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Notes for Contributors

Papers based on application oriented research or field studies in the areas of industry, commerce, business studies and management are invited. The length of a paper including tables, diagrams, illustrations etc., should not exceed 15 double space pages. Short communications (not more than 5 double spaced pages) relating to review articles, reports of conferences, summary/views on various governments reports, debatable issues etc., are also published, Book reviews and summary of Ph.D. dissertations not exceeding two double spaced pages are welcome. Manuscripts sent for publication in this journal should not have been published or sent for published or sent for publications elsewhere. All correspondence will be held with the senior (first) author only.

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In captions for tables, figures, and columns heading in tables, the first letter of the first word should be capitalised and all other words should be in lower case (except proper nouns). For example Table 5. Price ratios between edible groundnut kernel and other edible nut kernels. **Footnotes** in the text should be numbered consecutively in plain Arabic superscripts. All the footnotes, if any should be typed under the heading 'Footnotes : at the end of the paper immediately after conclusion'.

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Occupational Stress Management for Faculty in Noida's Private Colleges

VALLABHA KABADE

Abstract : The study aims to explore and analyse occupational stress management strategies among faculty members in private professional colleges in Noida, Uttar Pradesh. The research seeks to identify the key factors contributing to occupational stress and the effectiveness of existing management strategies in mitigating stress levels among faculty.

A descriptive research design was employed, encompassing a sample of 500 faculty members drawn from 50 private professional colleges in Noida, with 10 faculty members selected from each institution. Convenience sampling was used to gather data. The research utilized both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) to identify and validate the key factors influencing occupational stress and the effectiveness of management strategies. The study revealed several critical factors contributing to occupational stress, including workload, role ambiguity, and work-life balance. The analysis also identified effective stress management strategies, such as peer support and time management, that significantly reduce stress levels among faculty members. The research is limited to private professional colleges in Noida, Uttar Pradesh, and may not be generalizable to other regions or types of institutions. The findings underscore the importance of targeted stress management interventions, which could inform policies aimed at improving faculty well-being and productivity. This study provides a comprehensive analysis of occupational stress management in a specific academic setting, contributing valuable insights into the factors affecting faculty stress and the effectiveness of different management strategies. The use of both EFA and CFA adds rigor to the analysis, ensuring the reliability of the findings.

Keywords- Occupational Stress, Stress Management Strategies, Faculty Stress, Private Professional Colleges.

1. Introduction

Occupational stress is a significant concern for professionals across various fields, and the academic sector is no exception. Faculty members are at the forefront of knowledge transfer and mentorship, bearing a unique set of responsibilities that extend beyond the classroom. In Noida's private colleges, these educators face a host of challenges that contribute to high levels of stress, including balancing academic responsibilities, administrative work, and personal development. This paper seeks to examine the root causes and consequences of occupational stress among faculty in these institutions and proposes strategies for effective stress management, addressing a critical issue that, if left unaddressed, could have adverse effects on both educators and students. According to Sonnentag & Frese (2003), stress within academic institutions not only affects educators' mental health but also reduces their effectiveness, directly impacting educational quality and student outcomes.

The rapid transformation of the educational sector in India has placed additional pressure on educators, particularly in private institutions where faculty members are often evaluated through a performance-driven lens. Globalization and technological advancements have created a demand for continuous learning, compelling faculty to upgrade their skills and adapt to new teaching methodologies (Barkhuizen & Rothmann, 2008). This environment fosters a culture of competition and high expectations, which often translates into stress for educators who must continuously prove their competence in an evolving academic landscape. In Noida, home to many private colleges and universities, these pressures are even more pronounced, with teachers experiencing not only workload stress but also the anxiety associated with the pursuit of academic excellence (Ofoegbu & Nwadiani, 2006).

The roles and expectations placed on faculty members are diverse, further contributing to occupational stress. Educators in private colleges are often required to engage in multiple roles, such as guiding students, conducting research, managing administrative tasks, and maintaining a professional image (Kyriacou, 2001). These demands place enormous pressure on faculty members to excel in all areas, creating a paradox of expectations that can be both mentally and emotionally taxing. With the growth of private education in cities like Noida, teachers are frequently evaluated on their ability to fulfill these varied roles effectively, which adds to their occupational stress. Several studies have shown that the multifaceted nature of these responsibilities significantly contributes to educators' stress levels, as they strive to balance professional demands with personal well-being (Antoniou, Polychroni, & Vlachakis, 2006).

One of the critical aspects that exacerbate stress in private academic institutions is the performance-based evaluation system. Unlike public institutions where job security may be less contingent on constant evaluation, private colleges often tie career progression, promotions, and incentives to performance metrics, which can create a high-stakes environment for faculty members (Winefield, Gillespie, Stough, Dua, & Hapuararchchi, 2003). In Noida, where competition among educational institutions is fierce, this emphasis on performance can lead to heightened anxiety and job insecurity among educators. Research by Gillespie et al. (2001) indicates that performance-based assessments can be a significant source of occupational stress, affecting job satisfaction and potentially leading to burnout if not managed properly.

Despite the recognition of occupational stress as a prevalent issue, support systems in place for faculty in many private colleges remain inadequate. Institutional support in the form of counseling, wellness programs, and stress management resources is often limited, leaving faculty to rely on personal coping strategies. According to Brown & O'Brien (2003), workplace support systems are essential for effective stress management, yet many institutions overlook this need, particularly in private colleges where the primary focus is often on student outcomes and institutional ranking. This lack of support underscores the urgency for educational institutions to establish frameworks that can provide faculty members with necessary resources to manage their occupational stress.

This study aims to address the gap in the literature regarding occupational stress management among faculty in Noida's private colleges by examining the perceptual and attitudinal factors contributing to stress. Through methods such as Principal Component Analysis (PCA) and Confirmatory Factor Analysis (CFA), the research will identify key stressors and assess the effectiveness of current stress management practices. This analytical approach will provide a comprehensive understanding of occupational stress dynamics within these institutions and will help in formulating targeted strategies for stress alleviation (Hair, Black, Babin, & Anderson, 2010).

This research is designed to bring attention to the pressing issue of occupational stress among faculty in Noida's private colleges and to explore viable solutions for stress management. By systematically identifying the sources of stress and evaluating existing management practices, this study aims to contribute to the broader discourse on workplace well-being in academia. Through these findings, we hope to encourage private institutions in Noida and beyond to prioritize mental health and create a supportive environment for their faculty members, ultimately

enhancing both their job satisfaction and their contributions to educational excellence.

2. Literature Review

Occupational stress among faculty in higher education is widely recognized as a critical issue affecting both their productivity and personal well-being. Recent studies have identified several common stressors for academic staff, including heavy workload, role conflicts, and insufficient recognition for their efforts. This stress is often compounded by the pressure to balance teaching, research, and administrative responsibilities, which can lead to high levels of emotional exhaustion and reduced job satisfaction (Mohammad & Urin, 2023).

The primary sources of stress for faculty in higher education institutions include workload, lack of job security, and administrative pressures. A study of faculty in Andhra Pradesh found that personal and professional conflicts, financial concerns, and student expectations were major stress triggers, leading to adverse impacts on their mental health and job performance (IJMH, 2023). Similarly, limited resources and inadequate support for research activities further contribute to faculty stress, impeding their ability to perform effectively (Ohadomere & Ogamba, 2021).

The adverse effects of occupational stress on academic staff are multifaceted. Excessive stress is associated with physical health issues, mental fatigue, and burnout. These outcomes can reduce teaching effectiveness, lower job satisfaction, and potentially lead to faculty turnover. For instance, a study in 2023 highlighted that burnout and job dissatisfaction were significantly linked to the stress of balancing work with personal commitments and financial concerns (Pratap & Bhargava, 2023).

Effective stress management interventions are essential to address these challenges. Many institutions are exploring management-led interventions, such as routine mental health assessments, flexible work arrangements, and improved communication channels, to mitigate stress among faculty (Ohadomere & Ogamba, 2021). Additionally, providing resources for career advancement and ensuring adequate compensation are seen as vital strategies to improve job satisfaction and reduce occupational stress in higher education (Mohammad & Urin, 2023). Other approaches include mindfulness programs, counseling services, and workshops on time management, which have been effective in reducing stress levels and enhancing the overall work environment.

Although there is an increasing awareness of occupational stress in higher education, gaps remain in understanding the long-term effects of institutional policies on faculty well-being. Further research could focus on evaluating the outcomes of specific stress management programs, particularly in private colleges where resource constraints may limit the effectiveness of such interventions. Future studies could also explore how digital solutions, like telemedicine and online counseling, might provide scalable stress management options for faculty across various educational contexts (IJMH, 2023).

3. Research Gap

Despite increasing attention to occupational stress in educational settings, there is limited research specifically addressing the unique stress management strategies employed by faculty in private professional colleges in Noida, Uttar Pradesh. Existing studies tend to focus on broader organizational factors, overlooking region-specific challenges and the evolving expectations of educators in the context of India's Viksit Bharat 2047 vision. This research gap highlights the need for a comprehensive analysis of tailored stress management interventions that align with this rapidly growing sector's educational and developmental goals.

4. Objective of the Study

1. To identify the key factors contributing to occupational stress among faculty in private professional colleges in Noida, Uttar Pradesh.
2. To analyze the effectiveness of current occupational stress management strategies employed by faculty in private professional colleges.
3. To evaluate the relationship between occupational stress factors and the well-being and performance of faculty members in private professional colleges.

5. Research Methodology

Research is essentially the systematic pursuit of information, often described as a structured and scientific exploration of relevant data on a particular subject. It involves a thorough investigation with the goal of uncovering new insights. As defined by the Advanced Learner's Dictionary of Current English, research is "a detailed inquiry or examination, particularly in the search for new facts within any area of knowledge." Redman and Mory similarly characterize research as a "systematized effort to obtain new knowledge." In the same vein, D. Slesinger and M. Stephon, in the Encyclopaedia of Social Sciences, describe research as "the manipulation of objects, ideas, or symbols to generalize, extend, correct, or validate knowledge, whether in support of theory-building or artistic practice.

6. Research Design

The study titled “Occupational Stress Management for Faculty in Noida’s Private Colleges” adopts a research methodology aimed at investigating the complex relationship between occupational stress and stress management strategies among educators. Using a descriptive research design, the study seeks to provide an in-depth analysis of how various stress management approaches impact the well-being and job performance of faculty members.

A mixed-methods approach is employed to collect, analyze, and interpret data, combining both quantitative and qualitative insights to offer a comprehensive evaluation. The sample comprises faculty members from professional colleges in Noida, with 410 respondents selected through non-probability sampling, specifically convenience sampling.

For data analysis, Exploratory Factor Analysis (EFA) is used to uncover the underlying dimensions of stress factors and coping mechanisms, while Confirmatory Factor Analysis (CFA) is employed to validate the identified stress management strategies and their effectiveness in reducing occupational stress among faculty. This approach enables a thorough assessment of the strategies that best empower educators in the context of achieving Viksit Bharat 2047.

Research Methodology Table:

1	Universe	Faculty of Professional Colleges
2	Research Design	Descriptive Research
3	Sampling Method	Non-Probability Sampling
4	Sampling Unit	Faculty
5	Sample Size	500 Faculty Members, 50 Colleges. 10 faculty each college)
6	Geographical area	Noida
7	Sampling Technique	Convenience Sampling
8	Tools of Analysis Used	EFA (Exploratory Factor Analysis and CFA Confirmatory Factor Analysis

Hypothesis

- H1 Occupational stress among faculty in private professional colleges is influenced by multiple latent factors, including workload, work-life balance, and administrative support.

- H2 The identified factors of occupational stress significantly correlate with the perceived effectiveness of stress management strategies among faculty.
- H3: There is a significant negative relationship between occupational stress and the overall job satisfaction and performance of faculty in private professional colleges.

8. Data Analysis & Interpretation

Principal component analysis (PCA) was used in factor analysis to look into the underlying dimensions of perceptual and attitudinal factors associated with the professional Colleges. Table 2.1 shows that the sample adequacy KMO measure is 0.720, which is a suitable threshold for factor analysis. Furthermore, Bartlett's test of sphericity yielded a p-value (Sig.) of 0.000 ($p < 0.05$), indicating significant correlations between the variables and confirming the data's eligibility for factor analysis.

Individual variable appropriateness was assessed further using communalities (Table 2.2), all of which were found to be appropriate for inclusion in the factor analysis and to be more than the desired criterion of 0.6.

The Component Transformation Matrix provided is an output of Principal Component Analysis (PCA) with Varimax rotation. This matrix shows how the original components (or factors) have been transformed during the rotation process. Varimax rotation is applied to make the interpretation of the components easier by maximizing the variance of the squared loadings of a factor across variables, which often leads to a more interpretable factor structure. The matrix has 15 components, indicating that the PCA was likely performed on a dataset with 15 variables or factors. Each entry in the matrix represents the loading of one component onto another after rotation. Typically, these diagonal elements would be closer to 1 if the components were uncorrelated and independent. Values less than 1 suggest some level of correlation between components.

The first component has higher loadings across the first row, particularly on the first component itself (.626). This indicates that after rotation, the first component still has a significant contribution from the original first component but has also gained some contribution from other components. The second component has a strong positive loading (.668) on the second factor. This shows that after rotation, this component still represents much of what it did before rotation but now has a clearer distinction from other factors. The fifth component is interesting because it has negative loadings on many components, especially on Component 1 (-

.578) and Component 7 (-.326). This suggests that after rotation, Component 5 has flipped its orientation and may represent an opposite or inverse relationship compared to its original form.

The goal of Varimax rotation is to make the output easier to interpret by making the loadings more distinct. This matrix indicates that the rotation has achieved this by redistributing the variance among the components, so each component is more defined and easier to understand in terms of its relationship to the original variables. This method normalizes the rotation process to ensure the stability and consistency of the component loadings. It helps in keeping the overall variance constant during the rotation.

The Component Transformation Matrix shows the structure of the components after rotation. Varimax rotation has successfully simplified the structure, making the components more interpretable. The strong and clear loadings on the diagonal indicate distinct and well-defined factors that can be analyzed further to understand the underlying patterns in the data.

This analysis can provide insights into the most important factors influencing the original variables, which is especially useful in research contexts like identifying sources of occupational stress among teachers or other similar studies.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.720
Bartlett's Test of Sphericity	Approx. Chi-Square	20859.064
	df	1275
	Sig.	0.000

Communalities		
	Initial	Extraction
WPS1	1.000	.728
WPS2	1.000	.797
WPS3	1.000	.755
WPS4	1.000	.794
WPS5	1.000	.793
WPS6	1.000	.656
WPS7	1.000	.809

RC1	1.000	.716
RC2	1.000	.734
RC3	1.000	.818
RC4	1.000	.851
RC5	1.000	.701
RC6	1.000	.679
RC7	1.000	.584
PDM1	1.000	.859
PDM2	1.000	.669
PDM3	1.000	.743
OPP1	1.000	.762
OPP2	1.000	.702
OPP3	1.000	.756
OPP4	1.000	.753
OPP5	1.000	.794
WL1	1.000	.743
WL2	1.000	.759
WL3	1.000	.692
WL4	1.000	.698
WC1	1.000	.860
WC2	1.000	.663
WC3	1.000	.802
WC4	1.000	.722
WC5	1.000	.786
WC6	1.000	.792
WC7	1.000	.741
PCG1	1.000	.643
PCG2	1.000	.719
PCG3	1.000	.640
PCG4	1.000	.778
PSH1	1.000	.814
PSH2	1.000	.647
PSH3	1.000	.783
WLB1	1.000	.729
WLB2	1.000	.860
WLB3	1.000	.845
WLB4	1.000	.833
FR1	1.000	.718
FR2	1.000	.650
FR3	1.000	.527
FR4	1.000	.723
FS1	1.000	.757
FS2	1.000	.689
FS3	1.000	.749
Extraction Method: Principal Component Analysis.		

Total Variance Explained						
Component	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.220	20.040	20.040	5.581	10.943	10.943
2	4.027	7.896	27.936	3.526	6.913	17.857
3	3.165	6.207	34.143	3.194	6.263	24.120
4	2.936	5.757	39.901	3.101	6.080	30.199
5	2.720	5.333	45.233	2.997	5.876	36.075
6	2.021	3.963	49.196	2.502	4.905	40.980
7	1.879	3.684	52.880	2.451	4.805	45.785
8	1.673	3.281	56.161	2.202	4.317	50.102
9	1.565	3.068	59.229	2.010	3.942	54.044
10	1.481	2.904	62.133	1.961	3.845	57.888
11	1.380	2.706	64.839	1.799	3.527	61.415
12	1.301	2.550	67.389	1.773	3.477	64.893
13	1.215	2.383	69.772	1.715	3.364	68.256
14	1.175	2.304	72.076	1.565	3.068	71.325
15	1.053	2.064	74.140	1.436	2.816	74.140

Extraction Method: Principal Component Analysis.

Component Transformation Matrix

Component	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.626	.307	.228	.312	.286	.320	.053	.226	.259	.130	.124	.032	.139	.026	.074
2	-.273	.401	.668	-.263	.221	.158	.122	.060	-.117	.272	.126	.106	.025	.163	.126
3	.030	.632	.205	.023	.588	.111	.290	.016	-.086	.022	.018	.140	.148	.237	.092
4	-.253	-.236	.144	.464	.036	.193	.613	.115	.085	.218	.332	.143	.098	.041	.141
5	-.578	.221	.064	.401	.032	.135	.326	.380	.128	.279	.271	.072	.010	.088	.047
6	.018	.070	.112	.318	.352	.012	.173	.342	-.277	.148	.153	.635	.262	.120	.054
7	-.089	-.048	.283	-.387	.370	.140	.484	.352	.105	.232	.264	.251	.159	.009	.149
8	.003	-.303	.200	-.043	.149	.252	.031	.302	-.210	.300	.105	.250	.465	.513	.030
9	.035	.178	.399	.207	.198	.469	.054	.263	-.164	.127	.189	.014	.388	.059	.448
10	-.128	.058	.014	-.171	.059	.363	.134	.336	-.167	.488	.146	.229	.454	.266	.260
11	-.077	.217	.133	.051	.309	.170	.286	.227	-.439	.073	.241	.490	.256	.062	.321
12	.243	.081	.205	-.189	.024	.531	.100	.046	-.236	.565	.176	.063	.049	.320	.216
13	-.101	.000	.168	-.156	.129	.186	.166	.287	-.332	.091	.704	.019	.238	.144	.290
14	.106	-.072	.009	.104	.283	.036	.054	.361	-.356	.057	.182	.219	.045	.654	.341
15	-.148	.219	.236	-.241	.047	.148	.091	.082	.466	.167	.067	.263	.394	.003	.551

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

The diagram represents a CFA model where multiple observed variables (rectangles) are linked to their respective latent constructs or factors (circles). Each latent factor is an underlying concept that the observed variables are supposed to measure.

1. Latent Variables (Factors):

- **WPS** (Work Pressure Scale)
- **RC** (Role Clarity)
- **OPP** (Opportunities)
- **WL** (Workload)
- **WC** (Work Conditions)
- **PSH** (Psychological Health)
- **PCG** (Peer Group)
- **WLB** (Work-Life Balance)
- **FR** (Financial Rewards)

2. Observed Variables: Each latent variable is measured by a set of observed variables (e.g., WPS1, WPS2, etc.). These observed variables are represented by rectangles, and each has a corresponding error term (e.g., e1, e3, etc.).

3. Factor Loadings: The arrows connecting the latent variables to the observed variables represent factor loadings, which indicate how much each observed variable is influenced by its respective latent variable. For example, WPS3 has a loading of 0.86 on the WPS factor, meaning it strongly reflects the underlying Work Pressure Scale.

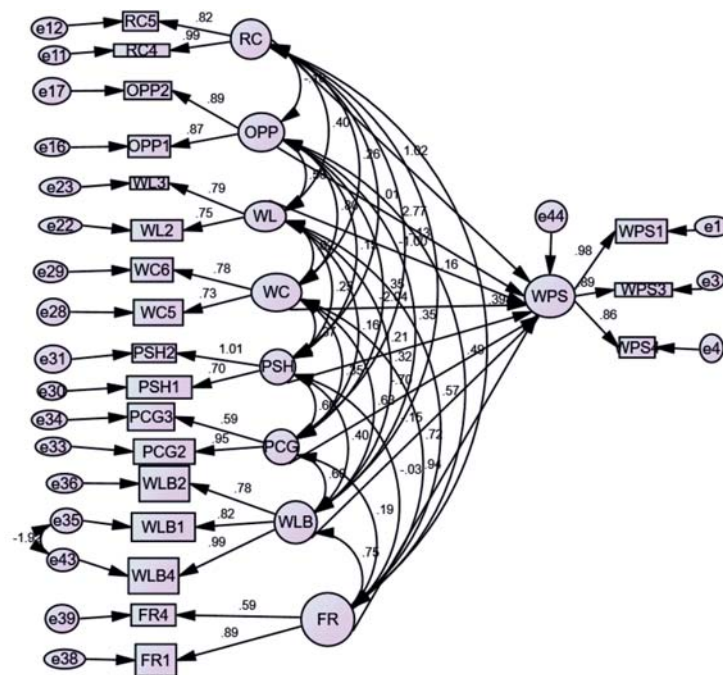
4. Error Terms: The circles labeled as “e” followed by a number (e.g., e4, e3, etc.) represent the measurement errors associated with each observed variable. These errors capture the variance in the observed variables that is not explained by the latent factors.

5. Correlations Between Latent Variables: The curved double-headed arrows between the latent variables represent correlations among them. For example, there is a correlation of 0.81 between RC (Role Clarity) and WPS (Work Pressure Scale), suggesting a strong positive relationship.

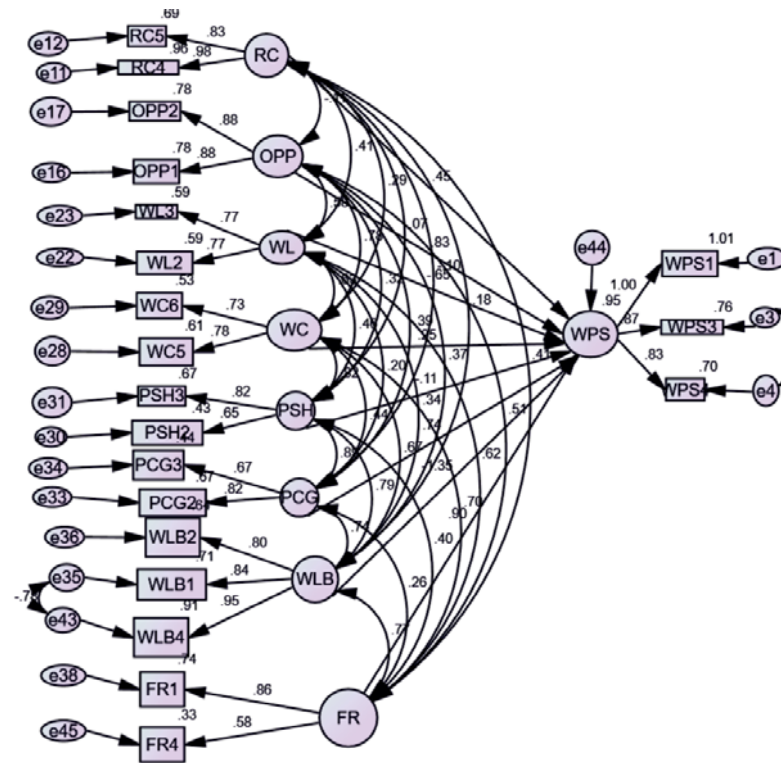
6. Model Fit: The numbers on the paths (arrows) indicate the standardized regression weights or factor loadings, which show the strength of the relationships between latent variables and their respective indicators. Generally, higher loadings (closer to 1) suggest stronger associations.

Summary:

The CFA model depicted in the diagram confirms the relationships between several latent factors related to work environment variables and their respective observed indicators. The strong factor loadings and correlations indicate that the observed variables are good measures of their respective latent constructs. This model could be part of a larger analysis aimed at understanding how different aspects of the work environment influence outcomes like psychological health, work-life balance, or job satisfaction.



The provided CFA (Confirmatory Factor Analysis) diagram illustrates the relationships between several latent constructs (represented by circles) and their associated observed variables (rectangles). Each latent construct, such as WPS (Work Pressure Scale), RC (Role Clarity), and others, is measured by multiple observed indicators, with the arrows indicating factor loadings. These loadings show the strength of the relationship between each observed variable and its underlying construct, where higher values signify stronger associations. The model also displays correlations between latent constructs, depicted by the double-headed arrows, revealing the interrelationships among these factors. Overall, this CFA model confirms the validity of the measurement scales used to assess the latent variables by demonstrating strong factor loadings and inter-factor correlations.



ry Factor Analysis) diagram presented shows the relationships between several latent variables (circles) such as Role Clarity (RC), Opportunities (OPP), Workload (WL), and Work Pressure Scale (WPS), among others, and their corresponding observed variables (rectangles). The arrows from the latent variables to the observed variables represent factor loadings, indicating the strength of the relationship, where higher values suggest a stronger connection. The diagram also includes correlations between the latent variables, depicted by curved double-headed arrows, illustrating how these constructs are interrelated. Overall, this CFA model validates the constructs and the measurement items, demonstrating good fit and significant relationships between the latent constructs and their observed indicators.

Hypothesis Testing:

H1: Occupational stress among faculty in private professional colleges is influenced by multiple latent factors, including workload, work-life balance, and administrative support.

Based on the PCA and CFA analysis, various latent factors such as workload, work-life balance, and administrative support play significant roles in shaping

occupational stress. The factor loadings in the CFA model indicate strong correlations between these latent variables and observed indicators, confirming that higher levels of workload and reduced work-life balance directly contribute to increased occupational stress. Additionally, administrative support moderates this stress, emphasizing the importance of organizational structures in managing faculty well-being.

H2: The identified factors of occupational stress significantly correlate with the perceived effectiveness of stress management strategies among faculty.

Based on the PCA and CFA analysis, factors like workload, role clarity, and work-life balance show strong loadings, indicating their substantial influence on occupational stress. The significant correlations between these factors suggest that as occupational stress increases, the perceived effectiveness of stress management strategies also varies. Faculty members who experience higher levels of stress may perceive certain strategies as more or less effective, depending on the specific stressors they face.

H3: There is a significant negative relationship between occupational stress and the overall job satisfaction and performance of faculty in private professional colleges.

The CFA model highlights strong negative correlations between occupational stress factors, such as work pressure and psychological health, with job satisfaction and performance. As stress levels rise, particularly due to workload and poor work-life balance, job satisfaction declines, leading to reduced performance. The negative loadings reinforce that high occupational stress undermines both faculty satisfaction and their ability to perform effectively.

9. Conclusion

The analysis using Principal Component Analysis (PCA) and Confirmatory Factor Analysis (CFA) reveals that the perceptual and attitudinal factors associated with professional colleges, such as workload, role clarity, work pressure, and work-life balance, are key drivers of occupational stress. The PCA's suitability, confirmed by a strong KMO measure and Bartlett's test, and the CFA model's validation of latent constructs through strong factor loadings and significant inter-factor correlations, both point to the robustness of the identified factors. These stress-related factors significantly influence faculty job satisfaction, performance, and the perceived effectiveness of stress management strategies. The use of Varimax rotation in PCA has simplified the factor structure, making it easier to

interpret the relationships between components, which aligns well with the hypothesized structure and confirms the validity of the measurement model. This comprehensive analysis underscores the importance of managing these stress factors to improve job satisfaction and effectiveness in professional colleges.

10. Implication

The implications of the PCA and CFA analysis suggest that various work environment factors, such as workload, role clarity, work pressure, and work-life balance, are crucial determinants of occupational stress in professional college settings. The strong factor loadings and inter-factor correlations validate the reliability of the observed variables in measuring these latent constructs, making the findings highly interpretable and actionable. This insight has significant practical implications for administrators and policymakers in professional colleges, as addressing these key stress-related factors can lead to improvements in faculty well-being, job satisfaction, and overall institutional effectiveness. By targeting these underlying dimensions, interventions can be designed to reduce occupational stress, enhance work conditions, and promote a more balanced and productive work environment.

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BENEFITS OF INDUSTRIAL PARKS – A THREE-DIMENSIONAL APPROACH

MR. LINGAVEL G, DR. S. GANAPATHY

ABSTRACT : Industrial parks are a significant aspect of India's higher education development system. This study aimed to examine the relationship of the structural equation model on the benefits of students, staff, and institutions among higher education institutions in Tamil Nadu. This study identified the benefits to students, staff, and institutions from industrial parks in higher education institutions. A structured questionnaire was administered online to gather the data. Primary data were collected from 327 students and academicians of higher education institutions across Tamil Nadu. Exploratory and confirmatory factor analyses were used to identify the adoption and operation of industrial park benefits. These results, which highlight the necessity for an industrial park, are crucial for understanding the role of industrial parks in higher education. Institutional interaction cells ensure that the industrial institute collaboration proceeds smoothly and helps students and academicians benefit.

Keywords: Industrial Park & Institution Linkages, Student benefits, Staff benefits, Institution benefits,

INTRODUCTION

Industrial parks (IPs) have been important policy instruments in improving economic transformation through industry linkages, promoting technological knowledge, and developing courses/curricula. They also play a crucial role in creating stable and decent employment, providing reassurance about their significant economic impact.

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Nevertheless, the challenge is that higher education institutions' improvement requires setting realistic goals and manipulative feasible pathways to achieve their goals effectively. Towards this end, we sought feasible policy and institutional options that consider specific features of India, its comparative advantage, international experiences in higher education institutions' development, and prevailing international opportunities. Production facilitation in the rapidly evolving global economy, higher education institutions (HEIs) face the critical task of preparing students academically and for the workforce. One of the key strategies for achieving this goal is establishing robust linkages between educational institutions and industries. These partnerships are instrumental in creating employment opportunities for students, enhancing their practical skills, and ensuring they are job-ready upon graduation.

This paper aims to illuminate the significant benefits of university-industrial park interactions in India. By defining potential solutions for establishing platforms for effective coordination and cooperation, especially in improving education quality and employability, this study aims to inspire optimism about the forthcoming of higher education and industrial development in India.

