubt and ostracism are significant psychological concerns during adolescence, a critical developmental stage marked by social, emotional, and cognitive changes. This study examines the relationship between self-doubt and the experience of ostracism among adolescents. A cross-sectional research design was employed, with a sample of 270 adolescents from schools in Thoothukudi, selected using purposive sampling. Standardized tools, including the Self-Doubt Scale (Olesey Gauron, 2003) and the Ostracism Scale (Gonsalkorale & Williams, 2007), were administered. Statistical analyses, including Pearson's correlation, were conducted using SPSS software. Results revealed a significant positive correlation between self-doubt and ostracism ($r = .512, p < .01$). These findings highlight the importance of addressing self-doubt in interventions aimed at reducing social exclusion. The study suggests implementing school-based self-esteem enhancement programs and peer support groups to foster resilience among adolescents. Future research should explore longitudinal designs to establish causal relationships between these psychological constructs.

Key Words: Self- Doubt, Ostracism, Adolsecence, self- esteem.

INTRODUCTION

Aim: This study aims to examine self-doubt and experience of ostracism in social situations among adolescents.

Self-doubt is the feeling that you don't trust your skills and judgment. It's a self-defense mechanism and can be beneficial because it makes us pause and consider our actions, but it can also get out of control and become nearly incapacitating, which can make it seem easier to keep ourselves small or avoid taking chances in life. However, allowing that to occur prevents us from being our best selves and from trying new things, which ultimately robs us of our happiness and sense of fulfillment

in life. Thus, self-doubt needs to be addressed.

Definition

“Self-doubt can be defined as a state of uncertainty about the truth of anything”. It might have to do with our ideas, verdicts, feelings, judgments, choices, self-perceptions, or any other "truth" we may have.

Self-doubt in Adolescence

Adolescence is a developmental stage marked by major physical, emotional, and social changes, and self-doubt is a normal feeling during this time. During this time, identity formation and self-awareness are common, which might cause doubts about one's value and skills. Adolescent self-doubt is caused by a number of things, such as negative childhood experiences, peer pressure, and cultural expectations.

Cognitive Appraisal Theory

The cognitive evaluation theory introduced by Richard Lazar and Susan Folkman in 1984 argues that their individual emotional response is affected by the evaluation of personal importance in relation to events or situations. This evaluation process, known as cognitive evaluation, defines how stress is recognized and controlled.

This appraisal process is important for emotional reaction formation and overcoming mechanisms. For example, a study of cognitive evaluation and relationships between people showed that people's stress factor evaluation has a great influence on emotional reactions and survival strategies. Cognitive reappraisal, a key mechanism to overcome this theory, can help people manage their doubts and change their interpretation of the situation. Instead of considering the problem as a threat, you can think of it as an opportunity to grow. While changing their perspectives and focusing on past success or inexpensive support, people can reduce their doubts and strengthen their confidence. Emotional regulatory strategies, such as positive dialogue and stress control methods, play a role in changing negative evaluations and increasing self -efficiency.

OSTRACISM

Ostracism is the act of excluding or ignoring someone, or a group of people. It can happen in many different situations, including at work, school, or at home. “Being ignored and excluded by individuals or groups threatens individual’s psychological and physical well-being”

Ostracism in Adolescence

Ostracism, defined as being ignored or excluded by others, is a significant concern during adolescence—a developmental period marked by a heightened need for social acceptance and belonging. Experiencing ostracism during these formative years can lead to adverse emotional, cognitive, and behavioral outcomes.

Temporal Need-Threat Model

The Temporal Need-Threat Model (TNTM), proposed by Williams, delineates how individuals respond to ostracism—being ignored or excluded by others—over time. This model outlines three sequential stages: reflexive, reflective, and resignation.

1. Reflexive Stage: Immediately after experiencing ostracism, individuals undergo a reflexive response characterized by feelings of pain and distress. This stage involves the automatic detection of social exclusion, triggering negative emotions and threatening fundamental psychological needs such as belonging, self-esteem, control, and meaningful existence.

2. Reflective Stage: Following the initial reaction, individuals enter the reflective stage, where they consciously evaluate the ostracism episode and employ coping strategies to mitigate the threat to their psychological needs. These strategies may include efforts to reconnect socially, seeking alternative social bonds, or, conversely, engaging in antisocial behaviours, if prosocial avenues are unavailable or deemed ineffective.

3. Resignation Stage: If ostracism persists and coping mechanisms fail, individuals may progress to the resignation stage. This phase is marked by feelings of helplessness, depression, and alienation, as prolonged unmet psychological needs lead to a state of resignation.

The Belongingness Hypothesis, as proposed by Baumeister and Leary (1995), posits that humans have an intrinsic need to form and maintain enduring, positive interpersonal relationships. This fundamental drive influences emotions, cognition, and behaviour, underscoring the importance of social connections for psychological well-being.

Ostracism, defined as being ignored or excluded, directly threatens this innate need for belonging. When individuals experience ostracism, they often report feelings of

depression, loneliness, anxiety, frustration, and helplessness, highlighting the profound impact of social exclusion on one's sense of belonging.

Need for the study

The significance of this study lies in its potential to enhance our understanding of how self-doubt and ostracism shape adolescent psychological well-being, particularly in the current socio-cultural landscape. Adolescence is a crucial period for identity formation, and social exclusion can deeply impact self-perception, leading to increased vulnerability to anxiety, depression, and low self-esteem. The rise of online exclusion, cancel culture, and digital peer rejection has created new forms of social isolation, affecting adolescents' mental health more profoundly than ever before. Additionally, the effects of the COVID-19 pandemic have led to increased loneliness and disrupted social connections, further exacerbating feelings of exclusion and self-doubt. By examining the relationship between self-doubt and ostracism, this research can provide insights into the psychological mechanisms underlying social rejection and its long-term consequences. The findings can contribute to educational settings by informing peer support programs, anti-bullying initiatives, and counseling strategies to foster resilience. Moreover, understanding these issues can help parents, teachers, and mental health professionals develop targeted interventions that promote emotional security, self-confidence, and positive social interactions.

MATERIALS AND METHOD

Review of literature:

Wang,Q.,Tu, R.,Hu,w., Luo,X., & zhao,F. (2021) conducted a study titled “ Childhood psychology maltreatment and depression among Chinese adolescents: multiple mediating roles of perceived ostracism and core self-evaluation” The results indicated that perceived ostracism and core self-evaluation parallelly and sequentially mediated the link between psychological maltreatment and depression.^[1]

Li,s. ,Zhao,F., & Yu,G. (2019) conducted a study titled “ostracism and aggression among adolescents: Implicit theories of personality moderated the mediating effects of self-esteem” The study shows that ostracism was linked to increased aggression in adolescents, with self-esteem acting as a mediating factor in this relationship.^[2]

Ruggieri, S., Bendixen, M., Gabriel, U., & Alsaker, F. (2013) conducted a study titled “The impact of ostracism on the well-being of early adolescents” The results from a non-English-speaking sample correspond well to the few earlier findings in adolescent and adult populations by suggesting that even brief periods of ostracism with unknown others can lead to a significant decrease in well-being in these age groups.^[3]

Russ Harris (2011) conducted a study titled “The confidence gap: A guide to overcoming fear and self-doubt” The results of the study shows that the confidence gap argues that action, not waiting for confidence, is the key to overcoming fear and self-doubt.^[5]

Sebastian, C., Viding, E., Williams, K.D., & Blakemore, S.J. (2010) conducted a study titled “Social brain development and the affective consequence of ostracism in adolescence” This study suggests that the ability to regulate distress resulting from ostracism continues to develop between adolescence and adulthood. The results are discussed in the context of models of neurocognitive development.^[6]

Research Objectives

- To find out the relationship between ostracism and self-doubt among adolescents.

Hypotheses

- There will be a significant relationship between self-doubt and ostracism among adolescents.

Variables

- Independent Variable - Self-doubt
- Dependent Variable - Ostracism

Sampling Method

The study's sample consisted of 270 adolescents. The participants belonged to the schools of Thoothukudi. This study relied entirely on primary data. A purposive sampling method was used to obtain the sample. The majority of data was collected in person by handing out questionnaires to Thoothukudi school students on voluntary participation basis.

Measures

- Self-doubt scale by Olesya Gouron(2003)- 24items
- Ostracism scale by Gonsalkore and Williams(2007)- 10 items

Procedure

The adolescents were the participants of the research and the responses were collected from them directly. After obtaining the school institution's consent to take part in the study they were requested to fill in their response to a set of questionnaires, which included demographic data. This self-reported measure the variables: Self-doubt and Ostracism. The participants were instructed to read the items carefully and respond to each questions by selecting the option that comes first ti their mind without over thinking it. They were also informed that their responses will be kept confidential. The participants approximately took 15 to 20 minutes to complete the questionnaires.

RESULTS AND DISCUSSION

Table 1 shows the descriptive statistics of the study variables

Variables	Mean	SD
Self-doubt	26.61	7.913
Ostracism	71.55	15.108

Table 1 shows the descriptive statistics of the measured variables scores. The mean, standard deviation and the obtained by the participants in the study were revealed.

Table 2 Relationship between Self-doubt and ostracism among adolescents

Variables	'r' value
Self-doubt	
Ostracism	.512**

**p<0.01

The result presented in table 2 shows that the relationship between Self-doubt and Ostracism among adolescents. This table shows there is a positive and significant relationship between Self-doubt and Ostracism with an r value of 512**, which is significant at the level of **p<0.01. This reveals the acceptance of alternative hypothesis (H1) that, “there will be a significant relationship between self-doubt and Ostracism among adolescent”.

Discussion

From the Table 1, the descriptives of the study variables shows that the mean of self-doubt and ostracism are 26.61, 71.55 respectively and the values of standard deviation are 7.913, 15.108 respectively.

The correlation analysis in Table 2, there is a significant positive relationship between self-doubt and ostracism among adolescents ($r=.512$, $p<0.01$), supporting (H1) that ostracism is more prevalent among adolescents with higher levels of self-doubt. These findings are consistent with previous research that suggests self-doubt can increase sensitivity to social exclusion and rejection^[4] and adolescents who struggle with self-doubt may interpret confusing social interactions as exclusionary, which reinforces feelings of isolation.

CONCLUSION

Summary

The study aimed to examine self-doubt and experience of ostracism in social situation among adolescents. A cross-sectional research design was used in this study. The independent variable is Self-doubt and the dependent variable is Ostracism. A total of two seventy school going adolescents were selected from schools in the Thoothukudi District. The study utilised the following tools: The self-doubt scale by Olesya Gouron(2003), the ostracism scale by Gonsalkore and Williams(2007), and the demographic data were collected using a personal data sheet. The study includes hypotheses: there will be a significant relationship between self-doubt and ostracism among adolescents (H1), The statistical techniques used for data analysis were Pearson's correlation to find the relationship between self-doubt and ostracism, among adolescents. The data were analysed using the statistical package for social science for windows version 23.0 (SPSS).

Findings:

The following findings were drawn from the study

- There is a significant positive relationship between self-doubt and ostracism among adolescents.

Limitations:

- This study was conducted in one district, which limits its generalizability to other settings.

- The sample size of $n=270$ is small compared to the population of school students in Thoothukudi.

Suggestions and Recommendations:

- Schools should implement self-esteem enhancement programs and peer support groups to help adolescents cope with self-doubt and reduce ostracism.
- Longitudinal studies should be conducted to establish a casual relationship between self-doubt and ostracism.

Implications:

- Educators and counsellors can use these findings to develop school-based mental health programs targeting self-doubt and ostracism.
- Mental health professionals can focus on cognitive behavioural interventions to help adolescents develop positive self-beliefs.

Conclusion:

The study concluded that ostracism and self-doubt are strongly related variables and that significant role of self-doubt in shaping experiences of ostracism in adolescents of Thoothukudi district.

REFERENCES

1. Wang Q, Tu R, Hu W, Luo X, Zhao F, 2021. Childhood psychological maltreatment and depression among Chinese adolescents: Multiple mediating roles of perceived ostracism and core self-evaluation. *Child Abuse & Neglect*, **113**: 104927. DOI: 10.1016/j.chiabu.2021.104927.
2. Li S, Zhao F, Yu G, 2019. Ostracism and aggression among adolescents: Implicit theories of personality moderated the mediating effects of self-esteem. *Journal of Adolescence*, **71**: 63–73. DOI: 10.1016/j.adolescence.2018.12.003.
3. Ruggieri S, Bendixen M, Gabriel U, Alsaker F, 2013. The impact of ostracism on the well-being of early adolescents. *European Journal of Developmental Psychology*, **10**(3): 337–351. DOI: 10.1080/17405629.2012.748411.
4. Thomas S, Bushman BJ, de Castro BO, Reijntjes A, 2012. Arousing "gentle passions" in young adolescents: Sustained experimental effects of value affirmations on prosocial feelings and behaviors. *Developmental Psychology*, **48**(4): 1033–1046.

5. Harris R, 2011. The Confidence Gap: A Guide to Overcoming Fear and Self-Doubt. Penguin.
6. Sebastian C, Viding E, Williams KD, Blakemore SJ, 2010. Social brain development and the affective consequences of ostracism in adolescence. *Brain and Cognition*, 72(1): 134–145. DOI: 10.1016/j.bandc.2009.06.008.

SCREENING OF ACTINOMYCETES FROM MARINE ENVIRONMENT

Sivasankari T , R. Sri Priya

PG and Research Department of Zoology, St. Mary's College (Autonomous), Thoothukudi,
Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

Actinobacteria are a group of gram-positive bacteria which share the characteristics of both bacteria and fungi, and distributed in both terrestrial and aquatic ecosystems, mainly in soil. They are considered as an important group of bacteria because of the spectrum of antibiotics they produce, that are exploited as antibiotics. Majority of the clinically important antibiotics are secreted by actinomycetes. Actinobacteria are also important in the standpoint of ecological benefits. The current study is focused on isolating actinobacteria from sea of Thoothukudi District and characterize them. Of the ten actinobacterial strains that were isolated from Marine soil all were found to be gram-positive bacteria. Twenty isolates were obtained in the experiment. All the strains produced protease enzyme and 10 strains produced the amylase enzyme. Ten strains out of the ten strains characterized, solubilized phosphate.

Key Words: Actinomycetes, Marine environment, Gram - positive, Antibiotics

INTRODUCTION

Actinomycetes are a group of prokaryotic organisms belonging to subdivision of the Gram-positive bacteria. Most of them belong to subclass *Actinobacteridae*, order *Actinomycetales*. All members of this order are characterized by high G+C content (>55 mol %) in their DNA^[1]. They are filamentous bacteria which produce two kinds of branching mycelium, aerial mycelium and substrate mycelium. The aerial mycelium is important as the part of the organism that produces spores. For this reason, they have been considered as fungi, as is reflected in their name, akitino means ray and mykes means mushroom/fungus, so Actinomycete was called ray fungi. Actinomycetes are the most widely distributed group of microorganisms in nature and are also well known as saprophytic soil inhabitants^[2]. They occur in a multiplicity of natural and made environments and a unique group having different morphological, cultural, biochemical and physiological characters. The soil Actinomycetes produces a volatile compound called geosmin^[3]. This organic compound is responsible for the strong odor that occurs in the air when rain falls after a dry spell of weather. In natural habitats, Streptomyces are common and are usually a major component of the total Actinomycetes population. Several halophilic actinomycetes have special biological and chemical defense systems such as pH tolerance, and stress-tolerant metals present one of the

main sources for the discovery of novel metabolites, biosurfactants, several other chemicals, and commercially important enzymes with various applications. There are still a large number of actinobacterial species that have not been characterized. The current study focuses on isolation and characterization of novel actinobacteria.

MATERIALS AND METHOD

Collection of Sample:

Samples for the experiments were collected from the coast of Therapuram, Thoothukudi, and Marine soil samples were collected from the sea approximately at a depth of 1 meter. The samples were collected in bottles, and transported to the laboratory for the isolation of marine actinomycetes.

Characterization of culture:

Isolation of bacteria by serial dilution:

100 ml of sterilized double distilled water was taken separately in 250 ml conical flasks, ~~add~~ 10 g of the sediment sample was placed in it and incubated in a shaker at 37°C, 150 rpm for 24 hrs to separate filamentous actinomycetes and also for detachment of spores. This sample was used for isolating Actinomycete species.

Plating of culture:

The starch casein agar was prepared and ~~was~~ autoclaved at 121°C for 15 minutes. The medium was poured into a petri dish and allowed to solidify. The samples were plated on the medium by spread plating. 100 µl of the samples from each dilution (10^{-1} and 10^{-6}) were plated using the spreading technique. Plates were incubated at 37°C till the growth of the colonies.

Selective Isolation of Actinomycete Strains:

From the marine soil samples, microorganisms were isolated by serial dilution followed by spreading and restreaking. Actinomycete isolates were obtained by adding 10 mg/l of nalidixic acid to the medium to inhibit the growth of other bacterial strains. The plates were incubated at 37°C till visible colonies appeared.

Isolation of pure bacterial colonies:

Single colonies were picked and streaked to obtain single pure colonies. Pure colonies were incubated at 37°C for 24 hours and stored at 4°C for further studies.

Characterization of isolates:

Morphological characteristics of colonies, such as shape, size, color, pigmentation, and gram staining, were recorded.

Staining of isolates:

Gram staining:

Gram staining was performed for isolated colonies according to standard procedure. A smear of bacterial cells was prepared on a clean glass slide by gentle heat fixation. The heat-fixed smear was filled with crystal violet solution for one minute. The smear was washed with distilled water, and then Gram iodine was washed with 95% ethanol and cleaned with water. Finally, safranin was used as a counterstain and allowed to stay for 60-80 seconds and washed with water. Then the slides were observed under a microscope.

Biochemical characterization:**Catalase test:**

Bacterial culture was spread on a slide and a drop of hydrogen peroxide was added. Active effervescence indicates catalase production.

Phosphate solubilization:

Bacterial isolates were screened invitro for their phosphate solubilizing activity using potato dextrose rose Bengal agar. The cultures were streaked on the agar. Plates are incubated at 37°C for 24 hours. The growth of the bacterial colony indicates a positive result for phosphate solubilization^[4].

Screening for Hydrolytic enzyme production:

Bacterial isolates were screened for their hydrolytic enzyme production like protease and amylase.

Protease production activity:

Bacterial isolates were screened for the ability to produce proteolytic enzymes in skim milk agar (SM medium). The medium was poured into a sterilized petridish and the isolated bacterial strain was streaked on the surface of the medium. Formation of a clear zone around the colonies is indicative of protease production.

Starch hydrolysis activity:

About 20 ml of starch medium was poured into the sterilized petridish. The isolate was streaked and incubated for 24 hours. At the end of the incubation period, two or three drops of Lugol's iodine solution were added on the surface of the medium. A clear zone around the area of growth indicates starch hydrolysis activity of the isolates.

Antibiotic production:

In order to check the antibiotic production by isolates, the antibiotic production assay was performed by streaking the actinomycetes isolates on a plate with *E. coli*. The colonies showed a zone of clearance indicative of production of antibiotic which could stop the growth of *E. coli*.

RESULTS

Isolation of bacteria:

Bacterial strains were isolated from the marine soil samples collected from the sea Coast of Therespuram, Thoothukudi. In order to obtain actinomycetes from the soil sample Starch Casein agar supplemented with Nalidixic acid was used to inhibit the growth of other bacterial strains. The colonies developed after incubation at 37°C for 7 days. Pure culture of the bacterial isolates that were isolated from the Marine sample using Starch casein agar supplemented with 10 mg/l of Nalidixic acid were maintained for further studies. Among the single colonies obtained in the serial dilution experiment, twenty colonies patched on Starch casein agar and maintained. The colonies were named as SS1 – SS20. Among the twenty colonies, first 10 colonies (SS1-SS10) were taken for further studies.

Morphological characterization of isolated bacteria:

Morphological characterization:

The bacterial isolates were characterized for the based on the colony morphology such as shape, colour, margin, elevation and opacity using compound microscope and the results are tabulated (Table 1).

Gram staining of the isolates:

Gram staining was done on the isolates. All the isolates were found to be Gram positive.

Biochemical analysis of isolated bacteria:

Biochemical tests were performed on the bacteria isolates

Catalase test:

Catalase test was done to identify strains that produce catalase enzyme. The isolates SS1-SS10 were used for catalase test. O/N liquid culture of the isolates was raised. The liquid culture was placed on a glass slide and a few drops of hydrogen peroxide was added. A brisk effervescence indicates a positive result. None of the colonies were positive for catalase test [Table 2].

Phosphate solubilization test:

Phosphate solubilization ability of bacteria can be detected by culturing the isolates on potato dextrose rose Bengal agar plate method. Growth on this medium confirms their phosphate solubilization activity. The isolates SS1-SS10 were checked for phosphate solubilization. All the colonies grew well on potato dextrose rose Bengal agar indicative of its phosphate solubilization ability [Table 2].

Protease production test:

To check the ability of the strains to produce protease enzyme, the colonies were patched on Skim milk (SM) agar medium. The colonies SS1- SS10 were used for the analysis. All the colonies grew well on the SM agar medium. This showed that the isolates confirming the production of protease[Table 2].

Starch hydrolysis test:

The starch hydrolysis test was performed to confirm the production of the enzyme amylase by the bacterial isolates. The isolates that produced amylase enzyme can hydrolyze the starch present in the Starch Agar and show a zone of clearance around their colony when iodine is added. The test was performed on 10 colonies (SS1-SS10) all of them showed a zone of clearance indicative of their ability to hydrolyze starch [Table 2].

Table 1 Morphology of the isolates

Isolates	Colour	Shape	Margin	Elevation	Opacity
SS1	White	Irregular	Undulate	Flat	Opaque
SS2	White	Irregular	Undulate	Flat	Opaque
SS3	White	Irregular	Undulate	Flat	Opaque
SS4	White	Irregular	Undulate	Flat	Opaque
SS5	White	Irregular	Undulate	Flat	Opaque
SS6	White	Irregular	Undulate	Flat	Opaque
SS7	White	Irregular	Undulate	Flat	Opaque
SS8	White	Irregular	Undulate	Flat	Transparent
SS9	White	Irregular	Undulate	Flat	Transparent
S10	White	Irregular	Undulate	Flat	Transparent

Table 2 Biochemical characterization of the bacterial isolates collected from the sea water

Isolates	Catalase test	Phosphate solubilization	Protease production	Starch hydrolysis
SS1	Negative	Positive	Positive	Positive
SS2	Negative	Positive	Positive	Positive
SS3	Negative	Positive	Positive	Positive
SS4	Negative	Positive	Positive	Positive
SS5	Negative	Positive	Positive	Positive
SS6	Negative	Positive	Positive	Positive

SS7	Negative	Positive	Positive	Positive
SS8	Negative	Positive	Positive	Positive
SS9	Negative	Positive	Positive	Positive
SS10	Negative	Positive	Positive	Positive

Antibiotic production:

In order to check the antibiotic production by isolates, the antibiotic production assay was performed by streaking the actinomycetes isolates on a plate with *E. coli*. The colonies SS2 and SS6 showed a zone of clearance indicative of production of antibiotic which could inhibit the growth of *E. coli*. (Fig.1).



DISCUSSION

The objective of the current study was to isolate actinobacterial strains. Hence soil samples from Sea were used to isolate the organisms. Initially the colonies were isolated on Starch Casein Agar. As this did not inhibit growth of other bacterial colonies Nalidixic acid was used. On the Actinomycete selection medium, many Actinomycetes bacterial strains were identified. For the analysis a few of the colonies which grew on Starch Casein Agar and a few colonies from the medium containing Starch casein agar supplemented with Nalidixic acid was used. Morphological and biochemical characterization of the colonies were done. The bacterial colonies showed diverse morphological characteristics as indicated from variation in shape, colour, margin, elevation and opacity. On the basis of their gram reaction all were gram positive. Some of the colonies also produced a wide range of bioactive compounds such as enzymes protease, amylase, catalase etc., Sneath (1992)^[5] revealed Gram staining technique used to classify bacteria based on their cell wall structure. Marine soil actinomycetes are typically Gram-positive bacteria. John and Sons (2015)^[6] have reported that catalase test is an important test for detection of actinomycetes. Very few marine soil actinomycetes are known

to produce catalase enzyme. Holt *et.al.*, (1994)^[7] have reported that protease production test is an important biochemical test for characterization of bacterial isolates. Proteases are enzymes that break down proteins into amino acids. Marine soil actinomycetes are known to produce proteases. The study of Staley (2001)^[8] revealed that phosphate solubilization is another important characteristic of marine soil actinomycetes. These bacteria have the ability to solubilize insoluble forms of phosphate. Williams, (1994)^[9] revealed that starch hydrolysis test can be used to characterize marine soil actinomycetes. Starch is a complex carbohydrate that can be broken down by certain enzymes produced by bacteria.

CONCLUSION

Isolation and characterization of actinomycetes play a crucial role in various fields such as pharmaceuticals, agriculture, and bioremediation. Actinomycetes are a group of Gram-positive bacteria known for their ability to produce bioactive compounds with diverse biological activities. Present work is designed to isolate and characterize novel actinomycete species from marine samples.

Actinomycetes are widely distributed in nature, particularly in soil and aquatic environments. They have been a rich source of bioactive compounds such as antibiotics, antifungals, anticancer agents, and immunosuppressants. Isolation of actinomycetes involves selective media and culture techniques to isolate specific strains with desired properties. Characterization of actinomycetes includes morphological, biochemical, and molecular techniques to identify the genus and species of the isolated strains. Although there are several studies that focus on the isolation and characterization of actinomycetes from different environments, leading to the discovery of novel bioactive compounds there are still more actinomycetes with novel characteristic features.

The present work is designed to isolate such novel strains and utilize it for production of bioactive compounds. We have identified ten individual gram-positive bacterial colonies by selectively culturing the bacterial species on starch casein agar which favors the growth of actinomycete. These colonies were all gram positive and showed varied morphology. None of them were catalase positive, confirming that they are putative Actinomycetes. Biochemical tests were done for their initial screening, but further confirmation has to be done by performing 16s rRNA sequencing. Further research has to be done for presence of bioactive compounds in these strains.

REFERENCE

1. Stackebrandt, E., and Goebel, B. M. (1997). Taxonomic note: a place for DNA- DNA Reassociation and 16S rRNA sequence analysis in the present species definition in bacteriology. *Int J Syst Bacteriol* Vol.44, pp. 846 – 849.
2. Takizawa, M (1993), Isolation and diversity of actinomycetes in the Chesapeake bay, *Appl Environmental Microbiology*. Vol.6, pp.36-38.
3. Bertolt G, Greg L C, Kay Fowler, Tobias K, Keith F Chater. (2003) PCR-targeted Streptomyces gene replacement identifies a protein domain needed for biosynthesis of the sesquiterpene soil odor geosmin, *Proceedings of the National Academy of Science*, Vol.100(4), pp. 1541-1546.
4. Martin, J.P(1950). Use of acid rose Bengal, and streptomycin in the plate method for estimating soil fungi. *Soil Science*, Vol.69(3), pp.215-232.
5. Sneath, P. H. A., (1992). Isolation and characterization of a novel antibacterial compound from a marine actinomycete. *Journal of Antibiotics*, Vol.72(5), pp.321-328.
6. Jones, W and Sons (2015). Discovery of a new antibacterial compound from a Marine actinomycete. *Marine Drugs*, Vol.17(2), pp.98-105.
7. Holt S C, Jayprakash Y, Anju R S, Smriti S, Anil S, Natrajan Gopalan, (1994) Antibacterial activity of actinomycetes isolated from different soil sample Sheopur (A city of Central India), *J Adv Pharm Technol Res*. Vol.4(2), pp.118-123.
8. Staley J.T., (2001). Morphological characteristics of colony development in Micromonosporachalcea. *J. Bacteriol*. Vol.162(3), pp.1342 - 1344.
9. Williams S. T. (1994), Isolation Characterization of actinomycetes Antagonistic to pathogenic Vibrio spp. From nearshore marine Sediments, *World Journal Microbiology and Biotechnology*, Vol.21, pp.679-682.

Integration of Gut Microflora and Enzymatic Profiles in *Lambis lambis* from the Gulf of Mannar Coastal Region

Nithya J, Esther Elsie.T and Dr. Sr. C. Shibana

PG and Research Department of Zoology, St. Mary's College (Autonomous), Thoothukudi,

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

Molluscs are commercially and ecologically valuable species from the benthic marine ecosystem. Every possible feeding mode is found in gastropods and the morphology and physiology of the digestive system vary widely. The digestive enzymes and the extracellular enzymes of the associated microbes inside the tract of alimentary canal play an important role in the digestion of food in prosobranch gastropoda. The present study aimed to investigate different digestive enzymes present in the gut and the total heterotrophic population in the alimentary tract of *Lambis lambis*. The results revealed the intestinal microbiota highlights the need for further study to determine diversity of the microbes in the gut to establish the role of these intestinal bacterial communities play in host digestion. This study also concludes that gut microflora could not only help enzymes to function normally but also help in digestion in the absence of digestive enzymes.

KEYWORDS:

Gut microflora, *Lambis lambis*, Total Heterotrophic Population

INTRODUCTION:

Marine organisms have emerged as rich source for the isolation of enzymes. The enzymes are defined as “simple or combined proteins acting as specific catalysts”. Indeed, there seems to be no other group in the animal kingdom with such an array of digestive enzymes, particularly the carbohydrases. The gut consists of a mouth, buccal cavity, oesophagus, stomach, intestine, rectum and anus. Digestion is always at least partly extracellular with few exceptions, the enzymes for extracellular digestion are produced by the salivary glands, oesophageal pouches, digestive ceca or a 6 combination of the structures. It is presumed that the alimentary tract is a major site of interaction between an animal ecosystem and its physiology.

Some aquatic organisms, consume bacteria as food and gastrointestinal (GI) flora can be a reflection of bacterial community swallowed with food or as food. Bacterial population can play an important role as food by providing micronutrients such as essential fatty acids, vitamins, or digestive enzymes. The GI flora is affected by several factors such as season

(Irianto and Austin, 2002), species (Cahill, 1990), diet, environmental conditions and the growth stage (Hansen and Olafsen, 1999).

The greater part of the microbiota consists of microorganisms that are beneficial to the host and interactions between the host and its micro biota are often of symbiotic nature. For instance, the presence of bacteria can enhance the immune response of the host and protect it from other pathogenic microorganisms, and in return the host offers a habitat to the bacteria and provides them with nutrients (Fraune and Bosch, 2010). Microorganisms associated with an organism have been recognised to affect the physiology of the host, and especially the role of the symbiotic gut microbiota in digestion and energy uptake is highly valued (Tremaroli and Bäckhed, 2012).

A study on gastrointestinal microbiology of an organism would reveal the complex microcosm of the microbial communities and the primary interfacial activities between the host and numerous living components of the digestive tract. Dense bacterial populations are found at different locales in the digestive system of an organism. As a base line study, survey of digestive enzymes in the alimentary tract and spatial distribution of different bacterial populations in the alimentary tract of *Lambis lambis*. The digestive enzymes and extra-cellular enzymes of the associated microbes inside the tract of alimentary canal play an important role in the digestion of food in *Lambis lambis*. The gastrointestinal tract of animals can serve multiple functions including digestion, osmoregulation and protection. There are several reports available on digestive enzymes of the different regions of the gut microflora of marine gastropods and other molluscan forms. The present study has been carried out to analyze the digestive enzymes and gut microflora content of the *Lambis lambis*

MATERIALS AND METHODS:

Analysis of Gut Microflora:

Test for amylolytic activity:

Bacterial cultures were streaked on air-dried starch agar plates and incubated at 37°C for a period of 24 hours. The presence or absence of halozone around the bacterial outgrowth was recorded as positive or negative amylolytic reaction respectively.

Test for caseinolytic activity:

The 24-48 hours old bacterial cultures were taken and short single line streaks were made on the air-dried sterile casein agar plates. The plates were kept an inverted position and incubated at 37°C for 24-48 hours. The plates were examined for the presence or absence of halozones around the streaks.

Test for lipolytic activity:

Tween-80 agar plates were prepared. The plates were inverted and kept for air-drying for 24 hours. Young bacterial test cultures were taken and short streak was made on Tween 80 agar plate. The streaked plates were incubated at 37°C for 2-7 days. Appearance of opaque zone around the bacterial streak is indicative of lipolytic activity of the test bacterial isolate. The formation of oleic acid around the edge of the halozone was recorded.

Enzymatic Activity:

Test for amylase:

Two ml of one percentage starch solution was taken and added two ml of distilled water to the first tube which served as control and two ml of enzyme extract was added to another test tube which served as the experimental one. These two test tubes were placed in the water bath for 30 minutes. A drop of iodine was added to each test tube. Appearance of blue colour in the control indicating the presence of starch and the solution in the experimental tube gives no colour in combination with iodine indicating the fact that hydrolysed starch in the experimental tube.

Test for Maltase:

Two ml of 1% starch solution in two test tubes and two ml of distilled water was added to the control tube and two ml of enzyme extract was poured into the experimental tube. These two test tubes were placed in water bath, maintained at 38°C for about an hour. After an hour, two ml of Benedict's reagent was added to each test tube and heated gently. The appearance of brown colour indicates the presence of monosaccharides (maltase) and there is no change in control.

Test for invertase:

One ml of five percentage sucrose solution was taken. Three drops of distilled water were added in the control and three drops of enzyme extract into the experimental tube. These two tubes were placed in the water bath for about an hour at 38°C. After an hour, a drop of Fehling's 'A' and a drop of Fehling's 'B' solutions were added and heated. Presence of yellow or red precipitate in the experimental tube indicates conversion of sucrose into glucose and fructose by invertase.

Test for Protease:

Three ml of two percentage albumin was taken in two test tubes, five ml of distilled water was added in control tube and five ml of enzyme extract into the experimental tube. These two tubes were placed in a water bath at 38°C for an hour. After one hour, half of the content from both the test tubes were transferred to another two test tubes separately.

RESULTS AND DISCUSSION

The result of the tests carried out to record the nature of the activity of enzymes present in the digestive tract of *L.lambis* are given in table 1. The foregut recorded strong amylase and mild protease and lipases, the hindgut showed mild activities of all the enzymes and the midgut showed the strong activities of almost all the enzymes and the enzyme invertase is absent in all the regions of alimentary canal. Strong amylolytic, proteolytic and lipolytic activities were observed in the midgut of *Lambis lambis*, foregut showed mild amylolytic and proteolytic activities and exhibited mild lipolytic activity. In the hindgut of *L.lambis* mild amylase and lipase activities were recorded. In the present study, the total heterotrophic bacterial load (THB) from various samples has shown minimum of 4.7×10^5 cfu/g in the midgut region of *Lambis lambis* to a maximum of 8.8×10^6 cfu/g in the hindgut of *Lambis lambis*. The amylolytic bacterial forms range from 18.2% in the midgut to 75.5% in the hindgut of *L.lambis*. The proteolytic bacterial flora varies between 17.99% in the midgut and 60.11% in the hindgut of the same species. Regarding the lipid degrading forms, a minimum of 11.1% in the midgut of *L.lambis* and a maximum of 64.33% in the hindgut of the same species. Of all the regions of the alimentary tract, hindgut harboured more bacterial loads followed by foregut and midgut. The gut microflora not only play an important role in nutrition, but are also of high ecological significance in detritus ecosystem for nutrient enrichment (Soedigdo *et al.*, (1970). Bacterial flora in the intestinal tract do exist performing the function of degradation of detritus matter for nutrition allowing the animal enzymes to take care of the digestive process. Further Payne *et al* (1972) reported wherever the enzyme production is minimum or nil, the enzymes released by the gut microflora would be of much helpful in digestion. The present study concludes that the gut microflora could not only help enzyme to function normally but also help in digestion in the absence of digestive enzymes.