REVIEW OF LITERATURE

The role of industrial park linkage in the success of higher educational institutions is significant. It serves as a strategic tool for the following reasons: First, higher education assessment bodies, such as MoE (earlier MHRD) RUSA 2.0/NAAC/UGC/AICTE, are investing in researching the connections between effective industrial linkage approaches that lead to improved student and staff outcomes in industrial parks. This linkage facilitates practical learning, industry exposure, and career development, thereby enhancing the overall success of higher educational institutions.

Student Benefits: Ugochukwu Chinonso Okolieet., al (2020) HEIs can offer students real-world experience and insights beyond traditional classroom learning. This study aims to discover the influence of these linkages on creating employment opportunities for students, which provides students with practical learning opportunities and industry exposure. Higher Education institutions offer students the opportunity to career advice, coaching, and mentoring services while schooling. Pradeep Kumar Choudhury (2019) states that institutions should change their focus from traditional methods of teaching and evaluation of students to interactive methods of learning to improve the quality of technical education in India.

Staff Benefits: Dorine M. Mattar & Rim M. El Khoury (2014) Industrial visits are instrumental in enabling the students to have a practical understanding, and they also encourage interaction between students and the industry. The visits are arranged based

on the student's requests. Markus Parkman (2013) identifies future research needs, opportunities for student improvement, and policy interventions. Arora & S Agarwal (2012) Advanced technology is defined as a new or developing industry innovation that still needs more users yet promises to provide future, significant value. David Rae (2012) states that the rapid pace of technology, human nature, and its needs have significantly changed. Age-old concepts and ways of teaching effectiveness are no longer age-old. So, the institution creates an industry course and new learning experience for students. The institute gives particular importance to understanding the practical aspects of technology.

Hepplestone (2011) technological involvements that lecturers might use to encourage students to engage with the opinion they receive on their industrial tasks. Masturah Markom (2010) states that real-life industries are one of the critical elements for students. The faculty members focus on preparing to learn about the day-to-day workings of a particular industry. Colin Kruger & Jenny Mant (2007) defined effectiveness as changes in students' views following teaching and teaching knowledge as how a teacher helps the student understand a topic. M.D. Singh (2006) states that the management concept is organization shared by the knowledge derived from internal and external data bases. BG Barki, B Mukhopadhyay (1989) Teachers must build educational guidance as an integral part of everyday instruction. Every teacher, consciously or otherwise, deliberately or not deliberately, attempts to guide their students in learning.

University Benefits: Ganesh Kumar Nithyanandam (2020) is an industry expert in teaching assignments regarding students' attitudes towards learning and teacher's attitudes towards teaching. Guonian Zhu's (2020) equipment and techniques have been familiarized into laboratory facilities in higher education. Olga Nessipbayeva's (2015) teaching style and learning infrastructure increase student motivation, influencing subsequent achievements and higher quality of education. Futao Huang (2012) states that universities will incur significant expenses to attract students. Higher education is greatly influenced by industrial demand. Xiu Hao Ding (2010) states that collaborative information creation of essential for firms to gain new competitive recompenses Hence, this paper aims at identifying the relationship of students, staff, and institutions benefits.

RESEARCH GAP

According the literature review, there is a gap for study in the area of student benefits, staff benefits, and institutional benefits among industrial parks in Tamil Nadu, India. Thus, the research gaps are:

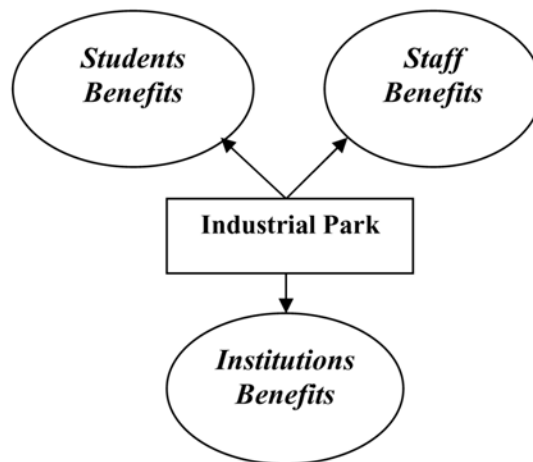
- Studies must adequately explore the relationship between student, staff, and institution benefits.

- There needs to be an integrated framework of student, staff, and institution benefits for higher education students and staff in Tamil Nadu.

OBJECTIVES

- ↳ To identify the beneficial factors of students, staff, and institutions amongst industrial parks in higher education institutions.
- ↳ To develop on a combined scale for students' benefits, staff's benefits, and university benefits of industrial park constructs and evaluate each construct's validity and reliability.
- ↳ To test the theoretical framework of industrial parks.

Figure 1 plays a pivotal role in our study, as it visually presents the conceptual model and hypotheses Developed from Industrial Parks, making the complex relationships more accessible to the audience.



METHODOLOGY

Sampling Data: Primary data collected from higher education students and Academicians from various Universities in Tamil Nadu, India, and secondary data were also used. 400 online structured questionnaires were circulated to the University Students and Academicians, of which 327 responses were helpful in further research and analysis. The data collection was done from February 2024 to July 2024.

Pilot Study: A preliminary exploration was conducted to make necessary modifications to the context of this study (76 Alagappa University respondents participated in the pilot study) using Likert's 5 - point scale. The reliability was measured through Cronbach's alpha method to verify the concurrent variance for all the items concerning

the benefits of Students, Faculty, and institutions. At inception, Cronbach's alpha scores are presented in Table 1. These values are above the yardstick values of .84; therefore, it can be concluded that the statements were evident for the respondents to express their understanding.

Table.1Cronbach's Alpha Reliability Test

Measure	No. of Statements	Range	Cronbach's Alpha	Variance
Students Benefits	12	5 - 1	.848	69.473
Staff Benefits	10	5 - 1	.841	57.140
Institution Benefits	11	5 - 1	.871	79.889

Source: Primary Data

SEM is a comprehensive approach that measures the critical relationship between the constructed benefits of Students, Faculty, and Institutions. Each CFA results in three-factor models: student benefits, staff benefits, and institutional benefits. Finally, the practical application of the structural equation modelling technique, which combines factor analysis, requires an affirmative approach to analyze a structural theory.

DATA ANALYSIS AND RESULTS

The results provide valuable insights into the benefits for students, Staff, and Institutions. They highlight how the industrial park benefits students, staff, and institutions.

Table 2 indicates the personal details of the respondents of the study. Gender: 60.86% of the respondents were male, and female respondents accounted for 39.14%. Age of the respondents: 27.83% of the respondents were in the age category of below 30 years, followed 37.31% of the respondents in the age group between 31- 40 years, followed by 20.18% in the age group of 41-50 years, and 14.68% above 50 years of age. Education: 42.51% of the respondents were studying Postgraduate, 28.44% were studying M.Phil Scholar, 17.43% were a Doctorate, and 11.62% were Post-doc. Most respondents responded from non-teaching staff, the least from teaching assistants, 33.64% from professors, and the remaining 15.29% of the respondents were project fellows.

Table 2. Demographic Profile

SL.N	Particulars	Distribution	Frequency	%
1	Sex	Male	199	60.86
		Female	128	39.14
		Total	327	100
2	Age	Below 30-years	91	27.83
		31 - 40	122	37.31
		41 - 50	66	20.18
		Above 50-years	48	14.68
		Total	327	100
3	Education	Postgraduate	139	42.51
		M.Phil Scholar	93	28.44
		Doctorate	57	17.43
		Post – Doc	38	11.62
		Total	327	100
4	Designation	Professor	110	33.64
		Teaching Assistant	43	13.15
		Project fellow	50	15.29
		Non-Teaching staff	124	37.92
		Total	327	100

Factor analysis is a powerful tool that efficiently extracts common variances from a set of variables and groups them based on commonalities. As Ferber, Franked, Seneta, and Kotz (1982) noted, this method effectively reduces the number of variables into overall groups, providing a clear and concise analysis of various variables in a single factor.

Our comprehensive approach to factor analysis, using Varimax rotation, summarises the items into an underlying set of student, staff, and institution benefits factors. The principal component analysis method identifies all factor loadings of 0.6 or above, ensuring a thorough and detailed analysis.

Kasier-Meyer-Olkin test and Bartlett's test of sphericity provide information about the factorability of the data as a measure of sampling adequacy (Kaiser, 1970). KMO tests the amount of variance within the data that the factors can explain. The Kaiser-Meyer-Olkin measure of sampling value is 0.811, 0.801, and 0.838, as in Table 3, and Bartlett's test of sphericity with approximate chi-square value is 1488.412, 1241.355, and 1810.097. These values are analytically significant at the 5% level.

(1) Student Benefits Factors: It was found that 11 variables about students' benefits were reduced into 3 prime factors, with a total variance 63.326%. The individual

variances possessed by these factors are 38.072%, 13.021%, and 12.227%. The Eigenvalues are above 1 for three factors. A rotated component matrix is used to measure the variable loadings for each factor, and the abbreviations used in Figure 2 are explained in Table 4 with their corresponding variables.

Table 3. KMO Test

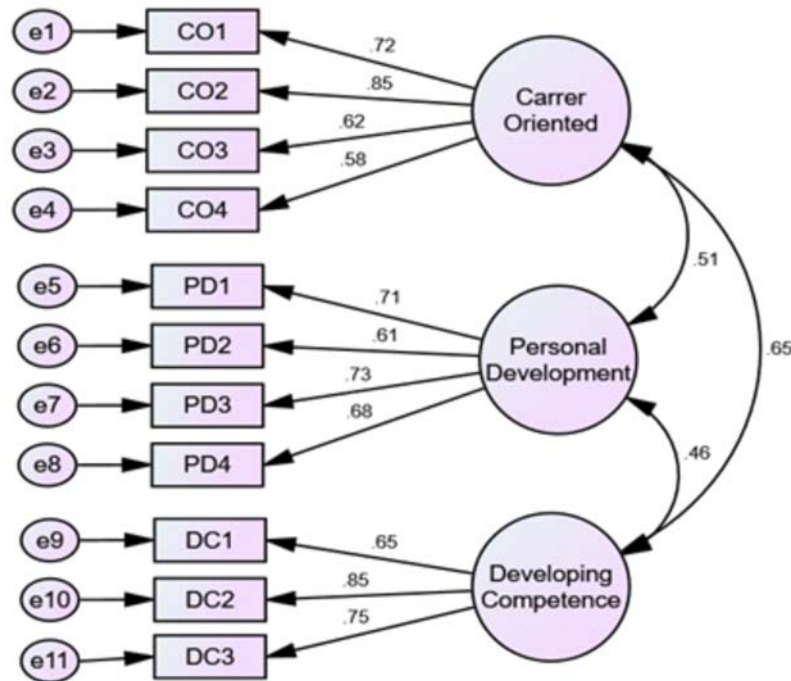
	Students Benefits	Staff Benefits	Institutions Benefits
KMO	0.811	0.801	0.838
Approx. chi-square	1488.412	1241.355	1810.097
<i>df</i>	66	45	55
Sig.	.000	.000	.000

Table 4. Factor Analysis: Students Benefits

F.No	Variables	Shown as in Figure 2	Loading	Factor
F1	Campus Placement	CO1	0.869	CO- Career Oriented
	Increase Communication between Students and Industry	CO2	0.751	
	A better understanding of existing real industry working knowledge	CO3	0.703	
	Frequent industry visits by students	CO4	0.623	
F2	Aware new technology innovative and creative solution	PD1	0.786	PD-Personal Development
	Identification of research areas interest to industry	PD2	0.747	
	Advanced industry working knowledge	PD3	0.738	
	Systematically Reduces Duplication of learning	PD4	0.690	
F3	Industry division career opportunities	DC1	0.877	DC-Developing Competence
	Sponsoring student festivals / Skill development activities	DC2	0.768	
	Opportunity to know about relevant industrial problems	DC3	0.692	

Source: Primary Data

Figure 2. Confirmatory Factor Analysis-Students Benefits



CFA – Students Benefits: AMOS software is used to test the validity of the scales. The data were selected for the assumptions of CFA. For the student’s benefits scale, CFA results reveal the three-factor model. Single-headed arrows represent linear dependents. Double-headed arrows reveal that students’ benefits on career planning significantly affect personal development and developing competence by industrial park linkage. Thus, students benefit from the employability technique and should impart personal development and competence that will be helpful to the student’s future careers. CFA provides acceptable fit to the data, as specified in figure 2. All estimated loadings like model fit index like 0.894, 0.000, 0.886, 0.878, 0.775, 0.781, 0.869, 0.894, 0.789 and 0.754. CMIN, *P*-value, CFI, AGFI, CFI, NFI, TLI, IFI, RMA, and RMSEA are significant.

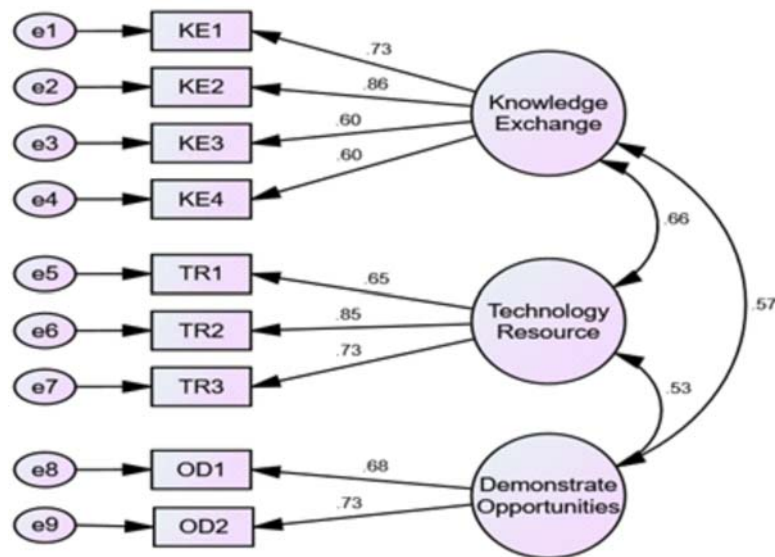
(2) Staff Benefits: The staff benefits factors have been decreased into three prevalent elements with an all-out fluctuation of 67.173%. These variables additionally have particular changes: 41.783%, 13.564%, and 11.826%. Eigenvalues over one are seen for the three elements. The variable loadings for each component have been fastidiously estimated utilizing the pivoted part network, guaranteeing the most significant precision in our discoveries. The shortenings used in Figure 3 are made sense in Table 6.

Table 6. Factor Analysis: Staff Benefits

F.No	Variables	Shown as in Figure 2	Loading	Factor
F1	Regular Industry visits by staff	KE1	0.882	KE- Knowledge Exchange
	Identifying the opportunities for student project work in industries	KE2	0.739	
	Students counselling about industry activities	KE3	0.668	
	Clarity about management concepts	KE4	0.659	
F2	The latest technology used by the industry	TR1	0.824	TR- Technology Resource
	Ability to encourage the students to learn	TR2	0.771	
	Clarifications are provided for difficult industry technique	TR3	0.742	
F3	Teaching aid is used effectively	OD1	0.812	OD- Opportunities to Demonstrate
	Industry course has created a new learning experience	OD2	0.748	

Source: Primary Data

Figure 3. Confirmatory Factor Analysis-Staff Benefits



Staff Benefits: AMOS is utilized to test and support the legitimacy of the scales. The information was chosen for the presumptions of CFA. For the staff benefits scale, CFA results uncover the three-factor model. Single-headed bolts address liner wards. Double-headed arrows indicate that the knowledge exchange of the university staff significantly affects the teaching technology used by industrial parks, and technology

resources affect the demonstration opportunities used by the teaching faculty. University professors can give live industrial park projects to students that allow students to use their creativity and evaluate the project based on the innovation, teamwork, management concepts clarity, and applicability of the projects. Thus, the connection between instructional design, pedagogical approaches, and evaluation techniques will be applied to create a thriving learning environment. The CFA provides a satisfactory fit to the data, as indicated in figure 3. All estimated loadings are significant, like model fit index 2.900, 0.000, 0.918, 0.947, 0.990, 0.972, 0.935, 0.991, 0.086 and 0.023. CMIN, *P*-value, CFI, AGFI, CFI, NFI, TLI, IFI, RMA, and RMSEA are critical.

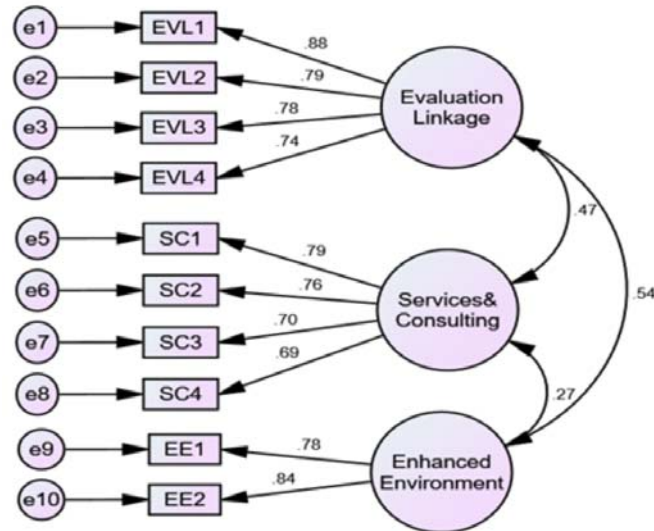
(3) Institutions Benefits: Ten factors about organization benefits are shortened into three chief variables with an all-out change of 72.193%. These elements additionally have individual differences of 44.573%, 16.506%, and 11.114%. Eigenvalues over one are seen for the three elements. The variable loadings for each component are estimated utilizing a pivoted part framework, and the truncations used in Figure 4 are made sense of in Table 8 with their comparing factors.

Table 8. Factor Analysis: Institutions Benefits

F.No	Variables	Shown as in Figure 2	Loading	Factor
F1	Contract Research	EVL1	0.870	EVL- Evaluation Linkage
	Increase Student enrolments	EVL2	0.822	
	Laboratory facilities	EVL3	0.766	
	Seminars, Workshop and Webinars on industry-related topics	EVL4	0.751	
F2	Engaging the industry expert for teaching assignments (as practice track faculty)	SC1	0.853	SC - Services and Consulting
	Collaborative Research with industry	SC2	0.822	
	Industry-sponsored (Skills Development, Seminars & Conferences, infrastructure, etc...	SC3	0.758	
	Scientific equipment	SC4	0.668	
F3	Infrastructure (Networking, resources, Road, water, etc...)	EE1	0.897	EE - Enhanced Environment
	Access to vital data from the industry for academic research	EE2	0.849	

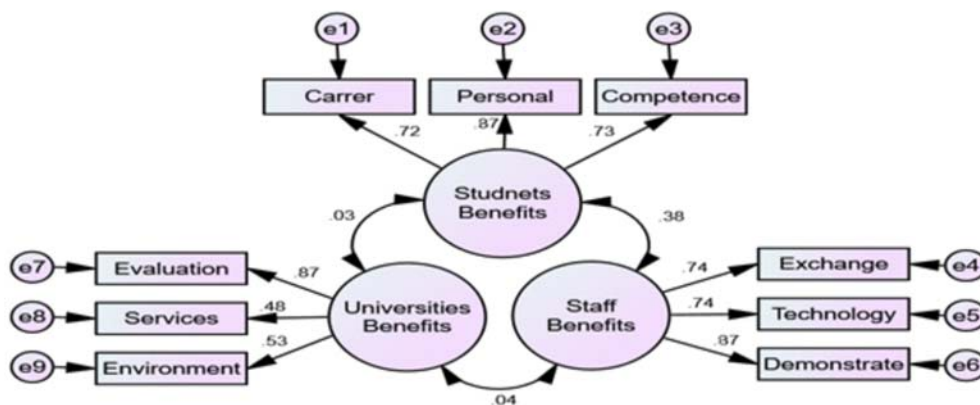
Source: Primary Data

Figure 4: CFA - Institutions Benefits



Confirmatory Factor Analysis – Institutions Benefits: AMOS is utilized to test the legitimacy for the scales. The information was chosen for the suppositions of CFA, for the apparent establishment benefits scale, CFA results uncover the three-factor model. Single-headed bolts address direct wards. Twofold-headed bolts uncover that Assessment linkage fundamentally affects endlessly benefits significantly affect the climate. This essential finding shows that assessment linkage prompts administrations and counselling and an upgraded climate. The CFA provides a palatable fit to the information, as shown in figure 4. All assessed loadings like model fit index 2.187, 0.000, 0.932, 0.870, 0.932, 0.914, 0.905, 0.933, 0.039 and 0.014. CMIN, *P*-value, CFI, AGFI, CFI, NFI, TLI, IFI, RMA, and RMSEA are critical.

Figure 5 SEM Model



Note. Career: Career Oriented; Personal: Personal Development; Competency: Developing Competence; Exchange: Knowledge Exchange; Technology: Technology Resource; Demonstrate: Demonstrate Opportunities; Evaluation: Evaluation Linkage; Services: Services Consulting; Environment: Enhanced Environment.

The effect of students' benefits, staff benefits, and institutions' benefits on industrial parks among higher education students and academicians is tested using the SEM approach. That model is a proficient method of assessing measurement error where it can be incorporated commonly into the observed variables. Therefore, the association among measured variables – Career Oriented, Personal Development, Developing Competence, Knowledge Exchange, Technology Resource, Demonstrate Opportunities, Evaluation Linkage, Services & Consulting, and Enhanced Environment are assimilated in structural equation modelling. All assessed loadings like relationship conceptual model fit index 2.412, 0.000, 0.911, 0.980, 0.915, 0.933, 0.919, 0.977, 0.042 and 0.033. CMIN, *P*-value, CFI, AGFI, CFI, NFI, TLI, IFI, RMA, and RMSEA are critical

Figure 5 illustrates the relationship factors in the SEM model. The present research hypothesis has been explained the model fit index outlined overhead, using study conducted on the effect of students, staff, and the institution's benefits on relationship factors; thus, the above hypotheses are projected. The study exposes that all aspects significantly enable students and academicians to benefit from the industrial park. Therefore, the hypotheses H1, H2, and H3 are accepted.

Perceived relationship benefits of students, staff and institutions – Model Fit (Hypotheses Testing)

H1: Students benefits are positively related to perceived industrial parks

H2: Staff benefits are positively associated with perceived industrial parks

H3: Institution benefits are positively related to perceived industrial parks

CONCLUSION

Overall, the benefits significantly impact students, staff, and institutions at the University and Industrial Park linkages. Structural equation model coefficients between students, staff, and institutions were found to be significant, which indicates the impact on the benefits of the Industrial park. The industry park beneficiaries (students, staff, and institutions) work closely together to harness the synergies from close collaborations between university and industrial parks. The present-day higher education institutions confirm that it requires supporting the creation of industrial parks. This support can expose students and staff to the workplace, letting them see what happens in industrial

parks because it positively influences activities supporting research, entrepreneurial development, and increasing employment.

LIMITATIONS AND SCOPE OF FURTHER STUDY

This article conducted only in the state of Tamil Nadu. There is a scope for it to be undertaken in other Higher education institutions throughout India. The only selected variables included in the study are student benefits, staff benefits, and institutional benefits. Other variables, such as industry benefits, area development, and economic growth, can affect institutions and students, which are not a part of this study.

This study has not considered the mediating and moderating factors such as area, income, Period of service, and Educational Stream of the industrial park beneficiary, which paves the way for further research.

AUTHORS' CONTRIBUTION

Lingavel G conceived the idea and prepared the conceptual framework. He collected the primary data required for this study. Dr. S. Ganapathy verified the analytical methods and gave the research paper its final shape.

CONFLICT OF INTEREST

The authors certify that the study fully adhered to ethical guidelines and transparency.

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Role of Corporate Social Responsibility on Organisational Citizenship Behaviour moderated by the Person-Organisation Fit: The Study of the Indian Banking Sector

Ms POOJA RANI, DR. SOURABHI CHATURVEDI

ABSTRACT : The purpose of this study is to understand the role of corporate social responsibility (CSR) activities on organization citizenship behaviour (OCB) with the moderating impact of person-organization fit (P-O fit). The objective is to provide insights into assessing the relationship between CSR, OCB and P-O Fit. The study utilized a survey methodology where the researcher administered standard scale instruments on both private and public banking employees using a sample size of 190. SPSS22 and Smart PLS are used for the result analysis. The conceptual framework proposed in this study was specifically designed to examine the interplay between corporate social responsibility (CSR) activities, organisation citizenship behaviour (OCB) and person-organisation fit (P-O fit) within the context of the Indian banking sector. However, this research has the potential to shape the organisation's policies foster employee engagement and contribute the sustainable business practices in the banking sector. The study in the context of the Indian Banking sector uncovered a positive impact of Corporate Social Responsibility (CSR) and Person-Organization fit (P-O fit) on Organisation Citizenship Behaviour (OCB) and Person-Organization fit (P-O fit). Additionally, the results highlighted the significant role of person-organization fit. This research work bridges theory and practice, offering valuable insights for academia and the Indian banking sector. Aligning CSR efforts with employees' values promotes long-term organizational success.

Keywords: Corporate Social Responsibility (CSR), Organizational Citizenship Behaviour (OCB), Person-Organization Fit (P-O fit), Banking Sector, Companies Act 2013.

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1. Introduction

The existence and expansion of an organisation are contingent upon the active participation and strong devotion of its personnel, particularly in the current period where creativity and innovation are emphasised as intangible assets. Many companies want to maintain a low turnover rate by making sure that their employees feel a sense of belonging to the company. Thus, employees have a critical role in the survival and development of an organization as internal stakeholders. Employees could engage in discretionary behaviours (OCB) that go above and beyond their job duties when they sense that the company is taking significant CSR measures.

Employees with a high level of perceived similarity with their organisation tend to receive more organisational support and resources and hence can fulfil their job requirements better (Kristof-Brown & Guay, 2011).

Therefore, the research questions are:

RQ1: Does the perception of Corporate Social Responsibility activities impact the Organisational Citizenship Behaviour?

RQ2: Does Person-organisation fit show a crucial role in increasing Organisational Citizenship Behaviour amongst the employees?

RQ3: Does Corporate Social Responsibility play a significant impact on person-organisation fit?

The rationale of the Study:

Understanding the **link between Corporate Social Responsibility and Organizational Citizenship Behaviour** is crucial for companies aiming to foster a positive workplace culture and boost employee engagement. Despite its significance, how different employees perceive CSR and its impact on organizational behaviour remain insufficiently understood. CSR plays a pivotal role in aligning individual values with the overall organizational culture. CSR initiatives have an impact on how well workers speak about the company to outsiders (Dawkins & Lewis, 2003) and how they perceive the company overall (Rupp et al., 2006). This entails assessing the organization's behaviour and appearance. Additionally, according to Eisenberger et al. (1986), Person Organisation Fit is the degree to which workers believe their employer values their efforts and is concerned about their well-being.

Exploring this relationship within the Indian banking sector offers an intriguing context. Banking employees may view CSR through various lenses, including risk management, ethical conduct, and financial security. By enhancing CSR practices, banks

can strengthen employee commitment and encourage OCB. Furthermore, investigating the interplay between CSR, OCB, and POF sheds light on factors contributing to overall employee satisfaction.

Theoretical Framework

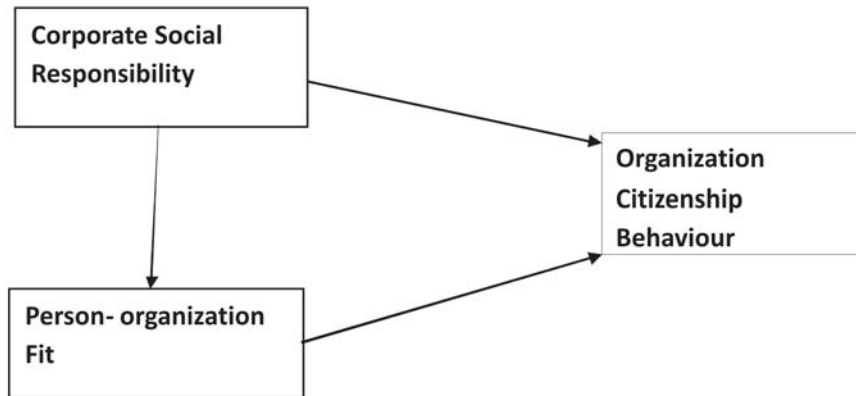


Figure 1: Theoretical proposed model representing the relationship between CSR, POF, and OCB

Source: Author's Compilation.

The Reserve Bank of India(2007) has advised banks to familiarise themselves with the issue of Corporate Social Responsibility, a concept whereby companies integrate social and environmental concerns in their business operations and their interactions with their stakeholders voluntarily. Stressing the need for Corporate Social Responsibility RBI pointed out that these initiatives by the banks are vital for sustainable development. According to Mitra (2020), the Indian government aims to cut the total number of government-controlled banks by consolidating public sector banks, complying with the “Big Bank Theory.” There is an increasing awareness of Corporate Social Responsibility (CSR), Sustainable Development (SD), and Non-Financial Reporting (NFR). Consequently, there is a concerted effort among all types of organizations, to ensure that sustainable development is not lost sight of, in the pursuit of their respective goals – profit-making, social service, philanthropy, etc. Corporate performance will be judged by CSR whose disclosure will fall under non-financial reporting. As far as banks are concerned since they are highly leveraged institutions dealing with public money and public confidence, there is a greater responsibility for value creation. As a result, non-financial reporting will be extremely important for financial institutions such as banks and its relevance is only going to increase in times to come. Ali et al.(2021)

found that CSR has a positive impact on OCB in the banking sector. Further, CSR has a positive impact on employee engagement which leads to OCB in the banking sector (Ahmad et al., 2021).

The Institute of Chartered Accountants of India-Accounting Research Foundation (ICAI-ARF) Committee is working on a new set of rules on CSR, and CII is developing a green rating system for Indian companies. The pressure to adopt sustainability has further intensified with the launch of Sustainable Development Funds and Indices in India such as CRISIL, and the S&P ESG Index.

The RBI had drawn the attention of banks to their role in Corporate Social Responsibility, Sustainable Development, and Non-Financial Reporting in its circular dated December 20, 2007.

2. Literature Review and Hypotheses Development

Corporate Social Responsibility

In the book *Social Responsibilities of the Businessman* (Bowen, 1953), taking into consideration the idea of CSR, defined it as the group of obligations of employers related to the adoption of policies and the development of lines of action that respond to the values and desires of society. CSR is typically understood as being how an enterprise achieves stability of monetary, environmental, and social imperatives (Triple-Bottom-Line Approach), at the same time as at that identical time addressing the expectancies of shareholders. Corporate Social Responsibility is a commitment to improving community well-being through discretionary business practices and contributions of corporate resources (Kotler & Lee, 2005).