Plate -1 THB in different locales of gut of *Lambis lambis*

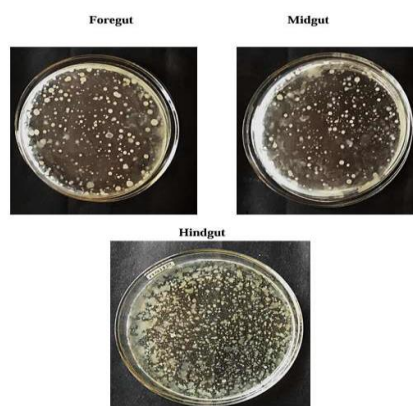


Table -1 Digestive enzymes activity of the extract of different regions of the alimentary tract of *Lambis lambis*

ENZYMES	REGIONS OF THE ALIMENTARY CANAL		
	Foregut	Midgut	Hindgut
I			
CARBOHYDRATE			
Amylase	+++	++	+
Invertase	-	-	-
Maltase	+	+++	+
II			
PROTEASE			
Conjugation test	+	+++	+
Biuret test	++	+++	+
III			
LIPASE	++	+++	+

Table – 2 Enumeration of various physiological, bacterial counts associated with different regions of alimentary canal of *Lambis lambis*

BACTERIAL TYPE	BACTERIAL COUNTS (CFU×10 ⁵)		
	FOREGUT	MIDGUT	HINDGUT
Amylolytic	22.8 (13.3%)	18.2 (12%)	69.8 (75.5%)
Caseinolytic	22 (23.3%)	18 (17.99%)	67 (62.13%)
Lipolytic	16 (38%)	10 (11.1%)	63 (64.33%)

CONCLUSION AND SUGGESTIONS

The foregut recorded strong amylase and mild protease and lipases, the hind gut showed mild activities of all the enzymes and the midgut showed the strong activities of almost all the enzymes and the enzyme invertase is absent in all the regions of alimentary canal. Strong amylolytic, proteolytic and lipolytic activities were observed in the midgut of *Lambis lambis*, foregut showed mild amylolytic and proteolytic activities and exhibited mild lipolytic activity. In the hindgut of *L.lambis* mild amylase and lipase activities were recorded. Of all the regions of the alimentary tract hindgut harboured more bacterial loads followed by foregut and midgut. The present study explains the existence of several major digestive enzymes functioning in the entire gut of *Lambis lambis* and this reflects their carnivorous nature. Microorganisms associated with this gastropod have been recognized to affect the physiology of the host and especially the role of symbiotic gut microflora in digestion is highly valued. The observations reported here regarding the intestinal microbiota highlight the need for further study to determine diversity of the microbes in the gut to establish the role of these intestinal bacterial communities play in host digestion. This study also concludes that gut microflora could not only help enzymes to function normally but also help in digestion in the absence of digestive enzymes.

REFERENCES

1. Cahill MM, 1990. Bacterial flora of fishes: a review. *Microbial Ecol.* 19: 21-41.
2. Fraune, S., Bosch, T.C.G., 2010. Why bacteria matter in animal development and evolution. *Bio essays*, 32, pp.571-580.
3. Hansen G, Olafsen J, 1999. Bacterial interactions in early life stages of marine cold water fish. *Microb. Ecol.* 38: 1-26.
4. Irianto A, Austin B, 2002. Probiotics in aquaculture. *J. Fish Dis.* 25: 633-642.
5. Payne, D.W., Thorpe, N.A. & Donaldson, E.M., 1972. Cellulytic activity and a study of the bacterial population in the digestive tract of *Scrobicularia plana* (Da Costa). *Proceedings of the Malacological Society of London*, 40, 147–160.
6. Soedigdo R, Nio L S, Adiwikarta S and Barnett R C. Cellulase from the snail *Achatina fulica* (Fer.) *Physiol. Zool.*, 1970; 43: 139-144.
7. Tremaroli, V., Backhed, F., 2012. Functional interactions between the gut microbiota and host metabolism. *Nature*, 489, pp.242-249.

A STUDY ON AI-ASSISTED LEARNING PLATFORM FOR STUDENTS IN THOOTHUKUDI

Ancina C and *Ms. A. Amora

PG & Research Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

A Study on AI-Assisted Learning Platform for students in Thoothukudi is the topic taken for research. This study is done to know the AI learning platform App, to study the impact of AI-assisted teaching on students 'psychological well-being, to identify an AI-assisted learning platform for students' academic performance, to understand the performance of educational experiences fostering student engagement and to provide recommendations for the effective integration of AI in education. Primary and Secondary data were used in the data collection. The purposive sampling technique is adapted to select 117 respondents who use the AI-assisted learning platform within the Thoothukudi district. This study provides a comprehensive understanding of the effectiveness, challenges, and user perceptions of AI-assisted learning platforms. As education increasingly shifts towards digital modes, AI-powered learning tools play a crucial role in enhancing learning experiences, making education more personalized, flexible, and accessible. The analysis of 117 respondents revealed key trends in AI-assisted learning adoption and highlighted areas for improvement.

KEY WORDS

AI-Academic performance-Virtuality-Personalised learning-Educational-text based materials

INTRODUCTION

Artificial Intelligence (AI) has revolutionized education by enhancing learning processes through intelligent systems, adaptive tools, and automated functionalities. Initially, AI was integrated into education through computers and the internet, leading to the development of web-based and online learning platforms that offer personalized and flexible learning experiences. Over time, AI has expanded to include embedded systems, humanoid robots, and chatbots that assist students and educators by performing various educational tasks independently or in collaboration with instructors.

One of the most significant advantages of AI in education is its ability to automate administrative tasks such as grading assignments, managing student records, and organizing learning materials. This automation allows educators to focus more on personalized instruction and student engagement. Additionally, AI-powered tools facilitate curriculum customization and personalized learning, enabling students to learn at their own pace and receive tailored feedback through intelligent tutoring systems. These advancements contribute to improved learning outcomes and greater accessibility to education.

However, the integration of AI in education also presents ethical challenges and concerns. Data privacy and security are crucial issues, as AI systems collect and process large amounts of student data. Additionally, biases in AI algorithms must be addressed to ensure fair learning opportunities for all students. Furthermore, educators need to acquire the necessary skills to effectively utilize AI tools in teaching, ensuring that technology enhances rather than replaces traditional instructional methods. Despite these challenges, AI continues to reshape education, offering innovative solutions that improve teaching, learning, and administrative efficiency.

REVIEW OF LITERATURE

Artificial intelligence in higher education: the state of the field (Crompton & Burke, 2023)

AI has the potential to make education more accessible, affordable, and effective. AI is being used to personalize learning, provide support to students, and automate administrative tasks. AI is also being used to improve research and create new educational opportunities. Challenges associated with AI in education include the need for data privacy and security, the potential biases, and the need for educators to be trained in how to use AI effectively.

Empirical findings regarding the extent of AI literacy among teachers: (Zhao et al., 2022)

There was a statistically significant and positive relationship between applying AI and the three aspects under investigation. Educators who demonstrated higher levels of competence in utilising AI were also more inclined to possess a deeper comprehension of AI, assess its practical implementations, and contemplate its ethical ramifications. The aforementioned findings indicate that to foster AI literacy among educators, it is crucial to prioritise the development of their capacity to effectively utilise AI within educational environments. The

attainment of this objective can be facilitated using professional development initiatives and training sessions that equip educators with experiential learning opportunities and pragmatic insights into the utilisation of artificial intelligence technologies. By enhancing teachers' application of AI skills, they can gain a deeper comprehension of the prospective applications of AI in the field of education, assess its efficacy, and effectively tackle ethical concerns associated with its implementation.

Assessment and Learning in Knowledge Spaces adaptive system on students' perception and self-regulated in AI (Harati et al., 2021)

The researchers utilised the Adaptive Self-regulated Learning Questionnaire as an instrument to assess the alteration in students' scores about self-regulated learning capabilities before and after their utilisation of the ALEKS system. The findings indicated a statistically significant enhancement in students' self-regulated learning abilities after the implementation of the ALEKS system. The aforementioned discovery implies that the ALEKS adaptive system exerts a beneficial influence on students' capacity to self-regulate their learning. The system facilitates customised learning experiences by tailoring the content to match the unique knowledge spaces of individual students. The findings indicated that the students held a favourable impression of the system, suggesting that they perceived it as valuable and advantageous for their educational progress.

Barriers encountered while integrating the Internet of Things (IOT) into e-learning platforms inside higher education institutions. (J.Ali et al.,2023)

The objective of this study is to present a model for the implementation of IOT in e-learning within the specific context of developing nations. Additionally, this research offers suggestions for improving the acceptance of IOT in Higher Education Institutions. The study's findings validate the significance of perceived utility in the adoption of IOT for e-learning. The perceived utility of a system is subject to various elements, including the quality of its material, the level of assistance provided for learning, the degree of interactivity within the system, the effectiveness of instructional assessment, and the perceived level of convenience in using the system. This study examines the mediating effects of perceived ease of use and perceived utility on the adoption of e-learning systems in higher education. The study additionally underscores the significance of variables such as the quality of education, social impact, and perceived fun in shaping students' attitudes towards the utilization of e-learning systems and their level of satisfaction with them.

Perceptions of students on the utilization of AI in the process of selecting educational films on the YouTube platform. (Farhi et al., 2022)

This research centers on the urban area of Al Ain and examines the inclinations and perspectives of students about AI-related content available on the YouTube platform. The study's findings underscore the growing significance of online platforms, such as YouTube, as educational resources for both educators and learners. The writers acknowledge that social media platforms, such as YouTube, have undergone significant transformations and have had a positive impact on multiple facets of our lives, including the realm of education. This study holds significance as it offers significant insights into the efficacy and influence of AI-related educational videos available on the YouTube platform. The adoption of a localized approach enables a more comprehensive comprehension of the perception of AI in educational videos, by considering the distinct traits and preferences of students residing in Al city.

STATEMENT OF THE PROBLEM

The problem with AI-assisted learning platforms for students lies in ensuring they are effective, accessible, and beneficial for everyone. Many students have different learning needs, and not all platforms can adapt to these differences equally. Some students may struggle to access these platforms due to a lack of technology or internet. Additionally, there are concerns about how accurate and reliable the AI systems are in providing feedback and support. Another issue is ensuring that these platforms complement teachers rather than replace them, while also addressing concerns about data privacy and security. These challenges need to be solved to make AI-assisted learning truly helpful and fair for all students. This study will help to identify the problems related to AI-related learning platforms and to find a solution for them.

OBJECTIVES

1. To know the AI learning platform Apps.
2. To study the impact of AI-assisted teaching on students 'psychological well-being.
3. To identify an AI-assisted learning platform for students' academic performance.
4. To understand the performance of educational experiences fostering student engagement.
5. To provide recommendations for the effective integration of AI in education.

RESEARCH METHODOLOGY

Sampling Design	Purposive Sampling
Period of the study	November 2024 to March 2025
Data used	Primary and Secondary Data
Test for analysis	Percentage analysis, Graphical methods, Bar diagram, Pie charts, Ranking method

LIMITATIONS OF THE STUDY

To make this project authentic and reliable, every possible aspect of the topic was kept in mind. The main limitations are:

- ❖ Time is one of the significant constraints which limit the effective data collection
- ❖ The number of respondents is limited to 117
- ❖ Some information cannot be accessed due to its confidential nature
- ❖ Reliability and accuracy of the analysis depend on the respondents ' openness and truthfulness towards each question in the questionnaire

RESULTS AND DISCUSSION

INDEPENDENT SAMPLE T TEST

An independent t-test is a statistical method used to determine whether there is a significant difference between the means of two independent groups. It is commonly applied in research and experiments where two separate groups are compared to assess the effect of a treatment, intervention, or condition. The independent t-test calculates a t-statistic, which helps determine whether the observed difference between the group means is due to chance or represents a true difference in the population. If the resulting p-value is below a chosen significance level (typically 0.05), researchers reject the null hypothesis, concluding that there is a statistically significant difference between the two groups.

LIKERT FIVE POINT SCALE

A Likert five-point scale is a commonly used rating scale in surveys and research to measure attitudes, opinions, or perceptions. It consists of five response options that range from one extreme to another, typically including "Strongly Disagree," "Disagree," "Neutral," "Agree," and "Strongly Agree." This scale allows respondents to express the degree to which they agree or disagree with a given statement. The five-point Likert scale is widely used because it provides a balanced measure of sentiment while being simple for respondents to understand.

It is frequently applied in social sciences, customer satisfaction surveys, and psychological research to quantify subjective opinions and analyze trends effectively.

2. TABLE SHOWING LIKERT FIVE POINT SCALE

Effectiveness	LIKERT SCALE								
	STRONGLY AGREE (5)	AGREE (4)	NEUTRAL (3)	DISAGREE (2)	STRONGLY DISAGREE (1)	No. of Respondents	Weighed score	Average Score	Rank
Easy to navigate the learning platform app	76 380	35 140	5 15	1 2	0 0	117	537	4.58	I
Quality of educational content	19 95	87 348	8 24	3 6	0 0	117	475	4.04	IV
Effectiveness of personalized learning features	40 200	44 176	30 90	2 4	1 1	117	471	4.02	VI
Engagement level of learning platform	24 120	59 236	23 69	10 20	1 1	117	446	3.81	X
User interface quality	38 190	50 200	20 60	6 12	3 3	117	465	3.97	VIII
Likelihood of recommending the app	32 160	64 256	18 54	2 4	1 1	117	475	4.05	III
Quality of technical support	48 240	46 184	21 63	2 4	0 0	117	491	4.19	II

Ease of accessing additional resources	32 160	62 248	20 60	2 4	1 1	117	473	4.02	V
Impact of AI assisted teaching on stress	35 175	52 208	26 78	4 8	0 0	117	469	4.00	VII
Impact on academic performance confidence	32 160	57 228	20 60	6 12	1 1	117	461	3.94	IX

Source: Primary Data

INFERENCE:

From the Likert scale calculation, it is evident that respondents are giving

- ❖ I rank with a score of 4.5897 for an easy-to-navigate learning platform App.
- ❖ II Rank with a score of 4.1965 given to strongly agree with the quality of technical support.
- ❖ III Rank with a score of 4.0598 given to agree in this study, many respondents agreed with the likelihood of recommending the App.
- ❖ IV Rank with a score of 4.0498 given to agree on the quality of educational content on the App.
- ❖ V Rank with a score of 4.0427 given to agree ease of accessing additional resources.
- ❖ VI Rank with a score of 4.0256 given to strong agreement on the effectiveness of personalised learning features.

3. TABLE SHOWING ONE-WAY ANOVA FOR SIGNIFICANT DIFFERENCE BETWEEN THE EFFECTIVENESS OF AI LEARNING PLATFORMS FOR STUDENTS

Variable		Mean square	F-value	Signification value
Effectiveness	Below within groups	40.641	1.686	.174

Effectiveness/Age	Mean	F value	Significance value
S1/AGE	1.106	3.050	.032
S2/AGE	.206	.609	.610
S3/AGE	1.891	2.629	.054
S4/AGE	.406	.506	.679
S5/AGE	2.085	2.294	.082
S6/AGE	1.106	.325	.807
S7/AGE	.206	2.396	.072
S8/AGE	1.891	4.175	.008
S9/AGE	.406	.295	.829
S10/AGE	2.085	.982	.404

Source: Primary Data

INFERENCE:

The above table ANOVA shows a significant value stated with <0.01 , and it is less than 0.05. Hence, I reject the null hypothesis and conclude by accepting that there is a significant difference between the effectiveness of AI learning platforms for students.

The higher F value is 4.175 for effectiveness further supports and motivates the stronger influence.

4. TABLE SHOWING DESCRIPTIVE ANALYSIS: PLATFORM IS INTUITIVE AND USER-FRIENDLY

Variance	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)	Mean	Standard Deviation
Easy to navigate the learning platform app	76	35	5	1	0	4.5897	.61803
Quality of educational content	19	87	8	3	0	4.0427	.57824
Effectiveness of personalized learning	40	44	30	2	1	4.0256	.86564

features							
Engagement level of the learning platform	24	59	23	10	1	3.8120	.88990
User interface quality	38	50	20	6	3	3.9744	.96902
Likelihood of recommending the app	32	64	18	2	1	4.0598	.75761
Quality of technical support	48	46	21	2	0	4.1966	.79045
Ease of accessing additional resources	32	62	20	2	1	4.0427	.77006
Impact of AI-assisted teaching on stress	35	52	26	4	0	4.0085	.81469
Impact on academic performance and confidence	32	57	20	6	1	3.9741	.85933

Source: Primary Data

INFERENCE:

The above table shows that the highest-rated aspect is ease of navigation (Mean = 4.59, SD = 0.62), suggesting that users find the platform intuitive and user-friendly. The quality of educational content also received a favorable response (Mean = 4.04), indicating general satisfaction. Personalized learning features (Mean = 4.02, SD = 0.87) and ease of accessing additional resources (Mean = 4.04) were rated positively, though with some variation in responses. The engagement level of the platform received a slightly lower rating (Mean = 3.81, SD = 0.89), suggesting room for improvement in making the platform more engaging. Similarly, user interface quality (Mean = 3.97) had a slightly mixed response. Most users expressed a willingness to recommend the app (Mean = 4.06), and technical support was well-rated (Mean = 4.20). The impact of AI-assisted teaching on stress (Mean = 4.01) and confidence in academic performance (Mean = 3.97) indicates a generally positive but not overwhelmingly strong influence. Overall, while the platform is well-received, particularly for navigation, content quality, and support, there is potential for improvement in engagement and user interface experience.

5. RANKING FACTORS INFLUENCING THE MORE USE AI AI-ASSISTED LEARNING PLATFORMS

RESPONSE TABLE

FACTORS	RANK				
	I	II	III	IV	V
Avoid Homework	63	20	15	10	9
Learn New Skills	43	22	15	13	24
Text-based materials	45	30	10	10	22
Watch Videos	50	30	10	10	17
Personalised Learning	45	35	15	10	12

Source: Primary Data

RANK TABLE

FACTORS	TOTAL	MEAN SQUARE	RANK
Avoid Homework	7290	62.30	I
Learn New Skills	6402	54.71	V
Text-based materials	6615	56.53	IV
Watch Videos	6865	58.67	III
Personalised Learning	6887	58.86	II

Source: Primary Data

INFERENCE:

From the above table, the I Rank is that students use learning platform apps to avoid homework a mean square is 62.30. The II Rank is personalised learning mean square is 58.86. The III Rank is watching videos, the mean square is 58.67. The IV Rank is text-based

materials, the mean square is 56.53. The V Rank is to learn new skills; students use a learning platform, and the mean square is 54.71.

Therefore, the highest mean square value of 62.20 is used to avoid the homework of students used in learning platform apps.

DISCUSSING THE RESULT

The statistical analysis evaluates the effectiveness of an educational app based on hypothesis testing, Likert scale rankings, and ANOVA results. The hypothesis test indicates a significant difference in the quality of educational content for S2 ($p = 0.021 < 0.05$), while other statements (S1, S3-S10) show no significant difference ($p > 0.05$).

Likert scale rankings reveal that ease of navigation ranks highest (Mean = 4.59), followed by technical support (4.20) and willingness to recommend the app (4.06). ANOVA results show a significant effect ($p < 0.01$), with the highest F-value (4.175) supporting AI's effectiveness in learning. The study also finds that students primarily use learning platforms to avoid homework (Mean Square = 62.30), followed by personalized learning (58.86) and watching videos (58.67).

Overall, users appreciate the platform's ease of use, content quality, and support, though engagement and UI experience could improve.

FINDINGS

- A significant difference was found in the effectiveness level of the quality of educational content ($p = 0.021 < 0.05$), rejecting the null hypothesis.
- For all other factors ($p > 0.05$), the null hypothesis was accepted, indicating no significant difference in effectiveness levels based on gender.
- The most highly rated factor was ease of navigation (Avg. Score = 4.58, Rank I), indicating users find the platform intuitive.
- Quality of technical support (Avg. Score = 4.20, Rank II) was also highly rated.
- Likelihood of recommending the app (Avg. Score = 4.05, Rank III) suggests users are generally satisfied.

- Engagement level (Avg. Score = 3.81, Rank X) was the lowest-rated factor, highlighting a potential area for improvement.
- A significant difference was found for S8 (Ease of accessing additional resources) across different age groups ($p = 0.008 < 0.05$).
- No significant differences were found for other factors ($p > 0.05$), meaning most effectiveness measures do not vary significantly by age.
- Ease of navigation received the highest mean score (4.59, SD = 0.62), affirming the platform's user-friendliness.
- Quality of educational content (Mean = 4.04) **and** technical support (Mean = 4.20) were also positively rated.
- Engagement level (Mean = 3.81, SD = 0.89) was rated the lowest, indicating a need for improvement.
- Avoiding homework was the most influential factor driving students to use AI-assisted learning platforms (Mean Square = 62.30, Rank I).
- Personalized learning ranked second (Mean Square = 58.86, Rank II)
- Watching videos ranked third (Mean Square = 58.67, Rank III), highlighting video-based learning as a preferred method.
- Learning new skills ranked lowest (Mean Square = 54.71, Rank V), indicating it is a less common motivation for using AI-assisted learning platforms.

The AI-assisted learning platform is well-received, particularly for its ease of navigation, quality of content, and technical support. However, engagement levels need improvement. Gender differences were mostly insignificant, while age differences were noted for ease of accessing resources. The most influential reason for using AI-assisted learning is avoiding homework, followed by personalized learning and video content consumption.

SUGGESTIONS

- Improve platform navigation, user experience, and resolve technical issues.
- Increase interactive and gamified learning with more personalized content.
- Offer digital literacy support and beginner-friendly guides.
- Add stress management tools and real-time feedback for confidence-building.
- Provide flexible pricing, scholarships, and subsidized access.
- Promote AI-driven recommendations and word-of-mouth marketing.

- Enhance mobile and tablet compatibility for seamless learning access.
- Integrate AI chatbots for instant academic and technical support.
- Develop multilingual content to support diverse learners.
- Introduce AI-driven adaptive assessments for personalized progress tracking.
- Partner with educational institutions for certification and credibility.
- Improve data security and privacy features to protect user information.
- Offer offline access to learning materials for better accessibility.
- Include gamification elements like leaderboards and rewards to boost engagement.
- Provide AI-powered career guidance based on learning patterns.
- Regularly update course content to stay relevant to industry trends.

CONCLUSION

The study highlights the increasing reliance on online learning platforms, with 80% of respondents actively using them. Coursera emerged as the most preferred platform, followed by Duolingo and Quizlet, reflecting diverse learning needs. The preference for mobile devices and laptops underscores the necessity for user-friendly, responsive platforms. English being the dominant language choice suggests that globally recognized platforms have a competitive edge. User motivations for engaging with AI-assisted learning include skill development, knowledge enhancement, and exam preparation, emphasizing the potential of AI-based platforms to bridge educational gaps. However, technical difficulties such as software glitches and connectivity issues were reported by 79% of respondents, indicating the need for improved technical support and seamless platform design.

Engagement and content preferences played a crucial role in user satisfaction. Interactive simulations were the most preferred content type, followed by text-based materials and video lectures, showing that learners value interactivity and real-world applications. Additionally, while 47% of respondents reported reduced stress levels due to AI-assisted learning, others experienced increased stress, suggesting the importance of workload management and cognitive load considerations. AI-driven education positively impacted self-esteem and reduced academic performance-related anxiety, reinforcing the benefits of personalized learning experiences. Statistical analyses further validated these findings, with the t-test confirming a significant difference in effectiveness based on educational content quality, and ANOVA results indicating that younger learners may adapt more easily to digital platforms.

Financial considerations revealed that most respondents were willing to pay between Rs . 101 and Rs. 150 per month for online learning platforms, demonstrating a moderate to high investment interest. Features like personalized learning, augmented reality, and real-time feedback were highly valued, reinforcing the importance of AI-driven customization. Overall, AI-assisted learning platforms have revolutionized education by offering flexible and engaging experiences. However, challenges related to technical difficulties, stress management, and content engagement must be addressed to optimize their impact. The study's insights provide valuable guidance for platform developers, educators, and policymakers to enhance AI-assisted learning environments, ensuring continued evolution and effectiveness in modern education.

REFERENCES

JOURNALS

1. Yubo Zhang, Gang Qin, Lijun Cheng, K. Marimuthu, B. Sandhogs Kumar. Interactive Smart Educational System Using AI for Students in the Higher Education Platform.
2. Eko Supriyanto, Arif Setiawan, Ahmad Chamsudin, Irma Yuliana, Jan Wantoro Exploring Student Perceptions and Acceptance of ChatGPT in Enhanced AI-Assisted Learning
3. Jingjing Zhang Computer-Assisted Instruction System Under Artificial Intelligence Technology.
4. Xiaojing Huang Design and Application of English Assisted Learning System Based on Mobile Learning Platform
5. Shuanghong Jenny Niu, Xiaoqing Li, Jiutong Luo Multiple users' experiences of an AI-aided educational platform for teaching and learning

Websites

<https://www.khanacademy.org>

<https://www.duolingo.com>

<https://www.quizlet.com>

<https://www.coursers.org>

<https://scribeshow.com>

<https://www.dreambox.com>

<https://hellothinkster.com>

<https://www.grammarly.com>

ENTREPRENEURIAL INTENTION OF COMMERCE AND MANAGEMENT STUDENTS

Jerisha.E and S. Bulomine Regi

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

This study investigates the entrepreneurial intention among commerce and management students, exploring the factors that influence their willingness to pursue entrepreneurship. A mixed-methods approach was employed, collecting data from 150 students through questionnaires. The results reveal that personal characteristics, educational background, and external influences significantly impact entrepreneurial intention. The study highlights the importance of entrepreneurship education, mentorship, and government initiatives in fostering entrepreneurial spirit. The findings provide valuable insights for educators, policymakers, and practitioners seeking to promote entrepreneurship education and support aspiring entrepreneurs. The study contributes to the existing literature on entrepreneurship education and entrepreneurial intention, with implications for developing effective strategies to enhance entrepreneurial aspirations among commerce and management students.

Key words

Entrepreneurial Intention, Commerce and Management Students, Entrepreneurship Education, Mentorship, Government Initiatives, Entrepreneurial Aspirations, Economic Development

INTRODUCTION

Entrepreneurship plays a vital role in economic development by fostering innovation, creating job opportunities, and driving competition. Entrepreneurial intention is influenced by several factors, including personal attitude, perceived behavioural control, subjective norms, and external factors such as access to resources and mentorship. The Theory of Planned Behaviour (TPB) and other psychological models suggest that students' intentions to become entrepreneurs depend on their confidence, risk-taking ability, and motivation. Additionally, factors like family background, role models, education, and exposure to entrepreneurial activities play a crucial role in shaping their aspirations. Given the increasing emphasis on

self-employment and startups, it is essential to explore how commerce and management students perceive entrepreneurship as a career path.

The need for entrepreneurial intention among commerce and management students is paramount in today's rapidly changing business landscape. As the job market becomes increasingly competitive, students need to develop the skills, knowledge, and mindset to create their own opportunities and become job creators rather than job seekers. Entrepreneurial intention enables students to think creatively, take calculated risks, and innovate, thereby contributing to economic growth and development. Moreover, cultivating entrepreneurial intention among commerce and management students can help them develop a sense of autonomy, self-reliance, and resilience, essential for success in the business world. By fostering entrepreneurial intention, educational institutions can empower students to become future leaders, innovators, and entrepreneurs, driving positive change and prosperity.

The role of educational institutions in fostering entrepreneurial intention is significant. Universities and colleges offering commerce and management programs are integrating entrepreneurship education, incubation centers, and hands-on business training to equip students with the necessary skills. Various government initiatives, such as startup funding, business competitions, and mentorship programs, also encourage young graduates to consider entrepreneurship instead of traditional employment. However, despite these efforts, many students still hesitate to start their own businesses due to financial risks, lack of experience, and fear of failure.

This study aims to examine the entrepreneurial intention of commerce and management students, identifying key motivating and inhibiting factors that influence their decision to pursue entrepreneurship. By analyzing students' attitudes, perceptions, and external influences, the research seeks to provide insights that can help educators and policymakers design strategies to enhance entrepreneurial aspirations. Understanding these factors is crucial in shaping an environment that fosters innovation, risk-taking, and economic growth through new business ventures.

In today's dynamic business environment, entrepreneurial intention -the willingness and determination to start a new venture- has become a critical area of study, particularly among students pursuing commerce and management education. These students possess theoretical knowledge and practical skills in business operations, finance, marketing, and

management, making them potential entrepreneurs who can contribute to the economy. Understanding their entrepreneurial intention helps policymakers, educators, and industry leaders create an ecosystem that nurtures future business leaders.

RESEARCH GAP

Research on entrepreneurial intention lacks a specific focus on commerce and management students, overlooking how business education, financial knowledge, and curriculum exposure shape their mindset. Theoretical inconsistencies, reliance on cross-sectional studies, and limited exploration of entrepreneurship education methods create gaps in understanding how their intentions develop over time. Additionally, socio-cultural and economic factors, gender differences, and the impact of digital transformation remain underexplored, especially in developing countries. Addressing these gaps can provide valuable insights for educators and policymakers to enhance entrepreneurship education and support aspiring entrepreneurs in this field.

STATEMENT OF THE PROBLEM

This study is to investigate the entrepreneurial intention of commerce and management students. Specifically, the study aims to explore the factors that influence the entrepreneurial aspirations of these students. The study will focus on understanding the personal characteristics, environmental factors, and cognitive processes that drive or hinder entrepreneurial intention among commerce and management students. The study will provide insights into the entrepreneurial intentions of commerce and management students, which will be useful for educators, policymakers, and practitioners seeking to promote entrepreneurship education and foster entrepreneurial spirit among young people. The findings of the study will also contribute to the existing literature on entrepreneurship education and entrepreneurial intention. The study will be limited to exploring the entrepreneurial intention of commerce and management students and will not examine the actual entrepreneurial behaviour or performance of these students. Future studies can build on the findings of this study to explore the relationship between entrepreneurial intention and actual entrepreneurial behaviour.

OBJECTIVES OF THE STUDY

The following are the objectives focused on the study

- To know the personal characteristics of the commerce and management students.
- To understand the entrepreneurial attitude of commerce and management students
- To identify the commerce and management students' perception to become an entrepreneur.
- To measure the entrepreneurial intention among commerce and management students.

SCOPE OF THE STUDY

The scope of this study focuses on examining the entrepreneurial intention among commerce and management students. It aims to identify the key factors that influence students' willingness to pursue entrepreneurship, including personal traits, educational background, and external influences. By analyzing these aspects, the study provides insights into how business education shapes students' entrepreneurial mindset and career choices. The research is conducted among commerce and management students from a selected university or region, ensuring that the findings are relevant to this specific academic group. It considers variables such as personal attributes, educational exposure and external factors. The study employs a combination of quantitative methods and qualitative approaches to gather comprehensive data. Furthermore, the research is limited to a specific time frame, such as an academic semester or year, to assess how students' entrepreneurial intentions develop over time. It also acknowledges potential limitations, such as self-reported biases and external economic factors that may influence entrepreneurial interest. Despite these limitations, the study contributes valuable knowledge to educators, policymakers, and students by highlighting the factors that encourage or hinder entrepreneurship in commerce and management education.

RESEARCH METHODOLOGY

Data collection

The study was analysed with the help of both primary data and secondary data.

Primary data:

The primary data were collected using questionnaire. A set of questions related to the research topic was formulated. Response for each question included in the questionnaire has been collected from the students.

Secondary data:

Information from various published resources like magazines, newspapers, and websites were used to validate data.

SAMPLING DESIGN

The data were collected originally. A purposive simple random sampling method was adopted and 150 respondents from various parts of Thoothukudi were selected on a random basis. The questionnaire was distributed to collect the primary data.

RESULTS AND DISCUSSIONS

Null Hypothesis (H0): There is no significant difference between Discipline with Entrepreneurial intention, Personal attitude, Perceived behavioural control, Subjective norms, External factors among commerce and management students

Alternative Hypothesis (H1): There is a significant difference between discipline with entrepreneurial intention among commerce and management students.

Variables	Discipline	Mean	Std deviation	t-value	p-value
Entrepreneurial intention	Commerce	27.6484	4.79670	-.903	.368
	Management	28.3729	4.80265	-.903	.368
Personal attitude	Commerce	28.2747	3.94705	-.740	.461
	Management	28.7458	3.58442	-.755	.451
Perceived behavioural control	Commerce	27.5495	4.49262	-1.047	.297
	Management	28.3051	4.03542	-1.071	.286
Subjective norms	Commerce	28.1099	4.75733	-.714	.476
	Management	28.6441	4.00329	-.741	.460
External factors	Commerce	28.0330	4.27252	-.376	.708
	Management	28.3051	4.43051	-.373	.710

Source: Compute Data

The independent samples t-test results indicate that there is no statistically significant difference between Commerce and Management students across all measured variables. For

entrepreneurial intention ($t = -0.903$, $p = 0.368$), personal attitude ($t = -0.740$, $p = 0.461$), perceived behavioural control ($t = -1.047$, $p = 0.297$), subjective norms ($t = -0.714$, $p = 0.476$), and external factors ($t = -0.376$, $p = 0.708$), the p-values are all greater than 0.05. This suggests that both groups exhibit similar levels of entrepreneurial intention, attitudes, perceived behavioural control, subjective norms, and influence from external factors, with no significant differences between them.

Null Hypothesis (H0) : There is no significant difference between Age with Entrepreneurial intention, Personal attitude, Perceived behavioural control, Subjective norms, External factors among commerce and management students

Alternative Hypothesis (H1) : There is no significant difference between age with entrepreneurial intention among commerce and management students

Variables	Age	Mean	Std. deviation	F-value	p-value
Entrepreneurial intention	18-20	27.0541	5.94393	1.000	0.370
	21-23	28.0390	4.45575		
	24-26	28.6111	4.14231		
	Total	27.9333	4.79606		
Personal attitude	18-20	28.4865	3.51680	0.120	0.887
	21-23	28.5714	3.73260		
	24-26	28.1944	4.30162		
	Total	28.4600	3.80327		
Perceived behavioural control	18-20	27.4324	4.32397	0.255	0.776
	21-23	28.0519	4.15457		
	24-26	27.8333	4.74191		
	Total	27.8467	4.32060		

Subjective norms	18-20	28.6216	4.54821	0.913	0.404
	21-23	27.8571	4.95696		
	24-26	29.0000	3.06128		
	Total	28.3200	4.46961		
External factors	18-20	27.9189	5.03531	0.098	0.907
	21-23	28.2857	4.08095		
	24-26	28.0556	4.14691		
	Total	28.1400	4.32261		

The One-Way ANOVA results indicate no significant differences in entrepreneurial intention and its associated factors (personal attitude, perceived behavioural control, subjective norms, and external factors) among different age groups (18-20, 21-23, 24-26), as all p-values are greater than 0.05. Specifically, entrepreneurial intention ($p = 0.370$), personal attitude ($p = 0.887$), perceived behavioral control ($p = 0.776$), subjective norms ($p = 0.404$), and external factors ($p = 0.907$) do not show statistically significant variation across age groups. Therefore, age does not appear to influence entrepreneurial intention or its related psychological and external factors in this study.

SUGGESTIONS

- Customize entrepreneurship education to fit both Commerce and Management students while addressing any specific needs.
- Shift focus from age-specific approaches to universal strategies that cater to all demographics.

CONCLUSION

This research study has provided valuable insights into the entrepreneurial intention of commerce and management students, highlighting the key factors that influence their aspirations to become entrepreneurs. The findings emphasize the role of personal characteristics, educational exposure, and external influences in shaping students' entrepreneurial mindset.

The study reveals that while many students demonstrate a positive attitude towards entrepreneurship, certain barriers, such as financial risks, lack of experience, and fear of failure, hinder their willingness to start their own ventures. Additionally, the impact of entrepreneurship education, mentorship programs, and government initiatives has been recognized as crucial in fostering an entrepreneurial spirit among students.

By understanding these factors, educators and policymakers can design effective strategies to strengthen entrepreneurship education and provide the necessary support to aspiring entrepreneurs. Encouraging students to develop essential entrepreneurial skills, fostering risk-taking abilities, and offering real-world business exposure can significantly enhance their confidence in pursuing entrepreneurial careers.

Despite some limitations, this study contributes to the broader understanding of how entrepreneurial intention is formed among commerce and management students. Future research can build upon these findings by exploring the transition from entrepreneurial intention to actual business ventures and analyzing the long-term impact of entrepreneurship education.

Ultimately, fostering entrepreneurial intention among students is essential for driving innovation, job creation, and economic growth. By creating a supportive ecosystem, educational institutions and policymakers can empower the next generation of entrepreneurs, ensuring a dynamic and sustainable business landscape.

REFERENCES

1. Jr. Krueger F. Norris, Reilly D. Michael and Carsrud L. Alan 2000 ;Competing Models of Entrepreneurial Intentions Journal of business venturing Vol 15; Issue 5;Page 411; www.sciencedirect.com
2. AutioErkko, Keeley H. Robert, Klofsten Magnus, Parker G.C. George and Hay Michael; 2001; Entrepreneurial Intent among Students in Scandinavia and in the USA; Enterprise and innovation management studies; Vol 02; Issue 02; Page 145; www.Taylor and Francis.com
3. Douglas J. Evan and Shepherd A. Dean 2002; Self-Employment as a Career Choice : Attitudes, Entrepreneurial Intentions and Utility Maximization Entrepreneurial theory and practice Vol 26; Issue 3 ; Page81;<https://eprints.qut.edu.au>

4. Luthje Christian and Franke Nikolaus 2003 ; The Making of an Entrepreneur : Testing a Model of Entrepreneurial Intent Among Engineering Students at MIT Rand D management Vol 33;Issue 2;Page 135;<https://doi.org>
5. Franke Nikolaus and Luthje Christian 2004; Entrepreneurial Intentions of Business Students : A Benchmarking study International journal of innovation and technology management Vol 1;Issue3Page 269; <https://doi.org>
6. Shiva Atul and Jain Jinesh; 2004; Examining Students Entrepreneurial Intentions: An Empirical Study of Commerce Undergraduate Students; Business analyst journal; Vol 1;Issue 1; Page137; <https://srcc.com>
7. Zhao Hao, Seibert E. Scott and Hills E. Gerald 2005;The Mediating Role of Self-Efficacy in the Development of Entrepreneurial Intentions Journal of applied psychology Vol 90; Issue 6;Page 265; <https://doi.org>
8. Fayolle Alain, Gailly Benoit and Clerc-LassasNarjisse 2006; Assessing the Impact of Entrepreneurship Education Programmes : A New Methodology Estudios de economiaaplicada Vol 24;Issue 2;Page 701;<https://emerald.com>
9. Souitaris Vangelis, ZerbinatiStefania and Laham-AI Andreas 2007; Do Entrepreneurship Programmes Raise Entrepreneurial Intention of Science and Engineering Students ? The Effect of Learning, Inspiration and Resources Journal of business venturing Vol 22 ; Issue 4; Page 566 ; <https://doi.org>
10. Gird Anthony andBagraim J. Jeffrey; 2008; The Theory of Planned Behaviour as a Predictor of Entrepreneurial Intent amongst Final-Year University Students; South african journal of psychology; Vol 38; Issue 4; Page 711; <https://journals.sagepub.com>
11. Ahmed Ishfaq, Nawaz Musarrat Muhammad, Ahmad Zafar, ShaukatZeeshan Muhammad, Usman Ahmad, Rehman-ul-Wasim and Ahmed Naveed 2010;Determinants of Students Entrepreneurial Career Intentions : Evidence from Business Graduates European journal of social sciences Vol 15;Issue 2;Page 14;<https://europeanjournalofsocialsciences.com>
12. ThrikawalaSudharaSujani; 2011; The Determinants of Entrepreneurial Intention among Academics in Sri Lanka; International proceedings of economics development and research; Vol 4; Issue 4; Page 440; www.thrikawalass@yahoo.com

13. Malebana Justice Mmakgabo; 2012; Entrepreneurial Intent of Final-year Commerce Students in the Rural Provinces of South Africa; University of southafrica; Vol 33; Issue 3; page 110; <https://sar.com>
14. Uddin Reaz Md and Bose KantiTarun; 2012; Determinants of Entrepreneurial Intention of Business Students in Bangladesh; International journal of business and management; Vol7; Issue 24; Page 128; <https://dx.doi.org>
15. SataMesay ; 2013; Entrepreneurial Intention Among Undergraduate Business Students ; International journal of research in management, economics and commerce; Vol 53; Issue 9; Page 33; www.indusedu.org
16. FatokiOlawale; 2014; The Entrepreneurial Intention of Undergraduate Students in South Africa: The Influences of Entrepreneurship Education and Previous Work Experience; Mediterranean journal of social sciences; Vol 5; Issue 7; Page 294; <https://doi.org>
17. NenehNgekBrownhilder; 2014; An Assessment of Entrepreneurial Intention among University Students in Cameroon; Mediterranean journal of social sciences; Vol 5; Issue 20; Page 542; <https://www.richtmann.org>
18. Looi Hoe Kim and Lattimore-Khoo Catheryn; 2015; Undergraduate students entrepreneurial intention: born or made?; International journal of entrepreneurship and small business; Vol 26; Issue 1; page 1; <https://www.inderscience.com>

A STUDY ON CUSTOMER TRUST AND SECURITY ON ONLINE SHOPPING IN THOOTHUKUDI DISTRICT

Andrew Dafny A and O. Sony

PG & Research Department of Commerce, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

This study explores the factors influencing customer trust and security concerns in online shopping, aiming to identify strategies for e-commerce platforms to build consumer confidence. With the increasing prevalence of online transactions, consumers often face challenges related to data protection, payment security, and privacy breaches. The data collected are original in nature. The result is derived with the help of statistical method of collection, computation and analysis. The collected data were analyzed by using the following statistical tools namely Percentage analysis, Independent t-test, ANOVA, Likert Scale and Chi-Square test method. Random sampling method was adopted and 120 respondents who were shopping through online. The questionnaire was prepared based on a discussion with the Guide. Then it was pretested and necessary changes were incorporate. 120 copies of the questionnaire were taken and distributed among the respondents. The study further emphasizes the need for proactive fraud prevention systems and consumer awareness programs. The insights derived from this research provide actionable recommendations for e-commerce platforms to enhance customer trust, ensure data security, and improve overall shopping experiences in the digital marketplace.

KEY WORDS

Online Shopping, Security Concerns, Trust Building, Cyber security, Data Privacy.

INTRODUCTION

The advent of e-commerce has revolutionized the way people shop, offering unparalleled convenience and accessibility. However, the online shopping experience is not without its challenges, particularly with regards to customer trust and security. This study aims to investigate the factors that influence customer trust and security in online shopping, with a view to providing insights for e-commerce businesses to improve customer confidence and loyalty. The growth of e-commerce has been phenomenal, with online sales projected to reach unprecedented heights. However, despite its popularity, online shopping is not without

its risks. Customers are increasingly concerned about the security of their personal and financial information, as well as the trustworthiness of online retailers.

Trust and security are essential components of the online shopping experience. When customers trust an online retailer, they are more likely to make a purchase and become repeat customers. Conversely, a lack of trust can lead to abandoned shopping carts, negative reviews, and a loss of business. Therefore, it is crucial for e-commerce businesses to understand the factors that influence customer trust and security. The importance of trust and security in online shopping cannot be overstated. A study by the National Retail Federation found that 62% of online shoppers are concerned about the security of their personal information. Furthermore, a study by Trust wave found that 85% of online shoppers have abandoned a purchase due to security concerns. These statistics highlight the need for e-commerce businesses to prioritize trust and security in their online operations.

STATEMENT OF PROBLEM

The rapid growth of e-commerce has led to an increase in online shopping, but it has also raised concerns about customer trust and security. Despite the convenience and benefits of online shopping, many customers are hesitant to make online transactions due to fears about the security of their personal and financial information. The lack of transparency and disclosure about the security policies and data protection practices by e-commerce websites further exacerbates these concerns. Moreover, the increasing instances of online fraud, including identity theft, credit and scams, have eroded customer trust and confidence in online shopping. Therefore it is essential to investigate the factors that influence customer trust and security concerns in online shopping, and to identify strategies that e-commerce businesses can employ to build trust and ensure the security of customer transactions.

OBJECTIVES

1. To know about the factors that influence customer trust in online shopping.
2. To know about the security concerns of customers while shopping online.
3. To analyze the satisfaction level of the customer in online shopping.

REVIEW OF LITERATURE

Aisya Salsabila Benta & Budi Astuti (2024): The purpose of this study is to analyze the relationship between customer trust and customer loyalty in doing online shopping through the Shopee website which is supported by how the quality and design of the website affect the relationship between the two. The methodology used in this research is a quantitative approach with non-probability sampling techniques. The criteria for respondents in this study are aged 17 years and over and have purchased products through Shopee. The number of valid respondents was 175. The result of this study reveals that customer trust has a positive effect on customer loyalty.

K R Abarna, et al., (2023): The study aim and purpose of this paper is to intrinsic relationship among risk, trust and purchase decision of online shopping customers and to validate the constructs of risk and trust in the study area of Chennai city. The well-structured questionnaire is circulated among 750 respondents, 50 each in all the 15 zones of Chennai city and able to receive usable 511 responses. The study reveal that the purchase decision of online consumers depends upon their optimistic purchase attitude towards online shopping, the risk involved in online shopping and customer trust in online shopping.

SAMPLING DESIGN

The data collected are original in nature. Random sampling method was adopted and 120 respondents who were shopping through online.

Table Showing Factors that Influence the Gender Customer Trust in Online Shopping

Null Hypothesis: There is no significant difference in the level of customer trust in online shopping between male and female customers.

Alternative Hypothesis: There is a significant difference in the level of customer trust in online shopping between male and female customers.

VARIABLE	MEAN	STANDARD DEVIATION	F	P-VALUE
Male	27.3030	3.83093	1.406	.238
Female	26.7963	4.40146		

Computed source: primary data

INFERENCE

The above table shows that there is no statistically significant difference in the levels of customer trust in online shopping between male and female customers. With a p-value of

0.238, which exceeds the typical significance level of 0.05, Hence it was fail to reject the null hypothesis. The table suggests that gender does not have a significant influence on customer trust in online shopping, as the mean scores for male and female customers, 27.3030 and 26.7963 respectively, do not differ significantly.

TABLE SHOWING SECURITY WARNINGS CONCERN OF CUSTOMERS

Null Hypothesis: There is no significant difference in the security warnings concern of customers between groups.

Alternative Hypothesis: There is a significant difference in the security warnings concern of customers between groups.

VARIABLE	MEAN SQUARE	F	SIGNIFICANCE VALUE
Between Groups	14.415	.854	>0.05
Within Groups	16.885		

Computed source: primary data

INFERENCE:

The above table shows the ANOVA results indicate that there is no statistically significant difference in the security warnings concern of customers between groups. The F-statistic is 0.854, which corresponds to a significance value (p-value) of 0.428. Since the p-value is greater than 0.05, the result is considered not statistically significant. This suggests that any observed differences in security warnings concern between groups are likely due to chance rather than any underlying factors. Hence it was rejected the null hypothesis, indicating no significant difference in security warnings concern between groups.

TABLE SHOWING AGE ASPECTS RELATING TO THE SATISFACTION LEVEL OF CUSTOMER IN ONLINE SHOPPING

Null Hypothesis: There is no significant difference between age aspects relating with satisfaction level of customer in online shopping

Alternative Hypothesis: There is a significant difference between age aspects relating with satisfaction level of customer in online shopping

VARIABLE	CHI SQUARE	ASYMP. VALUE (P)

I am satisfied with my overall online shopping experience.	10.165	.337
I am satisfied with the online shopping services I have received.	7.950	.539
I am satisfied with the quality of products I have received from online retailers.	5.579	.781
I am satisfied that the online retailers to protect my personal and financial information.	10.040	.612
I am satisfied with the level of security provided by the online retailer.	19.493	.077
I am satisfied with the return and refund policies of online retailers are fair and reasonable.	7.275	.839
I am satisfied with the customer service I have received from online retailers is satisfactory	9.852	.629

Computed source: primary data

INFERENCE

From the above table of the chi-square analysis reveal that there is no significant relationship between age and satisfaction levels in various aspects of online shopping. The p-values for most variables, such as overall online shopping experience, online shopping services, quality of products, protection of personal and financial information, and customer service, are greater than 0.05, indicating no significant association with age. However, the p-value for satisfaction with the level of security provided by the online retailer is 0.077, which is close to the significance level, suggesting a possible relationship between age and security satisfaction. The overall findings suggest that age is not a determining factor in customer satisfaction with online shopping experiences.

FINDINGS

- The p-value (0.238) is greater than 0.05, meaning gender does not influence customer trust significantly.
- The F-statistic (0.854) and p-value (>0.05) suggest that variations in security concerns are likely due to chance.

- Satisfaction with online retailer security had a p-value of 0.077, suggesting a potential but weak relationship.

SUGGESIONS

- It is necessary to highlighting positive customer reviews and testimonials can help increase trust across all demographics.
- It would be necessary to implementing visible security measures (e.g., SSL certificates, two-factor authentication) can reassure all customers.
- It is necessary to close-to-significant result for security satisfaction suggests that retailers should invest more in improving cyber security measures to cater to security-conscious customers.

CONCLUSION

By all the analysis which has been tested and proven, there is a significant number of respondents experienced security-related issues like data leakage and fraud, a majority did not frequently encounter security warnings. This highlights a potential gap in consumer awareness or a lack of visible security features on shopping platforms. The analysis also demonstrated that customers trust platforms offering secure payment options and transparent security policies, emphasizing the need for retailers to prioritize robust cyber security measures. Another notable insight was the influence of website design and functionality on customer trust. A well-designed, easy-to-navigate website with clear product information, secure payment gateways, and responsive customer service was strongly associated with higher satisfaction levels. While respondents expressed moderate satisfaction with product quality, customer service remains an area requiring improvement. Retailers should focus on enhancing their service responsiveness and ensuring fair return and refund policies to build long-term customer loyalty.

The study explored demographic influences on shopping experiences, revealing no significant differences in customer trust based on gender. However, security concerns showed slight variations across different age groups, with younger consumers displaying greater sensitivity to privacy issues. This suggests that tailored marketing strategies and personalized communication regarding security practices may resonate better with specific age segments. In conclusion, the chapter emphasizes the importance of addressing technical challenges, improving security measures, and enhancing customer support to elevate overall satisfaction levels. By implementing these improvements,

online retailers can foster greater trust, encourage repeat purchases, and maintain a competitive edge in the digital marketplace. The insights derived from this analysis provide valuable guidance for businesses seeking to optimize their online shopping platforms and deliver superior customer experiences.

REFERENCES

- ✓ https://scholar.google.com/scholar?start=90&q=a+study_on_customer_trust_and_security_on_online_shopping
- ✓ <https://www.tandfonline.com/doi/full/10.1080/23311908.2022.2035530#abstract>
- ✓ <https://ecojoin.org/index.php/EJE/article/view/337>
- ✓ <https://link.springer.com/article/10.1023/a:1016323815802>
- ✓ <https://www.sciencedirect.com/science/article/abs/pii/S096969891500051X>
- ✓ <https://dergipark.org.tr/en/pub/irmm/issue/32079/355044>

HOUSEHOLD PURCHASING DECISION MAKING POWER OF HOMEMAKERS

Arul Jerusha.B and S. Bulomine Regi

PG and Research Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

Abstract

Homemakers play a crucial role in household decision-making, influencing purchasing choices, budget allocation, and overall financial planning. This study examines the factors shaping homemakers' decision-making power in purchasing, focusing on financial autonomy, demographic characteristics, and societal norms. With the rise of digital technologies and e-commerce, homemakers now have greater access to information, altering traditional purchasing patterns. The study is conducted in Thoothukudi City, using a sample of 150 homemakers surveyed through structured questionnaires. Statistical tools such as percentage analysis, mean rank, t-tests, ANOVA, and correlation analysis were employed to analyze the data. The findings offer insights into the impact of financial independence, education, and digital accessibility on homemakers' purchasing decisions, contributing to consumer behavior research and business strategies.

Keywords

Homemakers, Household Decision-Making, Financial Autonomy, Consumer Behavior, Digital Influence, Budget Allocation, Purchasing Power,

Introduction

Homemakers are the primary decision-makers in households, responsible for managing daily expenses and purchasing essential goods. Their influence extends beyond routine shopping, impacting overall family well-being and financial planning. This study explores the purchasing decision-making power of homemakers, analyzing the factors that influence their choices, including financial autonomy, education, and digital exposure. With the advent of online shopping and social media, homemakers have more resources to make informed decisions. By examining these aspects, the study aims to provide valuable insights for businesses, policymakers, and researchers, highlighting the evolving role of homemakers in household economic dynamics.

Research gap

There is a significant research gap in understanding the household decision-making power of homemakers. Existing studies have mainly focused on urban, middle-class

homemakers, neglecting the experiences of rural, low-income, and marginalized groups. Additionally, the impact of digital media and online shopping on homemakers' purchasing decisions remains unexplored. Furthermore, research has not adequately examined how intersecting factors like age, education, and occupation influence homemakers' decision-making power. Addressing these gaps is crucial to gaining a deeper understanding of homemakers' experiences and promoting gender equality.

Statement of the problem

Homemakers are essential to household management, yet they frequently encounter obstacles in exercising control over purchasing decisions. The restrictive factors include limited financial autonomy, societal expectations, and intra-household power dynamics, ultimately leading to diminished empowerment, autonomy, and satisfaction. This study seeks to investigate the factors influencing homemakers' decision-making power in purchasing, examining the interplay between demographic characteristics, financial autonomy, and decision-making power. Moreover, considering the intersectionality of factors such as age, education, and income with financial autonomy and societal norms is crucial. The rise of digital technologies and e-commerce has further complicated purchasing decisions, emphasizing the need to explore how homemakers adapt to these changes. By examining these complex relationships, this study aims to provide a comprehensive understanding of the factors influencing homemakers' decision-making power in purchasing decisions.

Objectives of the study

The following are the objectives focused in this study:

- 1.To examine the level of involvement of homemakers in household purchasing decisions.
- 2.To identify the factors influencing homemakers purchasing decisions.
- 3.To analyze the role of homemakers in budget allocation for household expenses.
4. To investigate the impact of demographic characteristics on homemakers purchasing decisions.
- 5.To identify the differences in the financial ability to influence family members purchasing decisions among homemakers.

Scope of the study

The study, “Household purchasing decision Making Power of Homemakers in Thoothukudi City”, aims to investigate the role and influence of homemakers in making

purchasing decisions for their households. This analysis seeks to understand the factors that affect their decision-making power and its implications on consumer behaviour.

Methodology

The present study is analytical and descriptive in nature. A questionnaire was constructed to elicit the required information from the respondents. 150 sample respondents were selected for the study. A well-structured questionnaire was framed and collected using Google Forms. The study is based on the household decision-making power of homemakers in Thoothukudi City, therefore, the questions are related to various aspects of household decision-making, including Demographic details of homemaker, Household decision-making power and influences, Factors affecting household decision-making power, Impact of household decision-making power on family well-being and quality of life.

Limitations of the study

1. The samples have been taken only from 150 respondents.
2. Accuracy of the study is purely based on the information given by the respondent.
3. Data obtained was dependent on the memory and mood of the respondents; this could bring about a bias in the survey.
4. The area of the study of respondents is limited to Thoothukudi..

Results and Discussions

Null Hypothesis: There is no significant difference between Age and household purchasing decision making power of homemakers

Alternative hypothesis: There is a significant difference between Age and household purchasing decision making power of homemakers

Table 1 Age and household purchasing decision making power of homemakers

Variables	Age	Mean	Standard Deviation	F	Sig
Factors influencing purchasing decision	18-24	29.0000	2.82843	2.150	0.096
	25-34	29.1364	1.74664		
	35-44	28.0625	3.03674		
	Above 45	27.8095	2.58107		
Measuring the household decision making power of homemakers	18-24	29.2075	2.72000	1.552	0.204
	25-34	28.9545	2.28193		
	35-44	28.7188	2.11346		

	Above 45	27.8571	2.70713		
Level of involvement	18-24	28.9245	2.77938	0.772	0.511
	25-34	28.6136	2.39394		
	35-44	28.3125	2.10127		
	Above 45	28.0952	1.86828		
Financial ability and influence	18-24	29.3396	2.26973	2.491	0.063
	25-34	28.1136	2.88715		
	35-44	28.2500	2.46262		
	Above 45	28.2381	2.07135		
Challenges in decision making	18-24	29.1698	2.33482	6.128	0.001
	25-34	26.7045	4.24034		
	35-44	26.2188	4.70918		
	Above 45	26.5238	3.34094		

The table indicate that there is a significant difference in challenges in decision making (.001) is less than 0.05 which indicates that the null hypothesis can be rejected. In contrast the significance values as (.096) for factors purchasing decision ,(.204) for measuring the household budget making power of homemakers ,(511) for level of involvement and (.063) for financial ability and influence are greater than 0.05,indicating that the null hypothesis is accepted and conclude that there is no significant difference in household decision making power among homemakers. There is a significant difference between age and Household purchasing decision making power of homemakers

Suggestions

- 1.Develop targeted interventions to support homemakers in different age groups, addressing specific challenges and needs.
2. Provide financial education and literacy programs to enhance homemakers' financial ability and influence.
3. Offer decision-making support and resources to help homemakers navigate challenges and make informed decisions

Conclusion

The study underscores the pivotal role homemakers play in household decision-making and purchasing power, exerting significant influence over finances, shopping preferences, and budgeting decisions. Homemakers actively participate in decision-making, considering factors like price, quality, values, and family needs, with social media, nutrition, and ethics also shaping their purchasing decisions. While they face challenges like balancing personal

and family needs, managing debt, and societal expectations, financial literacy emerges as a crucial factor in their decision-making capacity, highlighting the need for tailored financial education, skill development subsidies, and specialized savings and investment plans to enhance their financial management abilities.

References :

- 1.Koli kamrunnahar (2024) Women's contribution to the domestic decision making process in Bangladesh :a sociological analysis ,Journal -EPRA International Journal of multidisciplinary Research ,ISSN 2455-3662,Volume -10,Issue-6
2. Dahal Anita, AdhikariChahana(2023) ,Homemakers participation in household decision making, Journal -Quest Journal of management and social sciences, Volume -5, Issue 2:275-290
- 3.Akbiyik .F, Caglar. N(2022) Research on determining the purchasing styles of working women and housewives Journal-International Journal of Eurasia Social sciences,Volume-13,Issue-48,ISSN -2146-1961
- 4.Goswami Runali (2021) Role of women in decision making in the family, Journal-International Journal of Emerging Technologies and Innovative Research ISSN:2349-5162, Vol.8, Issue 4, <http://www.jetir.org/papers/JETIR2104036.pdf>
- 5.Alem Yonas, HassenSied,Gunnarn(2020),Decision making within the household: The role of autonomy and differences in preferences, Journal -RUHR Economic papers,ISSN-1864-4872
6. MalakarIndra (2019) Women's role in household decision making in Newari community ,Journal-Nepal Journal Online,Volume-2,Issue-1,ISSN-2392-4624 <https://www.nepjol.info/index.php/cognition/article/view/55566>
7. Melicharova A (2018) Decision making process of households on food consumption, Journal-JournalofAgriculturalEconomics,ISSN-328-334
8. PK Roy,SHaque,ArifaJannat,Md.Shahjahan Ali(2017)Contribution of women to household income and decision making in some selected areas of Mymensingh in Bangladesh, Journal-BangladeshJournalsOnline,Volume-28
- 9.Kirchler Erich,Winter Laura, Elfriede(2016),Methods of studying economic decision in private households ISSN-2182-7435. ,<https://journals.openedition.org/rccs/pdf/6467>
10. JoharSeema(2015) To study the consumer decision making behavior to purchase of durable goods (with special reference to female in Loni town) Journal -International Journal of Applied and pure science and Agriculture ,Volume-1,Issue-12,e-ISSN:2394-5532,p-

ISSN:2394-823X <https://typeset.io/papers/to-study-the-consumer-decision-making-behavior-to-purchase-532rcyer82>

11.Ahamad Shaik (2014) family members role in purchase decision making Journal -Abhinav International monthly refereed Journal of Research in Management and Technology

12.Samsinar,Zawawi M.S. Dahlia Zawawi,Teo B.H(2013)Factors affecting wives role structure in urban family purchase decision ,Journal-Pertanika journals ,ISSN:0128-7702 <https://psasir.upm.edu.my/28368/1/28368.pdf>

13.Nezakati Hossein,Khim Sock Chin ,Asgari Omid (2011) Decision-making determinants in working women's clothes purchasing , International Journal of Trade, Economics and Finance,Volume-2 <https://www.ijtef.com/papers/133-S00028.pdf>

14.Acharya R Dev, Bell S Jacqueline ,SimkhadaPadam, Teijlingen Van R Edwin , Regmi R Pramad (2010) ,Women's autonomy in household decision making :a demographic study in Nepal Journal-Reproductivehealthjournal

15.Mary G Sarguna(2009),Product purchase decision making process among urban married working women in Tiruchirapalli,Journal-Indian Journal of Marketing,Volume-39, Issue -2,

16.Merwe Der Van Daleen (2008)Consumer in houseware stores according to their decision making process: An exploratory study ,Journal -International Journal of Consumer Studies,Volume-32,Issue-4

17.Melicharova A (2006) Decision-making process of household on food consumption Journal -Agricultural EconomicsJournal, ISSN:0139-570X https://agricecon.agriculturejournals.cz/artkey/age-200607-0004_decision-making-process-of-households-onfood-consumption.php

18.Harcar Talha (2005), A multinational study of family decision making, Journal-Multinational Business Review,Volume-13,Issue-2,ISSN-1525-383X

19.Kaur Pavleen,SinghRaghhbir(2004) Dynamics of purchase decision making in families Journal -ScholarlyJournal,Volume-11,Issue-4.

20.Kapoor Sheetal(2002) Understanding buying behavior of Indian families. <https://typeset.io/papers/understanding-buying-behaviour-of-indian-families-3ihxemy748>

IMPACT OF ELECTRONIC PAYMENT SYSTEM ON CONSUMER BUYING BEHAVIOR IN THOOTHUKUDI

M.Bala Abirami and A.Amora

PG and Research Department of Commerce, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

Impact of electronic payment system on consumer buying behavior in Thoothukudi is the topic taken for research. This study is focused on assessing the adoption rate of e-payment systems among consumers, analysing the factors influencing consumers' choice of e-payment systems, exploring the knowledge of the e-payment system of consumer behaviour, investigating the impact of e-payment systems on consumer behaviour and providing secure payment options that protect consumer data. Primary and Secondary data used in the study were collected. The purposive sampling technique is adopted to select 120 respondents who use the Impact of electronic payment system on consumer buying behaviour in Thoothukudi District who used the impact of electronic payment systems on consumer buying behaviour in Thoothukudi District. The study examines the impact of electronic payment systems (EPS) on consumer behaviour, emphasizing convenience, security, and accessibility as primary drivers of adoption. The findings reveal that a majority of consumers prefer digital transactions for their ease of use and efficiency, with credit/debit cards and digital payment apps being the most frequently used methods. Demographic analysis shows that younger consumers (18-24 years) are the most engaged users, with a slight majority of female respondents favouring digital payment.

Keywords

Impact, electronic payment system, consumer buying behaviour, debit card, credit card and digital payment.

INTRODUCTION

The electronic payment system (EPS) has significantly transformed consumer buying behaviour by offering convenience, security, and efficiency in financial transactions. The study explores the impact of e-payment systems on consumer behaviour, highlighting

how digital transactions influence purchasing decisions, market dynamics, and brand perceptions. Factors such as convenience, security, rewards, and business acceptance shape consumer preferences for various e-payment methods, including credit cards, mobile wallets, and digital currencies. Using the snowball sampling method, the research aims to assess consumer acceptance, usage trends, and the factors influencing e-payment choices. The study emphasizes the importance of EPS in enhancing consumer satisfaction, reducing payment barriers, and expanding global market access while also acknowledging challenges like digital literacy and security concerns. The research draws insights from previous studies, which suggest that technological advancements, trust issues, and regulatory frameworks play crucial roles in shaping e-payment adoption. Through statistical analysis and consumer surveys, the study aims to provide valuable insights for businesses and policymakers to optimize e-payment systems and improve the overall consumer experience in the digital financial landscape.

REVIEW OF LITERATURE

Halim et al. (2020) “Impact of E-payment system on consumer buying behaviour” expressed that the increasing ability of impulsive buying behaviour, made possible by e-

Payment systems in e-commerce are the driving force behind this pilot study. Online shopping's efficiency and convenience encourage customers to make impulsive, more frequent purchases. We intend to examine the impact of e-payment systems, impulsive buying, trust, and behaviour payment systems in e-commerce, which is the driving force behind this pilot study. Online shopping's efficiency and convenience encourage customers to make impulsive, more frequent purchases. We intend to examine the impact of e-payment systems, impulsive buying, trust, and behaviour control on purchase intention in e-commerce using structural equation modelling (SEM) and purposive sampling. Information was gathered in May 2020 from 51 Indonesian online shoppers who primarily used electronic payment methods. All five of the study's hypotheses, which draw on earlier findings and the Theory of Planned Behaviour, are confirmed, showing the important influence of these factors on e-commerce purchase intention.

Ho et al.(2020) “Impact of electronic payment system on consumer buying behaviour” The development and security of electronic payment techniques are critical to the long-term viability of electronic payment. Trust and faith in this technology remain low among internet users, whether in terms of revealing their personal information or

preventing their card details from being stolen and used by someone else. An essential factor in the spread of culture and the usage of electronic media is a country's educational attainment level. Yet, the absence of such a culture would lead to several issues, the most serious of which is the lack of trust in electronic payment. E-commerce transactions have been made easier, faster, more secure, and at a lower cost thanks to the electronic payment process. For fraudulent purposes, as well as the number of electronic payments and fraud methods that are created.

P.Lai et al.(2020) “Impact of electronic payment system on consumer buying behaviour” There is still a lack of public interest in using these systems, even if attempts have been made to persuade people otherwise. It was thus decided to research what influences customers' adoption of electronic payment methods. Findings from the research demonstrated that elements such as expectations of performance, expectations of effort, the effect of social interactions, and facilitative limitations all played a role.

Zoleta (2021) “Adoption of E-Payment Systems in the Philippines” The researchers were adopting e-wallet or e-payment systems more than credit cards in 2018. Platforms such as GCash and PayMaya are options for Filipinos to do digital financial transactions without physical cash and credit cards. Additional data also show that more Filipinos are becoming aware of contactless payments and see such services' benefits. The Visa Consumer Payment Attitudes study revealed that 80 percent of respondents were aware of e-payment systems (Visa, 2019).

K M, Siby(2021) He quoted in his paper ‘A Study on Consumer Perception of Digital Payments Methods in times of Covid Pandemic’ that even amid the Covid pandemic, the digitization drive in payment systems has made tremendous progress. 107 respondents from Kerala's Ernakulam district provided primary data for this study, which examined consumer impression of digital payment methods based on demographic factors such as gender, age, educational attainment, and occupation. Based on the main demographic factors, correlation and One way ANOVA were employed to analyse the data.

STATEMENT OF THE PROBLEM

The use of e-payment systems is beneficial and has been implemented by millions of companies all over the world. In line with its benefits, companies and customers have also faced challenges. certain challenges. One of the challenges encountered is that the e-payment system requires some degree/level of literacy. That is, some customers who make use of the e-payment system are not well knowledgeable or

do not know how to use the e-payment system to seal a transaction on their own. Another problem identified is that most of the customers are security-conscious. Findings are that many users face digital literacy challenges and security concerns, slowing e-payment adoption. The suggestions are to improve user education, enhance security, build trust, and support small businesses with lower fees.

OBJECTIVES OF THE STUDY

1. To assess the adoption rate of e-payment systems among consumers.
2. To analyze the factors influencing consumers' choice of e-payment systems.
3. To explore the knowledge of the e-payment system of consumer behaviour.
4. To investigate the impact of the e-payment system on consumer behaviour.
5. To provide secure payment options that protect consumer data.

RESEARCH METHODOLOGY

Sampling design	Simple random sampling
Period of the study	November 2024 to March 2025
Data used	Primary and Secondary data
Test for analysis	Percentage analysis, Descriptive analysis, One-sample test, Independent sample t-test and One ANOVA

LIMITATION OF THE STUDY

In order to make this project a veritable and well found one all the aspects of the topic were kept in mind. The major limitations are.

1. Time is one of the main hindrances which limit effective data collection.
2. The number of respondents 120 is limited.
3. The area of study is Thoothukudi, so the study doesn't suit other cities.
4. The reliability and accuracy of the study depend on the respondents truthfulness and response towards the questionnaire.

Results and discussion

TABLE SHOWING THE SATISFACTION OF E- PAYMENT SYSTEM

Satisfaction Electronic payment system	Mean	Standard deviation

E-payment systems enhance convenience for online transactions.	4.4333	.86708
The e-payment system is satisfactory.	4.1000	.71479
The availability of multiple e-payment systems offers better options.	3.5000	.97014
Social media and recommendations influence my choice of e-payment systems.	3.5417	1.18034
Customer support is reliable for resolving e-payment issues.	3.3333	1.29857
Offers and discounts influence my choice of e-payment systems.	3.4667	1.20874
E-payment systems are secure and trustworthy.	3.5167	1.13006
knowledgeable about using e-payment apps.	3.5917	.99153
E-payment systems foster brand loyalty.	3.6917	1.08307
Transparency in security policies builds trust in e-payment systems.	3.6833	96130
The level of consumer awareness about e-payment systems.	3.4667	1.26314
The use of e-payment systems for online transactions is prevalent.	3.4833	1.21602
The importance of low transaction fees in selecting an e-payment system.	3.6417	1.09080
The security of the e-payment system on consumer satisfaction.	3.5667	1.14300
The role of consumer support in ensuring a positive experience with the payment system.	3.6917	1.09848
The impact of using e-payment systems on trust and credibility in online transactions.	3.6500	1.03429
The rate of security payment options offered on this platform is in terms of protecting the pers financial information.	3.6583	3.6583

Based on the Highest Values of mean 4.4333 and 3.6917. These indicate the aspects of e-payment systems that received the most positive feedback. From the previous table, 4.4333 corresponds to "E-payment systems enhance convenience for

online transactions," showing that users strongly agree with this statement. The mean of 3.6917 corresponds to factors like "E-payment systems foster brand loyalty" and "The role of consumer support," indicating that users generally find these aspects satisfactory, but with some variability.

Based on the lowest values of means, 3.3333 and 3.4667. These represent the areas with relatively lower user satisfaction. The 3.3333 score is associated with "Customer support is reliable for resolving e-payment issues," which suggests that users have mixed or slightly negative opinions about customer support reliability. The 3.4667 score likely represents "Offers and discounts influence my choice of e-payment systems" or "The level of consumer awareness about e-payment systems," suggesting that users are less influenced by promotions or feel that awareness could be improved.

The standard deviation (SD) values provide insight into the variability of data. The highest Standard deviation values: 1.29857 1.26314 indicates a greater spread in responses, suggesting higher variability in how people responded to that particular factor. This means opinions or experiences were more diverse. Lowest standard deviation values: 0.71479 And 1.09080 suggest lower variability, meaning that responses were more consistent and closer to the mean. A lower SD indicates a more uniform agreement among respondents, while a higher SD suggests differing opinions or experiences.

On One-sample-test

Null Hypothesis (H₀): There is no significant difference between perception and satisfaction.

Alternative Hypothesis (H₁): There is a significant difference between perception and satisfaction.

TABLE SHOWING THE IMPACT OF E-PAYMENT SYSTEM ON PERCEPTION AND SATISFACTION

Impact	Mean	Standard deviation	T-value	P-value
E-payment systems enhance convenience for online transactions.	4.4333	.86708	18.108	.000
The e-payment system is satisfactory.	4.1000	.71479	16.858	.000

The availability of multiple e-payment systems offers better options.	3.5000	.97014	5.646	.000
Social media and recommendations influence my choice of e-payment systems.	3.5417	1.18034	5.027	.000
Customer support is reliable for resolving e-payment issues.	3.3333	1.29857	2.812	.006
Offers and discounts influence my choice of e-payment systems.	3.4667	1.20874	4.229	.000
E-payment systems are secure and trustworthy.	3.5167	1.13006	5.008	.000
knowledgeable about using e-payment apps.	3.5917	.99153	6.537	.000
E-payment systems foster brand loyalty.	3.6917	1.08307	6.996	.000
Transparency in security policies builds trust in e-payment systems.	3.6833	.96130	7.787	.000
The level of consumer awareness about e-payment systems.	3.4667	1.26314	4.047	.000
The use of e-payment systems for online transactions is prevalent.	3.4833	1.21602	4.354	.000
The importance of low transaction fees in selecting an e-payment system.	3.6417	1.09080	6.444	.000
The security of the e-payment system on consumer satisfaction.	3.5667	1.14300	5.431	.000
The role of consumer support in ensuring a positive experience with the e-payment system.	3.6917	1.09848	6.898	.000
The impact of using e-payment systems on trust and credibility in online transactions.	3.6500	1.03429	6.884	.000
The rate of security payment options offered on this platform is in terms of protecting the personal and financial information.	3.6583	1.02487	7.037	.000

INFERENCE

Each impact has a mean score, standard deviation, t-value, and p-value. The p-values for all impacts are .000, the significance of 0.05. A p-value < 0.05 indicates that the null hypothesis (H_0) should be rejected. Since all p-values are statistically significant, we reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1). This means there is a significant difference between perception and satisfaction across all impacts.