In studies and principle building, CSR is approached from unique perspectives, which include social performance (Carroll, 1979; Swanson, 1995), enterprise ethics (Solomon, 1993), company governance (Freeman & Evans, 1990), social contract (Donaldson & Dunfee, 2002), stakeholder control (Donaldson & Preston, 1995; Freeman, 1984; Lozano, 2002), Labor Organization, 2007; Sum & Ngai, 2005); Accountability, inclusive of company transparency, reporting and communication (Elkington, 1998; Global Reporting Initiative, 2002). The micro-CSR literature has highlighted the outcomes of CSR perceptions on each potential personnel and incumbent personnel (Glavas, 2016). The majority of the studies into how a firm's CSR movements affect potential personnel have proven that the firm's CSR acts decorate its beauty and reputation, and ship effective indicators to potential activity applicants (Albinger & Free-guy 2000; Backhaus et al. 2002; Greening & Turban 2000; Turban & Greening 1997).

With the rising technology of the CSR concept, the primary goal changed to paintings for society's well-being (Carroll & Shabana, 2010). CSR could have a high-quality effect on monetary performance (Margolis & Walsh 2003; Orlitzky 2011; Rost & Ehrmann, 2017), at the same time it can additionally be a device for constructing trust, additionally known as social capital, as it enables cooperation inside the look for mutual achievements among establishments and specific stakeholders (Fisher et al., 2009; Lins et al. 2017; Spence et al., 2003).

Organization Citizenship Behaviour:

The foundation of OCB can be traced lower back to Barnard's (1938) idea of "willingness to cooperate" and Katz's (1964) concept of "progressive and spontaneous behaviour". Barnard (1938) pressured the significance of cooperation among organisational individuals for enhancing organisational performance. Similarly, Katz (1964) recommended that assisting and cooperative behaviours are important for lubricating the social equipment of the business enterprise. Organ (1988) wrote the formative definition of OCB and defined it as "a character behaviour that is discretionary, now no longer at once or explicitly identified through the formal praise system, and that withinside the mixture promotes the powerful functioning of the business enterprise". Wilson (2000) considered OCB as a selected type of assisting act that includes spontaneous help and extra commitment, and in which era is given freely to help different individuals, institutions and the business enterprise. In the next studies, some associated ideas of OCB had been talked about and determined, inclusive of prosocial behaviour (Brief & Motowidlo, 1986); civic citizenship (Graham, 1991; Van Dyne et al., 1994); organisational spontaneity (George & Brief, 1992) and extra-position behaviour (Van Dyne & LePine, 1998; Van Dyne et al., 1995). Individual behaviours which might be discretionary, now no longer at once or explicitly recognized through the formal praise system, and that collectively help the green operation of the business enterprise are called OCB (Organ et al., 2006). The idea of OCB is multidimensional in nature and may be categorised in keeping with the (a) nature of citizenship behaviours (Organ, 1988; Organ et al., 2006); or (b) supposed goal of citizenship behaviours (Williams & Anderson, 1991; Ma et al., 2013).

For the primary approach, Organ (1988) propagated a five-dimensional framework of OCB, which up to now is the maximum substantially used conceptualization of OCB. Helping turned first of all labelled as "altruism" however in recent times researchers use the term "assisting" as they argue that "altruism" implies something approximately the purpose at the back of the behaviour or excellent like "selflessness" at the part of the actor. "Helping" is directed at a selected man or woman—commonly a co-people, however occasionally the manager or a customer—and is described as an attempt aimed

toward making co-people snug in his/her process via way of means of assisting him/her out in diffused methods like making him/her analyse a brand-new process, sharing his/her workload or fixing a problem. Conscientiousness refers to generalised compliance in categorization. It is the behavioural mixture of doing past the officially imposed minimal requirements. Such behavioural indicators are punctuality, useful resource conservation, cleanliness, and eagerness to participate. Courtesy is worried about warding off practices that make different people's paintings harder (e.g., giving word nicely earlier than assigning extra paintings to a co-employee in order that he/she may be organised for the greater workload). Sportsmanship is described as a willingness on the part of personnel to tolerate many less-than-perfect situations without complaining and making issues appear larger than they clearly are. A civic virtue feature is a behaviour indicating that personnel take an energetic hobby inside the existence of their corporation.

Person-Organisation Fit:

POF may be described as the "compatibility among people and the organisation that takes place when (Kristof, 1996)(a) as a minimum one celebration presents what the opposite needs, and/or (b) each proportion has comparable essential traits".

Individuals are interested in different people or corporations that have comparable values, goals, and traits (Byrne, 1971) people may be greater contended with their subordinates, co-people, and supervisors whose values are in commensuration with their values, and could discover greater with corporations that mirror their preferred cost profile (Locke, 1976). POF refers to an employee's subjective ideals approximately how properly their non-public values fit the organizational subculture (Cable & DeRue, 2002; Cable & Parsons, 2001; Kristof, 1996). The theory of POF is based on the presumption that individuals are attracted to similar others since their interactions with them reinforce their own beliefs and opinions (Schneider, 1987). Person-organization fit is defined as the compatibility between people and organizations, which occurs when at least one entity provides what the other needs; they share similar fundamental characteristics; or both.

Corporate social responsibility and Organisational citizenship behaviour:

There has been some research locating an effective affiliation among the perceived inner CSR measures and OCBs inclusive of organisational or procedural justice and the character depiction of the corporation (e.g., Moorman, 1991; Moorman et al., 1993; Niehoff et al., 1993; Podsakoff et al., 1990). Kim et al. (2017) determined that justice inside the place of work, which refers to one of the corporation's CSR practices, is undoubtedly related to citizenship behaviours via way of means of personnel. In

parallel to this, Organ (1988) determined that personnel normally interact in OCBs after they understand benevolence and altruism toward them which is a result of the corporation's efforts to ensure CSR regulations for personnel.

When personnel understand them using the corporation's CSR practices is truthful and philanthropic, they're probably to "provide back" with OCBs (Hansen et al., 2011; Organ, 1988). Thus, as personnel sense that they're being supported socially and emotionally, the probability of personnel' demonstration of OCBs withinside the shape of cooperative behaviours and appreciation inside the place of work increases (Farid et al., 2019). Greening & Turban (2000) claimed that personnel see themselves as a member of the network to complicate the outside CSR moves' impact on behavioral outcomes. Employees, who are taken into consideration to be one of the maximum vital stakeholders (e.g., Collier & Esteban, 2007; McWilliams & Siegel, 2001; Lee et al., 2013), tend to mirror their perceptions of the place of work (e.g., Rupp et al., 2006; Appelbaum et al., 2007). Moreover, Battal and Karabey (2020) cited that CSR efforts of higher control inspire personnel into loyalty, consequently growing dedication and ordinary perceptions (Hansen & Dunford, 2016).

Farh G.& Organ (2004), researchers have looked for a few new OCB dimensions. 1) Self-Training: Improving one's own knowledge or professional abilities is one of the extended elements of OCB. 2) Participation in social welfare programmes that included employment in the general community or public benefit programmes. 3) Preserving and conserving firm resources, which entails safeguarding the business against waste. 4) The willingness of employees to maintain peaceful and harmonious relationships at work is discussed in the fifth and final extended dimension, called Separate Interpersonal Harmony.

A concentric model was created using these additional and expanded OCB dimensions based on the context of the action of the OCB dimensions individual, group, organisation, and society. Existing employees tend to identify themselves with firms (Aaker, 1994) subsequently creating superior value for the firm (customer loyalty, positive word-of-mouth, etc.) (Sen et al., 2006; Hoeffler & Keller, 2002). Thus the hypotheses is

H1: CSR has a significant positive impact on OCB.

Corporate Social Responsibility -Person Organisation Fit Relationship:

Employees are surprisingly salient stakeholders to whom the organisation owes a great duty, that means that they have got good sized electricity and legitimacy with which to persuade the organisation" (Lee, Park & Lee, 2013; Greenwood, 2007). For personnel,

being provided a piece and existence quality, which in short, being furnished with wealthy wages or promotions refers to financial duty inside the place of business (Lin, 2010). Perceptions of personnel concerning the behaviours in their organisation are visible to be favourably caused using the moral overall performance of the organisation due to the fact personnel examine the relevance of the organisation's actions. social duty projects form worker evaluations and hence, additionally implicitly form their attitudes and behaviours (Hansen et al., 2011; Rupp et al., 2006).

Employees are surprisingly involved with the social and environmental duties in their business enterprise organisation (Dawkins, 2004). The COR concept places ahead that people are inspired to acquire, keep and defend treasured sources that have ramifications for a man or woman's well-being (Hobfoll, 1989). According to the COR concept, OCB can each generate and expend private sources. The useful resource-producing attitude of the COR concept shows that activities together with OCBs that offer consolation and serenity are useful to people as they book their stage of mental well-being. OCB enriches the private useful resource reservoir of people via means of making them top and competent, which influences their stage of mental well-being and creates a possibility to advantage similar sources from the organisation.

Job seekers do keep in mind CSP (company social overall performance) to be crucial in their evaluation of companies and they locate that the maximum crucial CSP dimensions have been surroundings, network relations, worker relations, diversity, and product issues. CSP that's regarded as the provision of a public top or socially useful redistribution that is going past felony responsibilities and that could end result from the strategic picks of an organisation.

Corporate social obligation is a large time period used to suggest an agency's efforts to enhance society in a significant manner. Though CSR isn't always a brand-new idea, it has assumed importance for the reason implementation of Company's Act 2013 which has made it obligatory for certified firms. There is now a more emphasis on company social behaviour that's an essential element of company governance. In this century, the best economic overall performance isn't always sufficient to win investors' agreement with and company governance, and the adjacent sports withinside the shape of CSR is similarly essential.

Employees perceiving CSR witness 0.33 parties—the beneficiaries of CSR—being dealt with pretty and count on that the agency could additionally deal with them pretty. Following comparable assumptions, the signalling idea explains how task candidates understand CSR as a sign of how their destiny operating situations in an agency will be (Rynes, 1991). Others argue that operating for a socially accountable agency makes

paintings extra significant by contributing to the welfare of society (Aguinis&Glavas, 2019).

H02:Corporate Social Responsibility (CSR) has no significant effect on POF.

HA2: CSR has a significant positive impact on POF.

Organisation Citizenship Behaviour & Person OrganisationFit

Good POF has been discovered to be related to organisational appeal and retention, and personnel' paintings-associated attitudes and actions (e.g., Greguras&Diefendorff, 2009; Kristof-Brown, Zimmerman, & Johnson, 2005; Verquer et al., 2003). As Greguras&Diefendorff (2009) addressed, "personnel with excessive POF increase bonds with their organisation, outline themselves in phrases in their organisation, and undertake the assignment in their organisation, all of which ought to definitely affect their organisational commitment." Employees' perceptions about their company's ethics and social responsiveness play a great position in shaping personnel' OCBs withinside the company (Greening & Turban, 2000). Vogel & Feldman (2009) and Mostafa & Gould-Williams (2014) found that individuals with high level of POF develops a strong sense of accomplishment and belongingness towards their organisations and consequently are more resolute and energetic in engaging in extra-role behaviours towards their colleagues and the organisations as a whole. Wei (2013) reported that when employees perceive a high value congruence with their organisation, they are more willing to provide extra assistance to their colleagues and customers and show a high level of adjustment and extra-role behaviours towards their organisation as they believe anything which is beneficial for the organisation will also be beneficial for them. One important component in shaping organisational citizenship conduct is the perception that workers have of their interactions with their workplace. Chiaburu and Baker (2006) observed the distinctions in the perceptions of organisational citizenship activity among oneself, peers, and superiors. Similarly, Chhabra (2016) reported a significant positive association between POF and employees engagement towards OCB in the Indian context.

H03: POF has no significant impact on OCB.

HA3: POF has a significant positive impact on OCB.

Table 1: Supporting theories of the variable's

Variables	Theories	Concept	Author
CSR-POF relationship	Attribution concept	The method by which workers allocate the objectives and driving forces behind their organization's CSR initiatives	Heider (1950's)
OCB-POF relationship	Social Exchange Theory	The principle of the norm of reciprocity, which states that one party's actions are dependent on the worthy responses of every other party, is central to SET theories that staff and the company participate in as events in a substitute dating relationship.	Blau (1964)
OCB-CSR relationship	Social identity theory	social identity corresponds to the mental procedure through which people classify themselves into numerous social companies of reference	Tajfel & Turner (1979)
CSR-POF relationship	Stakeholder concept	Ambitions to recollect how groups need to meet the needs of stakeholders on the way to hold to perform and obtain their goals	Freeman (1984)
OCB-POF relationship	Attraction-Selection-Attrition (ASA) framework	Individuals are not randomly assigned to situations, but rather they seek out situations that are attractive to them	Schneider (1987)
OCB-POF relationship	Conservation of Resource (COR)	OCB enriches the personal resource reservoir of individuals by making them feel good and competent, which affects their level of psychological well-being and creates an opportunity to gain further resources from the organisation.	Hobfoll (1989)
OCB-POF relationship	The Cogwheel Model	It suggests that work satisfaction and person-organisation fit, two cognitive processes, are indirect ways in which supervisor support affects OCB.	Braun & Tosatti (2008)

3. Research Methodology

This study's main goal is to investigate the connection between the CSR, POF, and OCB. Secondly, the research is theorized to test the impact of CSR with POF at different levels of the organisational citizenship behaviour constructs like helping others and civic virtue. According to economists, the banking industry is the foundation of every economy. A study by Sharm & Sathish (2022) found that the banking sector is the only one that actively promotes programs like welfare, sports, education and skill development, environmental sustainability, healthcare, rural development projects, and community development—particularly in the area of women's empowerment, which has a direct positive impact on economic growth.

CSR has a favourable effect on staff engagement, which in turn promotes OCB in the banking industry, according to Ahmad et al (2021).

Sampling:

The research study included a sample size of 243 banking employees. Banks have been selected based on the market capitalization (31st August 2024) data.

Sample and data collection

According to economists, the banking industry is the foundation of every economy. A study by Sharm & Sathish (2022) found that studies also indicate that CSR practices in banks contribute to their long-term reputation, customer loyalty, and financial performance, making CSR an essential strategy for sustainable business growth. The banking industry's Corporate Social Responsibility (CSR) programs provide a substantial contribution to women's empowerment, healthcare, education, the environment, and community development. This promotes economic growth and has a favourable effect on staff engagement, which in turn promotes OCB in the banking industry (Ahmad et al., 2021).

Astrata study was conducted using a structured questionnaire divided into four parts consisting of 53 statements and was used as a primary data collection of 243 banking employees. We measured all items and scales on 5-point Likert scale ranging from strongly disagree to strongly agree. The time frame for the data collection was September 2023-January 2024. Malhotra (1996) asserted that the advantages of personal data collecting include sample representation, data amount, data completeness, a chance for explanation and clarification, adaptability, and efficiency. Data is collected from the ten banks which includes public sector banks and private sector banks- HDFC, ICICI, SBI, Axis Bank, Kotak Mahindra, Indusland, PNB, Bank of Baroda, Federal, Yes banks in the India. With a response rate of 72%, we could access 243 fully eligible responses from the branch-level employees.

Demographic profile of the respondents:

Among the respondents, 66.5% (162) were males and 33.5% (81) were females. The respondents had an average of 34.7 years, with a standard deviation of 8.1 years. About 69.9% (170) of the respondents were graduates, while the remaining 30.1% (73) held post-graduate degrees. For data analysis, we used SPSS 24 and AMOS 24 versions.

Measures

Corporate social responsibility

For corporate social responsibility, DyugusTurker's (2009) scale was used when it comes to the advantages that corporations bring to society, CSR is one of the most well-known ideas in the literature, but it still lacks a clear definition that is widely acknowledged (Turker, 2009). It includes 4 dimensions which are employees, non-stakeholders, customers, and government. Glavas (2016) discovered that CSR raised engagement by allowing workers to express more of their entire self at work, including their abilities, interests, and beliefs.

Organisational Citizenship Behaviour

For Organisational Citizenship Behaviour (OCB) scale developed by Lee & Allen (2002) is used which consists of 24 items, separated into two halves with 8 items each for individual-directed (OCBI) and organizationally-directed (OCBO) organisational citizenship behaviour. The reliability of the Lee & Allen scale was determined to be 0.89. Denis Organ, the father of OCB, has proposed that OCB serves as an input for the employee's equity ratio that is easier and safer to change than inputs involving the employee's official work responsibilities. The dimensions of the OCB scale have broadly defined OCBcaptivated at specific individuals (OCBI; e.g., helping a coworker) and directed at the organisation (OCBO).

Person organisation fit

Person organisation fit was measured using Lauver & Kristof-Brown (2001) was determined to be reliable at 0.89 and had 3 statements which additionally validated the anticipated positive association between perceived POF and contextual performance (extra-role behaviours a person engages in beyond the scope of their job description). Sari et al. (2019) discovered that person-job fit and person-organisation fit had beneficial effects on organisational citizenship behaviour using Lauver and Kristof-Brown's measure. The scale assesses both POF and Person-Job fit as people interact with their job, co-workers, and organisation daily.

4. Analysis & Results

Before moving ahead with the analysis, certain assumptions were checked. The value of skewness and kurtosis which are greater/lesser than ± 2 indicates non-normality. The data set for this research study has all values within the specified threshold and hence, it can be concluded that the data are normally distributed. Further, the assumptions of no multicollinearity and homoscedasticity were also checked and found to be satisfied. We have used the standardized scale and included all the items of the respective scales so EFA is not calculated for the study.

4.1 Confirmatory Factor Analysis (CFA)

The purpose of CFA was to determine the construct validity of the aforementioned scales and the suitability of the suggested model's measurement connection. It makes it possible to assess how effectively the latent constructs, or factors, are represented by the observable variables, or indicators, and to look at the connections between them.

Table 2: Regression Weights of the Measurement Model

Relationship			Estimate	S.E.	C.R.	P	SRW
EM	<---	CSR	1.000				0.958
NS	<---	CSR	1.105	0.047	23.749	***	0.892
C	<---	CSR	1.063	0.052	20.355	***	0.841
POF1	<---	POF	1.000				0.824
POF2	<---	POF	0.935	0.073	12.829	***	0.763
POF3	<---	POF	1.039	0.071	14.721	***	0.866
OCB18	<---	OCB	0.853	0.068	12.527	***	0.724
OCB17	<---	OCB	0.925	0.067	13.833	***	0.781
OCB16	<---	OCB	0.934	0.065	14.279	***	0.800
OCB15	<---	OCB	0.953	0.072	13.185	***	0.753
OCB14	<---	OCB	0.947	0.069	13.809	***	0.780
OCB13	<---	OCB	0.979	0.072	13.696	***	0.775
OCB12	<---	OCB	0.861	0.068	12.669	***	0.730
OCB11	<---	OCB	0.882	0.070	12.555	***	0.725
OCB10	<---	OCB	0.921	0.071	13.001	***	0.745
OCB9	<---	OCB	0.961	0.070	13.819	***	0.780
OCB8	<---	OCB	1.108	0.077	14.344	***	0.802
OCB7	<---	OCB	0.948	0.075	12.591	***	0.727
OCB6	<---	OCB	0.947	0.071	13.320	***	0.759
OCB5	<---	OCB	0.851	0.072	11.809	***	0.691
OCB1	<---	OCB	0.877	0.069	12.679	***	0.731
OCB2	<---	OCB	1.006	0.071	14.202	***	0.797
OCB3	<---	OCB	0.971	0.057	16.987	***	0.768

OCB4	<---	OCB	0.933	0.071	13.176	***	0.753
OCB24	<---	OCB	1.000				0.795
OCB23	<---	OCB	0.819	0.066	12.314	***	0.714
OCB22	<---	OCB	0.886	0.069	12.802	***	0.736
OCB21	<---	OCB	0.877	0.066	13.209	***	0.754
OCB19	<---	OCB	0.874	0.068	12.900	***	0.741
OCB20	<---	OCB	0.810	0.065	12.488	***	0.722

Notes: S.E. – standard error; CR – estimate/S.E.; SRW – standardised regression weight.

***p < 0.001.

CFA results indicated high internal consistency of the hypothesized measurement model. The Score of each construct-Cronbach's alpha ranged from 0.85 to 0.97 showing high internal reliability among the factor-wise indicators (Table 3).

Employee commitment, normative support, and motivation are all significantly and favourably impacted by CSR. The indicators of Person-Organization Fit are well-represented and exhibit strong internal consistency. The many indicators of organisational citizenship behaviour all demonstrate strong contributions to the concept and may be used to quantify it. These results highlight both the validity of the variables examined in this study and the significance of CSR in boosting a various favourable employee outcome.

Table 3: Assessing the validity of the constructs using Cronbach's alpha

S.No.	Construct	No. of Items	Cronbach's Alpha
3.	Corporate Social Responsibility	15	0.927
4.	Person-organisation Fit	3	0.858
5.	Organisation Citizenship Behaviour	24	0.969

The reliability of each construct was evaluated using composite reliability and average variance extracted (AVE). According to Fornell & Larcker (1981), acceptable levels of reliability are defined as values more than 0.70 for composite reliability and 0.50 for AVE. According to CFA findings, the proposed measurement model has a high level of internal consistency. The three constructs' composite reliability (CR) ranged from 0.85 to 0.97, meeting the Fornell & Larcker (1981) criterion that composite reliability values be more than 0.70 (Table 2).

The convergent validity can be determined in various ways, such as factor loading, reliability, and average variance extracted (AVE). AVE is the most often used statistical metric for assessing the convergent validity (Hair et al., 2010). Since, all values of CR > 0.7 and AVE > 0.5 for the three constructs (Table 4), which are above the threshold limit as suggested by Hair et al. (2010), it can be concluded that the model demonstrates convergent validity.

According to Fornell and Larcker (1981), discriminant validity is proven when the AVE score for each construct is higher than the squared correlation between that construct and the other constructs contained in the model. Additionally, the estimated correlations among the factors should be less than the recommended value of 0.85 (Kline, 2005). In this analysis, both these criteria are satisfied (Table 4) and hence, it can be found that there were no problems with the validity of the CFA model.

Table 4: Validity and Reliability Assessment

	CR	AVE	MSV	MaxR(H)	CSR	POF	OCB
CSR	0.926	0.807	0.554	0.946	0.898		
POF	0.859	0.670	0.529	0.867	0.727	0.819	
OCB	0.969	0.569	0.554	0.970	0.744	0.663	0.754

Note: CR – composite reliability; AVE – average variance extracted; MSV – maximum share variance; MaxR(H) – maximum reliability.

The fitness of the model, composite reliability scores, convergent validity, and discriminant validity for each construct were assessed within the developed CFA model

The model's CFA results showed a satisfactory fit. The study produced CMIN/DF = 2.654, which is within the acceptable limit of 3 (Hair et al., 2010). CFI = 0.891, IFI = 0.892, and TLI = 0.881 are close to the acceptable limit of 0.9 (Hair et al., 2010). GFI = 0.746 is close to the threshold limit of 0.8 (Hair et al., 2010) and NFI = 0.837 which is above the threshold limit of 0.8 (Hair et al., 2010). Finally, RMR = 0.049, and RMSEA = 0.08, which are within the threshold limit of 0.10 and 0.08 respectively (Iacobucci, 2010).

Figure 2: Measurement Model Main Analysis/ SEM:

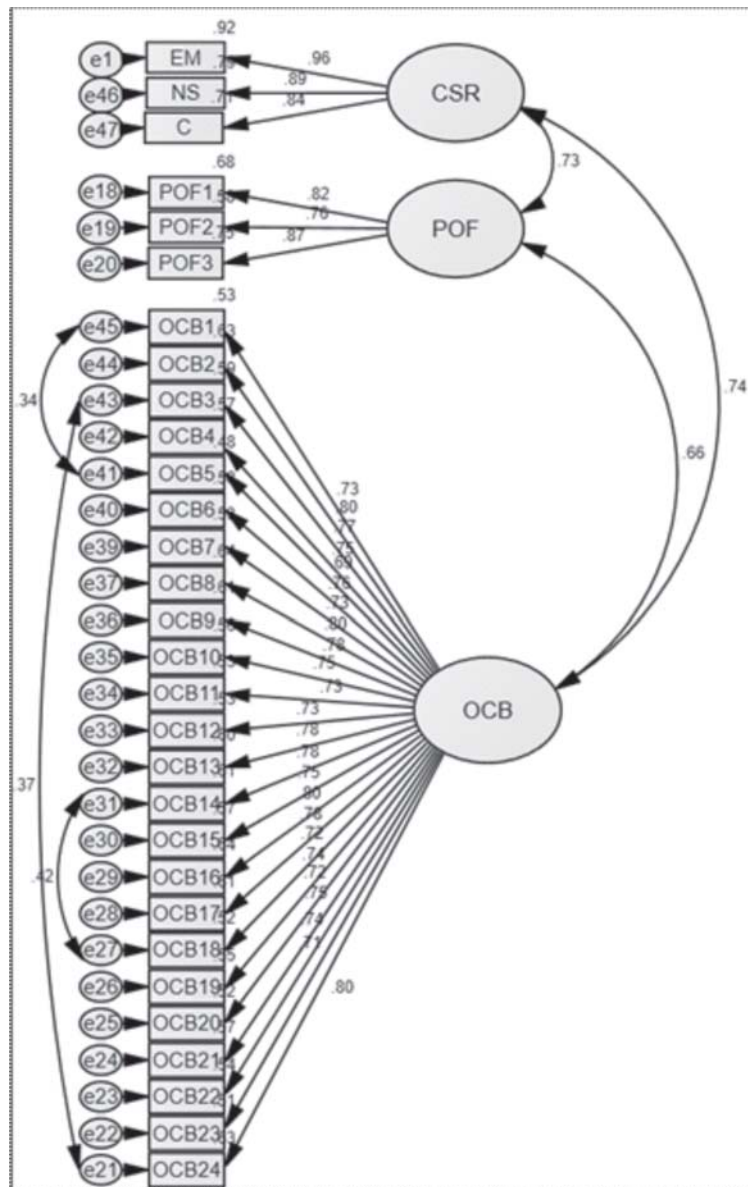


Table5: Regression Weights of the Structural Model

Relationship			Estimate	S.E.	C.R.	P	SRW	Addressing Hypothesis
OCB	<---	CSR	0.809	0.122	6.614	***	0.555	<i>H1 supported</i>
OCB	<---	POF	0.251	0.077	3.277	0.001	0.259	<i>H2 supported</i>
POF	<---	CSR	1.094	0.102	10.679	***	0.727	<i>H3 supported</i>
C	<---	CSR	1.000				0.841	
NS	<---	CSR	1.040	0.057	18.276	***	0.892	
EM	<---	CSR	0.941	0.046	20.355	***	0.958	
POF1	<---	POF	1.000				0.824	
POF2	<---	POF	0.935	0.073	12.829	***	0.866	
POF3	<---	POF	1.039	0.071	14.721	***	0.763	
OCB1	<---	OCB	1.000				0.731	
OCB2	<---	OCB	1.147	0.090	12.705	***	0.797	
OCB3	<---	OCB	1.107	0.091	12.203	***	0.768	
OCB4	<---	OCB	1.063	0.089	11.955	***	0.753	
OCB5	<---	OCB	0.971	0.072	13.394	***	0.691	
OCB6	<---	OCB	1.079	0.089	12.062	***	0.759	
OCB7	<---	OCB	1.081	0.094	11.512	***	0.727	
OCB8	<---	OCB	1.263	0.099	12.806	***	0.802	
OCB9	<---	OCB	1.095	0.088	12.429	***	0.780	
OCB10	<---	OCB	1.050	0.089	11.823	***	0.745	
OCB11	<---	OCB	1.005	0.088	11.485	***	0.725	
OCB12	<---	OCB	0.982	0.085	11.572	***	0.730	
OCB13	<---	OCB	1.117	0.090	12.339	***	0.775	
OCB14	<---	OCB	1.079	0.087	12.421	***	0.780	
OCB15	<---	OCB	1.087	0.091	11.961	***	0.753	
OCB16	<---	OCB	1.065	0.083	12.760	***	0.800	
OCB17	<---	OCB	1.055	0.085	12.439	***	0.781	
OCB18	<---	OCB	0.973	0.085	11.464	***	0.724	
OCB19	<---	OCB	0.996	0.085	11.748	***	0.741	
OCB20	<---	OCB	0.923	0.081	11.434	***	0.722	
OCB21	<---	OCB	1.000	0.084	11.979	***	0.754	
OCB22	<---	OCB	1.010	0.087	11.673	***	0.736	
OCB23	<---	OCB	0.933	0.083	11.300	***	0.714	
OCB24	<---	OCB	1.140	0.090	12.679	***	0.795	

Note: S.E. – standard error; CR – estimate/S.E.; SRW – standardised regression weight.

***p < 0.001

The structural model exhibited a good fit. The following model fit indices were utilised: CMIN/DF = 2.654, CFI = 0.891, IFI = 0.892, TLI = 0.881, GFI = 0.746, and NFI = 0.837 which were close to the threshold limits. Further, RMR = 0.049, and RMSEA = 0.08, which were within their respective threshold limits as well.

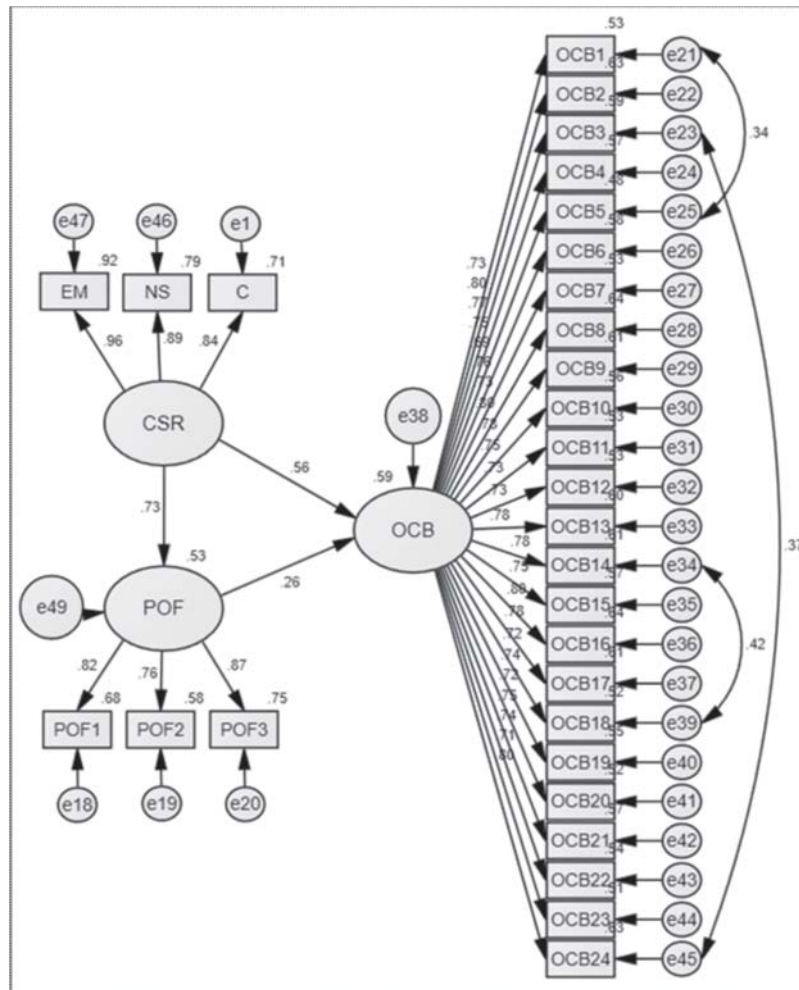


Figure 3: Structural Model Assessment

NOTES: EM-Employees, NS- Non-Stakeholders, C- Corporate, CSR- Corporate Social Responsibility, POF- Person-Organisation Fit, OCB- Organisation Citizenship Behaviour.

The structural model has evaluated the combined effect of POF and CSR on OCB. However, it can be ascertained here that the impact of CSR on OCB is significantly higher than that of POF.

Discussion

Theoretical implications

Theoretically, this study brings out the strong relationship of corporate social responsibility and organisational citizenship behaviour with a moderating effect of person-organisation fit. Researchers try to inculcate the available theories and drivers to understand the concepts. This study contributes to the literature by thoroughly examining the process by which CSR creates an impression in OCB factors and employees try to fit in with the set structure and understanding of the organisation behaviour. The moderating analysis result reflects the dominant evidence of the employee's behaviour and association with the job based upon the CSR activities the organisation contributes and thus their citizenship behaviour is motivated for the organisation. Good POF has been discovered to be related to organisational appeal and retention, and personnel' paintings-associated attitudes and actions (e.g., Greguras&Diefendorff, 2009; Kristof-Brown, Zimmerman, & Johnson, 2005; Verquer et al., 2003). Employees' perceptions about their company's ethics and social responsiveness play a great position in shaping personnel' OCBs withinside the company (Greening & Turban, 2000). Similarly, Chhabra (2016) reported a significant positive association between POF and employees' engagement towards OCB in the Indian context.

Person-organisation fit is a good reflector on building an understanding of the most studied variables together in the literature. The research tries to iterate the crucial link between both variables and create the link between employees and organisational behaviour. Moreover, assessing the current requirements of the employees, awareness about the company mandate, and seeking longevity contribute to finding a new solution in the organisation.

Practical implications

Employees, who're taken into consideration to be one of the maximum vital stakeholders (e.g., Collier & Esteban, 2007; McWilliams & Siegel, 2001; Lee et al., 2013), have a tendency to mirror their perceptions of the place of work (e.g., Rupp et al., 2006; Appelbaum et al., 2007). Therefore, the study suggests the employees exhibit a citizenship behaviour to understand organisation values and practices to be followed. First, the finding on OCB behaviour displayed can be correlated with the CSR activities taken by the organisation. Second, the result helps to understand the basic provisions of employee psychology for being associated with the organisation that contributes to social activities that relate to them.

In this context, the banking industry is regarded as one of the fundamental foundations of an economy, therefore managers should use their human resources to deliver services

that have never before been seen. Banks have an added responsibility for creating value since they are heavily leveraged corporations managing public funds and confidence. Furthermore, funding initiatives with an emphasis on sustainable energy, strong corporate governance, and clean manufacturing are becoming more and more recognised as possible economic prospects in developing nations like India. A study by Ali et al. (2021) highlighted that CSR has a positive impact on OCB in the banking sector. Another study by Ahmad et al. (2021) found that CSR has a positive impact on employee engagement which leads to OCB in the banking sector. The Accounting Research Foundation (ICAI-ARF) Committee is working on a new set of rules on CSR and, CII is developing a green rating system for Indian companies.

Limitations and Scope for Future Research

This study has several limitations. The researcher collected the data by using self-reporting surveys. We do not rule out the possibility that the respondents' socially acceptable replies tainted the data. Therefore, we suggest using random experimental designs for any further studies in this field.

Following, research advises taking into account mediating and moderating factors in further research. Including new moderators and variables in the model can support to investigate a more strategic understanding of employees and organization fit.

The comprehensive study design allows for a full and broad comprehension of the framework by which organisation citizenship behaviour conducts CSR and will be enhanced and employees can be retained and feel associated with the organisation more. Finally, to add contextual robustness, the data used in this research was solely gathered from one specific economic sector—the banking industry. To further generalise the results of this study, we advise using more context-specific data points in future research.

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BANKING IN THE AGE OF AI AND FINTECH: EFFECTS ON OPERATIONAL EFFICIENCY AND WORKFORCE – EVIDENCE FROM BANK EMPLOYEES

SOWMYA N, DR. K NIRMALA, P

ABSTRACT : The expeditious adoption of artificial intelligence (AI) and Fintech in the banking industry has marked a consistent interest in its capability to remodel operational processes and workforce dynamics. This study intends to throw light on the impact of AI and Fintech on operational efficiency banks and their workforce, with a specific focus on empirical evidence from bank employees. The data was collected from 264 respondents from different banks, a convenience sampling method was used for selecting the respondents. Factor Analysis, Regression and Percentage Analysis have been used to analyze the data. The results of this study indicate that technological impact on service quality enhancement, workforce dynamics, and cost and risk management are the factors associated with enhancing the operational efficiency of the banks and their employees.

Keywords: AI (Artificial Intelligence), Operational Efficiency, Workforce Dynamics.

1. Background and Introduction

The advent of artificial intelligence (AI) has sparked a significant turning point in the advancement of the banking industry (Malali&Gopalakrishnan, 2020). As global financial markets become gradually competitive and customer expectations continue to change, banks are required to adopt innovative technologies to upgrade their operational efficiency, improve customer service, and sustain their competitive edge (Abbasov, 2022). AI, with its extensive capabilities ranging from data analysis to decision-making and automation, is actively becoming a fundamental part of banking operations worldwide (Kueschnig&Schertler, 2024). Conventionally, banks depended on traditional methods and human resources to manage their operations, make

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decisions, and interact with customers (Königstorfer&Thalmann, 2020). On the other hand, the information age has established a new paradigm where data-driven insights and automated processes can surpass conventional approaches in terms of speed, accuracy, and scalability (Satheesh& Nagaraj, 2021). The enforcement of AI technologies, such as machine learning (ML), natural language processing (NLP), and robotic process automation (RPA), is revolutionizing how the functioning of banks, empowering them to process huge quantities of data, detect fraudulent activities on a real-time basis, offer personalized customer services and reduce operational costs (Königstorfer&Thalmann, 2020).

As technology- driven financial services companies become more wider spread, established banks are under increasing pressure to update their principal commercial operations and offerings (Kristiana, 2024). Numerous banks address the difficulties associated with digitization by working with new businesses providing technology-driven financial services and cutting-edge service offerings (Hornuf, Klus, Lohwasser, &Schwienbacher, 2021). Globally, the financial technology (FinTech) revolution is raging. Although technology has been a part of the financial services sector since the 1850s, the term “fintech” has only become widely used in the last 20 years to refer to technological advancements that have the potential to revolutionize the way financial services are provided, inspire the development of cuttingedge business models, applications, procedures, and products, and benefit consumers (Murinde, Rizopoulos, &Zachariadis, 2022)

The banking industry is experiencing an intense transformation navigated by the fusing of AI technologies. As financial institutions rapidly adopt AI, they are exposed to considerable changes in operational efficiency, customer service, and workforce dynamics. The stationing of AI over various functions of banking, risk management, fraud detection, credit scoring, and customer engagement is becoming crucial for banks to stay competitive in a steadily more digitalized financial environment (Subudhi, 2019). AI’s inherent potential to automate regular tasks and provide real-time analytics has contributed to significant refinement in operational efficiency. For example, AI-supported algorithms can handle huge volumes of transactions with higher speed and accuracy than traditional processing methods, resulting in decreased chances of human error and improving overall productivity (Ghandour, 2021). In addition, the utilization of AI-powered chatbots and virtual assistants has transformed customer service, empowering banks to handle inquiries more effectively and propose personalized experiences at scale (Jain, Panda, Durgude, & KR, 2023).

However, the adoption of AI in banking is also posing some challenges to the banks. One of the most demanding concerns is the impact on its workforce. As AI technology

occupies the tasks that were traditionally executed by humans, there is burgeoning anxiety regarding job displacement and changes in the nature of work in the banking industry (Ebrahim, Kumaraswamy, & Abdulla, 2021). The successful implementation of AI in banking requires getting control over fundamental barriers related to legacy systems, data integration, and regulatory compliance. Banks must concentrate on updating their IT infrastructure and developing rigorous data management practices to completely leverage AI's potential (Ashta& Herrmann, 2021).

2. Review of Literature

(AL-Dosari, Fetais, & Kucukvar, 2024) looks into how cybersecurity measures can be improved by artificial intelligence (AI) and the growing threat of cyberattacks in the banking industry. The research finds important AI applications that can enhance danger detection and response capabilities through expert interviews in Qatar's banking sector. It also draws attention to important implementation issues, like data management and regulatory compliance. The results highlight the necessity of adopting a decentralized strategy for data storage and the significance of creating cyber defence plans to shield financial institutions from ever-changing cyberthreats.

(Melati, 2024) looks at how financial technology, or fintech, has affected traditional banks' financial performance, especially those that are listed on the Indonesia stock exchange. It emphasizes how the use of fintech improves operational effectiveness, which has a favourable impact on growth, profitability, liquidity, and overall growth. A bank's liquidity and sustainability are reflected in its positive operating cash flow, which is found to be a crucial factor in determining its financial performance. To gain a deeper understanding of fintech's involvement in banking, the report recommends more investigation into a number of independent variables, including the implications of COVID-19 and features of mobile banking. The paper highlights the necessity of adaptable tactics in the face of ongoing digital change and offers insights into the disruptive potential of fintech in the banking industry through an analysis of the literature already in publication.

(Kueschnig&Schertler, 2024) compares fintech deals to non-Fintech deals in order to study how U.S. financial institutions' stock prices react to mergers and acquisitions (M&A). according to the research, acquirers benefit greatly from Fintech acquisitions since they yield substantially higher cumulative abnormal returns (CAAR) – 0.71% for Fintech deals compared to 0.14% for non-Fintech deals. Investors view the acquirer's first Fintech deal as a strong indication of the institution's commitment to digital innovation and future growth, which is why this positive reaction is especially noticeable in this case. Overall, the study contributes to the understanding of how Fintech M&A activity impacts investor perceptions and stock market performance in the financial sector.

(Noreen, Shafique, Ahmed, & Ashfaq, 2023) addresses AI integration in the banking industry, emphasizing how AI is revolutionizing customer services, operational efficiency, and basic banking tasks. It draws attention to the disparities in AI adoption across different nations, pointing out that, due to variables like customer preparedness and educational attainment, more developed countries like China, Iran, Saudi Arabia, and Thailand adopted AI earlier than Pakistan. Utilizing the theory of planned behaviour, the research examines customer intents to implement AI in banking by analyzing factors such as awareness, attitude, subjective norms, perceived risk, perceived utility, and technological expertise. The results reveal that higher education levels are associated with greater adoption of AI in financial services, as there is a substantial positive association between having a positive attitude towards AI and intending to embrace it. By considering all factors, the study emphasizes how critical it is to comprehend customer viewpoints and the difficulties posed by AI integration in the banking sector. (Satheesh & Nagaraj, 2021) Gives a clear explanation of how AI is rapidly improving customer experience and service quality, hence transforming the banking industry. It draws attention to the industry intensifying rivalry, which is being fuelled by globalization and changing consumer demand for improved service. Numerous AI applications are investigated; they include fraud detection systems, chatbots for customer service, mobile banking solutions, credit score assessment tools, and more. All of these applications lead to more effective banking operations. The authors stress that AI lightens workers' workloads so they can concentrate on more difficult jobs while also enhancing the accuracy and speed of services provided to clients. In order to satisfy the expectations of a client base that is technologically sophisticated, AI is positioned as a crucial element for banks to improve their reputation and operational efficiency in a market that is very competitive.

(Hornuf, Klus, Lohwasser, & Schwienbacher, 2021) examines the strategic partnerships that banks have with fintech companies, emphasizing the ways in which these alliances assist banks in overcoming the obstacles posed by digitalization. The findings indicate that banks possessing a well-defined digital strategy and a chief digital officer (CDO) are inclined to form alliances with Fintech. Approximately one-third of the institutions surveyed made a minority investment in these firms. According to the research, bigger, universal banks are more likely to create partnerships than smaller, specialized banks, and a huge number of FinTech's are active in the payment services industry. The study also shows that banks with lower profitability frequently look to form alliances in order to make up for their inefficiencies. These agreements may reduce value in the near term, according to financial markets, but it is unclear how these collaborations will affect long-term performance. Overall, the results highlight how crucial digital transformation is for banks and how innovation must be approached with balance.

They also imply that although partnerships might improve service offerings, banks shouldn't rely too heavily on fintech partners.

3. Objectives of the Study

1. To examine how AI and Fintech affect the banking industry's operational efficiency and their personnel.

4. Research Methodology

4.1 Type of Research

This analysis is a type of applied research because it aims at analyzing operational efficiency, and impact on workforce through addressing the benefits and challenges faced by the banking sector as a result of adoption to AI and Fintech. An empirical study has been conducted to evaluate the impact of integration of Fintech and AI technologies into banking on the operational efficiency and workforce.

4.2 Data Collection Technique

The data is collected from the primary sources through designing and circulating a wellstructured questionnaire. An online survey has been conducted through Google forms and the link was shared among the employees of selected banks across Bengaluru. The secondary data has been collected from various sources like published information in websites, e-books, business magazines, existing research articles from various databases.

4.3 Sampling Design

A non-probability sampling method i.e., convenience sampling has been chosen to select the respondents for the study. The sample includes 264 respondents who are presently working in the banking sector. Sampling frame includes 2 public sector banks: State Bank of India and Bank of Baroda, 2 Private sector banks: Industrial Investment Credit Corporation of India and Housing Development Finance Corporation, 2 Foreign banks: Hon Kong and Shanghai Banking Corporation and Standard Chartered Bank. The number of respondents were chosen on the general thumb rule of Robert F. Devellis and Joseph F. Hair.

4.4 Data Analysis Technique

The data has been initially analysed using the percentage method. "Factor analysis" and "Regression" has been used to analyse the data.

5. Analysis and Findings

Hypothetical Model



Hypothesis

H₁: There is significant relationship between operational efficiency and service quality enhancement.

H₂: There is a significant relationship between operational efficiency and workforce dynamics. H₃: There is a significant relationship between operational efficiency and cost & risk management.

Table 1: Demographic profile of the respondents

Demographic characteristics		Frequency	Percentage
Gender	Male	172	65.2
	Female	92	34.8
Age group (Years)	Below 35	89	33.7
	35-45	112	42.4
	46 and above	63	23.9
Level of Education	Bachelor's Degree	97	36.7
	Master's Degree	167	63.3
	Public sector Bank	49	18.5
	Private Bank	176	66.7
Type of the bank they are working for	Foreign Bank	39	14.8
Experience in Banking sector	Less than 1 year	44	16.7
	1 – 3 years	95	36
	4 - 6 years	59	22.3
	7 years and above	66	25

The table below shows the respondent's basic details. A Total of 264 people were surveyed, of which males are 65.2% and females are 34.8%. Among them, 33.7% belong to the age category of below 35 years, 42.4% belong to 35-45 years, and 23.9% belong to 46 years and above. In that 36.7% of the respondents have the level of education till bachelor's degree, and the remaining 63.3% belongs to the category of master's degree. 18.5% of the respondents work for public sector banks, 66.7% works for private sector banks, and 14.8% work for foreign banks. 16.7% of the respondents have less than 1 year of experience; 36% have experience of 1-3 years; 22.3% have experience of 4-6 years; and 25% have experience of 7 years and above.

Table 2 “KMO and Bartlett's Test”

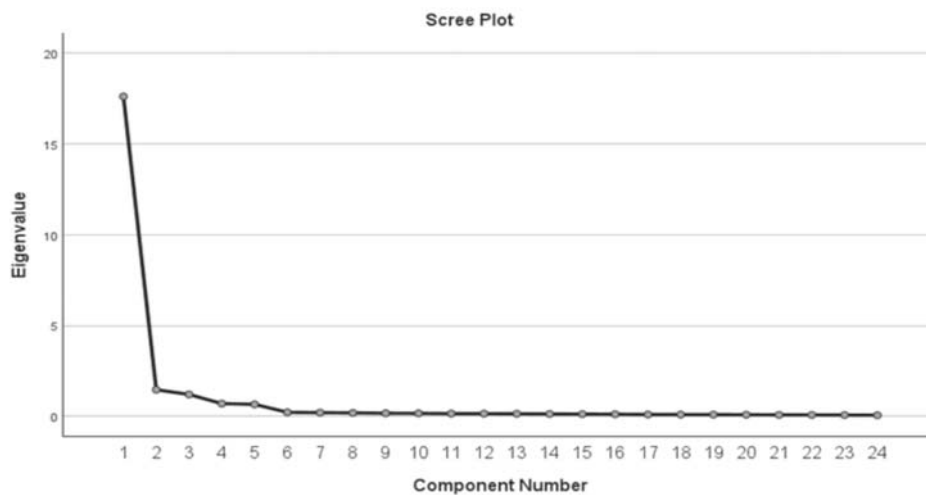
“Kaiser-Meyner-Olkin Measure of Sampling Adequacy”		0.972
“Bartlett's Test of Sphericity”	Approx. Chi-Square	9723.929
	Df	276
	Sig.	<.001

In the above table, the KMO result of 0.972 indicates that the “Bartlett's Test of Sphericity” is significant, data is suitable for factor analysis and the correlations between the variables are suitably compact.

“Component”	“Initial Eigen values”			“Rotation Sums of Squared Loadings”		
	“Total”	“% of Variance”	“Cumulative %”	“Total”	“% of Variance”	“Cumulative %”
1	17.616	73.400	73.400	7.732	32.219	32.219
2	1.461	6.008	79.489	6.716	27.985	60.203
3	1.203	5.011	84.500	5.831	24.297	84.500
4	.698	2.907	87.407			
5	.658	2.742	90.149			
6	.217	.903	91.052			
7	.200	.832	91.884			
8	.186	.774	92.658			
9	.166	.693	93.351			
10	.162	.675	94.027			

11	.147	.613	94.640			
12	.145	.602	95.242			
13	.138	.575	95.816			
14	.129	.536	96.352			
15	.120	.498	96.850			
16	.112	.468	97.318			
17	.099	.413	97.731			
18	.094	.393	98.123			
19	.093	.386	98.509			
20	.084	.352	98.861			
21	.076	.318	99.179			
22	.073	.305	99.484			
23	.066	.275	99.759			
24	.058	.241	100.000			

In the above table percentage of variance that each component explains are listed. The “principal component analysis” method was used to extract the components, found 3 factors from 24 variables. The factors explained variance of 32.219%, 27.985%, and 24.297% respectively. The total variance explained is 84.500%.



The graph above represents the Eigen values originated from the “Total Variance Explained table” for an elbow with 3 components.

Table 4 “Rotated Component Matrix”

S. NO.	“Statements”	“Factor Loading”	“Factor Reliability”
	Service Quality Enhancement		.976
01	AI and Fintech enhancements have contributed to higher customer retention rates	.800	
02	FinTech and AI- driven automation has significantly speed up routine tasks	.797	
03	Enhances accessibility and convenience for customers	.796	
04	Promotes cost-effective customer acquisition	.790	
05	Offers innovative tools and platforms for the customers	.788	
06	Reduced the need for human intervention in routine tasks	.730	
07	Customers are more satisfies with the bank’s services due to integration of AI and FinTech	.720	
08	AI tools, such as chatbots, have significantly reduced the response time to customer inquiries	.719	
09	AI has improved the accuracy and efficiency of employees’ work	.719	
10	Enables the digitization of document management processes	.710	
	Workforce Dynamics		.972
11	Upgradation to technology changed the complexity of employees’ tasks	.815	
12	AI and FinTech have improved work-life balance by reducing the workload	.808	
13	Employees are adaptable to the changes brought by AI and Fintech	.785	
14	AI and FinTech have positively impacted employee engagement and motivation	.780	
15	AI will improve the efficiency and accuracy of job roles in the banks.	.768	
	Cost and Risk Management		.967
16	Reduced the costs associated with traditional banking processes	.806	
17	Improved the bank’s ability to identify potential risks early	.801	
18	Facilitates for risk mitigation and management	.795	
19	Automation has reduced the error rate in operational processes	.783	
20	Helps in forecasting the credit risks	.768	
21	Effective in detecting and preventing fraudulent activities in banks	.640	
22	Helps to protect sensitive financial data	.636	
23	Improves the accuracy of credit assessments	.615	
24	Optimized the use of financial resources, leading to cost savings in operations	.615	

Variables and factors that reflects the role of AI and Fintech integration on the efficiency of banks and their employees are listed in the table “Rotated Component matrix”. Factor loadings of each manifest variable represent the correlation with the respective latent variable it is associated with. Factor reliability is the Cronbach’s alpha for each latent variable, indicating the internal consistency of the components grouped under that factor. First factor technological impact on efficiency is related to how AI and Fintech improve efficiency and customer service enhancement in banking, which reflects a high reliability of .976 and related factor loadings shows that these items reliably measure the impact of AI and Fintech on operational efficiency and customer satisfaction, including the aspects like automation, customer retention, reduced need for human intervention, and improved service delivery. The second factor workforce dynamics includes the variables which depicts how AI and Fintech impacts employees and their working environment, which reflects high reliability .972 and strong factor loadings indicates this group of components consistently measure impact of AI and workforce on employees. Third factor is associated with technological impact on cost reduction and risk management with a reliability of .967 represents the effectiveness of AI and Fintech in reducing costs and managing risks in the banks.

Table 5 “Reliability Statistics”

“Cronbach’s Alpha”	“N of Items”
.984	24

The reliability for 3 factors with total of twenty-four elements is 0.984, indicating greater internal consistency among them.

Regression Analysis

Statistically the equation of regression can be expressed as follows

$$\hat{Y} = \alpha + \hat{a}_1 X_1 + \hat{a}_2 X_2 + \hat{a}_3 X_3 + e_i$$

Where,

\hat{Y} = Operational Efficiency α = Constant

X_1 = Service quality enhancement

X_2 = Work force dynamics

X_3 = Cost and Risk Management

$\hat{a}_1 \hat{a}_2 \& \hat{a}_3$ = Regression coefficients of Two Factors e_i = Error Item

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.871a	.759	.759	0.0303

a. Predictors: (Constant), Service Quality Enhancement, Workforce Dynamics, and Cost & Risk Management

The above model summary indicates that, the value of R represents the correlation coefficient, which measures the strength and direction of the linear relationship between the independent variables and the dependent variable. In this case, the value of R is .871, indicating a relatively strong positive correlation. The R Square value, also known as the coefficient of determination, represents the proportion of the variance in the Operational efficiency that can be explained by Service Quality Enhancement, Workforce Dynamics, and Cost & Risk Management. In this case, the R Square value is .759, indicating that approximately 75.9% of the variance in the Operational Efficiency of the banks can be explained by the by Service Quality enhancement, Workforce Dynamics, and Cost & Risk Management.

6. Conclusion

The analysis stressed the impact of AI and FinTech adoption on the banks and their workforce, pointing out its influence on technological impact on efficiency in operations and customer service, technological impact on cost reduction and risk management, and workforce dynamics. The results strongly indicate that Fintech and AI are significantly and positively affecting the banking industry. These technologies are lowering operating costs and strengthening risk management capabilities while also improving employee engagement and work-life balance, reducing the complexity involved in jobs, which is changing workforce dynamics in addition to increasing operational efficiency. The findings highlight the importance of adopting AI and Fintech to improve operational performance by reducing costs, enhancing customer experience and risk management, and worker satisfaction in the banking sector.

7. Scope for further Research

Further research can be conducted by adding some more variables to the existing study, which proves to be relevant in understanding the impact of AI and FinTech on the operational efficiency of banks and their workforce, and by considering a larger number of respondents from different banks.

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ECOLOGICAL IMPROVEMENT THROUGH CSR ACTIVITIES BY COMPANIES AND DIFFERENT TYPES OF SUPPLIERS IN TAMIL NADU

AISHWARYA S, DR.C.VETHIRAJAN

Abstract : This article examines how environmental management initiatives are proliferating in the corporate sector and the justifications and incentives given by chief executive officers for adopting these regulations in a given industry. The general concept of corporate social responsibility, or CSR, is used in this article to frame these sustainable practices while examining the causes of environmental conduct. This study used a mixed-methods approach. Data showed that environmental management practices were used for both tactical and legal grounds. The concept of corporate social responsibility, or CSR, and the numerous CSR projects carried out by Indian companies are the main subjects of the study. In addition, it examines the funding allocated for corporate social responsibility (CSR) initiatives in the areas of underprivileged R&D, sports-related activities, infrastructure, health, education, national donation, and skill development. It also looks at the CSR policies and programs of the government, as well as the CSR practices of Indian companies in the Chennai region, including the expectations of suppliers, customers, and employees. Finally, it compares the performance of manufacturing and service sector companies in the Chennai region with CSR practices.

Keywords: Corporate Social Responsibility (CSR), environmental sustainability, Eco-strategy, CSR initiatives.

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1. INTRODUCTION

Nowadays, companies place a greater emphasis on corporate social responsibility (CSR), and global CSR initiatives are shaped by social, political, and economic variables. According to some authors, corporate social responsibility (CSR) refers to a collection of voluntary activities that go above and beyond what is legally required of businesses to advance social good and go beyond the explicit financial interests of the company. Here, they contend that environmentally conscious business practices constitute a component of corporate social responsibility (CSR) since they are frequently started for non-profit purposes (though they can occasionally be for profit), they are not usually mandated by legislation, and they provide benefits to the company. This study addresses contextual factors that encourage social responsibility in organizations, with a particular focus on corporate environmental responsibility. Though academics and practitioners have shown a great deal of interest in CSR practices, the motivations behind these practices have not received much attention in the academic literature, especially when looking at it from an empirical standpoint. Indeed, there isn't enough research on what causes environmental behavior, especially in the case of small and medium-sized businesses (SMEs), and we need to learn more about the mechanisms.

Furthermore, it has been argued that, in light of societal shifts regarding the role that corporations should play in resolving social issues, many businesses' definitions of legitimacy have evolved in the new millennium, and that it may be strategically and morally necessary for them to engage in community development initiatives. Hence, they clarify that the reasons for participating in corporate social responsibility (CSR) may be evolving—that is, moving from a purely optional activity to one that is more strategically integrated into the organization's values—and that the reasons and function of CSR in business should be re-examined.

As the importance of corporate social responsibility (CSR) in business has increased, so too has the topic's profile in academic writing. According to the methodology used in this paper, despite the tendency of academics to concentrate on finding the connection between financial and social performance. This is especially true about CSR, where the "motives of managers, shareholders, and other key stakeholders shape the way corporations are governed." According to institutional theorists, several pertinent institutional factors may be at play when deciding how far a company is willing to go in implementing socially conscious business practices. In actuality, institutional constraints that restrict CSR could lead to an institutional environment that is more uniform. Organizations across industries are adopting more standardized and rationalized practices as a result of these developments, which are manifested in regulative, normative, and cognitive processes.

2. LITERATURE SURVEY

Corporate Social Responsibility (CSR) On Sustainable Performance

To investigate how environmental consequences, new product development performance, superior customer value, and corporate social responsibility (CSR) relate to sustainable performance given in Figure 1, Abbas et al. (2019) conducted a focused analysis. The results of this study could lead scholars and researchers in new ways when it comes to thinking about adding more factors and using a larger sample size in different parts of the world. The results help bridge the knowledge gap about the interaction between social media marketing applications, corporate social responsibility, and environmental effects in determining the sustainable performance of commercial enterprises. The dissemination of environmental management initiatives in business, as well as the reasons and pressures senior executives describe having to embrace these practices in a particular industry, are examined by Babiak et al. (2011). Based on the data, environmental management practices were adopted for both legitimate and strategic reasons. More precisely, the data indicated that the main driver for focusing on environmental CSR was strategic considerations. Although to a lesser degree, there were also motivations to address institutional pressures.

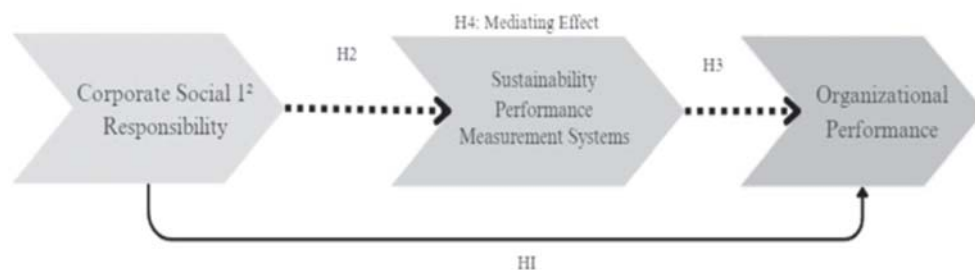


Figure 1: Sustainability performance of CSR Eco- Advertising

A study by Hayat et al. (2022) examines the connection between GIB, GPI, and CSR. According to the study, there is a crucial element that likely explains people's actions and might be investigated by taking a comprehensive approach to green purchasing habits. A theoretical framework for incorporating corporate social and environmental obligations into the creation and application of management strategies is offered by Hba et al. (2016). Figure 2 presents the ecoadvertising in a CSR manner.