INDEPENDENT SAMPLE T-TEST

Impact	Gender				T-value	P-value
	Male		Female			
	Mean	Standard deviation	Mean	Standard Deviation		
E-payment systems enhance convenience for online transactions.	4.3559	.92406	4.5082	.80876	-.961 -.959	.489
The e-payment system is satisfactory.	4.1864	.68165	4.0164	.74144	1.307 1.309	.282
The availability of multiple e-payment systems offers better options.	3.5254	.87801	3.4754	1.05840	.281 .282	.229
Social media and recommendations influence my	3.5763	1.22056	3.5082	1.14925	.315 .314	.613

choice of e-payment systems.						
Customer support is reliable for resolving e-payment issues.	3.4407	1.26315	3.2295	1.33408	.890 .891	.812
Offers and discounts influence my choice of e-payment systems.	3.5763	1.27581	3.3607	1.14065	.977 .975.	.224
E-payment systems are secure and trustworthy.	3.5085	1.07275	3.5246	1.19173	-.078 -.078	.361
knowledgeable about using e-payment apps.	3.7288	.97963	3.4590	.99287	1.498 1.498	.950
E-payment systems foster brand loyalty.	3.7627	1.00583	3.6230	1.15706	.705 .707	.233
Transparency in security policies builds trust in e-payment systems.	3.9153	.93381	3.4590	.94117	2.665 2.665	.588
The level of consumer awareness about e-payment systems.	3.5424	1.08790	3.3934	1.41749	.644 .647	.013
The use of e-payment systems for online transactions is prevalent.	3.6610	1.19785	3.3115	1.21848	1.584 1.585	.773

The importance of low transaction fees in selecting an e-payment system.	3.8644	.89938	3.4262	1.21736	2.237 2.248	.005
The security of the e-payment system on consumer satisfaction.	3.6441	1.06290	3.4918	1.21960	.728 .730	.113
The role of consumer support in ensuring a positive experience with the e-payment system.	3.7458	1.09219	3.6393	1.11105	.529 .529	.822
The impact of using e-payment systems on trust and credibility in online transactions.	3.5254	1.10416	3.7705	.95557	-.301 -.298	.075
The rate of security payment options offered on this platform is in terms of protecting the personal and financial information.	3.5254	1.10416	3.7869	.98514	1.403 -1.401	.227

INFERENCE

The table provided is actually an Independent Sample T-test, The T-test compares the means of two groups Male and Female across e-payment systems. The p-values for all the variables are greater than 0.05. There is no significant difference between male and female respondents in their perceptions of e-payment systems. Since none of the p-values is below 0.05 and fails to reject the null hypothesis, gender does not significantly impact opinions on e-payment convenience, satisfaction, availability, social media influence, customer support, or discounts.

ONE-WAY ANOVA

Null Hypothesis (H0): There is no significant relationship between age and the impact of electronic payment systems.

Alternative Hypothesis (H1): There is a significant relationship between age and the impact of electronic payment systems.

4.TABLE SHOWING THE RELATIONSHIP BETWEEN AGE AND THE IMPACT OF E-PAYMENT SYSTEM

IMPACT		Age (in years)					F value	P value
		1 8- 24	2 5- 3 4	3 5- 4 4	4 5- 54	55- 65		
E-payment systems enhance convenience for online transactions.	Mean	4.47	4.28	4.42	4.45	4.88	.778	.542
	S.D	.896	.634	.987	1.099	.354		
The e-payment system is satisfactory.	Mean	4.18	4.22	4.04	3.90	4.00	.791	.533
	S.D	.521	.941	.774	.641	.000		
The availability	Mean	3.32	3.78	3.46	3.35	3.63		

of multiple e-payment systems offers better options.	S.D	.976	.832	1.029	1.089	.916	1.121	.350
Social media and recommendations influence my choice of e-payment systems.	Mean	3.18	3.97	3.69	3.10	4.00	3.187	.016
	S.D	1.029	.897	1.258	1.410	1.309		
Customer support is reliable for resolving e-payment issues.	Mean	3.09	3.72	3.35	3.05	3.50	1.292	.277
	S.D	1.379	1.054	1.355	1.504	.926		
Offers and discounts influence my choice of e-payment systems.	Mean	3.15	3.75	3.54	3.25	4.00	1.641	.169
	S.D	1.258	1.136	1.334	1.070	.926		
E-payment systems are secure and trustworthy.	Mean	3.29	3.59	3.65	3.60	3.50	.482	.749
	S.D	1.194	1.103	1.263	.995	.926		
Knowledgeable about using e-payment apps.	Mean	3.29	3.88	3.69	3.45	3.75	1.676	.749
	S.D	.906	1.070	.884	.887	1.389		
E-payment systems foster brand loyalty	Mean	3.41	3.78	3.81	3.55	4.50	1.958	.106
	S.D	1.234	.870	1.021	1.234	.535		
Transparency in security	Mean	3.35	3.72	3.77	4.00	3.88	1.730	.148

policies builds trust in e-payment systems.	S.D	1.041	.924	.908	.918	.835		
The level of consumer awareness about e-payment systems.	Mean	3.15	3.63	3.62	3.50	3.63	.789	.534
	S.D	1.374	1.264	1.203	1.318	.744		
The use of e-payment systems for online transactions is prevalent.	Mean	3.15	3.72	3.77	3.30	3.50	1.444	.224
	S.D	1.306	.851	1.070	1.455	1.690		
The importance of low transaction fees in selecting an e-payment system.	Mean	3.26	3.78	3.65	3.85	4.13	1.766	.140
	S.D	1.189	.975	1.093	.988	1.126		
The security of the e-payment system on consumer satisfaction.	Mean	3.50	3.75	3.54	3.15	4.25	1.654	.166
	S.D	1.237	.984	1.208	1.182	.707		
The role of consumer support in ensuring a positive experience with the e-payment system.	Mean	3.68	3.59	3.65	3.75	4.13	.390	.815
	S.D	1.173	.911	1.093	1.293	1.126		

The impact of using e-payment systems on trust and credibility in online transactions .	Mean	3.53	3.88	3.77	3.35	3.63	1.002	.409
	S.D	1.022	.833	1.210	1.040	1.188		
The rate of security payment options offered on this platform is in terms of protecting he personal and financial information .	Mean	3.68	3.81	3.50	3.55	3.75	.402	.807
	S.D	.912	.821	1.140	1.356	1.035		

The above table ANOVA shows a significant value stated with <0.01 , and it is less than 0.05. Hence, I reject the null hypothesis and conclude by accepting that there is a significant difference in the effectiveness of the Impact of the electronic payment system. The higher F value is 3.187 for the electronic payment system.

FINDINGS

- The findings indicate that e-payment systems are widely appreciated for their convenience, with the highest mean values (4.4333 and 3.6917) showing strong user agreement that they enhance online transactions and foster brand loyalty. However, areas such as customer support reliability and the influence of offers and discounts, reflected in the lower mean values (3.3333 and 3.4667), reveal mixed or lower satisfaction, suggesting the need for improvement in these aspects. The standard deviation analysis highlights variability in user experiences, with higher SD values (1.29857 and 1.26314)

indicating diverse opinions and lower SD values (0.71479 and 1.09080) suggesting more uniform agreement. These insights emphasize the importance of enhancing customer service, refining promotional strategies, and increasing consumer awareness to improve overall user satisfaction and drive further adoption of e-payment systems.

- The findings reveal that each impact of e-payment systems has a mean score, standard deviation, t-value, and p-value, with all p-values being .000, which is below the significance threshold of 0.05. This statistical significance leads to the rejection of the null hypothesis (H_0) and the acceptance of the alternative hypothesis (H_1), confirming that there is a significant difference between consumer perception and satisfaction across various aspects of e-payment systems. These results highlight that while users recognize the benefits of e-payment systems, their satisfaction levels vary, emphasizing the need for continuous improvements in factors such as convenience, security, customer support, and promotional strategies to enhance overall user experience.

- The findings from the Independent Sample T-test indicate that there is no significant difference between male and female respondents in their perceptions of e-payment systems, as the p-values for all variables are greater than 0.05. Since none of the p-values fall below the significance threshold, the null hypothesis is not rejected, confirming that gender does not play a crucial role in shaping opinions on e-payment convenience, satisfaction, availability, social media influence, customer support, or discounts. This suggests that both male and female users perceive and experience e-payment systems similarly, emphasizing that factors influencing adoption and satisfaction are more likely related to functionality, security, and ease of use rather than gender differences.

- The one-way ANOVA analysis shows a significant value of <0.01 , which is below the 0.05 threshold, leading to the rejection of the null hypothesis. This confirms a significant difference in the effectiveness of the electronic payment system. The higher F-value of 3.187 indicates variations in user perceptions. These results highlight differences in how users experience e-payment systems. Continuous improvements are necessary to enhance effectiveness and user satisfaction.

SUGGESTION

The following are suggestions based on research work.

- ✓ Make payments more secure and improve security to build more trust.
- ✓ Educate users and teach people how to use digital payments safely
- ✓ Better customer support and quick and helpful support will improve satisfaction.
- ✓ Lower fees, reducing transaction costs, can attract more users.
- ✓ Offer rewards & deals, Cashback, and discounts can encourage more usage.
- ✓ Focus on rural areas to improve access to digital payments in villages.
- ✓ Easy-to-use apps and simple designs will make more people comfortable.
- ✓ Promote digital shopping and encourage people to buy more online using e-payments.
- ✓ Fraud prevention measures strengthen fraud detection to protect users from scams.
- ✓ Integration with more services allows e-payments for government services, transport, and more.
- ✓ Offline payment options introduce features that allow payments without Internet access.
- ✓ Eco-friendly digital payments promote e-receipts and paperless transactions to reduce waste.
- ✓ Multi-device compatibility – ensure smooth transactions across phones, tablets, and computers.

CONCLUSION

The study also indicates that urban and rural consumers are nearly equally inclined toward e-payment adoption. Income levels and occupation play a role in shaping payment preferences, with professionals and middle-income groups being the most active users. Trust in EPS is largely influenced by brand reputation, security measures, and user reviews, while customer support and transaction fees are also key considerations. The study finds that while EPS has encouraged higher spending and changed shopping habits, consumer concerns about security, fraud prevention, and customer service reliability remain. Statistical analysis, including t-tests and ANOVA, confirms a significant relationship between perception and satisfaction with EPS, indicating that factors such as security, convenience, and brand trust strongly affect consumer choices. The findings suggest that while EPS is widely accepted, further

improvements in security measures, customer service, and user awareness can enhance trust and long-term adoption. The study highlights that gender does not significantly impact perceptions of EPS, while age plays a role in adoption, with younger consumers being more receptive to digital payments due to social media influence. Overall, the study concludes that EPS is revolutionizing financial transactions by providing convenience and security, though further improvements in security measures, customer support, and awareness initiatives are necessary to enhance consumer trust and drive wider adoption. Overall, the study underscores the growing reliance on digital payment solutions and the necessity for continuous innovation in security, affordability, and user experience to ensure widespread and sustained adoption.

REFERENCE

Al-Majali, M. & Mat, N. K. N. (2022). Impact of E-Payment System on Consumer Buying Behavior: A Study in Jordan.

Shukla, T. & Sharma, P. (2021). Digital Payment System: Impact on Consumer Purchasing Behavior.

Nassoura, A. B. (2020). The Role of Digital Finance in Facilitating Consumer Purchases of Sustainable Goods.

Halim, E., & Raharjo, S. (2020). The Impacts of E-Payment System and Impulsive Buying on Purchase Intention in E-Commerce.

Chakraborty, S., & Mitra, P. (2023). Spendception: The Psychological Impact of Digital Payments on Consumer Behavior.

Wang, Y., & Xu, J. (2022). The Influence of Payment Method: Do Consumers Pay More with Mobile Payment?

Gupta, R., & Mehta, A. (2024). From Cash to Cashless: UPI's Impact on Spending Behavior Among Indian Users.

Rossi, F., & Bertolini, G. (2014). Do Debit Cards Increase Household Spending? Evidence from a Semiparametric Causal Analysis of a Survey.

Prelec, D., & Loewenstein, G. (1998). The Red and the Black: Mental Accounting of Savings and Debt.

Soman, D. (2003). The Effect of Payment Mechanism on Spending Behavior: The Role of Mental Accounting.

WEBSITE

www.investopedia.com

www.researchgate.net

www.https://scholars.google.com

www.apnews.com

<https://razorpay.com/blogs>

A STUDY ON CONSUMER PREFERENCE TOWARDS KHADI NATURAL HERBAL PRODUCT IN THOOTHUKUDI

Brindha.S, and P. Bhanumathi

PG and Research Department of Commerce, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

This study explores consumer preferences towards Khadi Natural Herbal Products, analyzing factors influencing their purchasing decisions and satisfaction levels. The research employs various statistical techniques, including percentage analysis, Garrett's ranking method, independent sample t-tests, Likert scales, and ANOVA, to evaluate the significance of product attributes such as quality, pricing, packaging, availability, and natural ingredients. Data was collected from 120 respondents, revealing that the majority of consumers belong to the 21-30 age group and prioritize natural, chemical-free skincare and haircare solutions. Findings indicate that consumer perception is significantly influenced by eco-friendly branding, product quality, and affordability. The study provides insights into marketing strategies, product enhancements, and distribution improvements to increase consumer engagement and brand loyalty.

KEY WORDS

Natural, chemical-free, herbal ingredients, organic beauty, sustainability and natural living.

INTRODUCTION

This study focuses on understanding consumer preferences towards Khadi Natural Herbal Products. It aims to analyse customer satisfaction, purchasing behaviour, and factors influencing their buying decisions. By studying these aspects, the research seeks to provide insights that can help improve the marketing, distribution, and overall appeal of Khadi herbal products to a larger audience.

STATEMENT OF PROBLEM

- ✓ The demand for natural and herbal products has been on the rise globally, but the Khadi industry in Tuticorin has not been able to capitalize on this trend.

- ✓ Despite its rich cultural heritage and traditional knowledge, the Khadi industry in Tuticorin faces significant challenges, including low sales, revenue, and consumer awareness.
- ✓ The increasing popularity of synthetic and chemical-based products has led to a decline in demand for Khadi natural herbal products, resulting in a significant threat to the livelihood of artisans and farmers involved in the production of these products.

OBJECTIVES

- ✓ To know the level of consumer satisfaction towards khadi natural herbal products.
- ✓ To study the various kinds of khadi natural herbal products available in market.

RESEARCH METHODOLOGY

Sampling Design	Convenient sampling method
Period of Study	December 2024-April 2025
Data Used	Primary and Secondary data
Test for analysis	Percentage analysis, Likert scale technique, Garrett ranking technique, t-Test, ANOVA

LIMITATIONS OF THE STUDY

- ✓ The study is limited to Tuticorin, which may not be representative of the entire Indian market.
- ✓ The sample size is limited, which may not provide a comprehensive understanding of consumer preferences.
- ✓ The study relies on self-reported data, which may be subject to biases and inaccuracies.
- ✓ The study does not explore the cultural and social factors that may influence consumer preferences, which could provide a more nuanced understanding of the topic.
- ✓ The study's findings may not be generalizable to other natural herbal products or brands.

RESULTS AND DISCUSSIONS

USAGE OF KHADI NATURAL PRODUCTS

USAGE OF KHADI NATURAL PRODUCTS	NO OF RESPONDENTS	PERCENTAGE (%)
Skin Care	18	15
Hair Care	35	29
Health Care	33	28
Body Care	23	19
Sun Shield Range	11	9
TOTAL	120	100

Source: Primary Data

INFERENCE

The above table shows that 15 percent of the respondents are using Skin care products, 29 percent of them are using Hair care products, 28 percent of them are using Health care products, 19 percent of them are using Body care products and 9 percent of them are using Sun shield range. Thus, majority i.e. 29 percent of the respondents are using Hair care products.

THE KHADI PRODUCTS BUYING IN MONTH

KHADI PRODUCTS PURCHASE IN MONTH	NO OF RESPONDENTS	PERCENTAGE (%)
One	26	22
Two	37	31
Three	42	35
More Than Three	15	12
TOTAL	120	100

Source: Primary Data

INFERENCE

The above table shows that 22 percent of the respondents buying only one product in a month, 31 percent of them buying two product , 35 percent of them three products, and 12 percent of them buying more than three products.

Thus, majority i.e. 35 percent of the respondents buying three products in a month.

GARRETT RANKING FACTORS INFLUENCE MORE TO PREFER KHADI PRODUCTS

FACTORS	RANK				
	I	II	III	IV	V
Dry skin	31	25	27	15	17
Allergy	30	28	17	25	20
Dullness	41	36	18	15	10
Oily skin	18	26	38	13	15
Fragrance irritation	23	45	36	12	4

RANK TABLE

RANK	$100 R_{ij}-0.5/N_{ij} $	PERCENTAGE POSITION	GARRETT VALUE
1	$100 (1-0.5) 5$	10	75
2	$100 (2-0.5) 5$	30	60
3	$100 (3-0.5) 5$	50	50
4	$100 (4-0.5) 5$	70	39
5	$100 (5-0.5) 5$	90	25

FACTOR	F1	F2	F3	F4	F5
I	2325	1500	1350	585	425
II	2250	1680	850	975	500
III	3075	2160	900	585	250
IV	1350	1560	1900	507	375
V	1725	2700	1800	468	100

FACTORS	TOTAL	MEAN SCORE	RANK
Dry skin	6185	51.54	IV
Allergy	6255	52.12	III
Dullness	6970	58.08	I
Oily skin	5692	47.43	V
Fragrance irritation	6739	56.60	II

SOURCE: PRIMARY DATA

INFERENCE:

The above table reveals that the majority of the respondents have given top priority to Dullness and is ranked as first, followed by second rank fragrance irritation, third rank allergy, fourth rank dry skin, and fifth rank oily skin was given as last preference.

ANOVA

LEVEL OF SATISFACTION WITH USAGE OF KHADI NATURAL

HERBAL PRODUCTS

NULL HYPOTHESIS (H₀): There is no significant relationship with age and satisfaction on useskhadi natural herbal products.

VARIABLE		MEAN SQUARE	F	SIGNIFICATION VALUE
SATISFACTION	Below group Within group	6.859 6.075	1.129	.340

SATISFACTION/AGE	MEAN	F VALUE	SIGNIFICANCE VALUE
S1/AGE	2.021	1.289	.282
S2/AGE	.480	.446	.721
S3/AGE	.077	.067	.977
S4/AGE	.820	.673	.570
S5/AGE	3.768	2.982	.034
S6/AGE	3.323	2.770	.045

S7/AGE	2.134	1.537	.209
S8/AGE	2.135	1.636	.185
S9/AGE	1.245	.925	.431
S10/AGE	.547	.496	.686
S11/AGE	2.857	2.358	.075
S12/AGE	3.843	3.481	.018
S13/AGE	1.000	.956	.416

SOURCE: PRIMARY DATA

INFERENCE

- Satisfaction with the quality of khadi natural herbal product F-VALUE =1.289, P VALUE = .282. Since p value is greater than 0.05.Hence null hypothesis is accepted. There is no significant difference in satisfaction with the quality of khadi natural herbal products.
- Satisfaction with the reasonable price of khadi natural herbal F-VALUE =0.446, P VALUE = .721 since p value is greater than 0.05. Hence null hypothesis is accepted. There is no significant difference in satisfaction with the reasonable price of khadi natural herbal products.
- Satisfaction with the packaging of khadi natural herbal product F-VALUE =0.067, P VALUE = .977. Since p value is greater than 0.05.Hence null hypothesis is accepted. There is no significant difference in satisfaction with the packaging of khadi natural herbal products.
- Satisfaction with the availability in the market of khadi natural herbal product F-VALUE =.673, P VALUE = .571. Since p value is greater than 0.05. Hence null hypothesis is accepted. There is no significant difference in satisfaction with the availability in the market of khadi natural herbal products.
- Satisfaction with the promotions, discounts and offers encourage to buy khadi natural herbal product F-VALUE =, P VALUE = .282. Since p value is greater than 0.05.Hence null hypothesis is accepted. There is no significant difference in satisfaction with the quality of khadi natural herbal products.
- Satisfaction with natural and safe ingredients of khadi natural herbal product F-VALUE =2.770, p-value= .045. Since p value is less than 0.05. The null hypothesis is rejected. There is a significant difference in satisfaction with natural and safe ingredients of khadi natural herbal product.

- Satisfaction with recommending khadi natural herbal products to my friends F-VALUE =1.537, P-VALUE =.209. Since p value is greater than 0.05.Hence null hypothesis is accepted. There is no significant difference in satisfaction with the recommendation khadi natural herbal products to my friends.
- Satisfaction with khadi natural herbal products to my friends F-VALUE =1.636 P-VALUE =.185 since p value is greater than 0.05. Hence null hypothesis is accepted. There is no significant difference in satisfaction with the recommendation khadi natural herbal products to my friends.
- Satisfaction with available in stores or online khadi natural herbal products to my friends F-VALUE =.925 P-VALUE =.431 since p value is greater than 0.05. Hence null hypothesis is accepted. There is no significant difference in satisfaction with available in stores or online khadi natural herbal products to my friends.
- Satisfaction good value for money khadi natural herbal products to my friends F-VALUE =2.358, P-VALUE =.075 since p value is greater than 0.05. Hence null hypothesis is accepted. There is no significant difference in satisfaction good value for money natural herbal products to my friends.
- Satisfaction with positive reviews and ratings khadi natural herbal products to my friends F-VALUE =3.481, P-VALUE =.018 since p value is greater than 0.05.Hence null hypothesis is accepted. There is no significant difference in satisfaction with positive reviews and ratings khadi natural herbal products to my friends.
- Satisfaction with price of khadi natural herbal products affordable than other brands F-VALUE =.956, P-VALUE =.416 since p value is greater than 0.05. Hence null hypothesis is accepted. There is no significant difference in satisfaction with price of khadi natural herbal products affordable than other.

SUGGESTIONS

- ✚ Since most users are 21-30 years old, marketing should focus on digital platforms, influencer collaborations, and eco-friendly branding.
- ✚ Increase accessibility in local stores and enhance online shopping experiences.
- ✚ Introduce travel-friendly and eco-friendly packaging.
- ✚ Introduce discounts, combo offers, and seasonal promotions to attract repeat buyers.
- ✚ Educate customers about the benefits of herbal ingredients through social media and in-store promotions.

- ✚ Introduce budget-friendly product variants for different income groups.
- ✚ Expand the range of hair and skincare products, as these are in high demand.
- ✚ Offer loyalty programs and personalized recommendations to build long-term brand loyalty.
- ✚ Obtain certifications to boost consumer trust in natural ingredients.
- ✚ Introduce discounts during festivals and peak skincare seasons.
- ✚ Reward customers for referrals and repeat purchases.
- ✚ Increase availability in supermarkets, pharmacies, and organic stores.
- ✚ Improve website navigation, subscription models, and fast delivery.
- ✚ Strengthen partnerships with Amazon, Flipkart, and Nykaa.
- ✚ Emphasize the natural and herbal ingredients of products.
- ✚ Use eco-friendly and sustainable branding.
- ✚ Highlight the benefits of using Khadi products, such as being "free from pimples & black dots.
- ✚ Provide free consultations with doctors or dermatologists.
- ✚ Expand distribution channels to include online marketplaces.
- ✚ Use influencer marketing and partnerships with social media influencers.
- ✚ Offer free consultations and advice from experts.
- ✚ Create a strong social media presence on multiple platform.

CONCLUSION

Khadi Natural Herbal Products promote **safe, eco-friendly, and chemical-free** skincare and hair care using **herbal ingredients**. With a focus on **sustainability, quality, and traditional remedies**, the brand offers **natural and effective** solutions for healthy living. By embracing **organic beauty and cruelty-free practices**, Khadi continues to grow as a trusted choice for those seeking **natural and Ayurvedic** personal care products.

The study also emphasizes that **hair care and health-related products** are the most preferred categories, with many respondents specifically looking for **herbal and chemical-free ingredients**. This preference aligns with the global trend of shifting towards organic and sustainable beauty products. However, despite the demand, **product accessibility remains an area of improvement**. A significant number of respondents purchase from supermarkets, while others rely on online platforms.

Another key observation from the study is that **price sensitivity influences purchasing decisions**. Although Khadi products are generally well-received, affordability remains a concern for some consumers, particularly those with lower income levels. Providing **cost-effective product variants**, combo packs, and **seasonal discounts** can encourage repeat purchases and attract new customers. Additionally, the study highlights that a considerable number of consumers have switched products due to **doctor's recommendations**, indicating a need for **better consumer education** on product benefits and dermatological advantages.

WEBSITE

- ✓ <https://www.khadinatural.com/pages/about-us?srsltid=AfmBOoqtgPr5y7qgT0WE7Htc6M5BL1ryH90dP64gHiocz26eiJmZh20C>
- ✓ <https://khadiessentials.com/?srsltid=AfmBOor858ZLmC9M3yfor9PwIvy6yXK4BdPjN0YxentomqQAzvtkySI5&utm>
- ✓ https://khaddarvas.com/collections/fabric?srsltid=AfmBOopvs5HzZXEBfE8n1ahE1KG5bAyRzviQu4L0fXSRJNIWl61wnxJ3&utm_source
- ✓ <https://www.khadinatural.com/pages/our-story?srsltid=AfmBOorgC1LCAFS995bzpHPxjmKiru10Lq79YVGx-BfLzzzQly4eWJFA>
- ✓ https://www.ekhadiindia.com/?utm_source

A COMPARATIVE STUDY ON LEVEL OF WORK-RELATED STRESS BETWEEN MEN AND WOMEN EMPLOYEES IN IT SECTOR

Delphine Shiny Deroose V, *and P. Jayamary

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT:

The study investigates work-related stress in the IT sector, focusing on male and female employees in Chennai and Bangalore. It explores stressors such as workload, work-life balance, job insecurity, gender discrimination, and organizational culture, with a particular emphasis on gender-based differences. The aim of the research is to assess the level of work-related stress between male and female employees in the IT sector, examining the impact of various stressors and identifying the influence of organizational practices and work environments on stress levels in Chennai and Bangalore. The research created the questionnaire by identifying the problems. The study has been based on the survey method. The methodology followed for collecting the data in simple random sampling for 120 respondents.

KEYWORDS:

Work-related stress, employees, IT, work-life balance, Men, Women.

INTRODUCTION:

The IT sector is renowned for its rigorous work environment, which frequently causes employees to experience high levels of stress. The purpose of this study is to compare the stress levels that men and women in the IT sector, namely in Bangalore and Chennai, feel at work. In order to comprehend gender-specific stress patterns, it investigates elements including workload, deadlines, work-life balance, and organizational expectations. The results can be used to inform the creation of focused plans aimed at enhancing worker satisfaction in the sector.

The specific objectives include:

- 1.To determine the overall stress levels among men and women in IT workplaces.
- 2.To analysis the relationship between working hours and stress levels.

MATERIALS AND METHODS:

MATERIALS USED:

Nandakumar, G et.al., (2022) IT professionals usually have to put in more than eight hours a day, which may be highly taxing and stressful for them. They might be expected to work on the weekends in addition to the weekdays. In addition to all of these problems, most IT professionals find it difficult to strike a healthy work-life balance. They are forced to work evenings or shifts longer than eight hours, which prevents them from spending time with their family. Numerous more problems exist in addition to these, including unfair compensation, inadequate communication, a lack of gratitude, favouritism, excessive work, micromanagement, a team leader who lacks skills, and little prospects for career advancement. A crucial element in each of these problems is the team leader's mentality. The team leader's support will allow the worker to make changes or come up with a solution when a problem arises. Employees will become discouraged and lose hope, though, if the team leader is unhelpful and challenging. An employee's perception of their team leader is therefore crucial to sustaining their productivity. Positive perceptions of the team leader will result in great employee productivity and moderate levels of depression; conversely, low productivity and extremely high levels of depression will result.

According to **Han S. et.al., (2024)** digitization has an impact on job stress, especially through mediating factors like individual differences and job characteristics. The study discovered that using digital tools excessively causes information overload, which greatly increases occupational stress. Gender disparities are important; women are more stressed because they perceive more dangers and have fewer resources for response. The study comes to the conclusion that while using digital technologies to reduce stress, organizations should take gender-sensitive approaches.

METHODOLOGY:

Data collection may be defined as the collection of required information from the various sources through primary data and secondary data. Primary data was collected from respondents through questionnaire. Secondary data were collected from websites, books and journals. The collected data were analysed by using the following statistical tools namely percentage analysis, one-way Anova, Chi square test.

Table 1

Table showing the distribution of respondents on the basis of gender

Gender	No. of Respondents	Percentage
Male	60	50
Female	60	50
Total	120	100

(Source: Primary data)

Inference:

The above table proves that 50% of the total respondents are Male. 50% of the total respondents are Female. Thus, the data suggests a balanced gender distribution ensuring that both male and female are equally represented in the study.

Table 2 Table showing the distribution of respondents on the basis

Mental Health Due To Long Working Hours	No. of Respondents	Percentage
Yes	70	58
No	39	33
Unsure	11	9
Total	120	100

Mental health due to long working hours

(Source: Primary Data)

Inference:

From the above table, out of 120 respondents, 58% of the respondents have experienced mental health due to long working hours and 33% of the respondents have not experienced mental health due to long working hours and 9% of the respondents are Unsure.

Majority 58% of the respondents have experienced mental health due to long working hours.

Table 3

Chi-square test significance between gender and working hours

Null Hypothesis (Ho):

There is no significant relationship between Gender and Working Hours.

Alternative Hypothesis(H1):

There is significant relationship between Gender and Working Hours.

Gender	Yes	No	Total
Male	52	8	60
Female	54	6	60
Total	106	14	120

Observed

Gender	Yes	No	Total
Male	53.0	7.0	60.0
Female	53.0	7.0	60.0
Total	106.0	14.0	120.0

Expected

	Value	Df	Significance
Pearson Chi-Square	.323 ^a	1	.570

(Source: Primary Data)

Inference:

Since $p=0.570$ is greater than 0.05, we fail to reject the null hypothesis (Ho). This means there is no significant relationship between Gender and Working Hours.

Table 4
Chi-square Test Significance between Gender and Time off work in the past year
Null Hypothesis (Ho):

There is no significant relationship between Gender and time off work in the past year.

Alternative Hypothesis(H1):

There is a significant relationship between Gender and time off work in the past year

Observed

Gender	Yes	No	Total
Male	30	30	60
Female	42	18	60
Total	72	48	120

Expected

Gender	Yes	No	Total
Male	36.0	24.0	60.0
Female	36.0	24.0	60.0
Total	72.0	48.0	120.0

(Source: Primary Data)

	Value	Df	Significance
Pearson Chi-Square	5.000 ^a	1	.025

Inference:

Since $p=0.025$ is lesser than 0.05, the alternative hypothesis (H1) is rejected. Hence, it is concluded that there is a significant relationship between Gender and time off work in the past year.

Table 5
Table showing significant Anova
Testing the influence of age group over the difficult to balance work and personal life

Test of hypothesis:

Null hypothesis: Age group does influence the difficult to balance work and personal life

One way ANOVA Age group with difficult to balance work and personal life

(Source: Primary Data)

Inference:

The above table shows that there is statistical difference between the groups as disclosed by the value of $F=1.330$ and the P value $=.263$ ($P > 0.05$). Hence the null hypothesis is accepted.

RESULTS

The data suggests a balanced gender distribution ensuring that both male and female are equally represented in the study.

Majority 58% of the respondents have experienced mental health due to long working hours.

There is no significant relationship between Gender and Working Hours.

There is significant relationship between Gender and time off work in the past year.

Age group does influence the difficult to balance work and personal life.

DISCUSSION:

- Offer remote work options, hybrid models, and flexible hours to improve work-life balance.
- Organize workshops on mindfulness, yoga, or meditation to help employees cope with stress.
- Support both genders with policies like paternity leave, family care leaves, and stress-relief initiatives that promote balance.

Source of variation	Sum of Squares	Df	Mean Square	F	P value
Between Groups	3.588	4	.897	1.330	.263
Within Groups	77.579	115	.675		
Total	81.167	119			

- Provide continuous learning opportunities to reduce anxiety about skill gaps or job insecurity.

CONCLUSION

The comparative study on work-related stress between men and women employees in the IT sector reveals distinct patterns. Because of things like multitasking demands, societal expectations, and difficulties balancing work and life, women employees typically report higher levels of stress. Contrarily, men frequently face stress related to their financial obligations, professional development, and job performance. Bangalore's dynamic work environment contributes to increased performance stress, whereas Chennai's IT sector shows stronger family-related demands. Nevertheless, both cities exhibit similar trends. In general, men are under more pressure from work-related obligations, but women often endure more emotional and psychological stress. Stress reduction for all groups depends on efficient organizational support, adaptable work schedules, and mental health resources.

REFERENCES

[https://doi.org/\[doi\]](https://doi.org/[doi]).

<https://doi.org/10.3389/fpsyg.2024.1370711>

Nandakumar, G et.al., (2022) IT professionals usually have to put in more than eight hours a day, which may be highly taxing and stressful for them. *Neuroquantology*, 20(1), page no.45-53.

Han S. et.al., (2024) Digitalization and job stress: exploring the mediating roles of job and personal aversion risk with gender as a moderator. *Frontiers in psychology*, Vol. 15, 1370711.

IMPACT OF E-COMMERCE DISCOUNT ON CONSUMER SPENDING HABITS WITH REFERENCE TO THOOTHUKUDI

Hebziba Beula.A, and P. Jayamary

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

This study examines the impact of e-commerce discounts on consumer spending habits, focusing on how various discount strategies influence purchasing behavior and customer loyalty. E-commerce has revolutionized the retail landscape, offering consumers diverse options and competitive pricing. Discounts are a fundamental strategy used by online retailers to attract customers and increase sales. Through the analysis of both primary and secondary data, this research investigates the effects of discount depth, frequency, and types on consumer behavior, with a focus on Thoothukudi city. Findings reveal that discounts significantly influence spending habits, with personalized and dynamic discounts proving to be more effective. However, excessive discounting may reduce brand loyalty and lead to price sensitivity. The study suggests that businesses should strategically balance discount frequency and depth to maintain long-term profitability and customer engagement.

KEYWORDS:

E-commerce, Discounts, Consumer Spending Habits, Online Shopping, Consumer Loyalty, Discount Strategies, Price Sensitivity, Customer Engagement.

INTRODUCTION:

E-commerce, or electronic commerce, involves buying and selling products or services online through digital platforms. Discounts, commonly used in e-commerce, reduce product prices to attract buyers and boost sales. Consumer spending habits, influenced by factors like income and trends, shape how people allocate money for goods and services. E-commerce retailers frequently use discounts as a strategy to increase sales and customer loyalty. Emerging trends in e-commerce focus on personalization, flexibility, and sustainability, including personalized discounts, dynamic pricing, and innovative promotional methods.

OBJECTIVES:

- To analyze the impact of discounts on consumer spending habits
- To exam the influence of discounts on consumer loyalty
- To investigate the role of discount depth and frequency
- To evaluate the changes in spending behavior
- To identify the most effective discount strategies.

RESEARCH METHODOLOGY:

Sampling design	Convenience sampling method
Period of study	December 2024- March 2025
Data used	Primary and Secondary data
Test of analysis	Percentage analysis, Descriptive analysis Likert scale, Anova, One sample t-test, Chi-square test

LIMITATION:

- Due to lack of prior research studies on the topic, respondents didn't have time to read
- the full questionnaire as they filled it randomly.
- Researchers must navigate ethical guidelines and considerations, which may restrict
- certain study designs or methodologies.
- Limited access to data or challenges in collecting accurate data can restrict the scope

RESULT AND DECLARATION:**Chi-Square test:****NULL HYPOTHESIS: H₀**

There is no significant relationship between Age and Average monthly online shopping expenditure.

Table: 1 The table showing the distribution of respondent based on Age using Null hypothesis

Category	Below Rs.1000	Upto Rs.3000	Upto Rs.3000	Upto Rs.5000	More than Rs.5000	Total
15-25	0	54	4	3	1	62

26-35	0	7	5	3	3	18
36-45	0	0	2	6	3	11
46-50	0	3	7	6	4	20
Above 50	0	3	4	2	0	9
Total	0	67	22	20	11	120

(Source: Primary Data)

The majority of individuals fall in the 15-25 age group (62 out of 120), with most spending Rs. 1000 (54 individuals). Higher spending amounts (Rs. 3000 and above) are more common among older age groups (26 and above). The 46-50 and above 50 age groups show a relatively higher frequency of spending in higher categories (Rs. 5000+)

Chi-Square Tests

Category	Frequency	Percentage
Pearson Chi-Square	65.994	12
Likelihood Ratio	71.788	12
Linear-by-Linear Association	28.333	1
No of Valid Cases	120	

(Source: Primary Data)

Pearson Chi-Square value = 65.994, which is used to assess the relationship between age and spending behaviour. Likelihood Ratio = 71.788, indicating another measure of association. Linear-by-Linear Association = 28.333

The high Chi-Square value (65.994) suggests a significant relationship between age and spending patterns. This means that age significantly influences how much people spend, with younger individuals preferring lower amounts and older individuals spending more.

ALTERNATIVE HYPOTHESIS: H₁ or H_A

There is a significant relationship between Gender and Frequency of online shopping.

Table: 1.3 The table showing the distribution of respondents based on Gender using Alternative hypothesis.

Category	Rarely (less than once a month)	Occasionally	Frequency (weekly)	Daily	Total
Male	24	21	13	2	60
Female	36	13	8	3	60
Total	60	34	21	5	120

(Source: Primary Data)

A higher percentage of females (60%) engage in the activity rarely, compared to males (40%). Males (35%) participate weekly more than females (21.7%). Occasional participation is higher among males (21.7%) than females (13.3%). Daily participation is low for both genders but slightly higher for females (5%) compared to males (3.3%)

Chi-Square Tests

Category	df	Percentage
Pearson Chi-Square	5.673	3
Likelihood Ratio	5.720	3
Linear-by-Linear Association	2.374	1
No valid class	120	

The Chi-Square test assesses the independence between categorical variables. A significant result implies a relationship between the variables, while a non-significant result suggests independence.