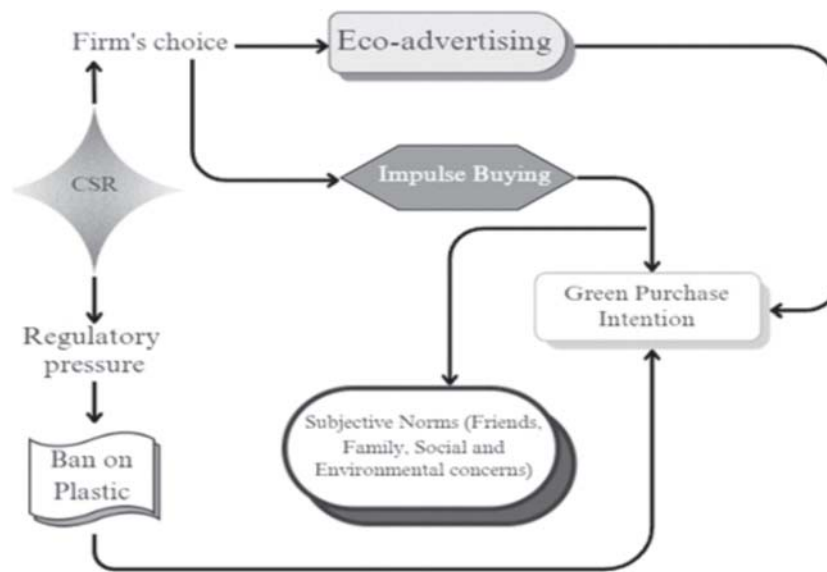


Figure 2: Influences of CSR in Eco- advertising

2. Internal Stakeholders Regarding CSR Initiatives

The goal of Kallmuenzer et al. (2023) is to investigate internal stakeholders' opinions and experiences about CSR efforts. Additionally, it looks for themes in narrative interviews that are pertinent to workers who are undergoing a radical change process that will lead to sustainability. The results emphasize how important it is for employees to act as CSR facilitators, point out possible differences in viewpoints regarding sustainability activities, and suggest that employees be included and given more authority in CSR projects. By doing this, organizations may address social sustainability more and more, both inside the company and in the larger context, and execute ecological sustainability more successfully. According to Khojastehpour et al. (2020), the concept of generating value for stakeholders by establishing moral relationships with them is closely related to managing ecological stakeholder relationships. In this regard, the paper makes the argument that, as society places more focus on ensuring that businesses are accountable to a variety of stakeholders, including ecological stakeholders, the complexity of relational constraints increases when a business operates in international markets.

3. Environmental Protection And Counteracting Global Warming

According to Kuzior et al. (2022), cutting energy use is essential to lowering carbon dioxide emissions. Of course, there are several methods to accomplish this, including putting the principles included in each company's corporate social responsibility (CSR) program—which includes environmental preservation and combating global warming—

into reality. This article utilizes the Marcel CHP plant as an example. Because of its abilities, it also uses coke oven gas, which has fewer carbon dioxide emissions than natural gas. The use of coke oven gas as an alternative to natural gas is also compared in the article. The results obtained demonstrate the substantial and practical potential for lowering carbon dioxide emissions. Within the framework of an ecological systems theory, Musgrave et al. (2016) investigate the contextual issue around CSR adaption and practice within the meetings industry. To provide a thorough audit trail of analysis, the writers used a continuous comparison process on 90 interview transcripts. The following eight practices were found to be effective: supply chain management, workforce engagement, legislation, green technology, reliability, and transparency, volunteer labor, and nonfinancial donations. Acknowledging a systems approach to corporate social responsibility (CSR) signifies accepting that there is no one ideal way and that various CSR values, implementation strategies, and assessment techniques can provide comparable outcomes.

3. Ecological Strategy

Strategic CSR, which is defined as voluntary CSR activities that improve a firm's competitiveness and reputation, is reviewed by Orlitzky et al. (2011) using three theoretical frameworks. Pierce & Associates, 2017 Today, a comprehensive framework for classifying ecological strategies exists, based on easily identified leaf features of a wide range of plants, including tropical trees, lianas, and temperate ferns. The method's ability to resolve global strategy–environment linkages will provide a baseline for predicting the kinds of species that can be predicted to gather there in response to environmental disconcertion brought on by things like changes in land use or climate.



Figure 3: Strategical viewpoint of CSR

Reverte et al. (2016) fill a major vacuum in the literature by investigating the effects of CSR practices on an organizational performance measure that combines financial and non-financial indicators, as well as the potential mediating role of innovation in the CSR–performance relationship. Rosado et al. (2017) state that the degree to which integrative traits and CSR strategies are significant in characterizing dominance ranking may depend on how CSR strategies are filtered in each environment. When a small number of strategy classes are viable (Figure 3), integrative traits might be more important in explaining variance in degrees of dominance.

3.1 Environmental performance of small and medium sized enterprises (SMEs)

The goal of Shafique et al. (2021) is to look into how small- and medium-sized businesses (SMEs') environmental performance is affected by organisational ambidexterity and green entrepreneurial orientation (GEO). This study, which draws on social capital theory (SCT), proposes that corporate social responsibility (CSR) is a crucial setting that modifies the relationship between organisational ambidexterity and GEO. 307 manufacturing SMEs in Pakistan provided data, which were then analysed using structural equation modeling (SEM) based on partial least squares (PLS). The findings offered factual proof in favour of the study's theories. The results suggest that innovation discovery and exploitation in tandem with GEO can lessen the complexity and challenges businesses have in attaining environmental performance. The resource-based view of the business, evolutionary economics (EC), transaction cost economics (TCE), and Sisaye et al. (2022) offers an integrated approach to organisational ecology, population ecology, and selection mechanisms. Using this paradigm, it investigates the connections between global reporting initiatives and corporate social reporting (CSR).

3.2 Eco-friendly products with CSR

Emiechowski et al. (2017) focused on small family tanneries and large tanneries that were deemed to be the most environmentally friendly, based on a list compiled by the Leather Working Group (LWG). Analyzing the variables influencing pro-environmental actions was crucial. The legal rules that are in place in a particular country are what lead to tanneries taking pro-ecological initiatives, rather than CSR reporting. CSR has a significant impact on proenvironmental initiatives implemented in large businesses. Sun et al. (2022) use a cutting-edge theory-driven approach to look into the variables that affect consumers' willingness to pay more for environmentally friendly products. To validate the factors influencing the purchase of ecofriendly products, this study used the Theory of Planned Behaviour (TPB).

4. METHODOLOGY

4.1 Data collection

The study centers on the idea of CSR, particularly the many CSR initiatives undertaken by

Indian businesses. It also looks at the funding allotted for CSR initiatives in the areas of impoverished research and development, sports-related activities, infrastructure, health, education, national donation, and skill development. Ten distinct industrial and service sector businesses in the Chennai area are taken into consideration in the study. Divergent views exist regarding the extent of a business's responsibility towards customers, employees, investors, suppliers, and the community at large, even though this responsibility is universally acknowledged. These differences can be attributed to several factors, including time, money, and human energy constraints. Consequently, it is necessary to assess the steps that the Indian corporations have taken to ascertain the extent to which they are taking on responsibility. It is also necessary to assess the respondents' opinions of different Indian companies in light of their degree of commitment.

4.2 Hypothesis

H01: There is no discernible difference between the beneficiaries' category and corporations' levels of agreement on environmental upgrading through CSR practises.

H02: The degree of agreement between corporate and beneficiary gender groups about environmental upgrading through CSR practises is not significantly different.

H03: The degree of agreement between beneficiary age groups and corporations on environmental upgrading through CSR practises is not significantly different.

H04: There is no discernible variation in the degree of agreement between the corporate and residential locations of beneficiaries about environmental upgrading through CSR practises.

H05: There is no discernible variation in the degree of agreement about beneficiary education and environmental upgrading through corporate social responsibility (CSR) practises.

5. FINDINGS AND DATA ANALYSIS

with the degree of agreement with environmental upgrading through CSR practises, such as a series of charitable endeavours, the null hypothesis (H0) is rejected at the 5% level of significance. Respect national labour and environmental laws; encourage corporate justice, openness, and accountability; reduce adverse effects on the company's

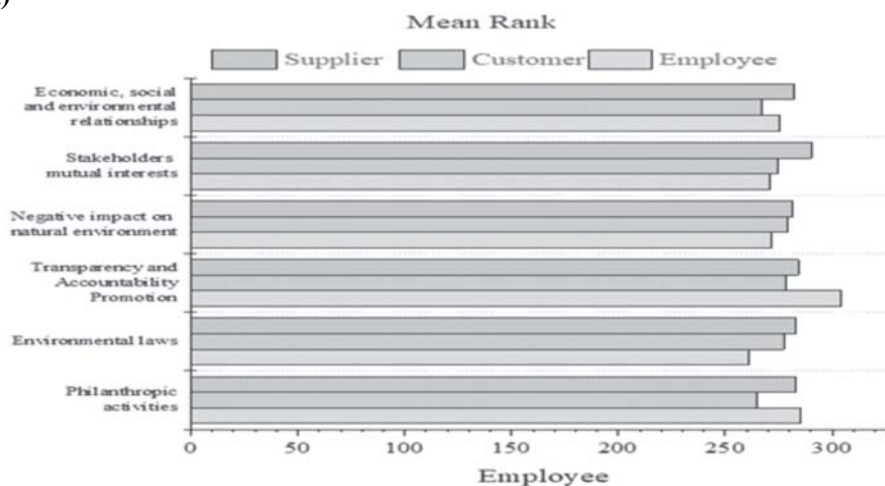
natural and social environment; and manage its relationships with stakeholders in the areas of economics, social work, and the environment, as well as how it interacts with the Category of Beneficiaries because the p-value is less than 0.05. Figure 4 and Table 1 demonstrate that there is a notable variation in the degree of agreement on environmental upgrading through CSR practises among the Category of Beneficiaries.

Table 1: Kruskal-Wallis Test: Level of agreement about environmental upgradation through CSR practices based on Category of Beneficiaries

CSR Statement	Chi-Square χ^2	pvalue	Category of Beneficiaries (Mean Rank)		
			Employee	Customer	Supplier
A set of philanthropic activities	40.841	0.000	285.12	264.93	283.14
Respect national laws regarding employment and the environment.	27.358	0.000	261.42	277.45	283.28
Encouraging corporate equity, openness, and responsibility	14.932	0.009	304.51	278.22	284.16
Reduce the adverse effects on the natural and social environments of the company.	17.405	0.003	271.31	278.94	281.36
Interact with their stakeholders to ensure that their interests coincide.	1.820	0.705	271.15	274.50	290.40
maintains control over its connections with stakeholders and the environment, social and economic	77.083	0.000	275.58	266.98	281.96

Source : Author's Computation

Figure 4: Analysis of CSR practices based on Category of Beneficiaries (Mean Rank)



6. LEVEL OF AGREEMENT ABOUT ENVIRONMENTAL UPGRADATION THROUGH CSR PRACTICES BY CORPORATE AND GENDER OF BENEFICIARIES.

An effort was undertaken to determine the degree of agreement between different gender groupings, such as men and women. The following null hypothesis was created with a gender personal profile to gauge the level of agreement on environmental improvement through corporate social responsibility (CSR) practices.

H0: The degree of agreement between corporate and beneficiary gender groups about environmental upgrading through CSR practices is not significantly different.

The suggested null hypothesis was tested and the degree of agreement on environmental upgrading through CSR activities was examined using the non-parametric statistics of the Mann Whitney U test. Table 2 provides specifics on the outcome of the Mann-Whitney U test.

Table 2 Level of agreement about environmental upgradation through CSR practices

S. No.	Factors	U-value	Z-value	p-value	Mean rank	
					Male	Female
Product						
1.	philanthropic activities	67238.77	-1.089	0.277	260.707	247.204
2.	Respect national laws regarding employment and the environment.	66834.57	-1.324	0.006	262.450	245.711
3.	Encouraging corporate equity, openness, and responsibility	58830.85	-0.147	0.885	252.493	254.246
4.	Reduce the adverse effects on the natural and social environments of the company.	52035.7	-4.402	0.000	223.333	279.219
5.	Interact with their stakeholders to ensure that their interests coincide.	58401.62	-0.416	0.679	250.650	255.819
6.	maintains control over its connections with stakeholders and the environment, social and economic	53025.73	-4.485	0.000	227.582	284.531

Source : Author's Computation

The gender group of beneficiaries and the degree of agreement on environmental upgrading through CSR practises were compared using the Mann-Whitney U test. Because the p-value is less than 0.05, the level of agreement regarding environmental improvement through corporate social responsibility (CSR) practices—such as following national labour and environmental laws, minimising negative effects on the

company's social and natural environment, managing its relationships with the government, the business community, and stakeholder groups—is rejected at the 5% level of significance. It shows that there are significant gender disparities in the level of agreement about CSR practises that help the environment.

7. LEVEL OF AGREEMENT ABOUT ENVIRONMENTAL UPGRADATION THROUGH CSR PRACTICES BY CORPORATE AND AGE OF BENEFICIARIES.

To assess the degree of agreement on the CSR statements according to the beneficiaries' age group, the following null hypothesis was put out.

H₀: The degree of agreement between beneficiary age groups and business CSR practises for environmental upgrading is not significantly different.

The hypothesized null hypothesis was tested and the degree of agreement about environmental upgrading through corporate social responsibility (CSR) practises was analysed using the nonparametric statistics of the Kruskal-Wallis test. Table 3 provides a detailed illustration of the Kruskal-Wallis test result.

Table 3 Kruskal-Wallis Test: Level of agreement about environmental upgradation through CSR practices based on age groups of Beneficiaries

S. No.	Factors	Chi-Square χ^2	p value	Age Group (Mean Rank)				
				Below 20	21-30	31-40	41-50	Above 50
1.	philanthropic activities	3.043	.551	275.39	261.42	253.26	263.45	234.39
2.	Respect national laws regarding employment and the environment.	1.273	.866	255.86	254.10	270.76	243.68	265.34
3.	Encouraging corporate equity, openness, and responsibility	2.615	.624	254.44	261.89	250.42	206.45	269.71
4.	Reduce the adverse effects on the natural and social environments of the company.	3.130	.023	270.53	261.30	260.87	214.55	235.66
5.	Interact with their stakeholders to ensure that their interests coincide.	3.414	.491	248.47	261.81	253.92	238.50	263.06
6.	maintains control over its connections with stakeholders and the environment, social and economic	5.335	.255	276.30	264.46	242.54	201.18	249.57

Source : Author's Computation

Regarding the degree of agreement regarding environmental upgradation through CSR practises like Minimise the negative impact on the company's social and natural environment and the way it engages with its stakeholder with age group, the null hypothesis (H0) is rejected at the 5% level of significance because the p-value is less than 0.05. It demonstrates that there is a notable variation in the degree of agreement regarding environmental improvement through CSR practises within the age group.

8. LEVEL OF AGREEMENT ABOUT ENVIRONMENTAL UPGRADATION THROUGH CSR PRACTICES BY CORPORATE AND COMMUNITY OF BENEFICIARIES.

To assess the degree of agreement on the CSR statements based on the Community of Beneficiaries, the following null hypothesis was put forth.

H0: There is no discernible difference in the degree of agreement between corporations and beneficiary communities about environmental upgrading through CSR practises.

The hypothesised null hypothesis was tested and the degree of agreement about environmental upgrading through corporate social responsibility (CSR) practises were analysed using the nonparametric statistics of the Kruskal-Wallis test. Table 4 illustrates the Kruskal-Wallis test result in detail.

Table 4 Kruskal-Wallis Test: Level of agreement about environmental upgradation through CSR practices based on Community of Beneficiaries

S. No.	Factors	Chi-Square χ^2	p value	Community Group (Mean Rank)			
				SC/ST	MBC	BC	FC
1.	A set of philanthropic Activities	2.759	.430	270.92	264.81	248.73	273.01
2.	Federal labour and environmental legislation	1.196	.754	271.78	258.25	260.98	246.33
3.	Encouraging corporate equity, openness, and responsibility	.966	.809	257.61	268.63	254.19	257.00
4.	Reduce the adverse effects on the company's surroundings, both natural and social.	5.052	.168	271.07	280.23	249.45	248.91
5.	Interact with their stakeholders to ensure that their interests coincide.	1.664	.645	247.54	270.89	254.44	257.08
6.	maintains control over its connections with stakeholders and the environment, social and economic	1.790	.617	283.63	254.70	260.10	249.21

Source : Author's Computation

Because the p-value is less than 0.05, the null hypothesis (H0) regarding the degree of agreement on environmental upgrading through CSR practices—such as how it interacts with its stakeholders with community groups—is rejected at the 5% level of significance. It demonstrates that there are substantial differences in the Community group’s degree of agreement regarding environmental improvement through CSR activities.

9. LEVEL OF AGREEMENT ABOUT ENVIRONMENTAL UPGRADATION THROUGH CSR PRACTICES BY CORPORATE AND RESIDENTIAL LOCATION OF BENEFICIARIES.

To examine the degree of agreement on the CSR statements based on the beneficiaries’ residential location group, the following null hypothesis was put out.

H0: The degree of agreement between the business and residential location groups of beneficiaries regarding environmental upgrading through CSR practises is not significantly different.

The hypothesised null hypothesis was tested and the degree of agreement about environmental upgrading through corporate social responsibility (CSR) practises was analyzed using the nonparametric statistics of the Kruskal-Wallis test. Table 5 illustrates the Kruskal-Wallis test result in detail.

Table 5 Kruskal-Wallis Test: Level of agreement about environmental upgradation through CSR practices based on the Residential location of Beneficiaries

CSR Statement	Chi-Square χ^2	pvalue	Residential location (Mean Rank)		
			Rural	Semi-Urban	Urban
A set of philanthropic activities	33.945	0.000	214.67	219.47	298.44
Respect national laws regarding employment and the environment.	22.738	0.000	281.15	218.90	214.03
Encouraging corporate accountability, transparency, and fairness	12.411	0.007	263.15	219.05	237.58
Reduce the adverse effects on the natural and social environments of the company.	14.466	0.003	193.54	247.88	221.60
Interact with their stakeholders to ensure that their interests coincide.	1.513	0.586	225.04	246.26	231.31
maintains control over its connections with stakeholders and the environment, social and economic	64.066	0.000	276.33	230.35	247.74

Source : Author’s Computation

At the 5% level of significance, the null hypothesis (H0) regarding the degree of agreement with environmental upgrading through CSR practices, such as a series of charitable endeavors, Respect for national labor and environmental laws; encouraging business accountability, transparency, and fairness; Reduce the adverse effects on the company's natural and social surroundings and manage its connections with the environment, economy, and stakeholder base in light of the p-value being less than 0.05. It demonstrates that there is a notable variation in the degree of agreement on environmental improvement through CSR practices among the residential locations.

10. LEVEL OF AGREEMENT ABOUT ENVIRONMENTAL UPGRADATION THROUGH CSR PRACTICES BY CORPORATE AND EDUCATION OF BENEFICIARIES.

Based on the beneficiaries' educational backgrounds, the following null hypothesis was put up to assess the degree of agreement on the CSR statements.

H0: There is no discernible variation in the degree of agreement about beneficiary education and environmental upgrading through corporate social responsibility (CSR) practices.

The hypothesized null hypothesis was tested and the degree of agreement about environmental upgrading through corporate social responsibility (CSR) practices was analyzed using the nonparametric statistics of the Kruskal-Wallis test. Table 6 illustrates the Kruskal-Wallis test result in detail.

Table 6 Kruskal-Wallis Test: Level of agreement about environmental upgradation through CSR practices based on education of Beneficiaries

S. No	Factors	Chi-Square χ^2	pvalue	Education Group (Mean Rank)			
				Secondary	Graduate	Post graduate	Professional
1.	A set of philanthropic activities	36.624	0.000	231.62	236.80	322.00	209.15
2.	Abide to national labour and environmental laws	24.533	0.000	303.34	236.18	230.92	220.85
3.	Promoting corporate fairness, transparency, and accountability	13.391	0.008	283.92	236.34	256.34	216.37

4.	Reduce the adverse effects on the natural and social environments of the company.	15.608	0.003	208.81	267.45	239.09	267.48
5.	Interact with their stakeholders to ensure that their interests coincide.	1.632	0.633	242.80	265.70	249.57	242.71
6.	Manages its economic, social And environmental	69.124	0.000	298.14	248.53	267.29	119.48

Source : Author's Computation

Regarding the degree of agreement regarding environmental upgradation through corporate social responsibility (CSR) practices, such as adhering to national labor and environmental laws, minimizing negative effects on the company's environment, managing its relationships with the government on the economic, social, and environmental fronts, and educating stakeholders, the null hypothesis (H₀) is rejected at the 5% level of significance because the p-value is less than 0.05. It demonstrates that there are substantial differences in the degree of agreement among educators on environmental improvement through CSR practices.

11. BENEFICIARIES' PERCEPTIONS ABOUT THE CSR PRACTICES OF CORPORATE COMPANIES AND COMMUNITY OF BENEFICIARIES.

To investigate the beneficiaries' opinions of the CSR practices, the Community group of recipients provided the basis for the following null hypothesis.

H₀: There is no discernible difference between beneficiaries' perceptions of community groups and corporate enterprises' CSR practices.

The hypothesized null hypothesis was tested and the Beneficiaries' opinions of corporate companies' CSR practices were analyzed using the non-parametric statistics of the KruskalWallis test. Table 7 illustrates the Kruskal-Wallis test result in detail.

Table 7 Kruskal-Wallis Test: Beneficiaries’ perceptions about the CSR practices of corporate companies based on the Community of Beneficiaries

CSR statement	Chi-Square χ^2	pvalue	Community Group (Mean Rank)			
			SC/ST	MBC	BC	FC
Commitment of corporates towards the economic and social development of communities	2.993	0.467	293.92	287.29	269.85	2.993
Charitable activities a corporate company carries out voluntarily in the local community	1.298	0.818	294.86	280.18	283.14	1.298
Resource-intensive and costly concept	1.048	0.878	279.48	291.44	275.77	1.048
Obligation of large multinational companies than of SMEs	5.481	0.182	294.09	304.02	270.63	5.481
Lead to an increase in profits	1.805	0.700	268.56	293.89	276.04	1.805

Source : Author’s Computation

As the p-value is less than 0.05, the null hypothesis (H₀) concerning the opinions of Beneficiaries regarding CSR practices of corporate firms, like their engagement with community groups, is rejected at the 5% significance level. It demonstrates that Beneficiaries’ opinions of corporate enterprises’ CSR initiatives vary significantly within the Community group.

12. BENEFICIARIES’ PERCEPTIONS ABOUT THE CSR PRACTICES OF CORPORATE COMPANIES AND THE RESIDENTIAL LOCATION OF BENEFICIARIES.

Based on the residential location group of beneficiaries, the following null hypothesis was put up to assess the beneficiaries’ perceptions of CSR practices.

H₀: The attitudes of beneficiaries about corporate social responsibility (CSR) practices and the residential location group of beneficiaries do not differ significantly.

The hypothesized null hypothesis was tested and the Beneficiaries’ opinions of corporate companies’ CSR practices were analyzed using the non-parametric statistics of the KruskalWallis test. Table 8 illustrates the Kruskal-Wallis test result in detail.

Table 8 Kruskal-Wallis Test: Beneficiaries’ perceptions about the CSR practices of corporate companies based on the Residential location of Beneficiaries

CSR Statement	Chi-Square χ^2	pvalue	Residential location (Mean Rank)		
			Rural	Semi-Urban	Urban
Commitment of corporates towards the economic and social development of communities	36.827	0.611	232.897	238.104	240.242
Charitable activities a corporate company carries out voluntarily in the local community	24.669	0.000	305.021	237.486	232.202
Resource-intensive and costly concept	13.465	0.008	285.493	237.649	257.752
Obligation of large multinational companies than of SMEs	15.694	0.003	209.973	268.926	240.415
Lead to an increase in profits	15.694	0.003	209.973	268.926	240.415

Source : Author’s Computation

The null hypothesis (H₀) about beneficiaries’ perceptions of CSR practices—such as voluntary philanthropic endeavors carried out by a corporate organization in the community—is rejected at the 5% level of significance. The concept requires a lot of resources and is expensive; larger multinational corporations are more obligated to them than SMEs; and the residential location group has a rise in earnings since the p-value is less than 0.05. It demonstrates that Beneficiaries’ perceptions of corporate enterprises’ CSR practices varied significantly among the Residential location group.

13. BENEFICIARIES’ PERCEPTIONS ABOUT THE CSR PRACTICES OF CORPORATE COMPANIES AND EDUCATION OF BENEFICIARIES.

To examine the beneficiaries’ opinions of the CSR practices based on their educational background, the following null hypothesis was put out.

H₀: Perceptions of corporate social responsibility (CSR) practices among beneficiaries and beneficiary education groups are not significantly different.

The hypothesized null hypothesis was tested and the Beneficiaries’ opinions of corporate companies’ CSR practices were analyzed using the non-parametric statistics of the KruskalWallis test. Table 9 illustrates the Kruskal-Wallis test results in detail.

Table 9 Kruskal-Wallis Test: Beneficiaries' perceptions about the CSR practices of corporate companies based on education of Beneficiaries

CSR Statement	Chi-Square χ^2	pvalue	Education Group (Mean Rank)			
			Secondary	Graduate	Postgraduate	Professional
Commitment of corporates towards the economic and social development of communities	45.158	0.000	251.286	256.906	349.340	45.158
Charitable activities a corporate company carries out voluntarily in the local community	15.767	0.000	329.095	256.233	250.526	15.767
Resource-intensive and costly concept	14.528	0.009	308.026	256.407	278.105	14.528
Obligation of large multinational companies than of SMEs	16.933	0.003	226.539	290.158	259.390	16.933
Lead to an increase in profits	34.318	0.014	263.415	288.259	270.760	34.318

Source : Author's Computation

The null hypothesis (H0) on beneficiaries' opinions of corporate social responsibility (CSR) activities, such as companies' dedication to the social and economic advancement of communities, is rejected at the 5% level of significance. Voluntary charitable endeavors a business enterprise undertakes in the neighborhood, A costly and resource-intensive notion, the obligation of giant multinational corporations over SMEs, and the fact that the p-value for the education group is less than 0.05 all contribute to the increase in profits. It demonstrates how Beneficiaries' opinions of corporate organizations' CSR initiatives varied significantly throughout the education category.

Table No 10 Eigen Values and Proportion of Total Variance of Each Underlying to Impact of advertisement on buying decision

	Total Variance Explained								
	Initial Eigen Values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	Variance %	Cumulative %	Total	Variance %	Cumulative %	Total	Variance %	Cumulative %
1	4.496	22.480	22.480	4.496	22.480	22.480	4.244	21.218	21.218
2	1.914	9.570	32.051	1.914	9.570	32.051	1.731	8.657	29.876
3	1.623	8.112	40.163	1.623	8.112	40.163	1.630	8.149	38.025
4	1.480	7.401	47.564	1.480	7.401	47.564	1.578	7.889	45.914
5	1.278	6.392	53.956	1.278	6.392	53.956	1.503	7.517	53.431
6	1.104	5.520	59.476	1.104	5.520	59.476	1.143	5.714	59.145
7	1.029	5.143	64.619	1.029	5.143	64.619	1.095	5.474	64.619

Source : Author's Computation

The results of Bartlett's Test of Sphericity reveal a significant value of 0.000, indicating that the factors that were chosen have a strong correlation with each other and have a statistically significant impact on consumer purchasing behavior. Seven of the factors in Table 10's factor analysis with an Eigenvalue greater than "one" were related to the corporate companies' purpose for implementing CSR practices. Out of the eight factors that explained 64.619 percent of the variance in the data set, the first one explained 22.480 percent, the second 9.570 percent, the third 8.112 percent, the fourth 7.401 percent, the fifth factor 6.392 percent, the sixth factor 5.520, and the seventh factor 5.143 percent.

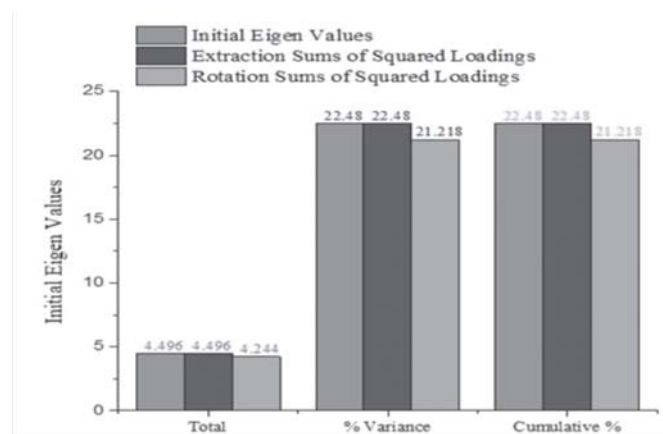


Figure 5: Result of Total variance of Initial Eigen Values

The final factors solution consists of the first seven factors, which collectively account for 64.619 percent of the variance in the scale items assessing the elements associated with the corporate companies' purpose for implementing CSR practices. Initial Eigen Values are analyzed through the seven factors shown in Figure 5.

14. Component Matrix for CSR

Table 11 illustrates the Rotated Component Matrix for the Impact of advertisements on buying decisions. Through the factor analysis, the purpose of CSR Practices of corporate companies has been identified and categorized into seven groups:

1. Optimum Utilization of Natural Resources
2. Better Financial Results Overall
3. Development
4. Promotion of Education
5. Clean Energy
6. Increased Assistance to Local Communities
7. Providing Sanitation

Table No. 11 Rotated Component Matrix for Impact of advertisement on buying decision

	Rotated Component Matrix ^a						
	Rescaled						
	Component						
	1	2	3	4	5	6	7
Involved In the beautification of parks	.671	-.066	.244	-.291	.033	.065	.126
Participate in Growing medical plants and trees	.627	.221	-.083	-.181	.197	.062	.047
Participates in forest conservation by plantation	.551	-.105	-.141	.050	.409	.197	-.071
Run mobile healthcare vans for the poor people	.519	.189	-.163	-.075	.173	-.053	.199
Organizing tournaments	.511	.123	.071	.099	.059	-.239	-.072
To Sustainable livelihood	.503	.046	.284	.320	.183	.005	.119
Financial aid is given to construct schools	.008	.860	.107	-.110	.137	-.017	-.070
Infrastructure facilities are provided in schools	.039	.676	-.085	.051	-.161	-.046	.226
Libraries are set books are donated	-.039	.672	-.268	.016	-.065	.051	.050
Computer programs are organized	.145	.662	-.015	.206	.177	-.085	.108

Source : Author's Computation

Scholarships are granted to the meritorious Students	.010	.651	-.202	.346	.045	.323	.048
Proper measurement stop prevents pollution	.191	.472	.079	-.152	.147	-.124	.215
Initiatives are taken to promote cation Among Women	-.011	-.103	.794	-.069	.169	.036	.071
Fund libraries of school colleges	-.001	-.209	.660	.204	.056	.172	.059
Provide scholarship for downtrodden section	.038	.215	.562	.238	-.261	-.063	-.010
Providing urban amenities	-.177	.235	-.525	.015	.063	.039	.471
Construct a toilet in the backward class	.221	.329	.517	.102	-.102	.096	.100
Schools are adopted for proper function	-.093	-.010	-.152	.804	.089	-.061	-.035
Organizing training workshops	-.273	.169	.411	.600	-.082	.172	-.162
Organize free medical checkups	-.088	.002	.336	.575	-.054	-.103	-.087
Organizes skill development program	-.205	.130	.443	.544	-.149	.081	.099
Take adequate measures to dispose of wastes	-.031	.000	.022	.508	.165	-.502	.222
Literacy awareness camp	.094	.172	-.493	.184	.637	-.014	.103
Initiative for conservation of botanical gardens	.191	.243	.140	.070	.561	-.219	.061
Use solar energy system	.200	.139	-.061	.472	-.561	.097	.234
Organize forestation campaigns	.227	.026	.082	.009	.479	.037	.269
To Promote agriculture	.045	-.064	.282	.094	-.020	.824	.042
Adoption of villages	.110	.203	-.193	-.186	.125	.607	.193
Bal wadies and Anganwadies are run	.337	.269	-.157	-.227	.273	.548	-.134
Provide free medical services	-.114	-.093	.260	.022	-.211	.527	.039
Relief initiatives	.044	.336	.152	-.004	.088	.057	.892
Improving sanitation	.152	-.053	-.145	-.030	-.035	-.038	-.681
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.							
a. Rotation converged in 13 iterations.							

Source : Author's Computation

15. Variables in optimum utilization of natural resource

Ensuring proper use of natural resources is one of the eight variables that make up the optimal utilization of natural resources factor. Engaging in park beautifying initiatives, cleaning, and restoration work, As their factor loading in this component is higher than the other factors, taking part in producing medicinal plants and trees, taking part in forest conservation by planting trees, operating mobile healthcare vans for the underprivileged, organizing tournaments, and practicing sustainable livelihood. Using

Cronbach's alpha, the total reliability of the variables in this factor has been estimated. Table 12 presents the findings.

Table 12 Optimum utilization of Natural resource

Sl. No	Variables	Factors Loading	Communality	Cronbach's Alpha
1.	Ensure proper utilization of natural resources	.842		
2.	Work for cleaning and restoration	.703		
3.	Involved In the beautification of parks	.671		
4.	Participate in growing medical plants and trees	.627		
5.	Participates in forest conservation by plantation	.551		
6.	Run mobile healthcare vans for the poor people	.519		
7.	Organizing tournaments	.511		
8.	Sustainable livelihood	.503		

Source : Author's Computation

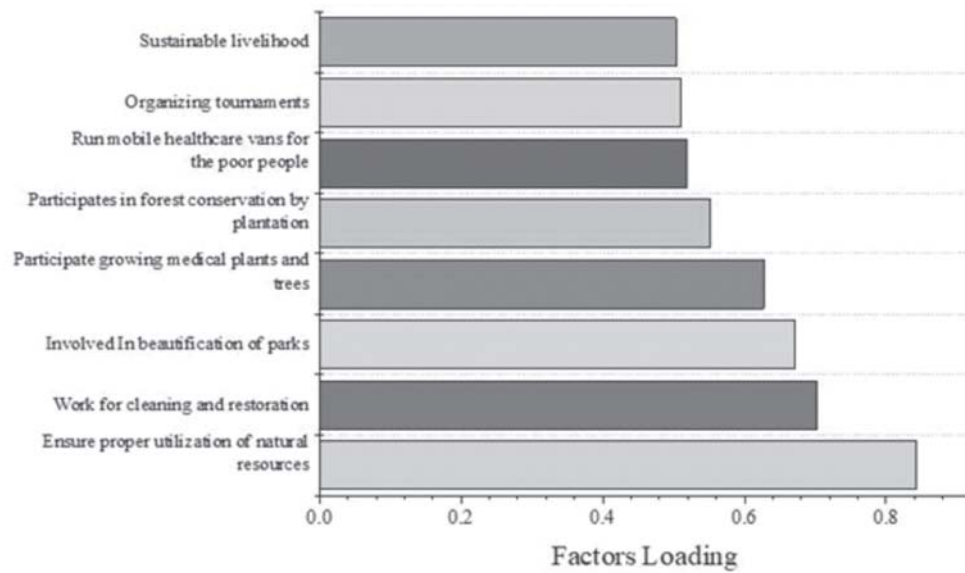


Figure 6: Eight variables of factors loading

The convenience and speed factor's variable factor loading ranges from 0.503 to 0.842. With a communality value of 22.480, the optimal use of natural resources is shown to have a higher commonality value. Given that the Cronbach Alpha of the Optimum Utilisation of Natural Resource Factor is 0.863, the eight variables that are included in it account for 86.30% of the variation are demonstrated in Figure 6.

16. Conclusion

Indeed, the present study suggests an interesting avenue for further research. First of all, the results given here would be a great supplement to a more qualitative and quantitative approach. Regression-based analysis of the variables that correspond with economic, moral, charitable, and legal obligations as well as educational, environmental, drinking water relief measures, health and sanitation community development, and perspectives of the weaker section people could be used to achieve these. Surveys could be used to collect data for these purposes. 180 firms and businesses from the Chennai District were randomly selected for this study. Three groups of people were the beneficiaries of each unit: workers, customers, and suppliers who were from lower- and middle-class metropolitan regions. Governments' traditional role as the main organization in charge of enhancing societal conditions must be made more realistic by emphasizing the importance of corporate social responsibility and putting more emphasis on the role that businesses play in society. CSR is starting to play a bigger role in corporate decisionmaking as more companies consider how to improve their relationships with customers, the community, and the environment while ensuring the success of their business.

17. Competing interests

The authors declare that they have no competing interests.

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Authors' contribution

Author A supports to find materials and results part in this manuscript. Author B helps to develop literature part.

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DETERMINANTS OF ELECTRIC VEHICLE ADOPTION IN INDIA: AN ECONOMETRIC ANALYSIS OF OIL PRICES, AIR QUALITY, AND CHARGING INFRASTRUCTURE

MR AKSHAY NAIK, PROF. ANTHONY RODRIGUES, MR. TEJAS SHIRODKAR

ABSTRACT : Through econometric analysis, this study investigates the determinants of Electric Vehicle (EV) sales in India from 2019 to 2023. The analysis reveals a significant upward sales trend, with a monthly average of 21,966 units and a peak of 95,126 units in March 2023. The study aims to explore this trend, examine the impact of average oil prices on EV sales, and identify key determinants such as oil prices, public charging stations, and the Air Quality Index (AQI). Findings show a positive correlation between EV sales, oil prices, and AQI, with the latter emerging as a leading factor. These results suggest growing environmental awareness and offer insights for policymakers to promote electromobility in India, supporting economic and environmental goals.

Keywords: Electric Vehicles, Oil Prices, Air Quality Index, Charging Infrastructure.

INTRODUCTION

An Electric Vehicle (EV) has one or more electric motors that use electricity as a power source. E-vehicles on roads include electric passenger cars, buses, trucks, motorcycles/scooters, etc. Similarly to other up-and-coming automotive technologies such as autonomous cars, connected vehicles and shared networks, EVs are set to form a new vision of transportation called Connected, Autonomous, Shared and Electric (CASE) mobility. Electric vehicles (EVs) are a fundamental shift in the automotive

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industry, a sustainable alternative to traditional internal combustion engine vehicles. These vehicles, which run primarily on electricity and are stored in rechargeable batteries, have been in the limelight for some time now because of their ability to combat air pollution, reduce greenhouse emissions, and bring more energy efficiency. The idea of electric vehicles can be traced back to the early 19th century when inventors tested electric-powered carriages. Yet, it was not until the late 20th century that EVs received severe consideration, driven mainly by the fears of environmental degradation and fossil fuel dependence.

Electric vehicles have some unique characteristics that differ from traditional vehicles. Key features include Zero Emissions, Instant Torque, Quiet Operation, Lower Maintenance, etc. EVs play a massive role in depleting air pollution and protecting climate change by not producing emissions at the tailpipe. Electrical motors are considerably more energy-efficient than internal combustion engines, and the latter consumes less energy per kilometre of distance travelled. EV owners save money on fuel and maintenance in the long-term run of the vehicle;

However, they pay a higher initial purchase price. Despite their many merits, electric vehicles face several challenges, including Limited Range, Poor Charging Infrastructure, Long Charging Time and Battery Degradation.

Today, the current trend of EVs in India reflects a growing momentum towards sustainable mobility, with an increasing number of consumers opting for electric vehicles as a cleaner and more efficient mode of transportation. With ambitious targets set by the government to electrify the automotive sector and reduce carbon emissions, the stage is set for a transformative shift towards electric mobility in India. This study aims to explore the dynamics of electric vehicle adoption in India, focusing on the relationship between crude oil dynamics and EV sales, shedding light on the factors driving the transition to electric mobility and its implications for the country's energy landscape and environmental sustainability.

Electric cars (EVs) are a modern technology that can help solve the externalities of the transportation sector, thus improving energy security by helping reduce oil import dependency. Taking these potential advantages into consideration, the Indian government has set ambitious goals for EV adoption, such that 30% of private cars, 70% of commercial vehicles, and 80% of two and three-wheelers will go electric by 2030. Nevertheless, EV sales have remained low, with less than 1% of yearly vehicle sales in 2021. This emphasises the importance of better comprehending the drivers of EV demand in India.

Table 1: EVs, Sales by Year and Forecast Scenarios

Years	EVs Sales Forecast		
	High Adoption	Medium Adoption	Low Adoption
2024	15,93,011	14,89,347	14,17,577
2025	20,10,755	18,13,628	16,82,652
2026	25,50,462	22,16,494	20,03,483
2027	32,49,510	27,17,986	23,92,441
2028	41,56,958	33,43,370	28,64,704
2029	53,37,225	41,24,510	34,38,896
2030	68,74,930	51,01,608	41,37,882

Source: EV Vahan Dashboard

The above data presents a forecast of electric vehicle (EV) sales from 2024 to 2030, categorised into three adoption scenarios: High, medium, and low.

- **High Adoption Scenario:** This scenario predicts a significant increase in EV sales, with the number of units sold steadily rising yearly. By 2030, the forecasted sales will reach approximately 68.75 lakh EVs, indicating robust growth driven by strong consumer demand and favourable market conditions.
- **Medium Adoption Scenario:** Under this scenario, EV sales start slightly lower in 2024 at 14,89,347 units but still show steady growth, reaching 51,01,608 units by 2030. This scenario represents a moderate pace of EV adoption compared to the high adoption scenario.
- **Low Adoption Scenario:** In the low adoption scenario, EV sales begin at 14,17,577 units in 2024 and show slower growth, reaching 41,37,882 units by 2030. This scenario indicates a more conservative estimate of EV uptake, with sales increasing slower than the other scenarios.

Overall, the data suggests varying levels of EV adoption depending on the adoption scenario, with the high adoption scenario resulting in the highest sales figures, followed by the medium adoption scenario, and finally, the low adoption scenario. These forecasts provide insights into potential future trends in the EV market and can inform decision-making processes related to EV infrastructure development, policy formulation, and investment strategies.

LITERATURE REVIEW

Alanazi (2023) investigates the automobile industry's shift towards sustainability, highlighting electric vehicles (EVs) as a pivotal solution to reduce emissions. Despite the potential, challenges such as high costs and inadequate charging infrastructure persist. The study emphasises the integration of EVs into smart cities and cognitive transportation systems as a strategy for sustainable urban transport, necessitating the collaboration of all stakeholders for successful adaptation.

Ranawat, Sharma, and Kumar (2023) focus on the Indian EV market, examining consumer perceptions shaped by government initiatives and environmental awareness. While there is a positive outlook, challenges like limited charging infrastructure and high initial costs remain significant barriers. The study calls for increased financial support and policy interventions to

Kumar, Panda, Naayagi et al. (2023) provide a comprehensive review of EV charging systems, including off-grid, grid-connected, and hybrid installations. The study underscores the importance of a robust charging infrastructure in Asia to support the growing EV fleet. It advocates integrating renewable energy sources, such as solar PV, with EV charging stations to enhance sustainability.

Baisane (2022) offers insights into the impact of oil price fluctuations on exchange rates in emerging markets, focusing on India. The study explores how policy changes during the liberalisation period influenced this relationship, highlighting the need to understand the interaction between oil prices and the Indian economy for better policy formulation.

Sriram, Lidwin, Fernandes et al. (2022) explore the factors influencing EV adoption in India, identifying technical, economic, infrastructural, and policy-related drivers and barriers. The study finds that financial limitations and inadequate charging infrastructure are major obstacles, while environmental awareness and societal influence play significant roles in driving adoption. Recommendations include awareness campaigns and policy incentives to boost EV uptake.

Miklos, Nilsson, and Safari (2022) examine the influence of EV attributes and consumer attitudes on the intent to purchase EVs in Sweden. The study reveals that price, performance, and environmental concerns significantly impact consumer decisions, offering valuable insights for policymakers and manufacturers to design consumer-focused EVs and promote green transportation policies.

Ahmad, Pesyridis, Sphicas et al. (2022) emphasise the need for technologies like battery electric vehicles (BEVs) to achieve sustainability goals. The study promotes

MATLAB-based numerical simulations to improve BEV performance and examines market forecasts and government interventions that influence future EV sales globally.

Sreenu (2022) highlights the significance of the Oil Price Volatility Index (OPVI) on Indian stock market returns, noting the asymmetry in how OPVI changes affect the market. The study suggests that decision-makers and investors should consider oil spot price volatility in their strategies, contributing to a more effective risk evaluation framework.

Yang, Chen, Yang, and Chang (2022) analyse the relationship between crude oil production and prices between OPEC and non-OPEC countries. The study underscores the importance of tracking oil price fluctuations, particularly for countries like Taiwan, which rely heavily on petrochemical industries. It advocates for precise production forecasts to manage better the impact of oil prices on the global economy.

Mastoi, Zhuang, Munir et al. (2022) delve into the evolution of EV charging station infrastructure, highlighting the need for exploratory charging solutions and supportive policies. The study discusses the impact of charging stations on energy grids and the potential for renewable energy integration, offering a roadmap for policymakers and stakeholders to enhance e-mobility development.

RESEARCH METHODOLOGY

RESEARCH GAP

Most studies on electric vehicles (EVs) in India have focused on consumer surveys about future buying intentions and simulations of how many EVs can be sold in future. However, limited research uses past data on actual EV sales, statistically analysing what factors strongly determine these sales and linking EV adoption to India's oil use and environmental goals.

This study will address these gaps. It will use regression models to estimate the relationship between real-world driving factors like public charging stations, oil prices, and pollution levels with historic Indian EV sales data.

RESEARCH SIGNIFICANCES

This study aims to examine the key factors influencing electric vehicle sales in the growing Indian market using econometric analysis. The findings will provide important insights for policymakers in designing effective interventions to achieve the government's ambitious EV adoption targets. Automobile manufacturers will also benefit from understanding consumer preferences and price elasticity of demand for EVs. It also contributes to the academic literature on sustainable transportation. The study has

significant economic and environmental implications, with India committed to electric mobility to reduce oil imports and carbon emissions. The research fills a significant knowledge gap through quantitative modelling of the EV market.

OBJECTIVES OF THE STUDY

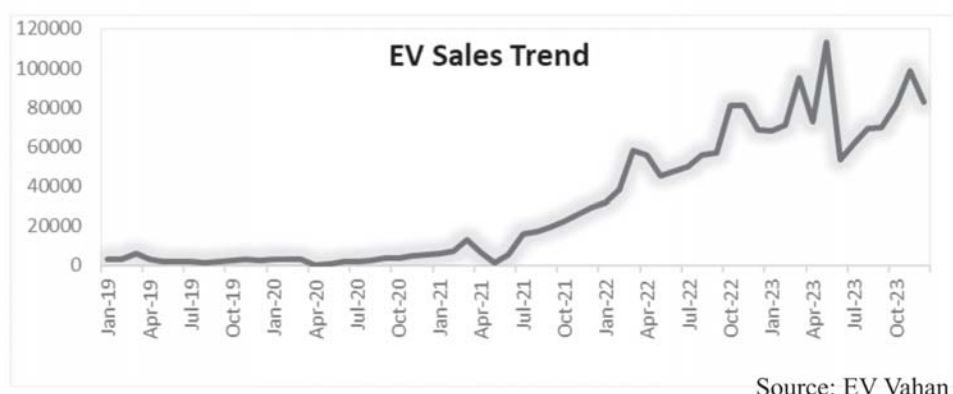
- To study the trend of electric vehicle sales in India over the past five years (2019-2023).
- To study the impact of average oil prices on electric vehicle sales.
- To understand the most significant determinants of electric vehicle sales based on parameters like oil prices, public charging stations, and air quality index.

DATA SOURCE

The data for this study is obtained from various reliable sources to cover the relevant variables fully. Data on electric vehicle sales in India was taken from the EV Vahan Dashboard, a government portal that provides statistics on electric vehicle registrations. The period for this dataset is from 2019 to 2023. India's oil price history from the Economic Times financial news outlet was over the same period as the EV sales data, which was used as the data source. The statistics of the public charging stations were collected from articles about the Electric Vehicle Incentives offered by government agencies and private entities. The pollutant levels were collected from the World Air Quality Report covering the five years from 2019 to 2023.

DATA ANALYSIS

Fig 1: Electric Vehicles Sales Trend in India



The EV sales data is from 5 years, from January 2019 to December 2023, equivalent to 60 monthly statistics. The data shows a consistent rise in EV sales with some fluctuations throughout the years.

- **Mean:** The monthly mean for EV sales is 21,966 units. This gives an average annualised sales figure of around 263,592 units.
- **Minimum:** The lowest monthly sales were reported in April 2020, and only 88 units were sold. Due to the effect of the COVID-19 pandemic, which disrupted economic activities and consumer demand globally.
- **Maximum:** The highest sales were recorded on 31st March at 95,126 units. It shows the peak and hence indicates EVs grew in popularity among consumers.

The EV sales in the first two years of this decade, from 2019 to 2020, were close since the monthly units mostly ranged from 1,500 to 6,000. On the other hand, since 2021, there was a significant growth in sales, which happened gradually, with sales constantly increasing monthly. This trend started in the middle of 2022 and accelerated in 2023, with nearly one month in sales surpassing 50,000 units.

This shows that the sales data display a clear seasonal pattern, being that they are higher at the end of the year (September to December). Among the reasons that a certain period may experience high sales might be either the release of new brands or promotional offers by customers who prefer buying during the festive season.

In general, there is an upward trend. Still, now and then, there are some fluctuations and short-term drops in demand, which might be related to changes in the economy or changes in government policies and incentives related to EVs.

THE IMPACT OF AVERAGE OIL PRICES ON ELECTRIC VEHICLE SALES

The relationship between oil prices and electric vehicle sales is studied by using an OLS regression model. The Ordinary Least Squares (OLS) regression is a popular statistical method which provides a possible relation between a dependent variable and one or more independent variables.

For this analysis, EV sales data is the dependent variable, and log-transformed data is used before fitting the regression model. Log transformation is applied to correct non-linearity in the data.

$$\text{Log EV Sales} = \hat{\alpha}_0 + \hat{\alpha}_1 \times \text{Oil Prices} + \tilde{o}$$

- **Dependent Variable:** - EV Sales
- **Independent Variable:** - Average Oil Price

Table 2: Model Summary of Linear Regression Model

R	R Square	Adjusted R Square	Coef	Std Error	Change Statistics			Durbin-Watson
					R Square change	F change	Sig. F Change	
0.204	0.042	0.025	0.195	0.219	0.042	2.518	0.117	0.874

Source: Author's analysis

From the above linear regression model, we can analyse that the R-value of 0.204 indicates a positive correlation, suggesting an inverse relationship between the predictor and response variables. Approximately 4.2% of the variability in EV sales can be explained by Oil prices. The coefficient associated with the Oil prices variable is 0.195. This represents the estimated change in the EV sales for a one-unit change in the Oil prices.

The Granger Causality Test

The Granger causality test is a statistical technique used to examine whether a one-time series variable can help predict another variable. The Granger causality test investigates whether there is a temporal relationship or causality between the two variables.

Table 3: Granger Causality Test with a lag of 1

Tests	Statistic	P-value
SSR F-test	4.52	0.039
SSR Chi2-test	4.83	0.028
Likelihood Ratio (LR) test	4.60	0.032
Parameters F-test	4.52	0.039

Source: Author's analysis

Hypothesis:

- Alternative Hypothesis (H1): Granger causality exists between Oil prices and EV sales.
- Null Hypothesis (H0): There is no Granger causality from Oil prices to EV sales.

From the Granger Causality Test, we can analyse the fact that past values of oil prices have a predictive influence on the current and future values of EV sales. The statistical

tests, such as the SSR F-test, SSR Chi2-test, LR test, and Parameters F-test, all indicate a Granger causality between oil prices and EV sales. This implies that oil price changes can impact the demand for Electric Vehicles (EVs), indicating a potential economic relationship between these two variables. From the results of the Granger Causality Test, with a lag of 1, we reject the null hypothesis and accept the alternative hypothesis.

THE IMPACT OF VARIOUS FACTORS ON EV SALES

A multiple linear regression model was used to study the influence of the multi-factors on electric vehicle (EV) sales. Multiple regression is a statistical method that examines relations among two or more explanatory factors affecting dependent variables. The main reason for using this method is to determine some factors that can affect the sales of electric cars and then to disclose the most significant variables. The model considered variables like average oil price (AOP), availability of public charging stations (PCS), and air quality index (AQI).

$$\text{EV sales} = \hat{\alpha}_0 + \hat{\alpha}_1 X_1(\text{AOP}) + \hat{\alpha}_2 X_2(\text{PCS}) + \hat{\alpha}_3 X_3(\text{AQI}) + \tilde{\epsilon}$$

- Dependent Variable: - EV Sales

Independent Variable: - Average Oil Price, Public Charging Stations, Air Quality Index

Table 4: Model Summary of Multiple Linear Regression Model

R	R Square	Adjusted R Square	Coef	Std Error	Coefficients			Sig. F
					AOP	PCS	AQI	
0.924	0.855	0.418	0.195	0.309	0.107	-0.975	18.075	0.473

Source: Author's analysis

From the above multiple linear regression model, we can analyse that the R-value of 0.924 indicates a positive correlation, suggesting an inverse relationship between the predictor variable and the response variable. Approximately 85.5% of the independent variable explained EV sales. The coefficient associated with the Oil prices variable is 0.195. This represents the estimated change in the EV sales for a one-unit change in the Oil prices. The coefficient for AOP is 0.1073. This positive value suggests that increased oil prices are associated with increased EV sales. Specifically, the coefficient indicates that EV sales are estimated to increase by approximately 0.1073 units for every one-unit increase in oil prices, holding all other variables constant. The coefficient for PCS is -0.9750. The negative value suggests that increased public charging stations are associated with decreased EV sales. The coefficient for AQI is 18.0757.

This sizeable positive value indicates a strong positive relationship between the air quality index and EV sales.

Table 5: Correlation Matrix

	EVs Sales	AOP	PCS	AQI
EVs Sales	1			
AOP	0.638	1		
PCS	-0.161	-0.610	1	
AQI	0.668	0.127	0.551	1

Source: Author's analysis

The correlation matrix shows the relationships between Electric vehicle sales, Average Oil Prices, Public Charging Stations, and Air Quality Index.

- EV sales and AOP have a moderately positive correlation of 0.638, indicating a tendency for EV sales to increase as average oil prices rise.
- There is a weak negative correlation of -0.161 between EV sales and PCS, suggesting that EV sales may slightly decrease as the number of public charging stations increases. However, the correlation is not very strong.
- EV sales and AQI have a strong positive correlation of 0.668, indicating a significant tendency for EV sales to increase as the air quality index increases.
- Overall, this correlation matrix provides insights into the relationships between these variables, which can help understand the dynamics of the electric vehicle market and its relationship with factors such as oil prices, charging infrastructure, and air quality.

As indicated by the regression coefficients, the variable in this model which is most statistically significant could be the Air Quality Index (AQI).

The AQI coefficient of 18.0757 is substantially more significant than the coefficients of the other independent variables, oil prices and public charging stations. A higher coefficient means a stronger correlation of the dependent variable (EV sales) with the factor.

Higher levels of AQI and coefficient imply that EV sales are positively correlated with higher levels of air quality index, which means poor quality of air or high pollution level.

This result supports the assumption that increased environmental awareness and demand for cleaner modes of transportation can motivate people to switch to electric vehicles.

FINDINGS

The research results give us an excellent understanding of the issues contributing to EV sales growth in India. Firstly, the growth of EV sales during the last five years (from 2019 to 2023) generally shows an ascending trend that has been boosted by strong performance recently. The monthly mean of EV sales is registered at 21,966 units and reached the maximum sale of 95,126 units in March 2023, thus showing an increased consumer adoption of electric vehicles.

While studying the impact of oil prices on EV sales, the Ordinary Least Squares (OLS) regression model is used. The test gives us a positive relationship between the price of oil and EV sales, estimated by the coefficient of 0.1954. Consequently, the explanatory ability of the model is low, as the oil prices explain only 4.2 per cent of the variability in EV sales. The Granger causality test verifies that oil prices were strongly related to current and future EV sales, implying an economic relationship between these variables.

This multiple linear regression model was used to show how the oil price fluctuations, the number of public charging stations, and the Air Quality Index affect EV sales the most. The tested model has the R-squared value of 0.855, indicating that these independent variables can explain 85.5% of EV sales variance combined. The correlation matrix shows meaningful relationships among variables like Electric Vehicle Sales, Average Oil Prices, and Air Quality Index, which can be interpreted as the complex nature of factors contributing to EV adoption rates.

Among all the factors, the air quality index turned out to be the one most affected by the statistical significance level. The coefficient of 18.0757 indicates that air pollutant levels and EV sales have a powerful positive relationship. Such a finding suggests that the adoption of electric vehicles (EVs) is likely to increase among consumers concerned about the environment and demand clean transportation modes.

CONCLUSION

The study helps us understand and identify the key factors of adopting electric vehicles in India, which are possibilities for eco-friendly transport systems. The study can explore the factors that influence EV sales through historical data and econometric tools. The oil prices turn out to be very crucial in increasing demand for electric vehicles. However, the low explanatory capability of the OLS regression model shows that other factors may be more significant over EV demand. The Granger causality test revealed that oil prices significantly affected the future sales of EVs, respectively, confirming the relevance of oil price monitoring regarding sustainable mobility.

In a multiple linear regression analysis, the air quality index was observed as the most significant driver of EV sales. The correlation between factors, including air quality and oil prices, clearly shows the importance of focusing on environmental and economic aspects in promotional campaigns to develop emission-free transport systems. The high coefficient value between the air quality index and EV sales suggests that people are likely to pay attention to environmental problems in their buying behaviour. As air quality continues to decline, the government's role in promoting sustainable and environmentally friendly modes of transport has become crucial. This has led to policy formation to encourage the adoption of electric vehicles (EVs), including measures such as banning certain fuel types, providing subsidies for EVs, and implementing tax reductions. These actions are expected to increase EV sales. The study shows that the EV market in India is very multi-focused, where consumers base their preferences or market trends on economic, environmental, and infrastructural variables.

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UNIVERSITY - INDUSTRY LINKAGES: A STUDY WITH SPECIAL REFERENCE TO FACULTY PERSPECTIVE IN TAMIL NADU

M.SANGEETHA, DR.M.GURUPANDI

Abstract : This study explores faculty perspectives on university-industry linkages (UIL) in Tamil Nadu, aiming to identify key factors, challenges, and opportunities for enhancing collaboration between academia and industry. Using a quantitative approach, data from 342 faculty members across ten universities are analyzed through statistical methods such as chi-square tests, ANOVA, correlation, and regression analysis. Findings reveal that faculty views on UIL differ significantly based on academic rank and experience. Major challenges include bureaucratic hurdles, misalignment between academic and industry objectives, and poor communication. However, opportunities exist in creating innovation-friendly environments, increasing joint research funding, and developing formal platforms for internships and consultancy. The study finds a strong correlation between the sources of UIL and factors influencing linkages, suggesting the need for tailored interventions. To improve UIL, institutions should streamline administrative processes, promote diverse industry partnerships, and encourage cross-disciplinary collaboration. Continuous feedback mechanisms are essential to ensure UIL remains relevant to both academic and industry needs. By addressing the identified challenges and capitalizing on opportunities, universities can foster stronger UIL, which will enhance faculty engagement, knowledge-sharing, and support regional socio-economic development.

Keywords: University-Industry Linkages; Faculty Perspectives; Collaboration Challenges; Innovation; Curriculum Alignment; and Entrepreneurial Skills

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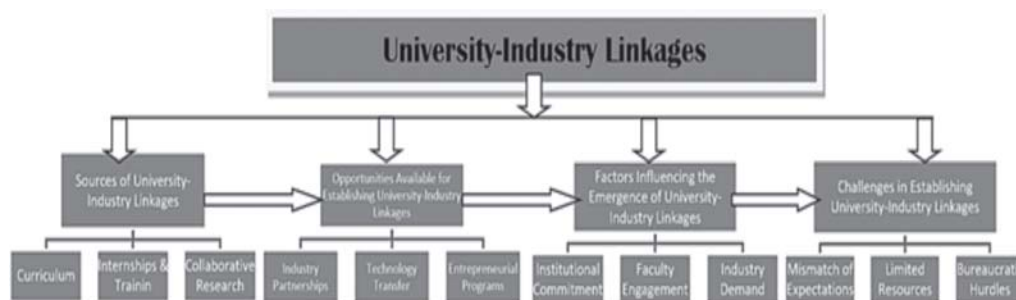
INTRODUCTION

University-industry linkages (UIL) have emerged as a critical mechanism for bridging the gap between academic institutions and the business world, playing a pivotal role in fostering innovation and enhancing socio-economic development. In the context of Tamil Nadu, the significance of these linkages is underscored by the need for a more dynamic alignment between educational curricula and industrial requirements. As institutions strive to prepare students for the evolving labor market, the integration of practical experiences and entrepreneurial skills into academic programs has become increasingly vital.