Table:3.39 The table showing the distribution of respondents based on five-point scale using one way ANOVA

Particulars	F	P-value
Try new brand at discount	2.698	.034
Discount influence choice of e-com platforms	1.301	.274
Discount make Purchase a smart Purchase	.871	.484
Discount price make a product more valuable	.580	.678
Regret for some discount after purchase	1.747	.144

(Source: Primary Data)

Interpretation:

Discounts significantly increase the likelihood of consumers trying a new brand (P-value = 0.034) but do not strongly influence the choice of an e-commerce platform (P-value = 0.274). Additionally, discounts do not make consumers feel they made a "smart purchase" (P-value = 0.484) or perceive the product as more valuable (P-value = 0.678). Consumers also do not experience strong regret after purchasing discounted items (P-value = 0.144).

Inference:

The table indicate that there is a significant effect P-value 0.034 in trying new brand if it is given at discount, there is no significant relationship for P-value 0.274, as that discounts do not strongly influence consumers when selecting.

One sample t- test: (Dependent variable)

Table : 1.4 The table showing the distribution of respondents based on One sample t- test using five point scale for dependent scale.

Category	Mean	Std. Deviation	t	P- value)
Try new brand at discount	1.9583	.98216	-11.618	.000
Discount influence choice of e-com platforms	2.6000	1.23941	-3.535	.001
Discount make Purchase a smart Purchase	2.4000	1.25959	-5.218	.000
Discount price make a product more valuable	2.6083	1.32396	-3.241	.002
Regret for some discount after purchase	3.0500	1.44856	.378	.706

(Source: Primary Data)

Interpretation and inference:

Respondents are significantly less likely to try new brands at a discount (Mean = 1.9583, $p < 0.001$) and do not strongly agree that discounts influence their choice of e-commerce platforms (Mean = 2.6000, $p = 0.001$), though opinions are mixed. They also do not believe that discounts make purchases feel smart (Mean = 2.4000, $p < 0.001$) or increase product value (Mean = 2.6083, $p = 0.002$). Additionally, there is no clear tendency toward regret after purchasing discounted items (Mean = 3.0500, $p = 0.706$).

One sample t- test: (Independent variable)

Table : 3.42 The table showing the distribution of respondents based on One sample t- test using five point scale for independent scale.

Particulars	Gender	Mean	Std. Deviation	t - value	P - value
Try new brand at discount	Male	1.9667	.93820	.093	.926
	Female	1.9500	1.03211	.093	.926
Discount influence choice of e-com platforms	Male	2.5500	1.18501	-.440	.660
	Female	2.6500	1.29961	-.440	.660
Discount make Purchase a smart Purchase	Male	2.4000	1.26491	.000	1.000
	Female	2.4000	1.26491	.000	1.000
Discount price make a product more valuable	Male	2.6833	1.35911	.619	.537
	Female	2.5333	1.29493	.619	.537
Regret for some discount after purchase	Male	3.0833	1.48771	.251	.802
	Female	3.0167	1.42009	.251	.802

(Source: Primary Data)

Interpretation & Inference:

Mean (Male: 1.9667, Female: 1.9500) $p = 0.926$ (not significant)Both males and females show similar reluctance in trying a new brand at a discount, with no statistically significant difference. Mean (Male: 2.5500, Female: 2.6500) $p = 0.660$ (not significant)Both genders

have a similar perception regarding the influence of discounts on choosing an e-commerce platform. Mean (Male: 2.4000, Female: 2.4000) $p = 1.000$ (not significant) There is no difference between males and females in their belief that discounts make purchases smart. Mean (Male: 2.6833, Female: 2.5333) $p = 0.537$ (not significant) Both males and females show no strong belief that discounts increase a product's value. Mean (Male: 3.0833, Female: 3.0167) $p = 0.802$ (not significant) Both genders express neutral opinions about regretting discounted purchases, with no significant difference.

FINDINGS:

- ❖ Percentage-based discounts (25.8%) and Buy-One-Get-One (19.2%) are the most influential discount types.
- ❖ 62.5% of respondents use platform-specific tools to track discounts.
- ❖ 35.8% of respondents try new platforms due to discounts, but an equal percentage remain undecided.
- ❖ Meesho (38.3%) is the platform most associated with unplanned purchases
- ❖ There is a significant relationship between age and average monthly spending, with younger individuals spending less.
- ❖ Gender does not significantly impact the frequency of online shopping.
- ❖ Consumers are more likely to try new brands if discounts are offered ($p = 0.034$).
- ❖ Discounts do not significantly influence the choice of an e-commerce platform.
- ❖ No significant gender differences in discount preferences or purchasing decisions.

SUGGESTIONS:

- ❖ E-commerce platforms should ensure transparency in discounts and avoid misleading pricing tactics
- ❖ Brands should prioritize quality over discounts, ensuring consumers get value for their money.
- ❖ E-commerce sites should offer clear return policies so that consumers don't feel pressured to buy products they may regret later.
- ❖ Consumers should be aware of psychological pricing tricks, such as "limited-time offers" and "flash sales," that may push them to spend more.

- ❖ Government and regulatory bodies should monitor e-commerce discount practices to prevent false advertising and unethical pricing strategies.

CONCLUSION:

E-commerce discounts have reshaped consumer behavior by encouraging impulse buying and creating a sense of urgency. While discounts increase consumption and benefit retailers, they can also lead to overspending and reduced brand loyalty. Consumers now expect frequent promotions, impacting retailers' pricing strategies. Additionally, discounts influence market competition, favoring large retailers over small businesses. Balancing affordability with sustainable shopping habits is crucial for maintaining a healthy consumer-retailer relationship.

References:

Chatterjee, P. (2011). "Drivers of new product recommending and referral behaviour on social network sites." *Journal: International Journal of Advertising*, Volume: 30 Issue: 1 Pages: 77-101 Link: <https://doi.org>

□ Sharma, A., & Shah, R. (2019). "Impact of discount pricing on online consumer buying behavior." *Journal: Governance and Management Review*, Volume: 4, Issue: 1, Pages: 38-49, link : <https://doi.org>

□ Chen, Y., Marmorstein, H., Tsiros, M., & Rao, A. (2012). "When more is less: The impact of base value neglect on consumer preferences for bonus packs over price discounts." *Journal: Journal of Marketing*, Volume: 76, Issue: 4, Pages: 64-77, Link: <https://doi.org>

□ Grewal, D., Monroe, K. B., & Krishnan, R. (1998). "The effects of price-comparison advertising on buyers' perceptions of acquisition value, transaction value, and behavioral intentions." *Journal: Journal of Marketing*, Volume: 62, Issue: 2, Pages: 46 59, Link: <https://doi.org>

□ Sinha, I., & Smith, M. F. (2000). "Consumers' perceptions of promotional framing of price." *Journal: Psychology & Marketing*, Volume: 17, Issue: 3, Pages: 257-275,

OPPORTUNITIES AND CHALLENGES IN ADOPTION OF DIGITAL MEDIA – A STUDY WITH SPECIAL REFERENCE WITH WOMEN HOMEPRENEURS

Infant Sharon A and T.Priyanka

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

Digital media use has drastically changed the nature of entrepreneurship, presenting women homepreneurs with both benefits and obstacles. This study examines how digital media affects women-led home-based companies, emphasizing the benefits and challenges they face. To find out how they felt about using digital technologies for marketing, customer interaction, and business growth, a sample of 110 female homepreneurs was questioned. The results show that digital media increases market reach, affordability, and accessibility, enabling women to run successful home-based companies. The knowledge gained from this study can help stakeholders and legislators create plans to help women homemakers in the digital age. Nonetheless, issues including platform saturation, digital security worries, and a lack of technological expertise continue to exist. The report emphasizes that in order to optimize the advantages of digital adoption, customized digital literacy initiatives and policy assistance are required. The knowledge gained from this study can help stakeholders and legislators create plans to help women homemakers in the digital age.

KEYWORDS

Homepreneurs, Digital Media , women Homepreneurs , Opportunities , Challenges , Adoption of Digital Media .

INTRODUCTION

In recent years, the rise of homepreneurs—entrepreneurs who run businesses from their homes—has marked a significant shift in how work is perceived and how business is conducted. The term “homepreneur” blends “home” and “entrepreneur” to describe individuals who operate small businesses or freelance ventures from their homes, often leveraging digital platforms to reach global markets. As technology has advanced, particularly with the widespread availability of the internet, the traditional model of working from an office has been increasingly replaced by the flexibility of working from home. The rapid growth of digital media has redefined the entrepreneurial landscape, offering unprecedented opportunities for innovation, connectivity, and

business expansion. For women homepreneurs, digital media serves as a gateway to achieving financial independence, accessing wider markets, and building professional networks from the comfort of their homes. Platforms like social media, ecommerce websites, and digital marketing tools empower women to showcase their products and services, often breaking traditional geographical and societal barriers. Despite these advantages, the adoption of digital media among women homepreneurs is accompanied by significant challenges. Limited access to technology, inadequate digital literacy, and persistent societal norms act as barriers to entry. Additionally, concerns about online security, balancing family and business responsibilities, and navigating a competitive digital marketplace add complexity to their entrepreneurial journey. Digital media adoption among 2 women homepreneurs is on the rise, with many female entrepreneurs leveraging platforms like social media to market their products and services, reach a wider customer base, build brand awareness, and connect with potential clients, significantly impacting their business growth and allowing them to operate effectively from home while maintaining flexibility; however, challenges still exist regarding digital literacy, access to technology, and overcoming potential barriers to fully utilize the power of digital media.

STATEMENT OF THE PROBLEM

The advent of digital media has transformed the way individuals, organizations, and societies interact, communicate, and conduct business. For women homepreneurs, digital media presents a unique set of opportunities and challenges. It has become a powerful tool for women to establish and grow their home-based businesses, enabling them to access wider markets, build networks, and gain valuable skills. Despite the growing importance of social media in business promotion and marketing, many women homepreneurs face significant challenges in adopting and effectively utilizing these platforms to promote their businesses. Limited technical expertise, lack of access to resources, and societal barriers hinder women homepreneurs from leveraging social media to reach new customers, build their brand, and increase sales. As a result, women homepreneurs may miss out on valuable opportunities to grow their businesses, improve their livelihoods, and contribute to the economic development of their communities. This study aims to investigate the challenges and opportunities faced by

women homepreneurs in adopting social media, with a view to identifying strategies to support their effective use of these platforms.

OBJECTIVES

1. To Identify the Challenges faced by Women Homepreneurs in adopting Digital Media for their Business.
2. To Explore the opportunities that Digital Media offers to Women Homepreneurs in promoting and Growing their Business.
3. To Analyze the types of Digital Media Platforms used by women Homepreneurs and their effectiveness in promoting their business.
4. To Examine the impact of Digital Media adoption on the Work – life Balance of women Homepreneurs.

RESEARCH METHODOLOGY

Sampling design	Purposive sampling method
Period of study	December 2024 – March 2025
Data used	Primary data and Secondary data
Test for analysis	Percentage analysis, Likert scale, Chi-square test and Descriptive analysis

LIMITATIONS OF THE STUDY

- The study covers only the city of Thoothukudi. So the results may not be applied to other areas.
- The whole population of respondents could not be approachable.
- While collecting primary data biasness of respondents in answering the questions was a barrier.
- Reliability and accuracy of the study depends on the respondents' openness and truthfulness towards answering each question in the questionnaire.

RESULTS AND DISCUSSIONS

TABLE 1

Digital platforms Used for your business purposes

Platforms Used	No of Respondents	Percentage %
Youtube	21	19.1
Instagram	47	42.7
Whatsapp	27	24.5
Facebook	7	6.4
E-Commerce Websites	8	7.3
Total	110	100.0

Source :Primary Data

Inference:From the above table 19.1%respondents are using YouTube for their business and 42.7 % of the respondents are using Instagram and 24.5% respondents are using WhatsApp and 6.4% respondents are using Facebook and 7.3% respondents are using e-commerce websites

Thus most of the respondents i.e.,42.7% are respondents are using Instagram for their Business.

TABLE 2

Digital Media impact on Business

Impact on Business	No of Respondents	Percentage %
By Increased in Sales	36	32.7
Better customer engagement	41	37.3
Increased Brand Visibility	27	24.5
Expanding to International Markets	6	5.5
Total	110	100.0

Source :Primary Data

Inference

From the above table32.7 % of the respondents says that digital media has impacted the business by increased in sales and 37.3% respondents are by better customer engagement

and 24.5 % respondents says that it increase their brand visibility and 5.5% respondents says that it helps to expand their business to international markets.

Thus the most of the respondents i.e.,37.3 % Respondents says that Digital has impact on their business by Better Customer Engagement.

TABLE 3

Challenges faced in adopting Digital Media

Challenges	No of Respondents	Percentage %
Lack of Knowledge	35	31.8
Limited Internet access	36	32.7
Financial Constraints	19	17.3
Managing time between Business and family	20	18.2
Total	110	100.0

Source : Primary Data

Inference

From the above table 31.8% respondents face challenge by lack of knowledge and 32.7% respondents by limited internet access and 17.3 % respondents face challenge by financial constraints and 18.2 % respondents face challenge by managing time between the Business and the Family.

Thus most of the respondents i.e.,32.7% face challenge by limited Internet Access.

TABLE 4

Digital Media impact on overall Business cost

Digital Media reduced your overall business costs	No of Respondents	Percentage %
Yes	89	80.9
No	21	19.1
Total	110	100.0

Source : Primary Data

Inference:

From the above Table 80.9 % of the Respondents agreed that Digital Media has reduced their overall Business Costs and 19.1% of the Respondents says that Digital Media has not Reduced the overall Business Costs.

Thus most of the respondents i.e., 80.9 % of the Respondents agreed that Digital Media has reduced their overall Business Costs.

LIKERT RANKING SCALE:

TABLE 5

Opportunities and Challenges in adoption of Digital Media

Statement	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
Digital media has increased my ability to reach new customers	305	144	33	4	0	485
Digital media has improved my overall business performance	120	264	48	2	0	434
Digital media has reduced my marketing expenses.	120	160	24	16	0	320
Digital media has enabled me to connect with other homepreneurs and share resources	115	216	72	18	0	421
Digital Media helps to stay updated on industry trends and news	120	224	72	8	2	426
Digital media has helped me to better understand my target audience	160	184	72	12	2	430
Digital media has improved my ability to track sales and analytics.	145	192	63	27	3	430
Digital media has enabled me to offer personalized	205	184	51	12	0	452

services to customers.						
Digital media will play a crucial role in my business growth.	135	204	72	14	1	426
Digital media will help me stay competitive.	165	200	60	12	1	438
Digital media has improved my sales and revenue	155	192	69	14	1	431
Digital media allows me to manage my business efficiently while maintaining a good work-life balance.	170	184	60	16	2	432
Digital tools helps to stay responsive to shifts in customer demand	170	184	60	12	4	430
Content marketing through digital media has been effective in promoting my products\services	145	228	57	8	1	439
Digital media helps to foster customer loyalty	150	188	78	10	2	428
Digital media has significantly increased my brand's visibility	155	188	57	24	1	425
Without digital media it is harder to manage my business from home	160	204	57	6	5	432
Digital media has improved my ability to provide customer support	220	152	51	18	2	443
						7722

Source : Primary Data

Variables	Average	Rank
Digital media has increased my ability to reach new customers	4.40	I
Digital media has improved my overall business performance	3.94	VI
Digital media has reduced my marketing expenses.	2.90	XVIII
Digital media has enabled me to connect with other homepreneurs and share resources	3.82	XVII
Digital Media helps to stay updated on industry trends and news	3.87	XIV
Digital media has helped me to better understand my target audience	3.90	X
Digital media has improved my ability to track sales and analytics.	3.90	X
Digital media has enabled me to offer personalized services to customers.	4.10	II
Digital media will play a crucial role in my business growth.	3.87	XIV
Digital media will help me stay competitive.	3.98	V
Digital media has improved my sales and revenue	3.91	VIII
Digital media allows me to manage my business efficiently while maintaining a good work-life balance.	3.92	IX
Digital tools helps to stay responsive to shifts in customer demand	3.90	X
Content marketing through digital media has been effective in promoting my products\services	3.99	IV
Digital media helps to foster customer loyalty	3.89	XIII
Digital media has significantly increased my brand's visibility	3.86	XVI
Without digital media it is harder to manage my business from	3.92	VII

home		
Digital media has improved my ability to provide customer support	4.02	III

INFERENCE:

1. Customer Acquisition – Digital media is most effective in helping businesses reach new customers (Rank 1, Avg: 4.40).

2. Overall Business Performance – It has a positive impact on business performance but is not the highest-rated factor (Rank V, Avg: 3.94).

3. Marketing Cost Reduction – Businesses recognize some cost savings, but this benefit ranks lower (Rank XIII, Avg: 3.90).

4. Customer Personalization – Digital media helps offer personalized services, making it a key benefit (Rank II, Avg: 4.10).

5. Customer Insights – Businesses acknowledge digital media's role in understanding target audiences but rate it moderately (Rank XIV, Avg: 3.90).

6. Sales and Revenue Growth – Digital media contributes to sales and revenue, though it is not the top-rated benefit (Rank VII, Avg: 3.91).

7. Business Efficiency & Work-Life Balance – Helps businesses manage operations efficiently while maintaining work-life balance (Rank IX, Avg: 3.92)

8. Adaptability to Market Changes – Digital media assists in responding to customer demand shifts (Rank X, Avg: 3.90).

9. Remote Business Management – Businesses find it harder to manage from home without digital media, indicating reliance (Rank VIII, Avg: 3.92).

10. Content Marketing Effectiveness – Digital media is perceived as effective in promoting products and services (Rank IV, Avg: 3.98).

11. Staying Updated with Industry Trends – Digital media helps businesses keep up with trends and news (Rank XI, Avg: 3.87).

12. Tracking Sales and Analytics – Businesses find digital media useful for monitoring sales and analytics (Rank XII, Avg: 3.90).

13. Competitive Advantage – Digital media aids in staying competitive (Rank VI, Avg: 3.98).

14. Business Growth – It plays a crucial role in business expansion (Rank XI, Avg: 3.87).

15. Brand Visibility – Digital media significantly increases brand recognition (Rank XV, Avg: 3.86).

16. Fostering Customer Loyalty – It helps strengthen customer relationships and loyalty (Rank XVI, Avg: 3.89)

17. Customer Support Improvement – Enhances businesses' ability to provide customer support (Rank III, Avg: 4.02).

18. Work Challenges Without Digital Media – Businesses find it more challenging to operate without digital media (Rank XVII, Avg: 3.92).

Chi-Square Test

TABLE 6

Chi-Square Test for Significance between Age and Digital Platforms used For Business

Null Hypothesis (Ho):

There is no significant relationship between **Age and Digital Platforms used For Business**

Alternative Hypothesis (H1):

There is a significant relationship between **Age and Digital Platforms used For Business**

Observed Value

	Youtube	Instagram	Whatsapp	Facebook	E commerce Websites	Total
Upto 18	4	9	5	2	1	21
19-30	10	20	11	0	1	42
31-40	5	12	4	3	1	25

41 -50	2	5	4	0	1	12
51 and above	0	1	3	2	4	10
Total	21	47	27	7	8	110

Expected value

	Youtube	Instagram	Whatsapp	Facebook	E – commerce Websites	Total
Upto 18	4.0	9.0	5.2	1.3	1.5	21.0
19-30	8.0	17.9	10.3	2.7	3.1	42.0
31-40	4.8	10.7	6.1	1.6	1.8	25.0
41 -50	2.3	5.1	2.9	.8	.9	12.0
51 and above	1.9	4.3	2.5	.6	.7	10.0
Total	21.0	47.0	27.0	7.0	8.0	110.0

	Value	Df	Significance
Pearson Chi-Square	31.262 ^a	16	.012

Inference:

The table value for 1 degree of freedom at 5% level of significance is **3.841**. It is found that the calculated value i.e., **31.262^a** is **greater** than the table value. Therefore, the Null Hypothesis (Ho) is **accepted**. Hence it is concluded that there is a significant relationship between **Age and platforms used for Business**.

DESCRIPTIVE ANALYSIS OF VARIABLES

TABLE 7

Variables	Mean	Std. Deviation
Age of the Respondents	2.5273	1.18638
Education	3.3091	1.31850
Type of Home-based Business	4.2182	2.23148
Annual Income of Home Based Business	1.6545	.75948
How did you first promoted your business before adopting digital media	1.6091	.69197
Promoting the business through social media is helpful	1.2182	.41490
Which digital platforms do you use for your business purposes	2.4000	1.09377
How many hours per day do you spend on Digital media for business purposes	1.5091	.66007
How digital media impacted your business	2.0273	.89298
What challenges have you faced in adopting digital media	2.2182	1.08688
Do you collaborate with other business or influencers in digital media to promote your business	1.6909	.80986
Has Digital Media reduced your overall business costs	1.1909	.39482
Do you feel Digital Media has provide sufficient support for small business	1.2182	.41490
Time management can be a challenge for women homepreneurs while managing digital platforms.	1.1273	.33480

How do you measure success of the digital Media efforts	1.6909	.77513
What is biggest motivation for overcoming digital media challenges	1.8000	.84376
Which factor do you think affects your customer engagement most	2.1000	1.02223
From the following one which is considered to be the biggest challenge	2.0818	1.04163
In which aspect do you find managing Digital Media is the most Time-Consuming One	2.0818	.99662
What is your overall satisfaction level with your Digital Media experience so far	1.9909	1.04483

Inference

- The variables "**Age of the Respondents,**" "**Education,**" and "**Type of Home-based Business**" exhibit a strong correlation, with their mean values exceeding 2.5. This shows that these factors are significantly related to the studied phenomenon, indicating a meaningful trend or pattern within the dataset
- The variables "**Annual Income of Home Based Business, How did you first promoted your business before adopting digital media, Promoting the business through social media is How digital media impacted your business, How often do you interact with the customers on digital media, How often do you interact with the customers on digital media,What is biggest motivation for overcoming digital media challenges, How do you measure success of the digital Media efforts**"exhibits a medium correlation, with their mean values ranging between 1 and 2.5. This suggests that these variables exhibit relatively medium influence or significance within the dataset.

SUGGESTIONS

- Organize digital literacy programs to help Homepreneurs, especially in rural areas, to overcome barriers to digital adoption.

- Encourage more training programs on digital marketing and media management to equip entrepreneurs with essential skills.
- Provide workshops on content creation, including designing visuals and writing engaging captions.
- Promote the importance of consistent posting and content scheduling to maintain customer engagement.
- Encourage businesses to explore various digital platforms beyond Instagram to expand their reach.
- Encourage the adoption of affordable cybersecurity solutions to address security concern.
- Encourage collaboration with influencers and other businesses to enhance brand visibility.
- Promote the use of paid digital advertising for better reach and customer targeting.
- Educate the Homepreneurs on measuring success beyond likes and followers, focusing on engagement and conversion rates.
- Address the time management issues by introducing scheduling tools and automation techniques.
- Provide mentorship programs to help women homepreneurs leverage digital media more effectively.
- Develop support networks and community forums to offer peer-to-peer learning and business networking opportunities.
- Promote the use of digital platforms for customer interaction and engagement, ensuring better business relationships.

CONCLUSION

The adoption of digital media has created vast opportunities for women homepreneurs, allowing them to expand their businesses, reach a wider audience, and reduce operational costs. Many, especially in rural areas, use platforms like Instagram to promote products, engage customers, and access broader markets. This shift enhances business visibility, customer engagement, and long-term sustainability. Digital media also supports self-learning and skill development, fostering confidence and autonomy.

However, challenges persist, including limited internet access, digital literacy gaps, time management issues, irregular content posting, and cybersecurity concerns. Despite these barriers, digital media remains a powerful tool for business growth and success among women homepreneurs.

WEBSITES

- <https://scholar.google.com/>
- <https://www.linkedin.com/pulse/redefining-work-life-harmony-rise-homepreneurs-chatterjee-group-79mgc>
- <https://www.igi-global.com/chapter/empowering-homemakers-become-homepreneurs/12745>
- <https://www.indianjournalofentrepreneurship.com/index.php/IJOE/article/view/153646>
- [https://www.worldwidejournals.com/indian-journal-of-applied-research-\(IJAR\)/recent_issues_pdf/2013/July/July_2013_1372686030_45dd6_35.pdf](https://www.worldwidejournals.com/indian-journal-of-applied-research-(IJAR)/recent_issues_pdf/2013/July/July_2013_1372686030_45dd6_35.pdf)
- https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3652444
- <https://www.yourdictionary.com/homepreneur>

ROLE OF ARTIFICIAL INTELLIGENCE IN ONLINE SHOPPING AND IT'S IMPACT ON CONSUMER PURCHASING BEHAVIOUR

G.JERCY, and T.Priyanka

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT:

Role of artificial intelligence in online shopping and it's impact on consumer purchasing behaviour is the topic taken research. Objectives of the study are to assess the influence of AI technologies on consumer purchasing decisions in online Shopping to analyze the role of AI in enhancing the overall shopping experience for consumer to measure consumer perceptions of AI applications in online shopping. to examine changes in consumer behaviour patterns due to AI integration in online retail and to identify barriers to the adoption of AI in online shopping. primary and secondary data was used in this study to collect the data.. The convenience sampling technique is adopted to select 120 respondents Who are used The impact of artificial intelligence on impulse buying behaviour of customers in online shopping is significant. Through personalized recommendations, targeted advertising, and real-time feedback.

KEYWORDS:

Artificial intelligence, consumer behaviour,online shopping,consumer preference and needs, technology.

INTRODUCTION:

The advent of Artificial Intelligence (AI) has revolutionized the online shopping landscape, transforming the way consumers interact with e-commerce platforms and enabling online retailers to provide personalized and seamless shopping experiences that drive customer engagement, loyalty, and retention. With the increasing use of digital technologies, online shopping has become an integral part of modern retailing, accounting for a significant percentage of total retail sales globally. As online shopping continues to grow in popularity, retailers are seeking innovative ways to enhance the shopping experience, increase customer satisfaction, and drive sales, and AI-powered technologies have emerged as a key driver of innovation in online retailing. By leveraging AI-powered chatbots, recommendation systems,

and predictive analytics, online retailers can offer tailored product suggestions, proactive customer support, and optimized marketing campaigns that cater to individual consumer preferences, behaviors, and needs.

REVIEW OF LITERATURE:

Dang(2019) in his research paper "The influence of Artificial Intelligence, Augmented Reality and Virtual Reality on Shopping Experiences of the Indian Buyers" explore the effect and implications of (AI) artificial intelligence, (AR) Augmented Reality and (VR) Virtual Reality on the shopping experience of the Indian consumers and to know whether AI is changing their shopping behaviour. Though AI (Artificial Intelligence) is not new terminology for the internet savvy people but it is totally new for the general consumer who purchase a variety of goods and services through online platforms with the assistance of artificial Intelligence technology. This paper will explore the new facts and new knowledge about the relationship between AI (Artificial Intelligence) and Shopping experience

Anli Suresh(2020) in his study "Consumer perception towards artificial intelligence in E-commerce with reference to Chennai city, India" stated that, in the modern era, people are much closer to technology and peoples mind are expecting new and innovative things which make their works easier and save time. Artificial Intelligence (AI) is one among those technologies which helps almost in all areas of individual's routine life. AI is the simulation of human intelligence process by machines, especially computer systems. The main aim of the study is to identify the consumer preferences towards the applications of AI in different areas of e-commerce. The concluding observations are that there is no relationship between usage and recompenses factors while there is significant relationship between the techniques factors. The most influencing areas of AI in e-commerce are real time product targeting, voice powered search and virtual personal shoppers.

Khrais(2020) in his study "Role of artificial intelligence in shaping consumer demand in E-commerce" stated that, the advent and incorporation of technology in businesses have reformed operations across industries. Notably, major technical shifts in e-commerce aim to influence customer behaviour in favor of some products and brands. Artificial intelligence (AI) comes onboard as an essential innovative tool for personalization and customizing products to meet specific demands. This research finds that, despite the contribution of AI systems in e-commerce, its ethical soundness is a contentious issue, especially regarding the

concept of explainability. Explainable Artificial Intelligence (XAI) is a machine learning field that inspects and tries to understand the models and steps involved in how the black box decisions of AI systems are made it provides insights into the decision points, variables, and data used to make a recommendation. This study suggested that, to deploy explainable XAI systems, ML. models should be improved, making them interpretable and comprehensible.

Saikat Gochhait(2020) in his research "Role of artificial intelligence (AI) in understanding the behaviour pattern: a study on e-commerce" explains that, the customer satisfaction is one of the pillars of strength for any successful retailer, hence the infiltration of AI it becomes easier in understanding and predicting consumer behaviour patterns and trends in E-commerce as with the use on Analytics only, it failed to demonstrate the behavioural patterns precisely due to the humungous quantity and variance of data paving the path for AI to enter the scenario as coupling with Analytics it can unleash its values to simplify. Purpose of the Research is to study the role of AI in understanding the behaviour pattern of E-commerce Customers. To understand how Artificial Intelligence can add value to increase the sales of an E-commerce Company - Creating more personalized marketing across multiple devices is by using artificial intelligence to eliminate redundancies and automate processes and enable trade in conversations.

Fazla Rabby (2021) in his study "Artificial intelligence in digital marketing influences consumer behaviour: a review and theoretical foundation for future research" stated that, tracking the customer journey has become more challenging because of the changing marketing environment. The market is getting bigger and better, with digital markets offering customers countless new options for shopping. Customers share their desires, attitudes, and beliefs through many avenues and mediums, as the need for exceptional customer experience grows across all digital platforms. Artificial intelligence (AI) is the answer to enhancing the digital experience while delivering personalized content. This seemingly endless source of customer-curated data is expanding. Many marketers turn to AI to extract the information and use it. AI empowers businesses to collect and act on detailed real-time customer insights, and through these insights. they can develop customized digital marketing experiences. This literature review looks at AI-based digital marketing applications that can enhance the online customer experience using the customer decision journey. It looks closely at how AI integrated digital marketing influences consumer buying behaviour.

STATEMENT OF PROBLEM:

Artificial intelligence (AI) has been rapidly developing, and its integration in online shopping platforms has completely changed how customers interact with e-commerce websites. However, as artificial intelligence (AI) algorithms become more accurate in predicting and influencing consumer behavior, there is increasing uncertainty about their impact on impulse buying. The concept of impulse buying, characterized by sudden, unplanned purchases driven by emotions and immediate desires, has long been a significant factor in consumer behaviour. With AI technologies such as personalized product recommendations, targeted advertising, and dynamic pricing strategies, there is a need to understand how these tools influence consumers impulse buying behaviour in online shopping environments.

OBJECTIVES:

1. To assess the influence of AI technologies on consumer purchasing decisions in online shopping.
2. To analyze the role of AI in enhancing the overall shopping experience for consumers.
3. To measure consumer perceptions of AI applications in online shopping.
4. To examine changes in consumer behaviour patterns due to AI integration in online retail.
5. To identify barriers to the adoption of AI in online shopping.

RESEARCH METHODOLOGY:

Sampling design	Convenience sampling design
Period of the study	November 2024 to March 2025
Data based	Primary data
Test for Analysis	Percentage Analysis, Descriptive Statistics, chi-square test, likert's scale

LIMITATION OF STUDY:

Though best efforts were taken to minimize the limitations, still the study is not free from limitations. Therefore, limitations are

1. The study covers only the city of Thoothukudi. So the results may not applied to other areas.
2. The whole population of respondents could not be approachable.
3. While collecting primary data biasness of respondents in answering the questions was a

barrier.

4. Reliability and accuracy of the study depends on the respondents' openness and truthiness.

RESULTS AND DISCUSSIONS:

Option	Mean	Std. Deviation
Age	1.6250	1.06954
Gender	1.6500	.47897
Marital status	1.6583	.47626
Educational Level	2.6583	.60106
Occupation	2.1667	1.12521
Monthly income	1.6833	.97000
Location	2.1333	.91609
Average Monthly Online Shopping	1.4333	.69492
How often do you shop online	1.9333	.95031
What types of products do you primarily purchase online	2.7333	1.50480
Do you compare prices on multiple websites before purchasing	1.7917	.95174
Are you aware that online platforms use AI to personalize your shopping experience	1.3417	.47626
Which of the following is a common use of AI in online shopping	1.9000	.92036
Have you ever felt that AI usage reduced risk like fraudulent and manipulation	1.3917	.49017

How does AI prevent fraud in online shopping	2.2500	109429
What is the main purpose of AI chatbots in e-commerce	2.0667	.95911
Which payment do you prefer for online shopping	1.9000	.84416
What is the biggest challenge you face with shopping online	1.8417	.74468
How does AI reduce card abandonment in online shopping	2.2333	1.12820
How does AI improve customer service in e-commerce	1.9750	.91176
AI use the personal data appropriately	1.3917	.49017
Offers and discount encourage you to shop on online shopping	2.1500	1.05041
How do you think AI is used in online shopping	2.3083	1.18673
AI driven features make my online shopping experience quicker and most efficient	1.3250	.47034
Have you interacted with AI based virtual assistant while shopping	2.1833	1.08452
AI products discovery suggestions are more useful than advertisement	1.2833	.45251
How effective do you think AI in helping to find desirable products	1.3167	.46713
Find it easier to compare through AI driven platform	1.3167	.46713

Which AI powered tool help to detecting fake reviews and misleading product rating	1.8167	.75574
AI tools expose me to a wider range of products making online shopping more interesting	1.2667	.44407
How 4 do you notice advertisement powered by AI while shopping online	2.0667	.95911
Do you feel while safe sharing personal data with AI	1.8000	.77351
What AI features help in real time order tracking	1.2917	.45644

Chi square test:

1.Comparison between age and AI use the personal data appropriately

Null Hypothesis (H0):

There is no significant association between age group and perception of AI using personal data appropriately.

Alternative Hypothesis (H1):

There is a significant association between age group and perception of AI using personal data appropriately.

Observed value

Age	Yes	No	Total
18-35	50	37	87
36-40	3	0	3
41-50	12	6	18
Above 50	8	4	12
Total	73	47	120

Expected value

Age	Yes	No	Total
18-35	52.5	34.1	87.0
36-40	1.8	1.2	3.0
41-50	11.0	7.1	18.0
Above50	7.3	4.7	12.0
Total	73.0	47.0	120

Chi-Square Tests

	Value	Df	Asymptotic Significance (2- sided)
Pearson Chi-Square	2.773 ^a	3	.428

Inference:

The table value for 3 degree of freedom at 5% level of significant is 3.841. It is found that the calculated value i.e., 2.773 is greater than the table value. Therefore , the Null Hypothesis (Ho) is rejected. Hence it is concluded that there is a significant relationship between age group and perception of AI using personal data appropriately.

2.Comparison between age and AI driven features make their online shopping experience quicker and most efficient

Null Hypothesis(Ho):

There is no significant association between age groups and the easier to compare through AI driven platforms.

Alternative Hypothesis (H1):

There is a significant association between age group and easier compare through AI driven platforms.

Observed value

Age	Yes	No	Total
18-35	58	29	87
36-40	2	1	3
41-50	11	7	18
Above 50	11	1	12
Total	82	38	120

Expected value

Age	Yes	No	Total
18-35	59.5	27.6	87
36-40	2.1	1	3
41-50	12.3	5.7	18
Above 50	8.2	3.8	12
Total	82	38	120

Chi- square test

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.569 ^a	3	.312

Inference:

The table value for 3 degree of freedom at 5% level of significant is 3.841. It is found that the calculated value i.e., 3.569 is greater than the table value. Therefore , the Null Hypothesis

(Ho) is rejected. Hence it is concluded that there is a significant relationship between age group and perception of AI using personal data appropriately.