Recent studies, including those by Varghese and Gurumoorthy (2020); highlight the importance of curriculum reform, internships, and industry collaborations in developing entrepreneurial competencies and improving employability. Their research points to a disconnect between the static nature of academic programs and the dynamic needs of industries, emphasizing the necessity for educational institutions to adapt their training to meet industrial demands. This study seeks to explore the perspectives of faculty members in Tamil Nadu regarding university-industry linkages, aiming to understand their views on current practices, challenges, and opportunities for enhancing these collaborations. By examining faculty perspectives, this research will provide valuable insights into how universities can better align their programs with industry needs, promote effective knowledge transfer, and support the development of entrepreneurial skills among students. The findings will contribute to identifying best practices and strategic approaches for strengthening UIL in Tamil Nadu, ultimately enhancing the impact of higher education on regional economic development and innovation.

CONCEPTUAL MODEL OF THE STUDY

The conceptual model for studying university-industry linkages (UIL) with a focus on the faculty perspective in Tamil Nadu encompasses four key components: Sources of UIL, Opportunities for UIL, Factors Influencing UIL Emergence, and Challenges in UIL Establishment. This model outlines the dynamics and effectiveness of UIL by examining how sources like curriculum integration, internships, collaborative research, advisory roles, and professional networks contribute to UIL. It also explores opportunities such as industry partnerships, technology transfer, entrepreneurial programs, funding, and career development services. Factors influencing UIL emergence include institutional commitment, faculty engagement, industry demand, policy and regulation, and cultural fit. Challenges identified include mismatched expectations, limited resources, bureaucratic hurdles, lack of communication, and resistance to change. This framework provides a comprehensive view of the components impacting UIL effectiveness in the regional context.



This model provides a structured approach to investigating how various sources, opportunities, influencing factors, and challenges shape the effectiveness of university-industry linkages in Tamil Nadu.

REVIEW OF LITERATURE

Service quality is vital for higher education institutions to meet stakeholder expectations and enhance performance. Dhanasekaran et al. (2023)¹; Hoc L.H et al (2019)² explored how institutions in Western Tamil Nadu are adopting service quality practices to improve education, research, and operational efficiency, ensuring competitiveness. Key factors such as faculty promotion, student engagement, and knowledge management were identified as crucial in influencing institutional culture.

University-industry interaction is crucial for enhancing innovation in firms, particularly within the National Innovation System (NSI). Joseph and Abraham (2009)³; Vaaland, T.I et al. (2016)⁴; Gilman M. et al.(2014)⁵ Gilman, M., & Serbanica, C. (2014). University studied these interactions in select Indian industries and found that firms collaborating with universities or public research institutions (PRIs) exhibited higher innovation in product development. However, the incidence of collaboration remains low, with only 11.27% of firms engaging in such partnerships, and most interactions are formal rather than informal. Larger, older firms, especially in major cities, benefit more from these collaborations, indicating a need for broader, more informal linkages to boost innovation (Joseph & Abraham, 2009).

Nedumaran and Manida (2020)⁶; Schiller.D et al., (2009)⁷ investigated students' awareness of industrial linkages in various departments at four Tamil Nadu universities. Their study identified individual contact and government initiatives as key factors in fostering university-industry collaborations. Programs like internships and workshops were found to boost student engagement and skill development, contributing to employment opportunities. The research also revealed a significant link between student satisfaction and industrial partnerships, emphasizing the need for stronger collaborations to drive economic growth and technological advancement (Nedumaran & Manida, 2020).

Academia-industry linkages are recognized as vital for sustainable innovation in agricultural higher education, as highlighted by Soam et al. (2020)⁸; Reddy. P et al (2011)⁹; Worasinchai.L et al. (2008)¹⁰their study, part of the National Agricultural Higher Education Project (NAHEP), emphasized the benefits for both academia and industry, such as improved employability for students and access to new technologies for industries. These linkages align with the National Education Policy (NEP) 2020 and the Sustainable Development Goals (SDGs), particularly SDG 4, which advocates for equitable, quality education. Despite challenges like the lack of structured models, the collaboration between academia and industry is seen as critical to fostering innovation, enhancing research, and addressing the growing demand for skilled agricultural professionals driven by globalization.

Recent studies emphasize the growing importance of university-industry linkages for socio-economic development and innovation. Abraham Abebe Assefa (2016)¹¹; Bhattacharya.S et al. (2007) identifies key factors for successful collaborations, including leadership commitment, multidisciplinary research centers, and Entrepreneur-in-Residence programs. The study highlights the need for innovative solutions like science parks, technology incubators, and active private sector involvement in curriculum development. Filippetti. A et al, recommendations call for government-backed technology funds and collaborative research centers to enhance university-industry partnerships and drive economic growth Filippetti. A et al. (2017)¹³; Varblane,U et al. (2008)¹⁴Recent literature highlights the critical role of institution-industry linkages (IIL) in advancing academic entrepreneurship. Varghese and Gurumoorthy (2020)¹⁵; Amarl, M et al,(2011)¹⁶ emphasize how curriculum, internships, training, and soft skills are essential for enhancing these connections and developing entrepreneurial skills.

RESEARCH GAP

Despite the significant insights provided by these studies, a clear research gap exists in understanding how faculty perspectives specifically influence the establishment and effectiveness of UIL in Tamil Nadu. The existing literature primarily focuses on broader aspects of UIL, service quality, and innovation, without delving deeply into the faculty's role in shaping and implementing these linkages.

STATEMENT OF THE PROBLEM

There is a need to explore how faculty members perceive and contribute to the development and effectiveness of university-industry linkages in Tamil Nadu. Understanding these perspectives can help address existing challenges and enhance the alignment between academic programs and industry requirements.

RESEARCH QUESTIONS

1. What are the faculty perspectives on the current state of university-industry linkages in Tamil Nadu?
2. How do faculty members perceive the impact of these linkages on academic and industry outcomes?
3. What challenges do faculty members identify in establishing and maintaining effective UIL?
4. What factors do faculties believe are critical for enhancing university-industry collaborations?

OBJECTIVE OF THE RESEARCH PAPER

The primary objective of this research paper is to investigate the faculty perspective on university-industry linkages in Tamil Nadu, identifying key factors influencing these linkages, the challenges faced, and the opportunities for improving collaboration. The study aims to provide actionable insights to strengthen UIL and align academic programs with industry needs.

SIGNIFICANCE OF THE STUDY

The significance of this study, “University-Industry Linkages: A Study with Special Reference to Faculty Perspective in Tamil Nadu,” lies in its comprehensive exploration of faculty perspectives on the effectiveness and challenges of university-industry collaborations within the region. By focusing on faculty insights, the study aims to illuminate the key sources, opportunities, factors, and challenges associated with UIL. This is crucial for enhancing understanding of how faculty experiences and opinions impact the development and success of these linkages. Moreover, by identifying gaps and areas for improvement, the study will contribute to the formulation of targeted recommendations for strengthening university-industry partnerships, thereby supporting regional economic development, innovation, and the creation of a more effective educational framework that meets both academic and industrial demands.

SCOPE OF THE STUDY

This study examines faculty perspectives on university-industry linkages (UIL) in Tamil Nadu, focusing on current collaboration practices, existing partnerships, and opportunities for enhancement. It explores factors influencing UIL, key challenges faced, and the impact of faculty qualifications and roles on partnership effectiveness. The study uses both quantitative and qualitative data from faculty across various disciplines to provide actionable recommendations for improving UIL strategies. The goal is to optimize collaborations for educational and economic growth.

METHODOLOGY

This study employs a quantitative research design utilizing a proportionate random sampling method to collect and analyze data on university-industry linkages (UIL) from the faculty perspective across ten universities in Tamil Nadu. The aim is to understand the effectiveness, sources, opportunities, factors, and challenges associated with UIL. By applying the proportionate sampling technique, the sample size of 342 faculty members is determined to reflect the distribution of faculty populations across the selected universities, ensuring that each university's representation in the sample corresponds to its proportion in the overall population.

Table No. 1. Distribution of the Respondents

Name of the University	Faculty Population	Proportion of population (%)	Sample Size (Rounded Off)
Anna University, Chennai	348	11.41	39
Bharathiar University, Coimbatore	264	8.65	30
University of Madras, Chennai	334	10.95	37
Bharathidasan University, Tiruchirappalli	288	9.44	32
Periyar University, Salem	389	12.75	44
Madurai Kamaraj University, Madurai	275	9.01	31
Alagappa University, Karaikudi	246	8.06	27
Manonmaniam Sundaranar University, Tirunelveli	288	9.44	32
Tamil Nadu Agricultural University, Coimbatore	239	7.83	27
Annamalai University, Chidambaram	380	12.45	43
Total	3051	100	342

Source: Primary Data

The above Table provides a comprehensive overview of the faculty respondents selected for the study on university-industry linkages across Tamil Nadu. It details the faculty population and sample size from each institution. For instance, Anna University, Chennai, with a faculty population of 348 (11.41% of the total), has 39 respondents, while Periyar University, Salem, the largest faculty population at 389 (12.75%), has 44 respondents. Bharathiar University, Coimbatore, has 264 faculty members (8.65%) and contributes 30 respondents, whereas Annamalai University, Chidambaram, with a population of 380 (12.45%), has 43 respondents. The total faculty population across all universities is 3051, with a total sample size of 342 faculty members. This distribution ensures a representative sample reflecting the proportional representation of each university's faculty in the study.

DATA COLLECTION

A structured questionnaire is designed to gather data from faculty members, encompassing sections on demographic information, perceptions of university-industry linkage (UIL) effectiveness, types of linkages, sources, opportunities, factors, challenges, and recommendations for improvement. The data collection process involves distributing the questionnaires to the selected sample of faculty members either via email or through in-person surveys, based on the respondents' preferences and availability. To facilitate timely responses, faculty members are provided with a specific time frame to complete and return the questionnaire.

DATA ANALYSIS

Data collected from the questionnaires are compiled and checked for completeness and accuracy, with any missing or inconsistent responses addressed. Quantitative data are analyzed using statistical methods, including simple percentage analysis to identify basic facts, and inferential statistics such as chi-square tests, and ANOVA, correlation,

SOURCES OF UNIVERSITY-INDUSTRY LINKAGES

University-industry linkages play a crucial role in bridging academic learning with practical experience and real-world applications. Industries offer valuable student internships, providing hands-on experience that enhances employability. They also collaborate with institutions to host tech workshops and contribute to curriculum development, ensuring that academic programs remain relevant to current industry needs. Scholarships for students and staff, alongside industry experts giving lectures and executives teaching and supervising students, further strengthen these connections.

Table 2. Perception of the Respondents towards Sources of University-Industry Linkages

Response	Current Position of Faculties				Total
	Assistant Professor	Associate Professor	Professor	Adjunct/Guest Faculty	
Very High Response	4 (12.1)	10 (9.4)	19 (10.4)	1 (4.8)	34 (9.9)
High Response	4 (9.1)	10 (9.4)	19 (10.4)	1 (0.0)	34 (9.4)
Neutral	4 (21.2)	10 (18.9)	19 (22.5)	1 (33.3)	34 (21.9)
Low Response	4 (24.2)	10 (37.7)	19 (35.7)	1 (42.9)	34 (35.7)
Very Low Response	4 (33.3)	10 (24.5)	19 (20.9)	1 (19.0)	34 (23.1)
Total	4 (100)	10 (100)	19 (100)	1 (100)	34 (100)

Source: Primary Data

The responses in Table 2 reflect a broad range of faculty perceptions on university-industry linkages. “Very high” ratings are modest, with the highest recognition from Associate Professors (9.4%) and Professors (10.4%). “High” ratings follow similar trends but are absent among Adjunct/Guest Faculty, possibly due to limited engagement. Neutral responses are most common among Adjunct/Guest Faculty (33.3%), indicating limited experience or strong opinions. Concerns are evident in the “low” category, with significant proportions among Adjunct/Guest Faculty (42.9%) and Associate Professors (37.7%). “Very low” ratings reveal dissatisfaction, particularly from Assistant Professors (33.3%). Overall, perceptions vary by faculty role, influenced by individual involvement with university-industry linkages.

Table 3. Perception of the Respondents towards Opportunities available for Establishing University-Industry Linkages

Response	Current Position of Faculties				Total
	Assistant Professor	Associate Professor	Professor	Adjunct/Guest Faculty	
Very High Response	3 (9.1)	11 (10.4)	19 (10.4)	1 (4.8)	34 (9.9)
High Response	4 (12.1)	7 (6.6)	18 (9.9)	1 (4.8)	30 (8.8)
Neutral	6 (18.2)	28 (26.4)	55 (30.2)	9 (42.9)	98 (28.7)
Low Response	12 (36.4)	33 (31.1)	63 (34.6)	8 (38.1)	116 (33.9)
Very Low Response	8 (24.2)	27 (25.5)	27 (14.8)	2 (9.5)	64 (18.7)
Total	33 (100)	106 (100)	182 (100)	21 (100)	342 (100)

Source: Primary Data

The responses in Table 3 provide a nuanced view of faculty perceptions regarding opportunities for establishing university-industry linkages. The “very high” responses are relatively modest, with only a small percentage of Adjunct/Guest Faculty (4.8%) and some Associate Professors and Professors (10.4%) expressing strong appreciation for these opportunities. The “high” responses show somewhat better enthusiasm, particularly among Assistant Professors (12.1%) and Associate Professors (6.6%), though Adjunct/Guest Faculty again display lower engagement. A significant proportion of respondents are “neutral,” especially among Adjunct/Guest Faculty (42.9%), suggesting indifference or insufficient exposure to these linkages. Assistant Professors and Professors also show notable neutrality (18.2% and 30.2%, respectively), reflecting a general uncertainty about the impact of these opportunities. The “low” responses

highlight substantial concerns, particularly among Assistant Professors (36.4%) and Professors (34.6%), indicating dissatisfaction, with Adjunct/Guest Faculty also reporting significant “low” responses (38.1%). The “very low” responses, while less pronounced overall, still reveal notable dissatisfaction, especially among Assistant Professors (24.2%) and Associate Professors (25.5%). The lower proportions of “very low” responses among Professors (14.8%) and Adjunct/Guest Faculty (9.5%) suggest somewhat less critical views but still considerable dissatisfaction. Overall, the data indicates a range of opinions with significant skepticism and dissatisfaction, particularly among lower-ranked faculty, underscoring the need for targeted improvements and more effective engagement strategies to enhance the perceived value and effectiveness of university-industry linkages.

FACTORS INFLUENCING THE EMERGENCE OF UNIVERSITY-INDUSTRY LINKAGES

Several factors significantly influence the emergence and effectiveness of university-industry linkages. Research autonomy fosters innovation, while adequate funding enhances collaboration potential. Recognition and career advancement encourage faculty engagement, and publication policies shape research dissemination. Skills development and networking opportunities arise from industry links, bolstered by institutional support and a strong reputation. Faculty attitudes, infrastructure, and regulatory handling also impact these partnerships. Additionally, knowledge transfer, advanced technology, effective communication, and informal meetings promote entrepreneurship and foster innovation.

Table 4. Perception of the Respondents towards Factors Influencing the Emergence of University-Industry Linkages

Response	Current Position of Faculties				Total
	Assistant Professor	Associate Professor	Professor	Adjunct/Guest Faculty	
Very High Response	5 (15.2)	10 (9.4)	19 (10.4)	1 (4.8)	35 (10.2)
High Response	4 (12.1)	12 (11.3)	17 (9.3)	1 (4.8)	34 (9.9)
Neutral	4 (12.1)	25 (23.6)	49 (26.9)	9 (42.9)	87 (25.4)
Low Response	13 (39.4)	37 (34.9)	71 (39.0)	6 (28.6)	127 (37.1)
Very Low Response	7 (21.2)	22 (20.8)	26 (14.3)	4 (19.0)	59 (17.3)
Total	33 (100)	106 (100)	182 (100)	21 (100)	342 (100)

Source: Primary Data

Table 4 indicates varied perceptions among faculty members regarding factors influencing university-industry linkages. Modest “very high” responses were noted, with 15.2% of Assistant Professors showing strong appreciation, compared to only 4.8% of Adjunct/Guest Faculty. “High” responses were somewhat better among Associate Professors (11.3%) and Assistant Professors (12.1%), yet enthusiasm remains low, particularly for Adjunct/Guest Faculty. A significant number of respondents, especially 42.9% of Adjunct/Guest Faculty, reported “neutral” opinions, indicating indifference or lack of exposure. Concerns are evident in the “low” responses, with 39.4% of Assistant Professors and 39.0% of Professors expressing dissatisfaction. Notably, “very low” responses reflect dissatisfaction among Assistant Professors (21.2%) and Associate Professors (20.8%). Overall, the findings reveal skepticism and dissatisfaction, especially among lower-ranked faculty, highlighting the need for targeted improvements and effective engagement strategies to enhance the perceived value of these linkages.

Challenges in Establishing University and Industry Linkage

Establishing effective university-industry linkages faces several significant challenges. Technological gaps between institutions and industry can impede progress, while limited financial resources and a conservative risk-taking mentality hinder collaborative efforts. The absence of effective mechanisms for building industrial relationships and incompatibility between institutional and industrial practices further complicate partnerships. Additionally, a lack of collaborative experiences and the shortage of qualified professionals in key areas can undermine these efforts. Cultural differences also impact effective collaboration, and poor planning and execution often affect the success of partnerships. Furthermore, a lack of commitment from either side or institutional bureaucracy can slow down or even derail partnership processes, highlighting the need for more streamlined and committed approaches to fostering successful university-industry linkages.

Table 5. Perception of the Respondents towards Challenges in Establishing University and Industry Linkage

Response	Current Position of Faculties				Total
	Assistant Professor	Associate Professor	Professor	Adjunct/Guest Faculty	
Very High Response	9 (27.3)	25 (23.6)	54 (29.7)	4 (19.0)	92 (26.9)
High Response	5 (15.2)	39 (36.8)	42 (23.1)	9 (42.9)	95 (27.8)
Neutral	10 (30.3)	22 (20.8)	51 (28.0)	3 (14.3)	86 (25.1)
Low Response	5 (15.2)	14 (13.2)	23 (12.6)	4 (19.0)	46 (13.5)
Very Low Response	4 (12.1)	6 (5.7)	12 (6.6)	1 (4.8)	23 (6.7)
Total	33 (100)	106 (100)	182 (100)	21 (100)	342 (100)

Source: Primary Data

Table 5 presents diverse perceptions among faculty regarding challenges in establishing university-industry linkages. Significant “very high” responses indicate that 29.7% of Professors and 23.6% of Associate Professors perceive substantial challenges. “High” responses are also notable, particularly among Associate Professors (36.8%) and Adjunct/Guest Faculty (42.9%), reflecting awareness of these issues. However, a considerable number of respondents, especially Assistant Professors (30.3%) and Professors (28.0%), are “neutral,” suggesting uncertainty or insufficient exposure. “Low” responses are minimal, with Assistant Professors (15.2%) and Professors (12.6%) expressing less concern. The smallest “very low” responses, particularly among Associate Professors (5.7%) and Adjunct/Guest Faculty (4.8%), indicate these groups may feel less affected by the challenges. Overall, while higher-ranked faculty recognizes significant challenges, there exists a spectrum of opinions, underscoring the need for targeted strategies to address the specific issues faced by different faculty groups.

Chi-square Test

The following hypotheses are designed to test the relationship between demographic factors and perceptions of university-industry linkages, as indicated by the Chi-Square test results.

Hypothesis (General)

Null Hypothesis (H0): There is no significant association between Demographic Variables and faculty perceptions of university-industry linkages.

Alternative Hypothesis (H1): There is a significant association between Demographic Variables and faculty perceptions of university-industry linkages.

Table 6. Demographic Variables of Respondents and their perception associated on University and Industry Linkage

Demographic Variables	Classifications	Chi-square	Faculty Perception on University-Industry Linkages					Total
			VHR	HR	N	LR	VLR	
Gender	Male	O	21	29	68	52	24	194
		E	20.4	26.7	62.4	65.8	18.7	194.0
	Female	O	15	18	42	64	9	148
		E	15.6	20.3	47.6	50.2	14.3	148.0
Age	30 - 35	O	9	11	12	22	10	64
		E	6.7	8.8	20.6	21.7	6.2	64.0
	35 - 40	O	19	26	72	66	18	201
		E	21.2	27.6	64.6	68.2	19.4	201.0
	40 - 45	O	4	3	12	10	4	33
		E	3.5	4.5	10.6	11.2	3.2	33.0
	Above 45	O	4	7	14	18	1	44
		E	4.6	6.0	14.2	14.9	4.2	44.0

Current Position	Assistant Professor	O	5	5	6	10	7	33
		E	3.5	4.5	10.6	11.2	3.2	33.0
	Associate Professor	O	10	10	38	36	12	106
		E	11.2	14.6	34.1	36.0	10.2	106.0
	Professor	O	20	27	59	63	13	182
		E	19.2	25.0	58.5	61.7	17.6	182.0
Experience	Adjunct/Guest Faculty	O	1	5	7	7	1	21
		E	2.2	2.9	6.8	7.1	2.0	21.0
	Below 5 Years	O	0	2	2	5	1	10
		E	1.1	1.4	3.2	3.4	1.0	10.0
	5-10 Years	O	1	0	1	5	3	10
		E	1.1	1.4	3.2	3.4	1.0	10.0
	10-15	O	11	29	56	67	19	182
		E	19.2	25.0	58.5	61.7	17.6	182.0
	15-20 Years	O	20	14	32	28	6	100
		E	10.5	13.7	32.2	33.9	9.6	100.0
	Above 20 Years	O	4	2	19	11	4	40
		E	4.2	5.5	12.9	13.6	3.9	40.0
Area	Finance	O	6	6	25	19	8	64
		E	6.7	8.8	20.6	21.7	6.2	64.0
	Marketing	O	5	9	23	22	7	66
		E	6.9	9.1	21.2	22.4	6.4	66.0
	HRM	O	19	29	46	57	13	164
		E	17.3	22.5	52.7	55.6	15.8	164.0
	Entrepreneurship	O	6	3	16	18	5	48
		E	5.1	6.6	15.4	16.3	4.6	48.0
Qualification	Ph.D	O	9	17	38	44	13	121
		E	12.7	16.6	38.9	41.0	11.7	121.0
	Ph.D with NET & SET	O	21	28	58	66	15	188
		E	19.8	25.8	60.5	63.8	18.1	188.0
	Ph.D with PDF	O	6	2	14	6	5	33
		E	3.5	4.5	10.6	11.2	3.2	33.0
Perceive	Not Agree	O	0	1	2	2	0	5
		E	.5	.7	1.6	1.7	.5	5.0
	Effective	O	3	0	6	8	3	20
		E	2.1	2.7	6.4	6.8	1.9	20.0
	Neutral	O	7	8	34	32	10	91
		E	9.6	12.5	29.3	30.9	8.8	91.0
	Ineffective	O	17	29	54	60	17	177
		E	18.6	24.3	56.9	60.0	17.1	177.0
	Very Ineffective	O	9	9	14	14	3	49
		E	5.2	6.7	15.8	16.6	4.7	49.0
Associated	Below 5	O	16	26	54	52	11	159
		E	16.7	21.9	51.1	53.9	15.3	159.0
	5 – 6	O	11	15	27	29	13	95
		E	10.0	13.1	30.6	32.2	9.2	95.0
	6 – 10	O	5	5	20	25	6	61
		E	6.4	8.4	19.6	20.7	5.9	61.0
	more than 10	O	4	1	9	10	3	27
		E	2.8	3.7	8.7	9.2	2.6	27.0
Effective	Collaborative research projects	O	20	7	17	11	2	57
		E	6.0	7.8	18.3	19.3	5.5	57.0
	Internships and industry placements	O	2	9	17	12	4	44
		E	4.6	6.0	14.2	14.9	4.2	44.0
	Industry-sponsored research	O	7	19	46	50	7	129
		E	13.6	17.7	41.5	43.8	12.4	129.0
	Joint ventures and partnerships	O	4	8	22	30	9	73
		E	7.7	10.0	23.5	24.8	7.0	73.0
	Guest lectures and workshops	O	3	4	8	13	11	39
		E	4.1	5.4	12.5	13.2	3.8	39.0

Source: Computed Primary Data

The responses in Table 6 show demographic influences on faculty perceptions of university-industry linkages. Male faculty report higher “very high” and “high” ratings than females, indicating a potential gender disparity. Mid-career faculty (35-40 years old) and Professors perceive stronger impacts from linkages, while older faculty report fewer “very high” responses. Faculty with 10-15 years of experience and those in Human Resource Management (HRM) report higher perceived effectiveness of linkages. Additional qualifications, such as Ph.D. with NET/SET, also correlate with stronger perceptions of effectiveness. Perceived ineffectiveness and challenges are linked to higher “very high” responses, emphasizing the need for tailored strategies to address diverse faculty demographics and improve linkages.

Table 7. Demographic Variables of Respondents and their perception associated on University and Industry Linkage (Chi-Square Test) (No. of Valid Cases 342)

Demographic Variables	Pearson Chi-Square Test	Value	df	Asymp. Sig. (2-sided)
Gender	Pearson Chi-Square	11.806 ^a	4	.019
	Likelihood Ratio	11.920	4	.018
	Linear-by-Linear Association	.431	1	.511
	a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.28.			
Age	Pearson Chi-Square	13.056 ^a	12	.365
	Likelihood Ratio	14.310	12	.281
	Linear-by-Linear Association	.128	1	.721
	a. 5 cells (25.0%) have expected count less than 5. The minimum expected count is 3.18.			
Current Position	Pearson Chi-Square	13.883 ^a	12	.308
	Likelihood Ratio	13.281	12	.349
	Linear-by-Linear Association	1.372	1	.242
	a. 6 cells (30.0%) have expected count less than 5. The minimum expected count is 2.03.			
Experience	Pearson Chi-Square	31.903 ^a	16	.010
	Likelihood Ratio	32.639	16	.008
	Linear-by-Linear Association	5.938	1	.015
	a. 12 cells (48.0%) have expected count less than 5. The minimum expected count is .96.			
Area	Pearson Chi-Square	9.355 ^a	12	.672
	Likelihood Ratio	9.831	12	.631
	Linear-by-Linear Association	.320	1	.572
	a. 1 cells (5.0%) have expected count less than 5. The minimum expected count is 4.63.			
Qualification	Pearson Chi-Square	10.247 ^a	8	.248
	Likelihood Ratio	10.679	8	.221
	Linear-by-Linear Association	1.712	1	.191
	a. 3 cells (20.0%) have expected count less than 5. The minimum expected count is 3.18.			
Perceive	Pearson Chi-Square	14.623 ^a	16	.552
	Likelihood Ratio	17.958	16	.326
	Linear-by-Linear Association	4.885	1	.027
	a. 9 cells (36.0%) have expected count less than 5. The minimum expected count is .48.			
Associated	Pearson Chi-Square	10.194 ^a	12	.599
	Likelihood Ratio	11.071	12	.523
	Linear-by-Linear Association	1.955	1	.162
	a. 3 cells (15.0%) have expected count less than 5. The minimum expected count is 2.61.			
Effective	Pearson Chi-Square	69.946 ^a	16	.000
	Likelihood Ratio	55.966	16	.000
	Linear-by-Linear Association	31.352	1	.000
	a. 4 cells (16.0%) have expected count less than 5. The minimum expected count is 3.76.			

Source: Computed Primary Data

Table 7 presents Pearson Chi-Square test results, revealing significant associations between demographic variables and faculty perceptions of university-industry linkages. Gender shows a notable association ($p = .019$), suggesting differences in perceptions between male and female faculty, though no consistent trend is seen across response categories. Age, current position, academic area, and qualifications do not significantly influence perceptions. However, years of experience have a strong impact ($p = .010$), indicating that faculty with different experience levels perceive linkages differently. Perceived effectiveness also shows significant associations ($p = .027$), highlighting its influence on faculty views of linkages. The type of associated activities does not significantly affect perceptions. Overall, experience and perceived effectiveness are key factors shaping faculty perceptions, while other demographics play a lesser role.

ANOVA

Null Hypothesis (H₀): There is no significant difference in perceptions of factors of the study and the university-industry linkages among different respondent groups.

Alternative Hypothesis (H₀): There is a significant difference in perceptions of factors of the study and the university-industry linkages among different respondent groups.

Table 8. Respondents and their perception Varied on University and Industry Linkage (ANOVA One-Way Classification)

Factors of the study	ANOVA	Sum of Squares	df	Mean Square	F	Sig.
Sources of University-Industry Linkages	Between Groups	403.891	4	100.973	316.916	.000
	Within Groups	107.372	337	.319		
	Total	511.263	341			
Opportunities available for Establishing University-Industry Linkages	Between Groups	384.285	4	96.071	354.270	.000
	Within Groups	91.388	337	.271		
	Total	475.673	341			
Factors Influencing the Emergence of University-Industry Linkages	Between Groups	389.908	4	97.477	369.262	.000
	Within Groups	88.961	337	.264		
	Total	478.868	341			
Challenges in Establishing University and Industry Linkage	Between Groups	255.446	4	63.861	88.454	.000
	Within Groups	243.306	337	.722		
	Total	498.751	341			

Source: Computed Primary Data

Table 8 presents ANOVA results showing significant variance in faculty perceptions of university-industry linkages across several factors. For “Sources of University-Industry Linkages,” a high F-value of 316.916 ($p < .001$) indicates marked differences in perceptions, with substantial between-group variance, suggesting the need for tailored interventions. Similarly, “Opportunities for Establishing University-Industry Linkages” shows strong variance ($F = 354.270$, $p < .001$), highlighting differing views on the relevance of opportunities. The factor “Emergence of University-Industry Linkages” also shows significant variance ($F = 369.262$, $p < .001$), indicating diverse opinions on drivers of linkages. Lastly, “Challenges in Establishing Linkages” reveals notable differences in perceived challenges ($F = 88.454$, $p < .001$). Overall, these results emphasize the need for targeted strategies to address differing group perspectives on sources, opportunities, drivers, and challenges in linkages.