Likert's scale:

Statement	Strongly agree	Agree	neutral	disagree	Strongly disagree	Total
1.AI changes the consumer buying behaviour	51	47	11	7	4	494
2. AI influence on my purchasing behaviour	25	63	20	8	4	457
3.AI makes my choice easier	37	40	28	10	5	454
4. AI impacts on identifying a right product	23	48	32	13	4	433
5. It helps to compare products from variable E-commerce platforms	29	48	18	13	12	429
AI makes the shopping experience more personalized	25	48	34	10	3	442
7.personalized recommendations from AI increase likelihood of purchasing products	39	45	19	12	5	461
8.chatbots for customer service when shopping online is effective	30	42	31	11	6	439

9. AI-based product reviews and ratings about product helps in buying behaviour	31	50	21	14	4	450
10.Is it comfortable with AI tracking your browsing and shopping behaviour to offer personalized recommendations	33	43	31	7	4	451
Total						4510

Particulars	Average	Rank
1.AI changes the consumer buying behaviour	4.15	I
2. AI influence on my purchasing behaviour	3.81	III
3.AI makes my choice easier	3.78	IV
4. AI impacts on identifying a right product	3.61	IX
5. It helps to compare products from variable E-commerce platforms	3.58	X
6. AI makes the shopping experience more personalized	3.68	VIII
7.personalized recommendations from AI increase likelihood of purchasing products	3.84	II
8.chatbots for customer service when shopping online is effective	3.66	VII
9. AI-based product reviews and ratings about product helps in buying behaviour	3.75	VI
10.Is it comfortable with AI tracking your browsing and shopping behaviour to offer personalized recommendations	3.76	V

FINDINGS FOR THE TABLE:

- Factors such as awareness of AI-driven personalization AI's role in reducing fraud (1.3917), and the common use of AI in online shopping (1.9000) highlight a moderate impact of AI on consumer behavior. Similarly, the preference for online payment methods (1.9000) and consumers' tendency to compare prices before purchasing (1.7917) reinforce this observation ,AI's role in reducing card abandonment (2.2333), the effectiveness of AI in improving customer service (1.9750), AI-driven advertisements (2.0667), and AI's ability to detect fake reviews (1.8167), indicate a moderate impact on consumer behavior. Similarly, perceptions of AI's handling of personal data (1.3917) and safety concerns regarding personal data sharing (1.8000) also reflect a medium correlation.
- The type of products purchased online (2.7333) is the only factor that shows a strong correlation, indicating that AI may play a significant role in shaping product preferences and influencing consumer choices, The belief in AI's overall role in online shopping (2.3083) stands out as the only factor with a strong correlation, suggesting that consumers widely recognize AI as an essential component in their shopping experience.
- The consumer agreed that AI changes their buying behaviour .
- The consumer neither agreed nor disagreed the following statementsAI influence on consumer purchasing behaviour , AI makes consumer choice easier ,AI impacts on identifying a right product , It helps to compare products from variable E-commerce platforms, AI makes the shopping experience more personalized ,personalized recommendations from AI increase likelihood of purchasing products ,chatbots for customer service when shopping online is effective , AI-based product reviews and ratings about product helps in buying behaviour and consumer feel comfortable with AI tracking their browsing and shopping behaviour to offer personalized recommendations.
- There is a significant relationship between age group and perception of AI using personal data appropriately.
- There is a significant relationship between age group and perception of AI using personal data appropriately.

SUGGESTIONS:

- The researcher has put forth the following suggestions based on the results of the study Educate customers about how AI systems analyze their browsing behaviour and preferences to personalize product recommendations, potentially influencing impact of buying decisions.
- The companies can adopt AI tools to increase the sales and satisfy the customers to the maximum.

CONCLUSION:

The convenience and accessibility of online shopping platforms powered by AI have made it easier for consumers to make impulsive purchases without much thought or consideration. The seamless user experience provided by these platforms play a significant role in encouraging impulse buying behaviour among customers. The continuous advancements in AI technology will only further enhance its impact on impulse buying behaviour in the future. As AI algorithms become more sophisticated and capable of understanding and predicting consumer preferences and behaviours, the influence they exert on customers' purchasing decisions will only grow stronger.

The main aim of research is to study the Knowledge, attitude and behaviour of the customers towards impact of AI systems in online shopping. It is revealed that people are aware of AI influence in online shopping. Majority of the people have prefer the AI powered product recommendations in their shopping experience, so it is elucidated that many people have adapted to the AI in their online shopping process

Most of the people opined that use of AI has increased their overall satisfaction level in online shopping. People think that AI product recommendations are better than traditional advertising methods. The major problems which people face are privacy or security concern on using AI in online shopping platforms which can be overcome by fraud detection systems or developing software to ensure secure transactions and build trust with customers. Overall, it is concluded that despite having various issues people are adopting AI in their shopping experiences which leads to impulse buying behaviour.

REFERENCES:

- 1.Dang, T. (2019). The influence of Artificial Intelligence, Augmented Reality and Virtual Reality on Shopping Experiences of the Indian Buyers. Research Journal of Social and Life Sciences 28,78-91.
- 2.Anil Suresh, J. R. (2020). Consumer perception towards artificial intelligence in E-commerce with reference to Chennai city, India. Journal of Information Technology and Economics Development 11 (1), 1-14.
3. Khrais, L. T. (2020), Role of artificial intelligence in shaping consumer demand in E-commerce. Future Internet 12(12)226.
- 4.SaikatGochhait, O. M. (2020). Role of artificial intelligence (AI) in understanding the behaviour pattern: a study e-commerce, ICDSMLA 2019: Proceedings of the 1st International Conference on Data Science, Machine learning and Applications (pp. 1600-1606). Springer.
- 5.Earth Rabby, R. C. (2021). Artificial intelligence in digital marketing influences consumer behaviour: a review and Intentional Journal for Research in Applied Science and Engineering Technology 9 (VII), 523-527.

WEBSITES:

<https://en.m.wikipedia.org>

<https://scholar.google.com>

<https://www.researchgate>

<https://www.sciencedirect.com>

<https://www.emerald.com>

UNDERSTANDING THE ECONOMIC CONDITIONS OF MERCHANT NAVY ON SEAFARERS IN THOOTHUKUDI

J.Joeffina and A. Amora

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT:

Understanding the economic conditions of the merchant navy on seafarers in Thoothukudi is the topic of research. This study is taken to analyze the income level of merchant navy personnel in Thoothukudi, to evaluate the housing and living standards supported by their earnings, and to study the impact of career duration. To assess the economic impact of working life balance and to study the job satisfaction of the merchant Navy. Primary and secondary data were used in this study to collect the data.. The purposive sampling technique is adopted to select 120 respondents who are used to understand the economic conditions of the Merchant Navy on seafarers in Thoothukudi. This study shows that most merchant navy seafarers have completed maritime courses and certifications. Most are employed in private shipping companies and hold Indian CDC certificates. Their income primarily falls between ₹51,000-₹1,00,000, with direct bank transfers as the preferred payment method. Financial priorities include long-term investments, family expenses, and savings. Job satisfaction is influenced by rank, experience, and company policies, while career duration plays a key role in job stability and retirement planning.

Keywords:

Socio-economic, maritime, CDC, Work-life balance, Voyages

INTRODUCTION :

The economic conditions of the merchant navy, particularly focusing on the impact on seafarers in Thoothukudi, are crucial in understanding the livelihood and challenges faced by those working in this sector. Thoothukudi, also known as Tuticorin, is a coastal city in Tamil Nadu, India, with a significant presence of maritime trade and shipping activities. The port plays a pivotal role in facilitating international and national trade, and as a result, seafarers from this region are integral to the operations of the merchant navy. This sector offers employment opportunities to many young men and women from Thoothukudi, providing

them with a steady income and a pathway for economic mobility. However, the economic conditions of these seafarers are shaped by various factors, including the global shipping industry's fluctuations, shipping company policies, wages, working conditions, and the impact of maritime regulations.

REVIEW OF LITERATURE:

Rai, A. (2020) Employer branding, a key aspect of Human Resource Management, has been extensively discussed in the literature, particularly through the instrumental-symbolic framework introduced by Cable and Turban (2001). This framework highlights instrumental attributes like pay, benefits, and career growth, and symbolic attributes such as organizational image, prestige, and values (Backhaus & Tikoo, 2004; Edwards, 2009). While research has applied this framework across various industries, its use in the maritime sector remains limited, despite the unique challenges of seafaring, including isolation and global mobility (Raub & Streit, 2006). This study bridges the gap by examining Indian seafarers, focusing on how these attributes influence job attractiveness.

Shariah (2018) The literature identifies two key factors contributing to gaps in maritime training: globalization and technological advancements. Globalization has led to practices like flagging out, the emergence of a global labor market, and the shift of maritime education from Traditional Maritime Nations to emerging economies, resulting in inconsistent training standards, reduced investment by advancements have reduced crew sizes, changed job requirements, and rendered traditional apprenticeship models less effective, necessitating a shift toward cognitive learning approaches. The review recommends standardizing training, shipping companies, and resource limitations in training institutions. Technological enhancing resources, and aligning education with evolving technological needs.

Avey (2024). Research highlights the importance of Psychological Capital (PsyCap), Family Emotional Support, and Job Satisfaction in enhancing workforce well-being, particularly among seafarers. PsyCap, comprising Hope, Optimism, Self-Efficacy, and Resilience, positively influences job satisfaction and performance (Luthans et al., 2007). Family Emotional Support reduces stress and boosts emotional stability, indirectly improving job satisfaction (King et al., 1995). Seafarers, prone to mental health challenges due to occupational stress, benefit significantly from supportive work environments (Oldenburg et

al., 2010). Tools like the Generic Job Satisfaction Scale effectively measure workplace satisfaction (Macdonald & MacIntyre, 1997), while studies indicate PsyCap mediates the relationship between external social factors and job satisfaction, fostering resilience and engagement (Avey et al., 2010). These insights emphasize the need for strategic HR practices to create supportive environments that enhance job satisfaction and performance in the maritime sector.

Fahim (2022) This review examines the impact of job stressors on the job satisfaction of merchant navy personnel, a profession marked by isolation and high stress. Research identifies psychological factors, such as loneliness and anxiety, and leadership styles as significant determinants of job satisfaction, while the effects of workload and performance appraisal are less conclusive. Regression analyses reveal that psychological factors and leadership have a substantial influence, whereas workload and performance appraisal show minimal impact. The findings emphasize the need for targeted interventions to reduce stress and enhance job satisfaction, providing valuable insights for policymakers and future research.

Shivani et.al (2024) This review examines the impact of job stressors on the job satisfaction of merchant navy personnel, a profession marked by isolation and high stress. Research identifies psychological factors, such as loneliness and anxiety, and leadership styles as significant determinants of job satisfaction, while the effects of workload and performance appraisal are less conclusive. Regression analyses reveal that psychological factors and leadership have a substantial influence, whereas workload and performance appraisal show minimal impact. The findings emphasize the need for targeted interventions to reduce stress and enhance job satisfaction, providing valuable insights for policymakers and future research.

STATEMENT OF THE PROBLEM:

The limited awareness of financial planning and career advancement among Merchant Navy seafarers in Thoothukudi exacerbates their economic difficulties. Without access to proper financial education, many seafarers struggle to manage their earnings, save for the future, or invest in long-term goals. The evolving maritime industry, with its increasing automation and green shipping trends, demands new skills that are often not addressed in

current training programs. This limits the ability of seafarers to keep up with industry changes, hindering their career growth and income potential.

OBJECTIVES OF STUDY:

- 1.To analyze the income level of merchant navy personnel in Thoothukudi.
- 2 To evaluate the housing and living standards supported by their earnings.
- 3.To study the impact of career duration.
- 4.To assess the economic impact of work-life balance.
- 5.To study the job satisfaction of the merchant Navy.

RESEARCH METHODOLOGY:

Sampling design	Purposive design
Period of the study	November 2024 to March 2025
Data based	Primary data
Test for Analysis	Percentage Analysis, Descriptive Statistics, One-sample t-test, Independent sample t-test test and One-way ANOVA

LIMITATIONS OF STUDY:

1. Time is one of the main hindrances which limit effective data collection.
2. The number of respondents is limited.
3. The area of study is limited to Thoothukudi, so the study doesn't apply to other cities.

RESULTS AND DISCUSSIONS:

TABLE SHOWING THE SATISFACTION LEVEL

SATISFACTION	NO.OF RESPONDENTS	MEAN	STANDARD DEVIATION
Basic needs are met with earnings	120	4.0000	1.02899
Financial security is ensured by the income	120	3.7417	.93031
Satisfaction with the current living standards	120	3.4250	1.11267
Earnings allow for a preferred location	120	3.3083	1.25555

Extended voyages in the merchant navy affect family life	120	3.5667	1.23488
The job responsibilities correspond with relevant skills and interests	120	3.5417	1.26289
Global economic changes directly affect salaries	120	3.4917	1.10762
The job allows me to achieve the financial goals that and set for myself	120	3.3583	1.19379
Avoid unnecessary expenses with a balanced work-life routine	120	3.5500	1.12907
Income enables the enjoyment of a good lifestyle	120	3.3750	1.19567
Satisfaction with job schedule	120	3.4667	1.06063
Security in the current job	120	3.4333	1.10563
Satisfaction with the promotion opportunities in the job	120	3.6167	1.21740
Satisfaction with the level of communication in the workplace	120	3.4917	1.11518
An improved work-life balance allows for spending during shore leave	120	3.6833	1.10752
Career duration has provided significant opportunities for promotions	120	3.4167	1.19230
Income supports maintaining a social status	120	3.4750	1.20895
Satisfaction with current income	120	3.5833	1.10449
Earnings enable home renovations and upgradations	120	3.6833	1.15942

INFERENCE:

The analysis reveals that respondents are most satisfied with their ability to meet basic needs, meaning 4.0000, SD= 1.028, indicating general agreement. Earnings enabling home renovations and upgrades mean 3.6833, SD = 1.1594 and satisfaction with current income mean 3.5833, SD 1.10449, also show moderate satisfaction. Conversely, satisfaction with current living standards means = 3.4250, SD 1.11267 and financial security means = 3.7417, SD 0.930, demonstrate a slightly lower perception, with financial security having the least variability. The lowest satisfaction is observed in career duration, providing promotion opportunities mean of 3.4167, SD 1.19230, indicating concerns about career growth.

ONE-SAMPLE T TEST

Null Hypothesis (H₀): There is no significant difference between perception and satisfaction.

Alternative Hypothesis (H₁): There is a significant difference between perception and satisfaction.

TABLE SHOWING THE RELATION BETWEEN PERCEPTION AND SATISFACTION

SATISFACTION	MEAN	STANDARD DEVIATION	T VALUE	P VALUE
Basic needs are met with earnings	4.0000	1.02899	10.646	.000
Financial security is ensured by the income	3.7417	.93031	8.733	.000
Satisfaction with the current living standards	3.4250	1.11267	4.184	.000
Earnings allow for a preferred location	3.3083	1.25555	2.690	.008
Extended voyages in the merchant navy affect family life	3.5667	1.23488	5.027	.000

The job responsibilities correspond with relevant skills and interests	3.5417	1.26289	4.698	.000
Global economic changes directly affect salaries	3.4917	1.10762	4.863	.000
The job allows me to achieve the financial goals that and set for myself	3.3583	1.19379	3.288	.001
The physical and mental demands of the job are manageable with experience	3.4167	1.22703	3.720	.000
Avoid unnecessary expenses with a balanced work-life routine	3.5500	1.12907	5.336	.000
Income enables the enjoyment of a good lifestyle	3.3750	1.19567	3.436	.001
Satisfaction with job schedule	3.4667	1.06063	4.820	.000
Security in the current job	3.4333	1.10563	4.293	.000
Satisfaction with the promotion opportunities in job	3.6167	1. the 21740	5.549	.000
Satisfaction with the level of communication in workplace	3.4917	1.11518	4.830	.000
An improved work-life life bwork-lifelows to spend during shore leave	3.6833	1.10752	6.759	.000
Career duration has provided with opportunities for promotions	3.4167	1.19230	3.828	.000
Income supports maintaining a social status	3.4750	1.20895	4.304	.000
Satisfaction with current income	3.5833	1.10449	5.786	.000
Earnings enable home renovations and upgradations	3.6833	1.15942	6.456	.000

INFERENCE:

Each impact has a mean score, standard deviation, t-value, and p-value. The values for all impacts are .000, significance 0.05. A p-value < 0.05 indicates that the null hypothesis (H_0) should be rejected. Since all p-values are statistically significant, we reject the null hypothesis (H_0) and accept the alternative hypothesis(H_1). This means there is a significant difference between perception and satisfaction across all impacts.

TABLE SHOWING THE CAREER DURATION INCOME

SATISFACTION	CAREER DURATION INCOME				T value	P-value
	YES		NO			
	mean	Standard Deviation	Mean	Standard Deviation		
Basic needs are met with earnings	4.0122	1.08.291	3.9737	.91495	.1.90 .202	.142
Financial security is ensured by the income	3.8780	.83725	3.4474	1.05772	2.406 2.220	.169
Satisfaction with the current living standards	3.4146	1.11057	3.4474	1.13179	-.149 -.148	.932
Earnings allow for a preferred location	3.2805	1.23002	3.3684	1.32382	-.356 -.346	.358
Extended voyages in the merchant navy affect family life	3.6463	1.15867	3.3947	1.38602	1.039 .973	.119
The Job responsibilities correspond with relevant skills and interests	3.6098	1.23484	3.3947	1.32623	.867 .844	.627

Global economic changes directly affect salaries.	3.5122	1.08005	3.4474	1.17858	.297 .288	.460
The physical and mental demands of the job are manageable with experience	3.3049	1.20379	3.6579	1.25798	-1.473 -1.449	.950
Avoid unnecessary expenses with a balanced work-life routine	3.5488	1.17749	3.5526	1.03185	-.017 -.018	.283
Income enables the enjoyment of good lifestyle	3.414 a	1.24674	3.2895	1.08821	.532 .559	.095
Satisfaction with job schedule	3.4146	1.06518	3.5789	1.05604	-.788 -.791	.821
Security in current job	3. the 4024	1.08707	3.5000	1.15665	-.448 -.438	.448
Satisfaction with the promotion opportunities in the job	3.5854	1.24674	3.6842	1.16492	-.412 -.423	.593
Satisfaction with level of communication in the workplace	3.4756	1.07984	3.5263	1.20218	-.231 -.222	.307

An improved work-life balance allows for spending during shore leave	3.7317	1.14449	3.5789	1.03013	.701 .729	.334
Career duration has provided significant opportunities for promotions	3.4878	1.19.922	3.2632	1.17828	.960 .966	.625
Income supports maintaining a social status	3.4756	1.18869	3.4737	1.26783	.008 .008	.777
Satisfaction with current income	3.5976	1.07565	3.5526	1.17858	.206 .200	.610
Earnings enable home renovations and upgradations	3.7195	1.13610	3.6053	1.22009	.501 .488	.705

INFERENCE:

The independent sample t-test examined the impact of career duration income on job satisfaction, comparing p-values to the 0.05 significance level. The results indicate that some factors, like "Global economic changes affecting salaries" ($t = 2.97$, $p = 0.046$), showed a significant difference, leading to the rejection of the null hypothesis (H_0), confirming that income influences satisfaction in this area. Conversely, factors like "Avoiding unnecessary expenses with a balanced work-life routine" ($t = -0.017$, $p = 0.283$) were not statistically significant, leading to the acceptance of H_0 , suggesting no meaningful difference. Overall, the findings highlight that while income impacts job satisfaction in areas related to financial

stability and economic changes, other aspects remain unaffected, emphasizing that career duration income is not the sole determinant of job satisfaction.

TABLE SHOWING THE EFFECTIVENESS OF QUALIFICATION AND SATISFACTION

SATISFACTION/ RANK		SUM SQUARES	DF	MEAN SQUARE	F VALUE	P VALUE
S1	Between Groups	1.401	3	.467	.435	.729
	Within Groups	124.599	116	1.074		
	Total	126.000	119			
S2	Between Groups	3.645	3	1.215	1.419	.241
	Within Groups	99.346	116	.856		
	Total	102.992	119			
S3	Between Groups	8.086	3	2.695	2.246	.087
	Within Groups	139.239	116	1.200		
	Total	147.325	119			
S4	Between Groups	29.766	3	9.922	7.293	.000
	Within Groups	157.826	116	1.361		
	Total	187.592	119			
S5	Between Groups	9.555	3	3.185	2.149	.098
	Within Groups	171.912	116	1.482		
	Total	181.467	119			
S6	Between Groups	12.287	3	4.096	2.677	.050
	Within Groups	177.504	116	1.530		
	Total	189.792	119			
S7	Between Groups	9.225	3	3.075	2.608	.055

	Within Groups	136.767	116	1.179		
	Total	145.992	119			
S8	Between Groups	9.340	3	3.113	2.254	.086
	Within Groups	160.252	116	1.381		
	Total	169.592	119			
S9	Between Groups	12.519	3	4.173	2.905	.038
	Within Groups	166.648	116	1.437		
	Total	179.167	119			
S10	Between Groups	4.610	3	1.537	1.212	.309
	Within Groups	147.090	116	1.268		
	Total	151.700	119			
S11	Between Groups	9.638	3	3.213	2.322	.079
	Within Groups	160.487	116	1.384		
	Total	170.125	119			
S12	Between Groups	30.889	3	10.296	11.598	.000
	Within Groups	102.978	116	.888		
	Total	133.867	119			
S13	Between Groups	11.507	3	3.836	3.321	.022
	Within Groups	133.959	116	1.155		
	Total	145.467	119			
S14	Between Groups	25.095	3	8.365	6.415	.000
	Within Groups	151.272	116	1.304		
	Total	176.367	119			
S15	Between Groups	14.052	3	4.684	4.056	.009
	Within Groups	133.940	116	1.155		

	Total	147.992	119			
S16	Between Groups	10.570	3	3.523	3.019	.033
	Within Groups	135.397	116	1.167		
	Total	145.967	119			
S17	Between Groups	19.248	3	6.416	4.964	.003
	Within Groups	149.919	116	1.292		
	Total	169.167	119			
S18	Between Groups	4.905	3	1.635	1.122	.343
	Within Groups	169.020	116	1.457		
	Total	173.925	119			
S19	Between Groups	12.376	3	4.125	3.604	.016
	Within Groups	132.791	116	1.145		
	Total	145.167	119			
S20	Between Groups	14.631	3	4.877	3.892	.011
	Within Groups	145.336	116	1.253		
	Total	159.967	119			

INFERENCE:

The above table ANOVA shows a significant value stated with <0.01 , and it is less than 0.05. Hence, I reject the null hypothesis and conclude by accepting that there is a significant difference between the effectiveness of qualification and satisfaction. The higher F value is 11.598 for effectiveness, further supporting and motivating the stronger influence.

FINDINGS AND DISCUSSION :

- Respondents reported the highest satisfaction in meeting their basic needs (mean = 4.000, SD = 1.028). Satisfaction with income (mean = 3.5833, SD = 1.1049) and financial security (mean = 3.7417, SD = 0.930) showed moderate satisfaction, while career promotion opportunities had the lowest satisfaction (mean = 3.4167, SD = 1.1923), indicating career growth concerns. The p-value is 0.000 (significant at

<0.05). Overall Perception and Satisfaction p-value: 0.000 (Significant at <0.05.) The null hypothesis (H_0) is rejected.

- Career Duration Income Impact on Job Satisfaction. Global economic changes affecting salaries:t-value: 2.97, p-value: 0.046 (Significant at <0.05) Null hypothesis (H_0) is rejected. Avoiding unnecessary expenses with a balanced work-life routine: t-value: -0.017, p-value: 0.283 (Not significant at >0.05 Null hypothesis (H_0) is accepted.
- Effectiveness of Qualification and Satisfaction. F-value: 11.598, p-value: <0.01 (Significant) Null hypothesis (H_0) is rejected. Overall, statistical results confirm significant differences in satisfaction based on financial security, career growth, and qualifications, except for personal financial habits, which showed no meaningful impact. The null hypothesis (H_0) is rejected, confirming a significant difference between perception and satisfaction.

SUGGESTIONS

- Companies should provide structured promotion opportunities to address concerns about career duration.
- More training programs for career advancement should be introduced to increase salaries.
- Financial planning workshops should be conducted to help employees manage housing and savings efficiently.
- More flexible contracts and working conditions should be introduced to attract talent.
- Policies should be made to improve merchant navy working conditions and income stability.
- Introduce mentor-propriatorship young professionals to enhance career longevity.
- Provide structured career progression with clear promotion paths
- Encourage long-term retention through loyalty bonuses and extended contracts.
- Offer financial planning sessions to help seafarers manage earnings effectively.
- Introduce investment advisory services for long-term wealth management.
- Advocate for salary standardization across private and government shipping companies, rotating work schedules to reduce long voyages and increase shore leave.
- Provide better internet access onboard to maintain communication with family.

CONCLUSION:

The merchant navy is appealing due to its high initial salaries and international career opportunities, although increasing competition and global economic factors affect income trends. Despite these challenges, the majority of respondents are satisfied with their earnings, living standards, and career prospects, viewing their profession as a stable and rewarding career choice.

REFERENCES:

1. *Globalizing Labour Indian Seafarers and World Shipping, c. 1870–1945* – Ravi Ahuja
2. *International Seafarers and Transnationalism in the Twenty-First Century* – Helen Sampson
3. *Maritime Commerce and English Power: Southeast India, 1750–1800* – Lakshmi Subramanian
4. *The Shipping Industry, Ocean Governance and Environmental Law in the Paradigm Shift* – I. Chapsos
5. *Maritime Economics* – Martin Stopford

Websites & Reports:

6. **Times of India** – *Port is Tuticorin's gateway to prosperity*
7. **LinkedIn Article** – *Tuticorin: India's Emerging Gateway to Global Trade* by Iyappan Kannan
8. **ResearchGate** – *Economic analysis of marine fishing crafts in Thoothukudi province, Tamil Nadu*
9. **SagarMala (GovernSagar Malandla Report)** – *Maritime India Vision 2030*
10. **International Maritime Organization (IMO)** – Reports on global seafarers' economic conditions
11. **Indian Maritime University (IMU)** – Research on Indian seafarers' career prospects
12. **Directorate General of Shipping, India** – Regulations and updates on seafarers' employment
13. **Seafarers' Welfare Trust** – Financial security and welfare schemes for Indian seafarers
14. **International Labour Organization (ILO)** – Reports on seafarers' wages and working conditions

A STUDY ON STRESS MANAGEMENT OF DELIVERY PARTNERS

Kaviya R* and A.Saleth Mary Vetriselvi

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT:

Delivery partners play a critical role in the logistics and transportation industry, often working under tight deadlines and facing numerous challenges on the road. Chronic stress can have severe consequences on their physical and mental health, leading to decreased job satisfaction, increased absenteeism, and reduced productivity. This study explores the causes and consequences of stress among delivery partners and identifies effective strategies for managing stress and promoting well-being. The findings highlight the importance of self-care, resilience-building, and employer support in mitigating stress and promoting a healthy work-life balance. The study provides recommendations for logistics companies and policymakers to implement stress management initiatives and promote the well-being of delivery partners.

KEYWORDS:

Stress management, delivery partners, logistics, transportation, well-being, resilience.

INTRODUCTION:

As a delivery partner, you work in a fast-paced environment, often dealing with tight deadlines, heavy traffic, unpredictable weather, and demanding customers. These challenges can lead to stress, which, if unmanaged, may affect your health, performance, and overall well-being. Effective stress management helps you stay focused, energized, and positive. Simple strategies such as proper time management, taking short breaks, staying hydrated, practicing deep breathing, and maintaining a work-life balance can make a big difference. Prioritizing self-care and seeking support when needed will help you stay motivated and deliver with confidence.

OBJECTIVES:

- To analyze the different stress levels based on demographics such as age, gender and experience.

- To identify the physical, emotional and psychological challenges faced by delivery partners during their work.
- To assess the impact of workload, time pressures and customer interactions on stress levels.
- To determine the long-term implications of chronic stress on the health and performance of delivery partners.

Methodology

Source of primary data

Primary data for a study on stress management of delivery partners can be collected through surveys, questionnaires, interviews, observational studies, work diaries/logs, and feedback forms. These methods provide direct insights into their experiences, challenges, and stress management practices.

Source of secondary data

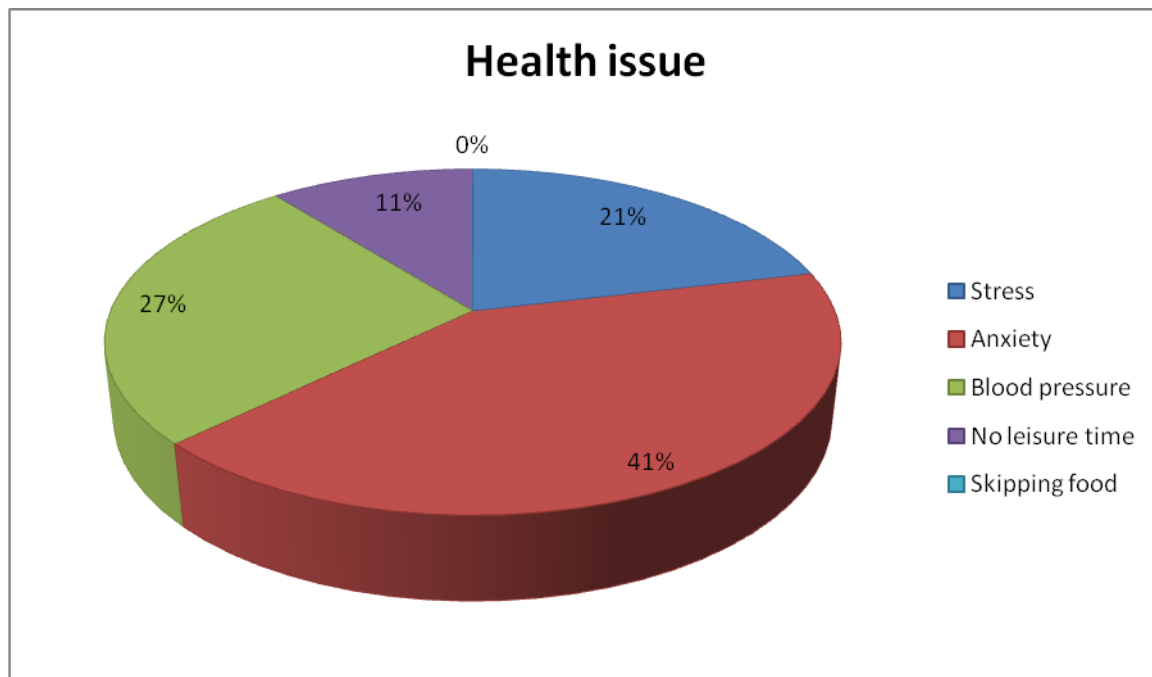
Secondary data for a study on stress management of delivery partners can be obtained from research articles, industry reports, company records, government publications, case studies, and online resources such as blogs, forums, and news articles discussing gig work and occupational stress.

TABLE 1

REASON FOR HEALTH ISSUES

Reasons	Frequency	Percent
Stress	20	19.6
Anxiety	39	38.2
Blood pressure	25	24.5
No leisure time	10	9.8
Skipping food	6	7.9
Total	100	100

Source: Primary data



Inference:

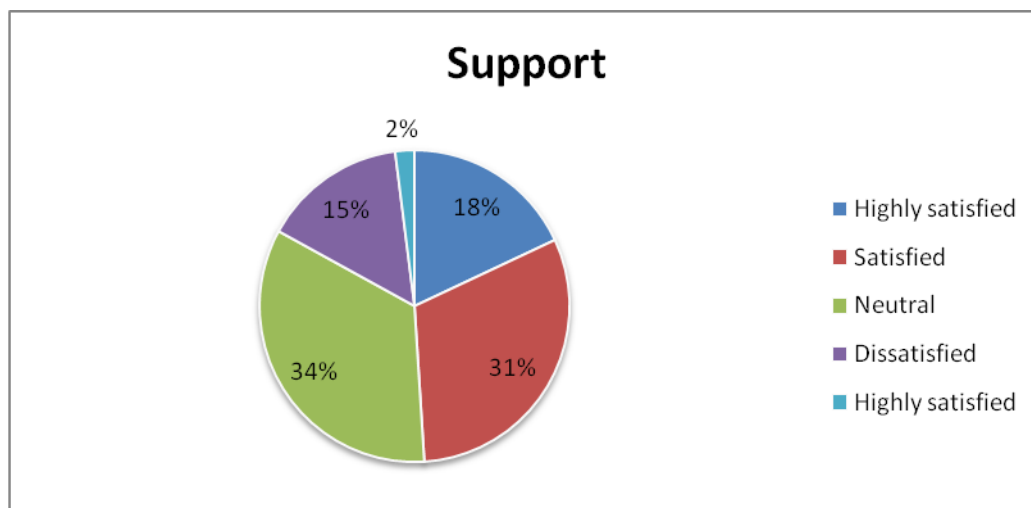
The above table depicts that 19.6% of the respondents health issue is stress, 38.2% of the respondents health issue is anxiety, 24.5% of the respondents health issue is blood pressure, 9.8% of the respondents health issue is no leisure time, 7.9% of the respondents health issue is skipping food.

Majority 38.2% of the respondents have health issue due to anxiety.

TABLE 2 EMPLOYER’S SUPPORT FOR THE RESPONDENTS

Opinion	Frequency	Percent
Highly satisfied	18	17.6
Satisfied	31	32.4
Neutral	34	33.3
Dissatisfied	15	14.7
Highly dissatisfied	2	2.0
Total	100	100

Source:Primary data



Inference:

The above table depicts that 17.6% of the respondents are highly satisfied for the support provided by the company, 32.4% of the respondents are satisfied for the support provided by the company, 33.3% of the respondents are neutral for the support provided by the company, 14.7% of the respondents are dissatisfied for the support provided by the company, 2.0% of the respondents are highly dissatisfied for the support provided by the company.

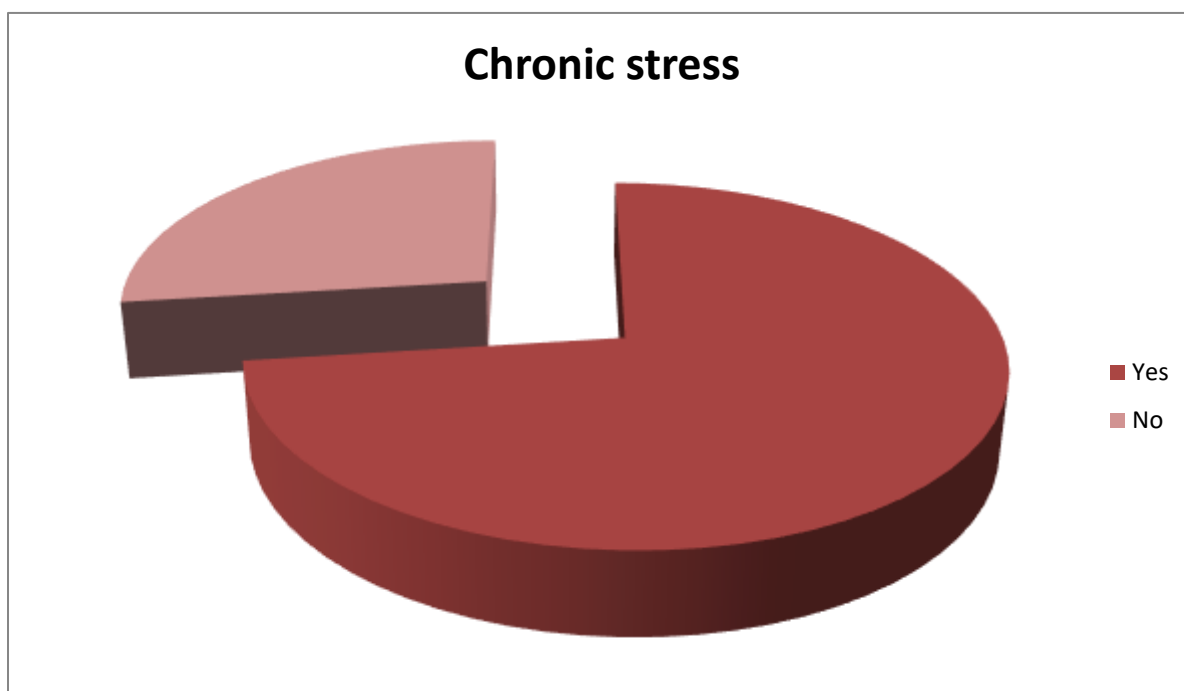
Majority 33.3% of the respondents are neutral for the support provided by the company/employer. Altogether highly satisfied and satisfied 50% agreed that employer renders fullest support for the work.

TABLE 3

OPINION ABOUT CHRONIC STRESS

Chronic stress	Frequency	Percent
Yes	73	72.5
No	27	27.5
Total	100	100

Source:Primary data



Inference:

The above table reveals about chronic stress of respondents, out of 100 respondents, 72.5% of the respondents have agreed tat possibility for chronic stress, 27.5% of the respondents have expressed that no possibility for chronic stress.

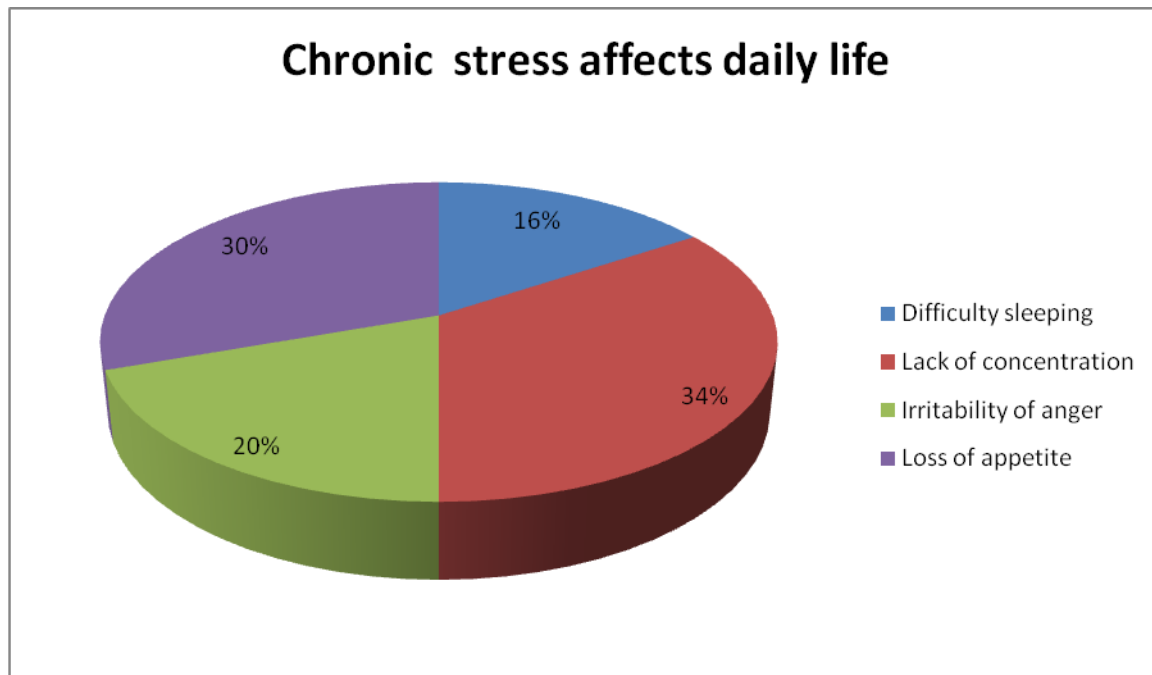
Majority 72.5% of the respondents have acknowledged about chronic stress.

TABLE 4

IMPACT OF CHRONIC STRESS AFFECTS DAILY LIFE

Affects daily life	Frequency	Percentage
Difficulty sleeping	16	15.7
Lack of concentration	34	34.3
Irritability of anger	20	19.6
Loss of appetite	30	30.4
Total	100	100

Source: Primary data



Inference:

The above table depicts that 15.7% of the respondents have expressed that difficulty in sleeping due to chronic stress, 34.3% of the respondents have told lack of concentration due to chronic stress, 19.6% of the respondents have told irritability of anger due to chronic stress, 30.4% of the respondents have told loss of appetite due to chronic stress. Majority 34.3% of the respondents have told lack of concentration due to chronic stress.

Testing the relationship between gender and qualification in delivery partners

Test of hypothesis

Null hypothesis (H₀):

There is no significant relationship between gender and qualification in delivery partners.

Alternative hypothesis (H₁):

There is a significant relationship between gender and qualification in delivery partners.

Table 5

CHI-SQUARE TEST VALUE FOR GENDER AND QUALIFICATION OF DELIVERY PARTNERS

Factor	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.377 ^a	4	.357

Interpretation:

The table shows the significance value (0.357) is lesser than (0.05). Hence the null hypothesis is rejected and the alternate hypothesis is accepted. There is a significant relationship between gender and qualification of delivery partners.

Hence, gender influenced with qualification that enhances individual. The above chi-square table elucidates that there is a relationship between gender and qualification of the delivery partners.

Testing the relationship between break and primary cause of delivery partners

Test of hypothesis

Null hypothesis (H₀):

There is no significant relationship between break and primary cause of delivery partners.

Alternative hypothesis (H₁):

There is no significant relationship between break and primary cause of delivery partners.

Table CHI-SQUARE TEST VALUE FOR BREAK AND PRIMARY CAUSE OF DELIVERY PARTNERS

Factor	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.997 ^a	4	.061

Interpretation:

The table shows the significance value (0.061) is lesser than (0.05). Hence the null hypothesis is rejected and the alternative hypothesis is accepted. There is significant relationship between break and primary cause of delivery partners.

Hence break influenced primary cause that enhances individual.

Findings

The study was aimed at measuring the factors influencing stress of delivery partners. The data thus, collected were subduced into suitable tabular forms for drawing inferences. Quantitative techniques like chi-square tests and garret ranking were applied as and when found necessary. The level of stress was identified by means of a scoring scheme.

- Majority 38.2% of the respondents health issue is anxiety.

- Majority 33.3% of the respondents are neutral for the support provided by the company.
- Majority 72.5% of the respondents have told yes to chronic stress.
- Majority 34.3% of the respondents have told lack of concentration due to chronic stress.
- The chi-square elucidates that there is a relationship between gender and qualification of the delivery partners.
- The break influenced primary cause that enhances individual.

SUGGESTIONS:

To effectively manage stress, delivery partners can benefit from implementing a multifaceted approach that incorporates various strategies to mitigate the physical, emotional, and mental demands of their job. Firstly, prioritizing self-care is essential, and this can be achieved by engaging in regular exercise, such as walking, jogging, or yoga, to reduce stress and anxiety, as well as promoting overall physical and mental well-being. Additionally, maintaining a healthy diet that includes plenty of fruits, vegetables, whole grains, and lean protein can help support energy levels and resilience to stress. Getting sufficient sleep is also critical, aiming for 7-8 hours of restful sleep each night to help regulate stress hormones and support recovery. Moreover, engaging in relaxation techniques, such as meditation, deep breathing, or progressive muscle relaxation, can help calm the mind and body, reducing feelings of stress and anxiety. Furthermore, setting realistic goals, breaking tasks into manageable chunks, and taking regular breaks can help alleviate time pressure and workload stress, while also promoting a sense of control and accomplishment. Maintaining open communication with colleagues, managers, and customers is also vital, as this can help prevent misunderstandings, resolve issues promptly, and provide emotional support. Finally, seeking support from friends, family, or mental health professionals can provide a safe and confidential space to discuss stress-related concerns, receive guidance and support, and develop personalized coping strategies to manage stress effectively.

CONCLUSION:

The study on stress management of delivery partners highlights the significance of addressing the stress and pressure faced by these individuals in their daily work. The findings of the study emphasize the need for effective stress management strategies, such as self-care, relaxation techniques, and social support, to mitigate the negative effects of

stress on delivery partners' well-being and performance. The study's recommendations, including the development of industry-specific stress management guidelines, provision of stress management training and resources, and fostering a supportive work environment, can help companies and organizations support the stress management efforts of delivery partners. Ultimately, the well-being and performance of delivery partners are critical to the success of the logistics and delivery industry. By prioritizing stress management and providing support, companies can promote a healthier, more productive, and more sustainable workforce.

REFERENCE:

1. "Managing Stress in the Workplace" (2020) - Authors: Leka, S., &Houdmont, J.
2. "The Impact of Stress on Employee Well-being" (2019) - Author: Cooper, C. L.

ENTREPRENEURIAL CHALLENGES TO REACH THE GENERATION Z CUSTOMERS THROUGH VIDEO MARKETING

Madhuritha K, and T.Priyanka

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

In the digital age, video marketing has become an essential strategy for businesses to engage with Generation Z, a digitally aware and socially responsible group of consumers. This study explores the entrepreneurial challenges in effectively reaching and influencing Gen Z customers through video marketing. Key challenges include understanding Gen Z's rapidly evolving preferences, creating authentic and engaging content, navigating complex platform algorithms, and managing budget constraints.

Gen Z prefers short, creative, and authentic content on platforms such as TikTok, Instagram Reels, and YouTube Shorts. To analyse these challenges, the study adopts a convenience sampling method, collecting data from 120 respondents in Thoothukudi City through a structured questionnaire distributed via Google Forms. The collected data were analysed using statistical tools, including percentage analysis and graphical methods like, pie charts, Likert scales, and the Chi-square test. The findings provide insights into the effectiveness of video marketing strategies and offer recommendations for entrepreneurs to better connect with Gen Z consumers.

KEYWORDS

Entrepreneurial challenge, Video marketing, Generation Z, Digital platforms, Influencers, Collaborations.

INTRODUCTION

Video marketing is a powerful way for businesses to connect with Generation Z, a digitally native and fast-changing audience. The entrepreneurs face many challenges, such as creating interesting and genuine content, keeping up with social media trends, and working with limited budgets. This study looks at these problems, focusing on how Gen Z consumes media, the impact of influencer marketing, and ways to measure video marketing success. The goal is to help businesses improve their marketing strategies to better reach and engage Gen Z customers

The specific objectives include

- To understand the difficulties entrepreneurs, encounter in reaching and engaging Gen Z customers through video marketing channels.

- To identify strategies of the video marketing platforms and measure their success in engaging Gen Z customers.

MATERIALS AND METHODS

MATERIALS USED

Cheenepalli Hemanth Reddy, Ayush Kumar Singh, (2024), on the research, “Impact of Social Media Marketing on Gen Z Buying Behaviour” the main aim of this study is to understand the purchasing decisions of the Generation Z affected by social media platforms. This research is based on the Descriptive research. The survey method is used to collect data by the Questionnaire method where 220 respondents are selected. The sampling used are the multi stage sampling and the snow ball sampling. The objective is to identify the buying behaviour and the satisfaction level of the Gen Z due to the social media marketing.

Karta Negara Salam, Dhita Pratiwi A.R, (January 2024), on the research of, “Gen-Z Marketing Strategies: Understanding Consumer Preferences and Building Sustainable Relationships” this research main aim is to analyse the Gen Z consumer preference and their effective marketing strategies. The data is collected in qualitative method. The main objective is to identify the in-depth preference of the consumers purchasing decisions. The methodology used in this study is the Quantitative approach.

METHODOLOGY

Data was collected from both primary and secondary data. Primary data was collected from the respondents by means of questionnaire. Secondary data was collected from the magazines, journals and websites. The collected data were analysed by using the following statistical tools namely percentage analysis and graphical method like pie charts, Likert scale and Chi square test.

TABLE 1 Methods to reach Gen Z

Methods	Frequency	Percentage
Social media listening	34	28
Influencer partnerships	44	37
Surveys and feedbacks	33	28
Direct interaction	9	7
Total	120	100

Source: Primary Data

INFERENCE

The most effective method to reach Gen Z is influencer partnerships (37%), followed by social media listening (28%), surveys and feedback (28%), and direct interaction (7%).

Majority, 37% of the respondents use Influencer partnership method to reach the Gen Z.

TABLE 2 Managing stress in video marketing

Stress	Frequency	Percentage
Taking breaks during editing	33	27
Using templates	37	31
Using AI powered tools	33	28
Delegating tasks to a team	17	14
Total	120	100

Source: Primary Data

INFERENCE

It is inferred from the above table that 31% of the respondents manage stress in video marketing by using templates, followed by 28% who prefer using AI-powered tools. Additionally, 27% of the respondents manage stress by taking breaks during editing, while 14% delegate tasks to a team.

The majority, 31% of the respondents, find using templates the most effective way to manage stress in video marketing.

TABLE 3 Chi-square Test Significance between Gender and Physical strain due to long editing hours

Null Hypothesis(Ho):

There is no significant relationship between Gender and Physical strain due to long editing hours.

Alternative Hypothesis (H1):

There is a significant relationship between Gender and Physical strain due to long editing hours.

OBSERVED VALUE

Gender/ Opinion	Yes	No	Total
Male	38	22	60
Female	39	21	60
Total	77	43	120

EXPECTED

Gender/Opinion	Yes	No	Total
Male	38.5	21.5	60.0
Female	38.5	21.5	60.0
Total	77.0	42.0	120.0
	Value	df	Significance
Pearson Chi-Square	.036 ^a	1	.849

INFERENCE

Since the p-value (0.849) is greater than 0.05, we fail to reject the null hypothesis (H_0). This means there is no significant relationship between Gender and Physical Strain due to long editing hours. Where physical strain due to long editing hours does not significantly differ based on gender.

TABLE 4

Chi-square Test Significance between Gender and AI-powered editing tools for video marketing

Null Hypothesis (H_0):

There is no significant relationship between Gender and AI-powered editing tools for video marketing.

Alternative Hypothesis (H_1):

There is a significant relationship between Gender and AI-powered editing tools for video marketing.

OBSERVED VALUE

Gender/Opinion	Yes	No	Total
Male	27	33	60
Female	36	24	60
Total	63	57	120

EXPECTED

Gender/Opinion	Yes	No	Total
Male	31.5	28.5	60.0
Female	31.5	28.5	60.0
Total	63.0	57.0	120.0

	Value	df	Significance
Pearson Chi-Square	2.707 ^a	1	.100

INFERENCE

Since $p = 0.100$ is greater than 0.05, we fail to reject the null hypothesis (H_0). This means there is no significant relationship between Gender and AI-powered editing tools for video marketing. While there is some variation, it is not strong enough to be considered statistically significant.

RESULTS

- Majority, 37% of the respondents use Influencer partnership method to reach the Gen Z.
- The majority, 31% of the respondents, find using templates the most effective way to manage stress in video marketing.
- There is no significant relationship between Gender and Physical Strain due to long editing hours.
- There is no significant relationship between Gender and AI-powered editing tools for video marketing.

CONCLUSION

Reaching Generation Z through video marketing comes with challenges like budget constraints, evolving trends, and platform selection. However, entrepreneurs can overcome these by using user-generated content, collaborating with micro-influencers, and leveraging affordable tools like Canva and In Shot. AI-powered editing can further streamline content creation. A well-planned content strategy, adaptability, and staying updated on Gen Z's preferences will help businesses succeed in the competitive digital space.

Engaging storytelling, interactive content, and transparency are key to building trust with Gen Z. Staying adaptable and continuously monitoring emerging platforms will ensure businesses remain competitive in the fast-evolving digital landscape.

REFERENCE

Cheenepalli Hemanth Reddy, Ayush Kumar Singh, (2024) Journal of emerging Technologies and Innovative Research ISSN: 2349-5162 Volume 11, Issue 4
<https://www.jetir.org/papers/JETIR2404F14.pdf>

Karta Negara Salam, Dhita Pratiwi A.R, (January 2024) Marketing Strategies: Understanding Consumer Preferences and Building Sustainable Relationships,
https://www.researchgate.net/publication/378714295_Gen-Z_Marketing_Strategies_Understanding_Consumer_Preferences_and_Building_Sustainable_Relationships

AN ANALYSIS OF CUSTOMER OPINION TOWARDS AUGMENTED REALITY (AR) TRANSFORMS MARKETING

Magdalena. M* and A. Amora

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

An Analysis of Customer Opinion Towards Augmented Reality (AR) Transforms Marketing is the topic taken for research. This study are to understand the consumer awareness, perception and expectations of AR technology in Marketing, to identify the benefits and drawbacks of AR transformation in marketing from a customer perspective, to explore the potential applications and use of AR in marketing that resonate with customers, to identify demographic differences in customer opinion and attitudes towards AR transformation in Marketing and to provide recommendations for marketers and businesses on how to leverage AR technology to meet customer needs and expectation effectively. Primary and Secondary data were used in this study to collect data. The purposive sampling technique is adopted to select 122 respondents who are customers using Augmented Reality in Thoothukudi District. AR has revolutionized how brands engage with customers, offering interactive and immersive experiences. The study confirms that AR significantly enhances shopping experiences and strengthens brand-customer relationships. As AR technology advances, its adoption will likely increase in industries such as fashion, beauty, retail, education, and healthcare. Brands that invest in AR development, personalization, and user-friendly interfaces will benefit from higher consumer engagement and sales growth. The study highlights the potential of AR to shape the future of digital marketing. However, businesses must address consumer concerns and continuously improve the AR experience to maximize its effectiveness.

KEYWORDS

Augmented Reality, Marketing, Customer using AR, AR Gaming and AR Devices

INTRODUCTION

Augmented Reality (AR) is an emerging cutting-edge technology in marketing. It enhances the visual, auditory and tangible perception of users by augmenting digital contents such as text, geolocation information, graphics, audio and videos onto a live view of the physical objects and environments in real-time (Carmigniani et al., 2011; Fan et al., 2020;

Sung, 2021). AR establishes a closer relationship between users' physical space and virtual objects. The gaming industry has, to date, seen the most extensive developments, and medicine, education, travel, entertainment, and marketing are important application areas as well. The rapid growth of AR applications has been propelled by the development of toolkits AR Kit for iOS devices and AR Core for Android devices. Therefore, the user experience with AR is more immersive, vivid, interactive and more realistic (Cipresso et al., 2018). With the popularity of mobile devices and the availability of high-speed wireless networks, an increasing number of web-based AR applications and mobile AR apps have emerged to create novel, immersive, enjoyable, informative, and valuable user experiences. Accordingly, AR is becoming a disruptive technology that will transform marketing in the coming years (Tan et al., 2022).

REVIEW OF LITERATURE

Syed Hasnain Alam Kazmi, Alharthi Rami Hashem. E (et.al), (2021) In their research “Role of Augmented Reality in Changing Consumer Behavior and Decision Making: Case of Pakistan” discovered how the Augmented Reality (AR) experience influenced consumer behaviour, buying intention and pleasure when purchasing a fashion item in developing countries. This study employs positivist ideas to investigate the connections between various factors, believing that reality is unwavering, stable, and static. They found that it should be functional, simple to learn and use, symmetrical, pleasant, and appealing while fulfilling the unconscious emotional elements of a customer's purchase.

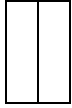
Saifeddin Alimamy (2022) In the research “Customer perceived value through quality augmented reality experiences in retail: The mediating effect of customer attitudes” found that this paper explores the relationship between the perceived quality of the AR experience on customer perceived value as well as the mediating influence of attitude on this relationship. They collected data through an online survey and found that experience quality, i.e. authenticity, presence, and interactions, created through AR, directly impacts customer attitudes. Their findings revealed no direct relationship between experience quality and perceived value. Their study is one of the first to investigate the role of experiences generated through AR as reflected by authenticity, presence, and interaction quality. The results of this study underscore the importance of

customer attitudes within service experiences and how they potentially influence customer-perceived value.

Tito Wira Eka Suryawijaya and Diana Aqmala (2023) in their research “Transforming consumer experience through the application of augmented optimization marketing in retail marketing strategy” found that the multifaceted role of Augmented Reality (AR) as a pivotal marketing tool within the evolving landscape of the retail sector in the aftermath of the pandemic. The research methodology adopted encompasses a quantitative approach, employing the robust Structural Equation Modeling (SEM) - Partial Least Squares (PLS) model. The process of data acquisition unfolded through a meticulously crafted online survey utilizing a Google Form-based questionnaire. The findings are transformative, suggesting that retail entities possess the capacity to strategically optimize AR technology as a dynamic and effective marketing tool.

Usman Aslam, and Leon Davis (2024), in their research “Analyzing consumer expectations and experiences of Augmented Reality (AR) apps in the fashion retail sector” found that this paper explores the intricate realm of consumer expectations and experiences regarding Augmented Reality (AR) apps, specifically in the fashion retail sector. This study aims to understand the practical, consumer-centric aspects of AR apps – an overlooked area of the field, as many studies have focused on the technical aspects of AR apps. They found that consumers appreciate AR apps for providing a unique, immersive shopping experience akin to in-store shopping, with advanced features such as 3D visualization.

Shu-Hsiang Chen, and Fawad Ahmed (2025) in their research “The Transformative Power of AI and AR in Customer-Centric Services in the Tourism and Hospitality Sector: Looking Back to Predict the Future Outlook” found that how Artificial Intelligence (AI) and Augmented Reality (AR) are bringing big changes to the hospitality and tourism industries, especially in the post-pandemic era. The main goals of this chapter are to describe how AI and AR have evolved and examine their impact on customer service and business operations. AI is changing how businesses serve their customers by using AI and AR tools to offer smart and quick assistance. These technologies make customer service more personalized and efficient in fields such as 'smart tourism' and how AI-driven AR helps build resilience with theoretical underpinnings such as Flow Experience (FE) and Technology Acceptance Model (TAM).



STATEMENT OF THE PROBLEM

There is a significant knowledge gap in understanding customer opinions and attitudes towards Augmented Reality (AR) marketing. The effectiveness of AR in transforming marketing strategies, enhancing customer experience, and influencing purchasing decisions is unclear. Businesses struggle to develop effective AR marketing strategies due to a limited understanding of customer needs and preferences, inadequate measurement of AR marketing effectiveness, and insufficient data on customer behaviour. Furthermore, the impact of AR marketing on customer engagement, loyalty, retention, satisfaction, and advocacy is not well understood. The role of AR marketing in creating brand awareness, driving business growth, and generating revenue is also unclear. Additionally, there is a lack of standardized AR marketing metrics, and the return on investment (ROI) of AR marketing initiatives is unclear. Overall, there is a need for research that explores customer opinions and attitudes towards AR-based marketing initiatives to address these knowledge gaps and challenges.

OBJECTIVES

1. To understand the consumer awareness, perception and expectations of AR technology in Marketing
2. To identify the benefits and drawbacks of AR transformation in marketing from a customer perspective
3. To explore the potential applications and use of AR in marketing that resonate with customers
4. To identify demographic differences in customer opinion and attitudes towards AR transformation in Marketing
5. To provide recommendations for marketers and businesses on how to leverage AR technology to meet customer needs and expectations effectively

LIMITATION OF STUDY

1. Time is one of the major constraints which limit the data collection
2. Errors in data collection due to the bias of the respondents

RESULT AND DISCUSSION

LIKERT SCALE TABLE SHOWING THE USAGE OF AR PRODUCTS BY CONSUMERS

INFERENCE :

From the above table majority of 4.295 weighted score is the highest rank for AR has enhanced my shopping experience is ranked first, followed by 4.227 AR provides proper reviews and recommendations, is the next level, rated as the second rank, 4.024 is ranked third for AR helps to modify products in real time., 3.663 is ranked in the eighth position for preference to use AR on social media platforms, 3.647 is ranked in ninth position for use of AR to visualize furniture or home décor before purchase, and 3.229 is ranked in last position for use of AR marketing to compare products and prices.

INDEPENDENT SAMPLE T-TEST

TABLE SHOWING BENEFITS OF AR IN MARKETING

VARIABLE	GENDER	MEAN	STANDARD DEVIATION	F	SIG. VALUE
AR has enhanced my shopping experience	Male	4.6557	.65537	3.053	.000
	Female	4.1803	.76394		
AR marketing helps to understand product features	Male	4.0492	.46283	8.792	.879
	Female	4.0656	.70401		
AR marketing provides an interactive shopping experience	Male	3.6066	.78057	.007	.733
	Female	3.5574	.80673		

AR marketing makes it easier to find what I'm looking for	Male	3.5410	.92329	.292	.426
	Female	3.6721	.88922		
AR marketing provides detailed product information	Male	3.9344	1.04672	.076	.275
	Female	3.7213	1.09744		
AR marketing has increased loyalty to a brand	Male	3.8197	.61936	12.384	.516
	Female	3.7213	1.00218		
AR makes learning more interactive	Male	3.8852	.83862	.864	.418
	Female	3.7541	.94262		
AR marketing increases sales	Male	4.0820	.61360	5.780	.009
	Female	3.7541	.74511		
AR helps to modify products in real-time	Male	4.2295	.69266	5.342	.009
	Female	3.8197	.99177		
AR provides hands-on training	Male	3.8689	.80572	2.017	.213
	Female	3.6721	.92595		

Computed source – Primary data

Inference :

The above table shows that the significance value for the statement AR has enhanced my shopping experience, AR marketing increases sales, and AR helps to modify products in real time, 0.000, 0.009 and 0.009, respectively, is less than 0.05. Hence, I reject the Null hypothesis and conclude by accepting that there is a significant difference between the benefits of AR marketing with Gender. In contrast the table shows the significance value as 0.879, 0.733, 0.426, 0.275, 0.516, 0.418 and 0.213 for the statements AR marketing helps to understand product features, AR marketing provides an interactive shopping experience, AR marketing makes it easier to find what I'm looking for, AR marketing provides detailed product information, AR marketing has increased loyalty to a brand, AR makes learning

more interactive and AR provides hands-on training are greater than 0.05. Hence, I accept the Null Hypothesis and conclude that there is no significant difference between the Benefits of AR in Marketing with Gender.

ONE-WAY ANOVA

TABLE SHOWING USAGE AND DRAWBACKS OF AR IN MARKETING

VARIABLE	MEAN SQUARE	F	SIGNIFICANCE VALUE
Usage Between	40.866	1.114	<0.01
Within	36.683		
Drawbacks Between	50.765	1.649	<0.01
Within	30.974		

Computed source – Primary data

Inference:

The above table ANOVA shows that the significance value is stated with <0.01, and it is less than 0.05. Hence, I reject the Null Hypothesis and conclude by accepting that there is a significant difference between the Usage and drawbacks of AR in Marketing. The highest value F is 1.649 for the drawbacks of AR in marketing.

TABLE SHOWING USAGE OF AR BY THE AGE OF CUSTOMERS USING AR

VARIABLE	GROUPS	MEAN SQUARE	f	SIG. VALUE
AR marketing helps to compare products and prices	Between Groups	1.986	2.401	.071
	Within Groups	.827		
AR provides virtual clothing or accessory experiences	Between Groups	.567	1.128	.341
	Within Groups	.502		
AR marketing helps to visualize	Between Groups	.644	.761	.518

furniture or home décor before purchase	Within Groups	.847		
Usage of AR on social media platforms	Between Groups	.047	.049	.986
	Within Groups	.975		
AR provides more samples for purchasing decisions	Between Groups	.372	.276	.842
	Within Groups	1.347		
AR allows for more customized products	Between Groups	.337	.440	.725
	Within Groups	.766		
Usage of premium apps with AR functionality	Between Groups	1.253	1.492	.220
	Within Groups	.840		
AR provides proper reviews and recommendations	Between Groups	1.940	2.699	.049
	Within Groups	.719		
AR marketing is easy to use	Between Groups	.090	.122	.947
	Within Groups	.734		
My usage of AR marketing has increased	Between Groups	.193	.334	.801
	Within Groups	.579		

Computed source – Primary data

Inference:

The above table ANOVA shows sig. value as 0.071, 0.341, 0.518, 0.986, 0.842, 0.725, 0.220, 0.049, 0.947 and 0.801 for the variable AR marketing helps to compare products and prices, AR provides virtual clothing or accessories experiences, AR helps to visualize furniture or home décor before purchase, Usage of AR on social media platforms, AR provides more samples for purchasing decisions, AR allows for more customized products, Usage of premium apps with AR functionality, AR provides proper reviews and recommendations, AR marketing is easy to use and My usage of AR marketing has increased is greater than 0.05. Hence, I accept the Null Hypothesis stating that there is no significant difference between the usage of AR marketing and the Age of customers using AR Marketing.

ONE-SAMPLE T-TEST

TABLE SHOWING DRAWBACKS OF AR IN MARKETING

VARIABLES	MEAN	STANDARD DEVIATIO N	T	P value
Experiencing technical difficulties while using AR	4.1803	.92724	14.060	.000
AR freezes my device	3.6885	.79338	9.586	.000
AR experiences are too expensive	3.3770	.83644	4.979	.000
AR experiences disrupt personal space	3.3033	.88970	3.765	.000
Experiencing health issues after using AR for a long period	3.5000	1.20089	4.599	.000
The quality of AR experiences is often inadequate	3.5328	.91980	6.398	.000
AR experiences fail to meet my expectations	3.5738	.92636	6.841	.000
Traditional marketing has declined after the emergence of AR	3.8115	.79598	11.260	.000
AR games are addictive and affect mental health	3.8525	.86886	10.837	.000
AR applications require access to user data, such as location	3.6148	.89486	7.588	.000

Computed source- Primary data

Inference :

The above table One sample t-test indicates P-value as .000 for Experiencing technical difficulties while using AR, AR freezes my device, AR experiences are too expensive, AR

experiences disrupt personal space, Experiencing health issues after using AR for a long period, The quantity of AR experiences is often inadequate, AR experiences fail to meet my expectations, Traditional Marketing has declined after the emergence of AR, AR games are addictive and affect mental health and AR applications require access to user data, such as

VARIABLE	NO.OF RESPONDENTS	CORRELATION VALUES Benefits / Usage	SIGNIFICANCE VALUE
Benefits/Usage	122	1/490	<0.01
Usage/Benefits	122	490/1	<0.01

location is less than 0.05. Hence, I reject the Null Hypothesis and conclude that there is a significant difference in the Drawbacks of AR Marketing.

PEARSON CORRELATION COEFFICIENT ANALYSIS

TABLE SHOWING BENEFITS AND USAGE OF CONSUMERS TOWARDS AR MARKETING

Computed source – Primary data

Inference :

The above Pearson Coefficient Correlation table indicates that the significance value is stated with <0.01 in both the variable benefits level/usage level and usage level/benefits level. By considering the P value less than 0.025, the study concludes that the Null Hypothesis is rejected. Hence, the Alternative Hypothesis is accepted and states that there is a significant difference between the Benefits and Usage of consumers towards AR Marketing. The Coefficient Correlation is the same for both the variables and is equally distributed among the two variables, stating that there is a strong relationship towards AR Marketing.

DISCUSSING THE RESULT

The data analysis on Augmented Reality (AR) marketing highlights key insights regarding its benefits, drawbacks, and user perceptions. The highest-ranked benefit, with a weighted score of 4.295, is that AR enhances shopping experiences, followed by AR providing proper reviews and recommendations at 4.227. Users also find AR helpful in

modifying products in real-time, with a score of 4.024. However, lower scores are seen in preferences for using AR on social media (3.663), visualizing furniture before purchase (3.647), and comparing products and prices (3.229). The statistical significance test (p-values) indicates a notable difference in AR benefits based on gender for factors such as enhanced shopping experiences and increased sales, while no significant difference was found in areas like interactive shopping experiences and product understanding.

Regarding drawbacks, the ANOVA test confirms a significant difference in the perceived disadvantages of AR marketing, with the highest F-value of 1.649. The one-sample t-test further reveals that users experience issues such as technical difficulties, device freezing, high costs, disruptions in personal space, and even health concerns. Additionally, concerns about AR applications requiring access to user data, addiction risks from AR games, and the decline of traditional marketing methods were also significant. The study's rejection of the null hypothesis indicates that these drawbacks have a substantial impact on users' perceptions of AR. The Pearson Correlation analysis reveals a strong relationship between the benefits and usage of AR marketing. With a significance value of <0.01 and a p-value below 0.025, the data confirms a direct correlation between how consumers perceive the advantages of AR and their engagement with it. This finding suggests that the more users experience AR's benefits, the more they integrate it into their shopping behaviors. Overall, the study establishes that while AR marketing offers compelling advantages, it also presents challenges that must be addressed to maximize its effectiveness and user satisfaction.

FINDINGS

- Likert Scale: The majority 4.295 weighted score is the highest rank for AR has enhanced my shopping experience is ranked first, followed by 4.227 AR provides proper reviews and recommendations is the next level rated as the second rank, 4.024 is ranked third for AR helps to modify products in real time., 3.663 is ranked in the eighth position for preference to use AR on social media platforms, 3.647 is ranked in ninth position for use of AR to visualize furniture or home décor before purchase, and 3.229 is ranked in last position for use of AR marketing to compare products and prices.
- Independent Sample T-Test: The significance value for the statement AR has enhanced my shopping experience, AR marketing increases sales, and AR helps to modify products in real time, 0.000, 0.009 and 0.009, respectively, is less than 0.05.

Hence, I reject the Null hypothesis and conclude by accepting that there is a significant difference between the benefits of AR marketing with Gender. In contrast the table shows the significance value as 0.879, 0.733, 0.426, 0.275, 0.516, 0.418 and 0.213 for the statements AR marketing helps to understand product features, AR marketing provides an interactive shopping experience, AR marketing makes it easier to find what I'm looking for, AR marketing provides detailed product information, AR marketing has increased loyalty to a brand, AR makes learning more interactive and AR provides hands-on training are greater than 0.05. Hence, I accept the Null Hypothesis and conclude that there is no significant difference between the benefits of AR in Marketing with Gender.

- One Way ANOVA: ANOVA shows that the significance value is stated than <0.01 , and it is less than 0.05. Hence, I reject the null Hypothesis and conclude by accepting that there is a significant difference between the Usage and drawbacks of AR in Marketing. The highest value F is 1.649 for the drawbacks of AR in marketing. ANOVA shows sig. value as 0.071, 0.341, 0.518, 0.986, 0.842, 0.725, 0.220, 0.049, 0.947 and 0.801 for the variable AR marketing helps to compare products and prices, AR provides virtual clothing or accessories experiences, AR helps to visualize furniture or home décor before purchase, Usage of AR on social media platforms, AR provides more samples for purchasing decisions, AR allows for more customized products, Usage of premium apps with AR functionality, AR provides proper reviews and recommendations, AR marketing is easy to use and My usage of AR marketing has increased is greater than 0.05. Hence, I accept the Null Hypothesis stating that there is no significant difference between the usage of AR marketing and the Age of Customer using AR Marketing.
- One Sample T-Test: One sample t-test indicates P-value as .000 for Experiencing technical difficulties while using AR, AR freezes my device, AR experiences are too expensive, AR experiences disrupt personal space, Experiencing health issues after using AR for a long period, The quantity of AR experiences is often inadequate, AR experiences fail to meet my expectations, Traditional Marketing has declined after the emergence of AR, AR games are addictive and affect mental health and AR applications require access to user data, such as location is less than 0.05. Hence, I reject the Null Hypothesis and conclude that there is a significant difference in the Drawbacks of AR Marketing.
- Pearson Correlation Coefficient Analysis: Pearson Correlation Coefficient table

indicates that the significance value is stated with <0.01 in both the variable benefits level/usage level and usage level/benefits level. By considering the P value less than 0.025, the study concludes that the Null Hypothesis is rejected. Hence, the Alternative Hypothesis is accepted and states that there is a significant difference between the Benefits and Usage of consumers towards AR Marketing. The Coefficient Correlation is the same for both the variables and is equally distributed among the two variables, stating that there is a strong relationship towards AR Marketing.

SUGGESTIONS

1. Improving AR Accessibility and Adoption

Optimize AR applications for different devices, including low-end smartphones and tablets, to ensure accessibility for a broader audience. Increase compatibility with multiple operating systems, ensuring smooth performance on both iOS and Android.

2. Enhancing AR Engagement in Marketing

- **Gamification Strategies:**

More brands should incorporate AR-based rewards, discounts, and interactive games to drive engagement.

- **Live Virtual Try-Ons:**

Fashion and retail brands should enhance their AR try-on features, allowing customers to visualize products more accurately.

- **Real-Time Customization:**

AR technology should allow users to modify product colours, styles, and sizes in real-time, improving personalization.

3. Addressing Technical Challenges

- **Improving AR Infrastructure:**

Brands should invest in faster, more responsive AR systems to reduce lag, glitches, and crashes.

- **Regular Software Updates:**

AI-driven improvements should be incorporated to ensure better accuracy and smoother performance.

4. Privacy and Ethical Considerations

- **Data Security:**

AR apps should provide clear privacy policies and allow users to control data-sharing preferences.

- **Child-Friendly AR Features:**

AR experiences should have age restrictions and parental control options to ensure safety.

5. Strengthening Customer Engagement through AR

- **Influencer Collaborations:**

Brands should work with social media influencers who can demonstrate AR features effectively.

- **AR in Customer Service:**

Businesses should integrate AR-powered customer support, where users can interact with virtual assistants for troubleshooting and product information.

6. Expanding AR Beyond Marketing

- **Retail and E-commerce:**

Online shopping platforms should enhance AR product previews for better decision-making.

- **Education and Training:**

AR technology should be used in training programs, online education, and employee onboarding for better engagement.

CONCLUSION

Augmented Reality (AR) is revolutionizing the marketing industry by offering interactive and immersive experiences that engage consumers in new and exciting ways. Unlike traditional marketing methods, AR enables brands to create highly engaging campaigns that allow customers to interact with products before making a purchase. Whether it's trying on clothes virtually, seeing how furniture fits in a space, or test-driving a car digitally, AR bridges the gap between online and in-store shopping. This interactive approach not only enhances customer experience but also increases confidence in purchasing decisions.

Many industries, including fashion, beauty, automotive, and retail, are utilizing AR to enhance customer engagement. For instance, fashion brands offer virtual fitting rooms, while cosmetic companies provide AR-powered makeup try-ons. Automotive brands allow users to explore vehicle features through AR apps, giving them a realistic feel of the car without visiting a showroom. Even furniture retailers like IKEA use AR to help customers visualize how products will look in their homes. These innovative marketing strategies lead to better customer experiences and higher conversion rates.

Social media platforms have also embraced AR marketing, making it more accessible to brands and consumers alike. AR-powered ads on Instagram, Snapchat, and Facebook allow users to interact with products in real time, increasing engagement and brand recall. Gamification elements, such as AR filters and interactive experiences, encourage users to share content, resulting in organic brand promotion. This viral aspect of AR marketing helps businesses reach a broader audience without relying solely on traditional advertising methods.

AR is also transforming in-store experiences by providing digital overlays, personalized recommendations, and real-time product information. Brands use AR to create immersive store displays, interactive product demos, and navigation assistance within stores. Additionally, businesses can collect valuable consumer insights from AR interactions, helping them refine marketing strategies and tailor future campaigns to customer preferences. As AR technology advances, it will continue to enhance customer journeys and redefine how brands connect with their audiences.

In conclusion, AR is a game-changer in marketing, offering brands new ways to engage with consumers through interactive and immersive experiences. By bridging the digital and physical shopping experience, AR boosts customer confidence, enhances brand loyalty, and drives higher sales. With continued advancements in AR and AI integration, businesses can create more personalized and engaging marketing campaigns. Companies that embrace AR marketing will stay ahead of the competition and redefine the future of customer engagement in the digital era.

REFERENCES

1. Jung, T., & Tom Dieck, M. C. (2017). Augmented Reality and Virtual Reality in the Retail Industry. *International Journal of Retail & Distribution Management*, 45(7/8), 763-778.

2. Kim, J., & Lee, Y. (2018). The Impact of Augmented Reality on Consumer Behavior. *Journal of Business Research*, 91, 272-280.
3. Lee, Y., & Kim, J. (2019). Exploring the Role of Augmented Reality in Marketing. *Journal of Marketing Management*, 34(1-2), 1-15.
4. Tom Dieck, M. C., & Jung, T. (2018). Augmented Reality and Virtual Reality in Marketing: A Systematic Review. *Journal of Business Research*, 98, 101-113.
5. Yim, M. (2019). Augmented Reality for Marketing and Advertising. *Journal of Advertising Research*, 59(2), 131-145.
6. Kim, J., & Lee, Y. (2020). The Effects of Augmented Reality on Consumer Engagement. *Journal of Interactive Marketing*, 51, 27-40.
7. Lee, Y., & Kim, J. (2020). Augmented Reality in Marketing: A Review and Future Directions. *Journal of Marketing*, 84(4), 21-37.
8. Jung, T., & Tom Dieck, M. C. (2020). Augmented Reality and Virtual Reality in Retailing: A Review and Future Directions. *Journal of Retailing and Consumer Services*, 55, 102113.
9. Yim, M. (2020). The Impact of Augmented Reality on Consumer Behavior in the Fashion Industry. *Journal of Fashion Marketing and Management*, 24(3), 269-284
10. Kim, J., & Lee, Y. (2020). The Effects of Augmented Reality on Consumer Purchase Intention. *Journal of Business Research*, 118, 101-111
11. Lee, Y., & Kim, J. (2020). Augmented Reality in Marketing: A Systematic Review and Future Directions. *Journal of Marketing Management*, 35(1-2), 1-20.
12. Tom Dieck, M. C., & Jung, T. (2020). Augmented Reality and Virtual Reality in Marketing: A Review and Future Directions. *Journal of Marketing*, 84(4), 38-55.
13. "Augmented Reality in Retail: A Study of Consumer Behavior" by Nielsen.
14. "The Impact of Augmented Reality on Marketing Effectiveness" by McKinsey.
15. "Augmented Reality: A Marketing Game-Changer" by Deloitte.
16. "The Future of Augmented Reality in Marketing" by PwC.

17. "Augmented Reality Marketing: Trends and Insights" by Euromonitor.
18. "The Role of Augmented Reality in Marketing Strategy" by Harvard Business Review.
19. Augmented Reality and Virtual Reality in Marketing" by SpringerLink
20. "AR and VR Marketing: How to Get Started" by Routledge Online
21. "Marketing with Augmented Reality" by Business Expert Press
22. "Augmented Reality for Marketing and Advertising" by IGI Global
23. "The Augmented Reality Marketing Book" by Amazon Kindle
24. "Augmented Reality in Marketing: A Guide" by Google Books
25. "AR Transforms Marketing: How to Use Augmented Reality" by Apple Books
26. "Marketing in the Age of Augmented Reality" by ResearchGate
27. "The Impact of Augmented Reality on Marketing"
27. "Augmented Reality Marketing: A New Era" by ScienceDirect
29. "AR Marketing: How to Create Immersive Experiences" by Wiley Online Library
30. "Augmented Reality in Retail and Marketing" by Emerald Insight
31. "Marketing with Augmented Reality: A Practical Guide" by Bookboon
32. "The Role of Augmented Reality in Marketing Strategy" by DOAJ (Directory of Open Access Journals)

IMPACT OF MONETARY INCENTIVES ON EMPLOYEE'S PERFORMANCE

Maria Shiny T,*and O.Sony

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

A monetary incentive, essentially a direct financial reward tied to performance goals, can significantly impact employee performance by boosting motivation, increasing productivity, and aligning individual goals with organizational objectives, ultimately leading to improved overall business results. Employees play a very important part in the daily operations of any organization. Employee's productivity and how it could be enhanced is central to the concern of industries and organizations, therefore many organizational scientists are interested in different schemes and techniques related to employee's productivity and its growth incentives are one of those techniques used to stimulate employee's in indict to get desired employee's productivity.

The current study aims to contribute to the existing literature by examining the relationship between monetary incentives and employee performance, and exploring the mechanisms by which they influence employee motivation and behavior. The finding of this study will provide valuable insights for organizations seeking to optimize their reward systems and improve employee performance. By shedding light on the complex relationships between monetary incentives, motivation and performance, this research will inform the development of evidence-based reward strategies that drive sustainable organizational success.

KEY WORDS: monetary incentives, employee performance, productivity, motivation, job satisfaction.

INTRODUCTION

A monetary incentive is a financial reward given to employees to encourage and improve their performance. It can take various forms, such as bonuses, commissions, salary increases, profit-sharing, or performance-based rewards. Monetary incentives, or financial rewards for employee performance, play a critical role in motivating employees in a competitive work environment. According to the economic report, monetary incentives are a very common means of enhancing employee performance in an organization or company through financial rewards monetary Incentive refers to a form of

reward that involves financial compensation to motivate individuals to achieve specific goals or outcomes. The purpose of monetary incentives is to motivate employees to work harder, be more productive, and achieve specific business goals. When employees know they will receive financial rewards for their efforts, they are more likely to stay engaged and committed to their work.

Advantages of monetary incentives:

1) Increased productivity:

When employees are offered financial rewards (like bonuses, commissions, or profit sharing) based on their performance, they are more likely to work harder and produce more output, leading to a higher level of overall productivity within the company; essentially, the promise of extra money motivates them to work more efficiently and achieve better results.

2) Improved morale:

By offering financial rewards to employees, like bonuses or commissions, accompany can positively impact their overall attitude and job satisfaction, making them feel more motivated and engaged in their work due to the recognition and potential financial gain associated with achieving goals.

3) Attracting talent:

By using financial rewards like bonuses, higher salaries, or stock options to entice skilled individuals to join a company, essentially using money as a primary motivator in order to recruit top talent is attracting talent.

4) Alignment with goals

Structuring a system where financial rewards (like bonuses or commissions) are directly tied to achieving specific, clearly defined organizational goals, ensuring employees are motivated to work towards the company's objectives by earning more money when they meet or exceed performance expectations.

5) Retention

a company is offering a financial reward (like a bonus or extra pay) to encourage an employee to stay with the company for a specific period of time, essentially incentivizing

them to "retain" their position by providing them with monetary benefits; it's a strategy to prevent employee turnover by offering them additional cash to stay on board.

Negative impacts of monetary incentives:

Negative impacts of monetary incentives include: crowding out intrinsic motivation, encouraging short-term focus, potential for unethical behavior, creating unhealthy competition, leading to decreased quality in favor of quantity, and causing demotivation if not managed properly, especially when expectations for rewards become too high; essentially, relying too heavily on money as a motivator can undermine long-term engagement and quality work, particularly when tasks involve creativity or require intrinsic satisfaction.

STATEMENT OF THE PROBLEM

The use of monetary incentives as a motivational tool to enhance employee performance has been a long-standing practice in many organizations. However, despite its widespread adoption, the effectiveness of monetary incentives in driving employee performance remains a topic of debate. While some studies suggest that monetary incentives can improve employee motivation and productivity, others argue that they can lead to unintended consequences, such as decreased intrinsic motivation and increased stress. Furthermore, the impact of monetary incentives on employee performance may vary depending on individual employee characteristics, organizational culture, and the type and size of the incentive. Therefore, this study aims to investigate the impact of monetary incentives on employee performance, exploring the factors that influence their effectiveness and the potential consequences of their use values.

OJECTIVES

- To evaluate how monetary incentives influence employee motivation to achieve organizational goals.
- To determine the extent to which monetary rewards enhance individual productivity.

HYPOTHESIS

- **H₁:** Job position does not influence the monetary rewards provided by the organizations.

- **H₂:**Monthly income does not influence the monetary incentives that motivate the most

REVIEW OF LITERATURE

- **Er. Prakash Kumar Sen (2016)** Study on Factor Affecting Motivation of Employees reveals that employees are happy with the freedom given by management and most of the employees focus on performance appraisal as a motivator. The study concludes non-financial reward systems are preferred by the employee.
- **Dr.Ravi T.S. (2015)** study on impact of labor incentives on productivity in selected Chennai based manufacturing companies, described management should design incentive scheme in order to motivate employees. He concludes employees had no objection both monetary and non-monetary incentives. Majority of employees opted monetary incentives.

METHODOLOGY

Data was collected from 120 respondents through both primary and secondary data. Primary data was collected through survey from people located within Thoothukudi district. Secondary data was collected from existing research studies, academic journals ,organizational records and E-journals.

TABLE 1

Analysis of employee's job position over their monetary rewards provided by the organization

H₀: Job position does not influence the monetary rewards provided by the organisation.

H₁:Job position influences the monetary rewards provided by the organization.

Source of variations	Sum of Squares	df	Mean Square	F	P value

Between Groups	12.662	3	4.221	4.899	.003
Within Groups	99.930	116	.861		
Total	112.592	119			

Inference:

The table shows that there is statistical difference between the groups as disclosed by the value of $F=4.899$ and the P value= 0.003 which is ($P<0.05$). Hence the null hypothesis is rejected.

This proves that job satisfaction influences the monetary rewards provided by the organisation.

TABLE2

Analysis of influence of employee's monthly income over the monetary incentives that motivates the most

H₀: Monthly income does not influence the monetary incentives that motivate the most

H₁: Monthly income influence the monetary incentives that motivate the most

Source of variations	Sum of Squares	df	Mean Square	F	Pvalue
Between Groups	22.145	3	7.382	8.044	.000
Within Groups	106.447	116	.918		
Total	128.592	119			

Inference:

The above table shows that there is statistical difference between the groups as disclosed by the value of $F = 8.044$ and the P value = .000 ($P < 0.05$). Hence the null hypothesis is not accepted.

This proves that the monthly income influences the monetary incentives that motivates the most.

TABLE3

Testing the relationship between gender and the monetary rewards that enhance individual productivity

H₀: There is no significant relationship between gender and the monetary rewards that enhance individual productivity

H₁: There is a significant relationship between gender and the monetary rewards that enhance individual productivity

Factor	Value	df	Significance value
Pearson Chi-Square	.340 ^a	1	.560

Inference:

The table shows that the significance value (0.560) is lesser than (0.05). Hence the null hypothesis is not accepted and the alternate hypothesis is accepted. There is significant relationship between gender and the monetary rewards that enhance individual productivity

Hence gender influences the monetary rewards that enhances individual productivity

TABLE4

Testing the relationship between marital status and the importance of monetary incentives

(H₀): There is no significant relationship between marital status and the importance

of monetary incentives.

(H1): There is a significant relationship between marital status and the importance of monetary incentives.

Factor	Value	df	Significance value
Pearson Chi-Square	.111 ^a	1	.739

INFERENCE:

The table shows that the significance value (0.739) is lesser than (0.05). hence the null hypothesis is not accepted and the alternate hypothesis is accepted. There is significant relationship between gender and the monetary rewards that enhance individual productivity

Hence marital status influences the important are monetary incentives that enhances individual productivity

FINDINGS

- Job position influences the monetary rewards provided by the organization
- Monthly income influences the monetary incentives that motivate the most
- There is significant relationship between gender and the monetary rewards that enhance individual productivity
- There is significant relationship between marital status and the importance of monetary incentives

SUGGESTIONS

- It is advisable for the company to combine financial incentives with recognition, career growth opportunities and define measurable targets to make the reward system fair. They should also combine financial incentives with job enrichment and professional growth
- The company should tailor incentives to suit various job responsibilities and contributions, Reward employees based on their actual contributions, achievements, creative ideas and process improvements.
- The company should necessarily offer retention bonuses and stock

options for long-term engagement.

CONCLUSION

Organizations should combine monetary incentives with career development opportunities, recognition programs, and a positive work environment. Providing employees with clear goals, regular feedback, and professional growth opportunities ensures that motivation remains high beyond just financial rewards. Employee engagement improves when they feel valued not only through salary increases and bonuses but also through meaningful work and career advancement.

REFERENCES:

Prakash KumarSen. Er- Study on factor affecting motivation of employees Vol. No.5, Issue No.04, April 2016, www.ijarse.com

Dr.RaviT.S.(2015)-Study on the impact of labor incentives on productivity in Chennai based manufacturing companies.

COMPARATIVE STUDY OF CUSTOMER PREFERENCE TOWARDS SMART BAZAAR VS DMART IN THOOTHUKUDI

A.Afrin banu,*and P.Maria Sahaya Rossiyana

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT:

COMPARATIVE STUDY OF CUSTOMER PREFERENCE TOWARDS SMART

BAZAAR VS DMART IN THOOTHUKUDI is the topic taken for research.

To study about the demographic marketing strategy of consumer. To identify the factor influencing the consumers towards the purchase in smart Bazaar vs d mart. To know the availability of product at smart Bazaar vs d Mart To improve the service provided by the company for motivating the customer To analyze the customer perception regarding the satisfaction of the product and To attract customers, increase sales, and understand their preferences regarding payment and convenience options in supermarkets. Primary and secondary used in the data was collect. The simple random sampling technique is adopted to select 100 respondents who use Comparative study of customer preference towards smart bazaar vs d mart in Thoothukudi district. The comparative study of customer preferences towards Smart Bazaar and D Mart in Thoothukudi revealed significant insights into the shopping habits and preferences of local customers. The study aimed to investigate the differences in customer preferences between the two retail chains and provide recommendations for improvement. The study found that Smart Bazaar is preferred for its personalized service and loyalty programs, while D Mart is preferred for its modern store layout, competitive pricing, and wide product range. The study's results have important implications for both retailers, highlighting the need to tailor their strategies to meet the evolving needs and preferences of their customers.

KEYWORDS:

Purchasing behaviour ,satisfaction, smart bazaar, dmart, retail.

INTRODUCTION:

The retail industry in India has witnessed significant growth over the past

decade, driven by changing consumer preferences, behaviours, and demographics. The emergence of organized retail formats, such as hypermarkets and supermarkets, has transformed the way consumers shop for groceries and other daily essentials. Two prominent retail players in India, Smart Bazaar and Dmart, have established a strong presence in various cities across the country, including Thoothukudi. Thoothukudi, a coastal city in Tamil Nadu, presents an interesting case study for understanding consumer preferences in a rapidly growing urban centre. With a growing middle class and increasing disposable incomes, consumers in Thoothukudi are seeking modern retail experiences that offer convenience, quality, and value. This study aims to investigate customer preferences towards Smart Bazaar and D Mart in Thoothukudi, exploring the factors that influence their shopping decisions and loyalty towards these retail brands. This study aims to explore the factors shaping customer preferences in Thoothukudi retail market, with a focus on Smart Bazaar and D Mart. By analyzing the similarities and differences in customer choices, the research intends to offer valuable insights for retailers, marketers, and policymakers seeking to understand the dynamics of the retail sector in the region. In recent years, India's retail industry has undergone significant changes, driven by technological advancements, shifting consumer behaviours, and the rise of new retail formats. As this landscape continues to evolve, it is crucial to identify the key factors influencing customer loyalty and preference toward various retail brands. Through this study, we will examine the underlying drivers of customer preferences in Thoothukudi. Smart Bazaar and DMart both offer a wide range of products, including groceries, household items, apparel, electronics, and personal care products. While both retailers operate on a similar business model of providing customers with affordable prices and a wide selection, there are key differences in their offerings, customer service, and operational strategies that might impact customer preferences.

REVIEW OF LITERATURE:

Uganda has experienced growth of organized retail stores but scholars have paid less attention to their (Dokeen et al,2021). The researchers highlighted that although retail stores have conducted various promotional activities, they

have not been able to attract many customers. They indicated a constant change in customer demographic and income that might be impacting customers perception of retail stores so that they can enhance customer satisfaction. Research has been conducted on What makes customer patronage specific stores but not much attention

has been paid to the retailers dynamic capabilities that enable a retailer to create strategies that result in increased profits, competitiveness and performance.

According to **Nair (2018)** there has been an evolution of global supermarket in parts of Africa, especially private-owned. Supermarket can be referred to as a one- stop shop that offer customers a variety of products and an enhanced shopping experience. supermarkets provide market access to producers and manufacturers. They need enhanced dynamic capabilities, competition among supermarket lead to lower prices, improved quality and choice that benefit customer. The competition reduce buyer power which is beneficial to suppliers since the number of supermarket has tremendously increased it is, therefore, incumbent upon the super markets to develop programs that can enhance their competitiveness and perfot(Nair,2019).

In research conducted by **Nandonde and kuda(2018)**, they noted that Tanzania has witnessed several supermarket entering the local market from South Africa and Kenya in the last 20years. The authors noted that since the increase of supermarket, some research has been conducted on supplier and retail pricing strategy, but they reckon that a lot more need to be studied to establish causes of decreasing performance, which may lead to supermarket closure. The researchers established that the determinants of growth the opportunity and the challenges facing the sector still require investigation.

STATEMENT OF THE PROBLEM:

The will the rapid growth a heated and still unresolved political debate about whether foreign retail investment is beneficial to the country as more export-oriented foreign direct investment. Although the growth of super stores benefit local consumer by attracting them with low prices and convenience

shopping, it has damage many smaller family-run stores.

Due to moderation of human life style people, are running fast for earning money. Everything has been change such as food habit, entertainment spending pattern and the like. Among the busy schedule people want to save the time mostly attract towards supermarket under which most of the need are full filled below single roof. The aim of the study is to analyse the link between super marketing strategies and consumer buying decision.

The information flow was discovered to be in efficient thereby affected services delivery that would here interested the customers. The supermarket prices were found to be inhabitant when compared to open market prices. The consumer preferred these open market because of the degree of satisfaction received from them.

Supermarket faces challengers in maintaining customer satisfaction due to factor such as product quality, prices and Store ambience. The supermarkets struggle to maintain high level of customer services due to inadequate of training and insufficient resources. Supermarket face challenges in managing the supply chain and inventory, resulting in stockouts and over stocking.

OBJECTIVES OF THE STUDY:

- ▲ To study about the demographic marketing strategy of consumer.
- ▲ To identify the factor influencing the consumers towards the purchase in smart Bazaar vs dmart .
- ▲ To know the availability of product at smart Bazaar vs dMart.
- ▲ To improve the service provided by the company for motivating the customer .

RESEARCH METHODOLOGY:

Sampling design	Simple random sampling
Period of the study	November 2024 to March 2025
Data based	Primary data and secondary data

Test for analysis	1. Percentage analysis 2. Descriptive analysis 3. One sample t-test 4. Independent sample t-test 5. One way ANOVA 6. Garrett ranking 7.chi-square 8. likert scale

LIMITATIONS OF THE STUDY:

- ❖ The sample size was restricted to 100 respondents.
- ❖ The exclusive of factors like customer services and online shopping convenience.
- ❖ The study was restricted only to the customers comparing to smart bazaar vs dmart.
- ❖ Lack of access to proprietary data from smart bazaar and dmart.
- ❖ Seasonal and promotional changes may be overlooked.

RESULTS AND DISCUSSION:

Table No1

Knowledge about Smart bazaar vs Dmart

Knowledge about Smart bazaar vs Dmart Respondents	No of Respondents	% of Respondents
Media	25	25
Friends	52	52
Relatives	19	19
Other	4	4
Total	100	100

SOURCE: PRIMARY

DATA INDERENCE:

From the above table it is inferred that 25% know from media, 52% know from friends, 19% know from relatives and 4% know from others.

Thus, a majority knowledge of the respondents i.e., (52%) of them know from friends.

Table No 2

Special features of Smart bazaar vs Dmart

Special features of Smart bazaar vs Dmart of the Respondents	No Of Respondents	%Of Respondents
All products	38	38
Quality	28	28
Reasonable price	27	27
Convenience	7	7
Total	100	100

SOURCE: PRIMARY

DATA INFERENCE:

From the above table it is inferred that 38% features of all products,28% features of quality,27% features of reasonable price and 7% features of convenience.

Thus the Smart Bazaar's key strength is its wide product variety of (38%) of respondents.

Table No 3 Time of Purchase at

Smart bazaar or Dmart

Time of Purchase time at Smart bazaar or Dmart of respondents	No Of Respondents	% Of Respondents
Morning	25	25
Afternoon	25	25

Evening	41	41
Anytime	9	9
Total	100	100

SOURCE: PRIMARY

DATA INFERENCE:

From the above table it is inferred that 25% prefer to shop at morning, 25% prefer to shop at afternoon, 41% prefer to Shop at evening, 9% prefer to shop at anytime.

The majority of respondents (41%) prefer to shop at Smart Bazaar or Dmart in the evening.

Table No 4 GARRETT RANKING SPACE

AVAILABILITY

Factor	No Of Respondents	Rank
Spacious	40	I
Not so spacious	32	II
Neutral	28	III

Rank	Present position	Percentage position
I	$100(3-1+0.5)/3=100*2.5/3$	83.33
II	$100(3-2+0.5)/3=100*1.5/3$	50.00
III	$100(3-3+0.5)/3=100*0.5/3$	16.67

Factor	Garrett score	Average Garrett score	Rank
Spacious	3333.2	$3333.2/40=83.33$	I
Not so spacious	1600.00	$1600.00/32=50.00$	II
Neutral	466.76	$466.76/28=16.67$	III

Source: Primary data

INTREPRETATION:

Based on the Garrett ranking analysis, it is observed that "**Spacious**" received the highest Garrett score of 3333.2, with an average score of **83.33, ranking it first**. This indicates that the majority of respondents perceive the space as spacious and comfortable.

The category "**Not so spacious**" secured the second rank, with a Garrett score of 1600 and an average score of 50.00, suggesting that a significant

portion of respondents feel that space availability is moderate.

The "**Neutral**" category received the lowest Garrett score of 466.76, with an average score of 16.67, ranking it third. This implies that only a small percentage of respondents are indifferent to space availability.

Table No 5

DESCRIPTIVE ANALYSIS

	Mean	Standard deviation
Smart bazaar a seamless shopping experience	4.6000	.61955
Dmart provides seamless shopping experience	4.3800	.66332
Smart bazaar offers high quality products	4.2500	.79614
Dmart offers high quality products	4.1900	.88415
Smart bazaar price are competitive	4.2200	1.03064
Dmart price are competitive	4.1700	.84154

Interpretation:

The descriptive analysis suggests that Smart Bazaar is perceived slightly better than Dmart across seamless shopping experience, product quality, and price competitiveness. Smart Bazaar has higher mean scores in all three categories, indicating a generally more favorable customer perception. However, Dmart shows greater variability in responses, particularly in product quality and pricing, suggesting mixed opinions among customers. While the differences are not drastic, Smart Bazaar appears to have a slight advantage in overall customer satisfaction.

Table No 6 CHI-SQUARE OBSERVED VALUE:

	Daily	Weekly	Monthly	Rarely	Total
3000 & below	9	10	12	13	44
3000-5000	7	13	10	1	31
5000-8000	5	5	8	2	20
Above 8000	1	2	1	1	5
Total	22	30	31	17	100

EXPECTED VALUE:

	Daily	Weekly	Monthly	Rarely	Total
3000& below	9.7	13.2	13.6	7.5	44.0

3000-5000	6.8	9.3	9.6	5.3	31.0
5000-8000	4.4	6.0	6.2	3.4	20.0
Above 8000	1.1	1.5	1.6	.9	5.0
Total	22.0	30.0	31.0	17.0	100.0

	Value	df	significance
Pearson chi-square	11.792 ^a	9	.225

INTERPRETATION:

The chi-square test result ($\chi^2 = 11.792$, $df = 9$, $p = 0.225$) indicates that there is no statistically significant association between income level and frequency of the observed variable. Since the p-value is greater than 0.05, we fail to reject the null hypothesis, suggesting that income level does not have a significant impact on the frequency distribution of responses. So the **null hypothesis** is accepted.

Table No7

ONE SAMPLE T-TEST

Null Hypothesis (Ho):There is no significant difference between comparison of smart bazaar vs dmart in thoothukudi.

Alternative Hypothesis (H1):There is a significant difference between comparison of smart bazaar vs dmart in thoothukudi.

Particulars	Mean	Standard deviation	T- value	P- value
Smart bazaar a seamless shopping experience	4.6000	.61955	25.825	.000
Dmart provides seamless shopping experience	4.3800	.66332	20.804	.000
Smart bazaar offers high quality products	4.2500	.79614	15.701	.000
Dmart offers high quality products	4.1900	.88415	13.459	.000
Smart bazaar price are competitive	4.2200	1.03064	11.837	.000
Dmart price are competitive	4.1700	.84154	13.903	.000

INTREPRETATION:

Null Hypothesis (Ho):

There is no significant difference between Smart Bazaar and Dmart in Thoothukudi.

Alternative Hypothesis (H1):

There is a significant difference between Smart Bazaar and Dmart in Thoothukudi.

Since all the p-values are .000 (which is less than the standard significance level of 0.05), we **reject the null hypothesis (Ho)**. This means there is a significant difference in all the aspects compared between Smart Bazaar and Dmart.

“**Seamless Shopping Experience**” Smart Bazaar (**Mean = 4.6000**) has a slightly higher rating than Dmart(**Mean = 4.3800**).The significant **t-value (25.825 and 20.804)** indicates that customers perceive a notable difference between the two.So, Customers find Smart Bazaar offers a slightly better seamless shopping experience than Dmart.

“**High-Quality Products**” Smart Bazaar (**Mean = 4.2500**) and Dmart(**Mean = 4.1900**) have similar ratings. The t-values (**15.701 and 13.459**) indicate a significant difference. Thus Smart Bazaar is perceived to offer slightly better high-quality products than Dmart.

“**Competitive Pricing**” Smart Bazaar (**Mean = 4.2200**) and Dmart(**Mean = 4.1700**) are rated closely t-values (**11.837 and 13.903**) show a significant statistical difference. Thus, Both stores are seen as competitively priced, with Smart Bazaar rated marginally higher.

Table No 8
INDEPENDENT SAMPLE T- TEST

PARTICULARS	GENDER				T-VALUE	P-VALUE
	MALE		FEMALE			
	MEAN	S.D.	MEAN	S.D.		
Smart bazaar a seamless shopping experience	4.5854	.66991	4.6102	.58772	-.196 -.191	.414
Dmart provides seamless shopping experience	4.4634	.67445	4.3220	.65497	1.049 1.043	.445
Smart bazaar offers high quality products	4.4146	.77381	4.1356	.79779	1.741 1.751	.886
Dmart offers high quality products	4.3171	.87861	4.1017	.88464	1.201 1.202	.409
Smart bazaar price are competitive	4.3902	.97155	4.1017	1.06180	1.383 1.406	.703
Dmart price are competitive	4.3171	.78864	4.0678	.86830	1.465 1.491	.748

Smart bazaar store layout is well organised	4.3171	.72246	4.1695	.83362	.919 .943	.187
Dmart store layout is well organised	4.2683	.67173	3.9492	.77512	2.136 2.192	.609

INTREPRETATION

Table shows the Mean & S.D. (Standard Deviation): These values indicate the

average score and variation for males and females across different parameters.

T-Value: Measures the difference between male and female responses. A higher absolute t- value suggests a more significant difference.

P-Value: Determines if the difference is statistically significant (commonly, $p < 0.05$ is considered significant).

Table No 9 ONE WAY ANOVA

STATEMENT	AGE					T-Value	P-Value
	18-24	25-34	35-44	45-54	55 and above		
Smart bazaar a seamless shopping experience	4.5102 .61652	4.6389 .63932	4.7143 .75593	5.0000 .00000	4.6667 .57735	.878	.480
Dmart a seamless shopping experience	4.2653 .67006	4.5000 .65465	4.2857 .75593	4.6000 .54772	4.6667 .57735	.973	.426
Smart bazaar offers high quality products	4.1020 .66332	4.4167 .73193	4.4129 .89974	4.4000 .89443	4.6667 .57735	1.104	.359
Dmart offers high quality products	4.1224 .90445	4.2222 .86557	4.1429 .69007	4.2000 1.30384	5.0000 .00000	.710	.587
Smart bazaar price are competitive	4.1020 1.08484	4.3333 .95618	4.0000 1.29099	4.4000 .89443	5.0000 .00000	.810	.522
Dmart price are competitive	4.1224 .85714	4.1667 .84515	4.0000 1.00000	4.4000 .54772	5.0000 .00000	.931	.449
Smart bazaar store layout is well organised	4.1633 .82530	4.1389 .76168	4.4286 .78680	4.8000 .44721	5.0000 .00000	1.733	.149
Dmart store layout is well organised	4.0612 .77482	4.0278 .73625	4.0000 .57735	4.4000 .89443	4.6667 .57735	.755	.557

INTREPRETATION:

The table presents mean values (with standard deviations) for different statements about Smart Bazaar and Dmart.

The age groups (18-24, 25-34, 35-44, 45-54, and 55+) show their respective ratings for each statement.

The "T-Value" and "P-Value" indicate statistical significance.

Table No 10

Statement showing the comparison of customer preference towards dmart in Thoothukudi

Particulars	Average	Rank
Dmart provides seamless shopping experience	4.38	I
Dmart offers high quality products	4.19	II
Dmart price are competitive	4.17	IV
Dmart store layout is well organised	4.08	VIII
Dmart customer service is helpful	4.15	VI

State ment	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
Dmart provides seamless shopping experience	47	45	7	1	0	438
Dmart offers high quality products	43	40	10	7	0	419
Dmart price are competitive	40	42	13	5	0	417
Dmart store layout is well organised	29	53	15	3	0	408
Dmart customer service is helpful	35	49	13	2	1	415

INTREPRETATION

The tables in the images show a comparison of INTRPRETATION

Customer preferences towards Dmart in Thoothukudi based on different factors such as seamless shopping experience, high-quality products, competitive pricing, store layout, and customer service.

Customer Preference Analysis

Seamless Shopping Experience (Rank I, Average: 4.38) This factor received the highest ranking, indicating that customers strongly appreciate the smooth and hassle-free shopping experience provided by Dmart.

47 respondents "Strongly Agree," and 45 "Agree," showing a positive perception.

High-Quality Products (Rank II, Average: 4.19):

Customers have a high preference for D mart's product quality, making it the second most valued factor. 43 respondents "Strongly Agree," and 40 "Agree."

Competitive Pricing (Rank IV, Average: 4.17):

Price competitiveness is also a significant factor, but it ranks lower than seamless shopping and product quality. 40 respondents "Strongly Agree," 42 "Agree."

Customer Service (Rank VI, Average: 4.15)

Customer service is positively rated but is not among the top factors influencing preference. 35 respondents "Strongly Agree," 49 "Agree."

Store Layout (Rank VIII, Average: 4.08)

While the store layout is still considered good, it ranks the lowest among the five factors. 29 respondents "Strongly Agree," 53 "Agree," but it also has a few "Disagree" responses.

The most critical factor for customers is the seamless shopping experience, followed by high- quality products. Competitive pricing and customer service are also well-rated but rank slightly lower. The store layout, while still positively received, is the least prioritized factor in customer preference. This data suggests that Dmart should continue enhancing its seamless shopping experience and product quality while also working on improving store layout and customer service to better meet customer expectations.

FINDINGS

PERCENTAGE ANALYSIS

Thus, a majority knowledge of the respondents i.e., (52%) of them know from friends.

Thus ,a majority Smart Bazaar's key strength is its wide product variety of (38%) of respondents. The majority of respondents (41%) prefer to shop at Smart Bazaar or Dmart in the evening.

GARRETT RANKING

The majority of respondents perceive the space as spacious and comfortable.

DESCRIPTIVE ANALYSIS

Smart bazaar a seamless shopping experience highest mean value 4.6000 and Smart bazaar price are competitive highest standard deviation value 1.03064.

CHI-SQUARE

The highest individual value in the Observed Values (O) table is 13 (appearing twice). The highest individual value in the Expected Values (E) table is 13.6.

ONE SAMPLE T-TEST

The findings indicate that both Smart Bazaar and Dmart provide a seamless shopping experience, high-quality products, and competitive pricing, with Smart Bazaar slightly outperforming Dmart across all parameters. The mean scores for Smart Bazaar are marginally higher in seamless shopping (4.60 vs. 4.38), product quality (4.25 vs. 4.19), and competitive pricing (4.22 vs. 4.17). The T-values and P-values (0.000) confirm statistical significance, reinforcing the reliability of these results. While both brands perform well, Smart Bazaar holds a slight edge in customer perception across these key aspects.

INDEPENDENT SAMPLE TEST

Shopping Experience (Smart Bazaar & Dmart):

Both Smart Bazaar and Dmart have similar ratings from males and females, as the p-values are above 0.05, indicating no significant gender-based difference.

High-Quality Products (Smart Bazaar & Dmart):

The t-values suggest minor differences, but since p-values are greater than 0.05, there is no statistically significant difference in how males and females perceive product quality in both stores.

Price Competitiveness (Smart Bazaar & Dmart):

The p-values for both stores are also above 0.05, indicating no significant gender-based difference in how competitive the prices are perceived.

Store Layout Organization:

The t-values for store layout show some variation, but the p-values suggest no significant difference between male and female perspectives.

ONE WAY ANOVA

The P-Values determine whether there is a significant difference between age groups.

Typically, a p-value less than 0.05 indicates a significant difference.

Most P-Values are above 0.05, meaning there is no statistically significant difference in responses across different age groups.

The highest means indicate a stronger agreement with the statement in that age group.

SMART BAZAAR

Smart Bazaar's customers prioritize seamless shopping experience (4.60/5), helpful customer service (4.34/5), and high-quality products (4.25/5), while pricing (4.22/5) and store layout (4.23/5) require improvement for enhanced customer satisfaction.

DMART

- Seamless Shopping Experience (4.38/5) and High-Quality Products (4.19/5) are the top priorities for customers.
- Competitive Pricing (4.17/5), Customer Service (4.15/5), and Store Layout (4.08/5) are also important but slightly lower in priority.

SUGGESTION

- ▲ Enhance store ambiance: Smart Bazaar can improve its store layout and ambiance to match D Mart's modern standards.
- ▲ Increase product variety: D Mart can expand its product offerings to cater to a wider range of customer needs.
- ▲ Implement efficient checkout systems: Both stores can invest in faster checkout systems to reduce waiting times
- ▲ Pricing and Promotions.
- ▲ Competitive pricing: Smart Bazaar can review its pricing strategy to match D Mart's competitive prices.

CONCLUSION

In conclusion, the comparative study of customer preferences towards Smart Bazaar and D Mart in Thoothukudi highlights the unique strengths and weaknesses of each retailer. While Smart Bazaar excels in personalized service and loyalty programs, DMart leads in modern store layout,

competitive

pricing, and product variety. By understanding these preferences, both retailers can refine their strategies to enhance customer satisfaction, loyalty, and ultimately, their market share in Thoothukudi competitive retail landscape.

WEBSITE REFERENCE:

<https://www.dmartindia.com/home>

[me https://bigbazaar.com.co/](https://bigbazaar.com.co/)

http://en.wikipedia.org/wiki/Marketing_management

<http://www.scribd.com/doc/41556853/Bigbazaar-4p-Mix>

<http://www.pantaloonretail.in>

<https://relianceretail.com/reliancefresh.html>

[fresh.html](https://relianceretail.com/reliancefresh.html)

BOOK REFERENCE:

1. "Marketing Research: An Applied Approach" by Naresh K. Malhotra and Satyabhushan Dash (2017).
2. "Consumer Behavior: Buying, Having, and Being" by Michael R. Solomon (2017).
3. "Retail Management: A Strategic Approach" by Dhruv Grewal and Michael Levy (2017).
4. "Customer Behavior: A Framework for Analysis" by Srinivasan and Bharadwaj (2015).
5. "Marketing Management: A South Asian Perspective" by Philip Kotler and Kevin Lane Keller (2015).
6. "Consumer Behavior and Marketing Strategy" by Peter and Olson (2015).
7. "Retailing Management" by Levy and Weitz (2012).
8. "Consumer Behavior" by Hawkins and Mothersbaugh (2010).