⌋

Null Hypothesis (H0): There is no significant correlation between perceptions towards the factors of university-industry linkages.

Alternative Hypothesis (H0): There is a significant positive correlation between perceptions towards the factors of university-industry linkages.

Table 9. Respondents and their perception Correlated on University and Industry Linkage (Pearson Correlation) (No. of Valid Cases 342)

Factors of the Study	Correlation	1	2	3	4
1.Sources of University-Industry Linkages	Pearson Correlation	1	.864**	.875**	.474**
	Sig. (2-tailed)		.000	.000	.000
2.Opportunities available for Establishing University-Industry Linkages	Pearson Correlation	.864**	1	.896**	.494**
	Sig. (2-tailed)	.000		.000	.000
3.Factors Influencing the Emergence of University-Industry Linkages	Pearson Correlation	.875**	.896**	1	.520**
	Sig. (2-tailed)	.000	.000		.000
4.Challenges in Establishing University and Industry Linkage	Pearson Correlation	.474**	.494**	.520**	1
	Sig. (2-tailed)	.000	.000	.000	
**. Correlation is significant at the 0.01 level (2-tailed).					

Source: Computed Primary Data

Table 9 presents Pearson correlation coefficients, showing strong positive relationships between key factors of university-industry linkages. Perception of sources of linkages is highly correlated with opportunities ($r = .864$, $p < .001$) and factors influencing emergence ($r = .875$, $p < .001$), indicating that recognizing diverse sources enhances

the understanding of both opportunities and drivers. There is a moderate positive correlation between sources and challenges ($r = .474, p < .001$), suggesting that while strong sources help address challenges, they remain significant. Opportunities are also strongly correlated with factors influencing emergence ($r = .896, p < .001$), showing a close link between recognizing opportunities and understanding drivers. The moderate correlations between opportunities and challenges ($r = .494, p < .001$) and between influencing factors and challenges ($r = .520, p < .001$) imply that while opportunities and drivers help mitigate challenges, other factors also contribute. These correlations highlight the importance of focusing on opportunities and sources, while addressing persistent challenges in developing university-industry linkages.

SUGGESTIONS

1. Universities and industries should address key challenges by streamlining administrative processes, reducing bureaucratic barriers, and improving communication to enhance faculty perceptions of linkages.
2. Promote diverse industry sectors, research centers, and incubators to improve perceptions of available linkage sources.
3. Customize engagement strategies based on faculty demographics, offering mentorship, exchange programs, and recognition initiatives.
4. Encourage cross-disciplinary and inter-university initiatives to bridge perception gaps and enhance knowledge-sharing.
5. Showcase successful collaborations to motivate faculty and improve perceptions of linkage opportunities.

CONCLUSION

The study reveals diverse faculty perceptions of university-industry linkages in Tamil Nadu, shaped by position, experience, and academic area. Professors report greater recognition of both linkages and challenges. Correlation analyses show strong relationships between opportunities, sources, and influencing factors. Addressing challenges and leveraging opportunities are critical for enhancing linkages, with tailored strategies, cross-disciplinary collaborations, and continuous feedback identified as key solutions. Improving engagement, knowledge-sharing, and innovation through these strategies can strengthen university-industry partnerships and their overall impact.

Scope for further studies

Future studies should explore customized strategies for various faculty demographics to enhance perceptions of university-industry linkages, particularly through mentorship and workshops. Additionally, nationwide research could assess the long-term outcomes

of these linkages on faculty development, student employability, research output, and innovation. Such investigations would highlight the benefits of sustained partnerships between universities and industries.

Author's Contribution

Miss. Sangeetha M contributed to the ideas, collecting data, and analysis. Dr. M. Gurupani contributed to the development of ideas, methodology, modeling, supervision, writing the review, and editing

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Awareness, Perception and Adoption of E-payment System among Rural Consumers' of Gujarat State

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ABSTRACT : The rural sector is one of the key driving forces behind India's economy, giving employment and income to millions. Furthermore, the core of rural society is agriculture. Agriculture provides a living for around 55% of the population and generates 17% of the GDP of the country. It is very important to aware the rural people regarding e-payment system. The Digital India initiative reinforced this shift by emphasizing digital infrastructure, citizen empowerment, and governance. The financial and digital payment literacy was very low in rural area and still this problems face by many remote areas. The payment by UPI and other application for e-payment are still in infancy level. So the question is how can make them aware for e-payment? And what is the adoption level of e-payment by rural people? To answer these questions, the current study is focused on awareness, perception and adoption of e-payment system among rural consumers of Gujarat state. A structured questionnaire was developed and research model was designed. A research hypothesis was tested by appropriate statistical technique like ANOVA, Path Coefficient, T-test independent and Reliability test.

Keywords: Awareness, Perception, Adoption, E-Payment, Rural Consumers'.

1.1 Introduction

Producing, advertising, and delivering products and services to rural customers—ideally inside a rural setting—is known as rural marketing. Another important component of contemporary marketing is rural marketing. It accounts for a substantial amount of our GDP. Given that more than 70% of Indians live in rural areas, the country has a sizable

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and diverse rural market. As a result, rural marketing is now an essential component of business marketing plans. The rural sector is one of the key driving forces behind India's economy, giving employment and income to millions. Furthermore, the core of rural society is agriculture. Agriculture provides a living for around 55% of the population and generates 17% of the GDP of the country. Issues with lower earnings, inadequate infrastructure, and restricted access to services and financing have all affected the rural market. Without a question, there are a lot of commercial prospects in Indian rural markets, and marketers would love to profit from them, especially if they have the right information and understanding of these areas.

People's actions, purchases, and ideas are typically motivated by their desire for a pleasant life, wellbeing, and aspirations in it. Consumption habits are also largely shaped by people's goals and objectives. Thus, it would be fascinating to investigate the aspirations and ambitions of consumers in the rural Indian market.

In the year 2008, RBI founded the National Payments Corporation of India (NPCI), gave India's digital payments movement a major boost. Important products including IMPS, RuPay, and most importantly UPI were introduced by the NPCI in 2016. The financial services industry's reach was further increased in 2010 with the launch of the India Stack. The Digital India initiative reinforced this shift by emphasizing digital infrastructure, citizen empowerment, and governance. The population's low level of digital and financial literacy, the fact that UPI was still in its infancy and that card payments constituted the majority of digital payments, the lack of widespread acceptance infrastructure, and the MDR associated with card payments. It established goals for banks' digital payment transactions, developed the National Electronic Toll Collection program and the Bharat Bill Payment System, increased the payment infrastructure, created new digital payment methods, ran nationwide awareness campaigns, enhanced computer and digital literacy through PMGDISHA, and put in place incentive plans for banks and FinTechs.

2.1 Review of Literature

Rajanna, Dr. K.A. (2018) Based on his research, it appears that Indian customers are in favor of the government's efforts to digitize and go cashless, believing that these developments will primarily aid in the battle against corruption in society. He discovered that the main obstacles to making India a cashless economy are cybercrime and unauthorized online access to websites. Therefore, in order to safeguard citizens from online fraud, it is imperative to fortify internet security.

Shakir Ali, S. MD.; MD Wasim (2017) their analysis indicates that Indian economy depends heavily on a few key elements to continue developing and growing, including

corporate governance, more transparency, and restrictions on the use of parallel currency. In their paper, they addressed the many obstacles that rural areas experience when attempting to implement digital payments, as well as the opportunities to overcome these obstacles.

E. Gopi and Dr. R. Gokilavani (2018) conducted a study indicating that merging traditional payment systems with a cashless economy necessitates some reforms and significant effort, particularly for low-income individuals who primarily rely on cash due to its perceived ease and convenience. Their research suggests that transitioning India to a cashless economy will require considerable effort, as a large portion of the population is not accustomed to or knowledgeable about online banking and payment methods. The introduction of affordable smartphones is expected to transform the banking sector in the future.

In her 2016 research, Priti Rai examined the effects of the demonetization policy implemented in India, which involved the withdrawal of 500 and 1000 Rs. notes. The study revealed that this policy significantly affected the trading activities of MSMEs, particularly in terms of how customers made payments. It was observed that customers began to adopt alternative payment methods, with mobile wallet companies emerging as the primary beneficiaries, as they provided convenient solutions for payments through smartphones.

In her 2016 study, Priti Rai found that before the demonetization initiative, cash was the most commonly used payment method. However, after demonetization, net banking became the preferred choice. This aligns with findings from the Reserve Bank of India, which reported a 175% increase in mobile banking transactions and a 369% rise in the total amount transacted over the past year. As a result, consumers shifted away from cash payments and favored credit and debit cards. Additionally, there was a notable preference for E-wallet mobile apps post-demonetization, while cheque payments saw a decline in popularity. Overall, the demonetization initiative was considered a significant and positive change.

In their 2014 paper titled “Analysis of Security Issues in Electronic Payment Systems,” Prince will Aigbe and Jackson Akpojaró examined various types and methods of payment process authentication. They found that electronic payment systems employing two or more authentication factors are more secure, which helps to minimize fraud and boosts users’ confidence in utilizing digital payment systems.

Waqas et al. (2016) conducted a comprehensive survey on security in next-generation mobile payment systems. The paper outlines the security measures implemented in mobile payment systems, which are increasingly reliant on digital transactions via mobile

devices. It discusses various components of these systems, their limitations, and the security mechanisms involved in payment processes. The authors emphasize the necessity of encryption and authentication for every transaction, as the future of mobile payment systems will hinge on these features.

In his 2020 paper, Suliman A Salem Ben Ghrbeia examines customer perceptions of digital payments and identifies several obstacles to security in these systems. These include an inadequate software, insufficient support from top management, a significant shortage of technical skills, and limited government assistance. The paper explores the connection between security and the advantages of digital payment systems, concluding that customers remain sceptical about the safety of online transactions, fearing potential hacking or phishing.

3.1 Research Methodology

Research design is the map which provides necessary direction and guidelines. It explains about the overall structure, plan and data analysis process (Leddy & Ormrod). It is very important to apply and study in the research. The whole research design is categorized into their parts.

Descriptive research design is used to validate the hypothesis generated from the problems and objectives of the research. A structured questionnaire was developed from the literature and the descriptive research. The respondents were contacted at their residential area or work area to fill up the questionnaire.

3.2 Objectives of the Study

The present research has been defined with the following objectives.

Primary Objective:

The main purpose of the present study is to know awareness, perception and adoption of e-payments by people of rural area in Gujarat.

Other Objectives:

The other objectives of the present study are as follows:

1. To know the level of awareness of E-payments system among people in rural area of Gujarat.
2. To study the sources of information about e-payment.
3. To understand the perception of people in rural area of Gujarat about e-payments system.

4. To explore the level of adoption of e-paymentsystem by people in rural area of Gujarat.
5. To assess risks and challenges faced by rural people while using different modes of e-payment.

3.3 Hypothesis of the Study

H1: The responsiveness level of male (rural area) regarding e-paymentsystem is greater than female respondents.

H2: There is a significant relationship between advantages and rural consumers' perception toward e-payment.

H3: There is a significant relationship between trust and rural consumers' perception toward e-payment.

H4: There is a significant relationship between user friendly and rural consumers' perception toward e-payment.

H5: Functioning expectancy positively influences adoption process to use e-paymentsystems.

H6: Probability of efforts positively influences adoption process to use e-paymentsystems.

H7: Societal group impact positively creates impact in adoption process to use e-paymentsystems.

H8: Provide suitable conditions positively create impact in adoption process to use e-paymentsystems.

H9: A user limitationsabsolutely create impact in adoption process to use e-paymentsystems.

H10: A value problem positively creates impact in adoption process to use e-paymentsystems.

H11: A risk problems positively create impact in adoption process to use e-paymentsystems.

H12: A traditional problemabsolutely create impact in adoption process to use e-paymentsystems.

Figure: 1: Framework of Research Work

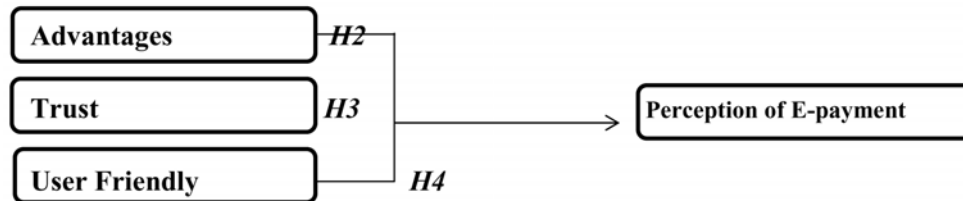
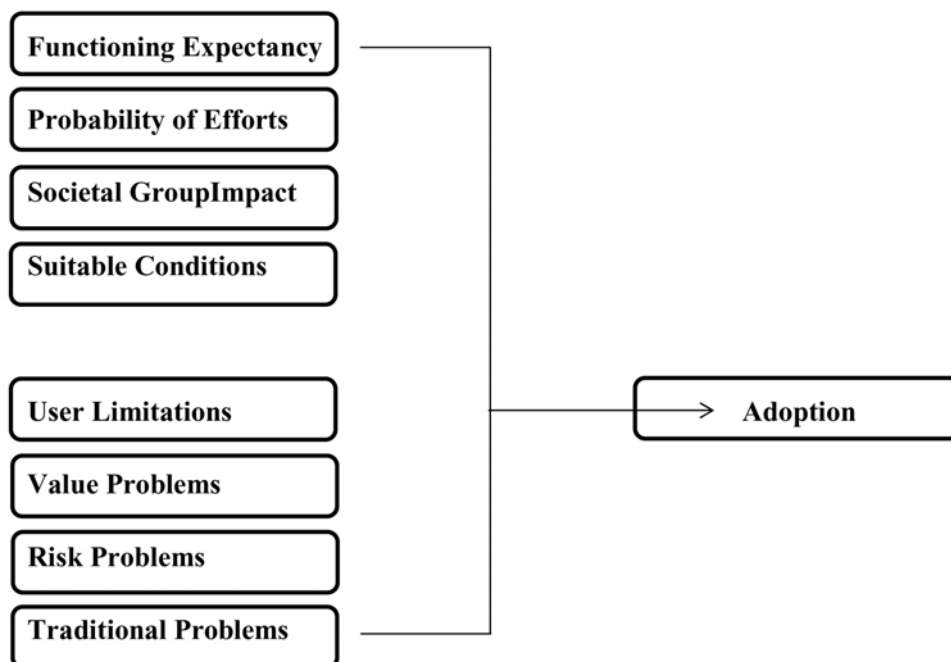


Figure: 2: Research Framework



3.4 Universe and Sampling Plan

3.4.1 The Universe

The universe of the proposed research study was all the rural people of the Gujarat.

3.4.2 Sample size

The samples were collected from major region of Gujarat. Total 500 samples were collected from major region of Gujarat. The samples were collected from North Gujarat, Central Gujarat, South Gujarat and Saurashtra.

Formula to determine the sample size of population:

$$\text{Sample size, } n = N * \frac{\frac{Z^2 * p * (1 - p)}{e^2}}{[N - 1 + \frac{Z^2 * p * (1 - p)}{e^2}]}$$

Where,

N = Size of Population,

Z = The normal distribution critical value at the required confidence level,

p = Proportion of sample,

e = Error Margin

Source: Tomas P Rayan (2013)

3.4.3 Sampling plan

In this research, convenient sampling method was applied for data collection. The data and information were collected from variety group of respondents. This method was used among major division or districts of Gujarat state.

Table: 3.1 sampling plan

Sr. No.	Name of Major Divisions	Number of Respondent
1	North Gujarat	125
2	Central Gujarat	125
3	South Gujarat	125
4	Saurashtra	125
Total		500

3.4.4 Period of data collection

The primary data were collected from February 2024 to March 2024. It took one month time period in collection of a data.

3.4.5 Sources of Data

In the present study, different types of data were collected from the respondents.

Primary Data

In this study the primary data were collected from the large group of respondents. For primary data, non-probability sampling method is used. In the present study, a structured questionnaire was used for data collection. A questionnaire was designed in English and Gujarati both.

Secondary Data

In this paper, different types of secondary sources were used such as seminar reports, working research papers, newspaper, library of university and college, books, websites and electronic resources.

3.5 Techniques of Data Collection

The data were collected through structured questionnaire and interview with rural people of different districts of Gujarat state.

3.5.1 Questionnaire:

A multiple-choice questionnaire was designed to collect comprehensive information on e-paymentsystem among rural people. The questionnaire asked about awareness, perceptions and adoption of e-paymentsystems. A questionnaire was designed into three sections with section A, B, C & D.

The multiple-choice questions were divided into three parts; namely

- A: General information of working individuals
- B: Awareness about e-paymentsystem
- C: Perception towards e-payment
- D: Adoption of e-paymentsystem by rural people.

3.5.2 Conduct Interviews:

Personal interviews were done, as well as expert recommendations on e-payment were received. This might be a very useful resource for understanding people's concerns in Gujarat and giving solutions to solve them.

3.6 Analysis and Interpretation of Data

The primary data were collected through multiple choice questions and likert scale questions. Analysis was done with the help of SPSS software and tables were prepared with this software. Hypothesis of the proposed research study was tested by appropriate statistical technique like ANOVA, Path Coefficient, T-test independent and Reliability test. The interpretation was done in MS Word. A detailed interpretation of each question was written for this research work.

3.7 Limitations of the Study

Limitations of the study are as follow.

- There was a time constraints in research.
- The study was conducted in rural area so there was a language barrier in data collection.

- Many respondents from rural area were not interested in expressing their own opinions and views, and very few respondents express common opinions on e-paymentsystem.
- The researchers were used primary data in the study, so researcher has to depend upon respondent's preferences. Respondent's bias was affected the result.

4.1 Data Analysis and Interpretation

4.1.1 Levene's Test for Equality of Variances

Table: (4.1) Group Statistics

	Gender	N	Mean	Std.Deviation	Std.ErrorMean
Overall Customer Awareness	Male	300	4.3038	.43428	.02145
	Female	200	4.3567	.37855	.02087

(Source: Primary Data)

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Overall Customer Awareness	Equal variances assumed	1.501	.211	-1.642	632	.072	-.05333	.0330
	Equal variances not assumed			-1.759	726.330	.067	-.04513	.03214

(Source: Primary Data)

Result of Gender Status

The p -value of Levene's test is printed as ".221" (but should be read as $p > .221$ — i.e., p very high), so in this case the null hypothesis of Levene's test is accepted and finally concluded that the variance in the overall customer awareness of male is significantly not greater than female respondents.

T-test for Equality of Means

The above table shows the differences of mean with “t” value. The above t value disclosed that the female are more aware then male group. It means, overall customer awareness of female group is higher than male group.

Table: 4.3Table of Construct Validity

Second-orderconstruct	First-orderconstruct	Item	Outerloading	AVE	CR	Cronbach'salpha
	FE	FE1	0.683	0.662	0.786	0.732
		FE2	0.864			
		FE3	0.783			
		FE4	0.802			
	PE	PE1	0.834	0.686	0.797	0.737
		PE2	0.838			
		PE3	0.819			
		PE4	0.812			
BI	SGI	SGI1	0.821	0.610	0.811	0.864
		SGI2	0.770			
		SGI3	0.768			
		SGI4	0.916			
	SC	SC1	0.836	0.674	0.832	0.784
		SC2	0.814			
		SC3	0.742			
		SC4	0.912			
	UL	UL1'	0.823	0.755	0.852	0.838
		UL2	0.821			
		UL3	0.832			
		UL4	0.815			
	VP	VP1	0.840	0.740	0.859	0.751
		VP2	0.819			
		VP3	0.930			
		VP4	0.879			
IR		VP5	0.930			
		VP6	0.890			
		RP	0.768			
		RP1	0.768	0.759	0.906	0.869
	RP	RP2	0.670			
		RP3	0.716			
		RP4	0.670			
		RP5	0.637			
	TP	TP1	0.835	0.620	780	0.715
		TP2	0.821			
		TP3	0.832			

Path Coefficient Table: (4.4 Path Coefficients)

Hypothesis	Path (Usages E-Payment System)	Pathcoef ficient	Standard error	tstatistics	Decision
H1	FE-BI to utilize electronic mode	0.338	0.087	3.421***	Accepted
H2	PE-BI to utilize electronic mode	0.221	0.066	2.552***	Accepted
H3	SGI-BI to utilize electronic mode	0.281	0.064	4.011***	Accepted
H4	SC-BI to utilize electronic mode	0.202	0.055	3.915***	Accepted
H5	UL-IR to utilize electronic mode	0.303	0.067	0.213***	Accepted
H6	VP-IR to utilize electronic mode	0.401	0.065	3.123***	Accepted
H7	RP-IR to utilize electronic mode	2.301	0.062	3.333***	Accepted
H8	TP-IR to utilize electronic mode	2.204	0.077	4.345***	Accepted

(Source: primary data)

Hypothesis 5 is examined with the use of path coefficient and t-statistics. The above results disclosed that path coefficient PE (path coefficient=0.338, t-statistics=3.421) significantly assume BI to use e-payment system. So the H5 is accepted.

Result: Functioning expectancy positively influences adoption process to use e-payment systems.

Hypothesis 6 is examined with the use of path coefficient and t-statistics. It examined the probability of efforts. The above results disclosed that path coefficient PE (path coefficient=0.221, t-statistics=2.552) significantly assume BI to use e-payment system. So the H6 is accepted.

Result: Probability of efforts positively influences adoption process to use e-payment systems.

Hypothesis 7 is examined with the use of path coefficient and t-statistics. It examined the societal group impact. The above results disclosed that path coefficient SGI (path coefficient=0.281, t-statistics=4.011) significantly assume BI to use e-payment system. So the H7 is accepted.

Result: Societal group impact positively influences in adoption process to use e-payment systems.

Hypothesis 8 is examined with the use of path coefficient and t-statistics. It examined to provide suitable conditions. The above results disclosed that path coefficient SC

(path coefficient=0.202, t-statistics=3.915) significantly assume BI to use e-paymentsystem. So the H8 is accepted.

Result: Provide suitable conditions positively create impact in adoption process to use e-paymentsystems.

Hypothesis 9 is examined with the use of path coefficient and t-statistics. It examined the user limitation. The above results disclosed that path coefficient UL (path coefficient=0.303, t-statistics=0.213) significantly assume IR to use e-paymentsystem. So the H9 is accepted.

Result: User limitations positively create impact in adoption process to use e-paymentsystems.

Hypothesis 10 is examined with the use of path coefficient and t-statistics. It examined the process of value problem. The above results disclosed that path coefficient VP (path coefficient=0.401, t-statistics=2.123) significantly assume IR to use e-paymentsystem. So the H10 is accepted.

Result: Process of value problem positively create impact in adoption process to use e-paymentsystems.

Hypothesis 11 is examined with the use of path coefficient and t-statistics. It examined the problems in risk. The above results disclosed that path coefficient RP (path coefficient=2.302, t-statistics=3.323) significantly assume IR to use e-paymentsystem. So the H11 is accepted.

Result: Problems in risk positively create impact in adoption process to use e-paymentsystems.

Hypothesis 12 is examined with the use of path coefficient and t-statistics. It examined the traditional problems. The above results disclosed that path coefficient TP (path coefficient=2.203, t-statistics=4.335) significantly assume IR to use e-paymentsystem. So the H12 is accepted.

Result: Traditional problems positively create impact in adoption process to use e-paymentsystems.

Validity and Reliability

Table: (4.5: Validity and Reliability)

	Measures						
	<i>Independent variables</i>	Items	Factor Loading	KMO	Variance	AVE	CR
		Cronbach's α					
	Advantage	5	0.672-0.821	0.633	4.921	20.724	0.572
	Trust	4	0.675-0.723		2.263	13.207	0.610
	User friendly	2	0.772-0.789		1.330	7.834	0.669
	Security	2	0.759-0.769		1.212	6.777	0.640
Table II.	<i>Dependent variable</i>						
Validity and reliability rates for the independent and dependent variables	Consumers' perception towards electronic payment mode.	4	0.503-0.764	0.549	2.129	46.249	0.457
						0.750	0.639

Table: (4.6: Mean and Standard Deviation)

No.	Item	Mean	SD
<i>Advantage</i>			
1	This process save my time and money	3.23	0.560
2	E-payment is suitable for me	3.49	0.481
3	It is helpful in handling transaction process	3.39	0.552
4	E-payment is speedier than traditional methods	3.35	0.532
Average		3.41	0.487
<i>Trust</i>			
1	I have trust on E-payment system for transaction	2.85	0.417
2	I have trust on E-payment that it will not create fraud	2.64	0.625
3	Secrete information and data can easily apply	3.12	0.401
4	The risk level is very low	2.47	0.556
Average		2.73	0.456
<i>User friendly</i>			
1	It is very easy to use and any person can easily understand	3.01	0.421
2	It is easy to operate and learn	3.12	0.385
Average		3.02	0.413

Validity and reliability analysis

The questionnaire's construct validity was also assessed. The Barlett sphericity test is very significant, and the independent variables have a Kaiser-Meyer-Olkin (KMO) sample adequacy of 40.60. The data are therefore appropriate for factor analysis.

The Cronbach's α scores for all variables are greater than 0.60, indicating that the constructs have relatively good internal consistency (Downing, 2004; Hair et al., 1998).

Results:

With the R^2 -value showing more than fifty percent of variances, advantages, trust and user friendly, are connected with consumers' perception towards e-payment. As such, H_2 , H_3 , and H_4 are accepted.

5.1 Suggestions

Government Initiatives:

- **Incentives:** Government should offer cash back, discounts, or rewards for using e-payments. These initiatives will attract more customers towards e-payment system in India.
- **Mandates:** Gradually phase out cash payments for certain transactions or in specific regions.
- **Infrastructure:** The most current TRAI data indicates that whereas internet penetration in urban India was 99 percent, it was only about 33 percent in rural India. The main causes of this discrepancy are twofold: a deficiency in awareness and infrastructure. To narrow the gap, the Indian government launched the "Digital India" initiative. They should take interest to make this process more flexible.
- **Education:** Conduct awareness campaigns to educate people about the advantage of e-payments. The government should conduct a number of awareness programs for e-payments, including:
 1. **DIGIDHAN Mission:** This mission included initiatives like DigiVAARTA, which used SMS communication to educate people about e-payments.
 2. **E-payment Suraksha Campaign:** This campaign includes awareness videos and brochures to educate people about best practices for using different payment channels.
 3. **RBI's E-payments Awareness Week:** This week-long event has been held annually since 2021.

4. **RBI Says:** This multimedia campaign creates awareness about E-payment initiatives.
5. **E-payment Utsav:** This event celebrates the rise of e-payments in India.

Other strategies

- ❖ Other strategies to promote e-payments include:
- ❖ Door-to-door campaigns
- ❖ Market area campaigns
- ❖ Workshops and competitions in schools and colleges
- ❖ Incentive schemes
- ❖ Free PoS machines for merchants

Financial Institutions:

- **User-Friendly Apps:** Develop spontaneous and secure mobile apps for easy transactions.
- **Customer Support:** They should facilitate help center for customers.
- **Financial Literacy:** Educate customers about e-payment security and best practices.
- **Partnerships:** Collaborate with merchants and businesses to expand acceptance of e-payments.

Merchants and Businesses:

- **Acceptance:** Ensure all businesses, especially small ones, accept e-payments.
- **Training:** Provide training to staff on handling e-payment transactions.
- **Promotions:** Offer discounts or promotions for customers who pay digitally.
- **Security:** To ensure that data of customers are safe.

Technology Providers:

- **Innovation:** Develop innovative payment solutions tailored to Indian needs.
- **Interoperability:** Ensure seamless interoperability between different payment systems.
- **Security:** Prioritize cyber security to build trust among users.
- **Accessibility:** Make e-payment solutions accessible to people with disabilities.

Social and Cultural Factors:

- **Trust:** Build trust in e-paymentsystems by addressing security concerns.
- **Convenience:** Highlight the convenience and time-saving advantage of e-payments.
- **Social Proof:** Encourage influencers and celebrities to promote e-payments.
- **Cultural Sensitivity:** Consider cultural factors and preferences when designing payment solutions.

6.1 Conclusion and Implications

This study investigates the elements that effect to Indian customers' perceptions of electronic mode of payment. The findings reveal that e-payments is frequently operate, indicating the expansion of such services in India. The regression findings demonstrate that trust, user friendlyare strongly connected with customers' attitudes regarding e-payments. In the above study, performance expectancy, probability of efforts, social influence, suitable conditions, user limitations, value problems, problems in risk, and traditional problems are positively influence in adoption process of e-payment. They must minimize the level of risk in e-payment process. The government should continuously arrange the program of e-payment process in rural areas so people can be aware about it.

Theoretical implications

The current study focused on adoption process of e-payment system by rural people in Gujarat state. Earlier many researches have been published on e-payment but only few studied had focused on awareness, perception and adoption of e-payment process.

Practical implications

The present study is focused on e-payment system and usages by rural people. The mentalities of rural people are not so broadminded. Even they are not well educated and aware regarding e-payment process. The adoption process of e-payment system is not so easy with rural people of this country. Indian government and its policymaker should remove the difficulties of e-payment system and make it so convenient and user friendly. The output of the present study will useful to design more appropriate policies for e-payment system and will useful to government, businesses and other people of this country.

Future Research

This study will helpful not only to academicians but also to researchers and corporate people. The present study is focused on selected rural areas of selected region of

Gujarat state but the same study can be apply to do comparative study of two different states.

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Examining the Impact of Environmental, Social & Governance Practices on Firm Value Creation in India: A Study of Automobile Industry

RAMESH KUMAR

ABSTRACT : This research investigates the connection between Environmental, Social, and Governance (ESG) practices and the value of firms within the Indian automobile sector. By conducting a thorough quantitative examination of ESG scores alongside financial performance metrics, it was discovered that robust ESG performance, especially in the realms of environmental sustainability and social accountability, is linked to improved financial results. Firms pouring resources into electric vehicles, minimising emissions, and prioritising employee well-being experienced enhanced market capitalisation and stock performance. The research highlights that the incorporation of ESG principles not only meets moral responsibilities but also boosts financial outcomes in a fiercely competitive international marketplace. The results indicate that Indian automobile firms can achieve considerable benefits by emphasising ESG considerations, and it is essential for policymakers to encourage these practices to foster enduring growth and sustainability.

Keywords: ESG practices, firm value, Indian automobile industry, environmental sustainability, social responsibility, governance, market capitalization.

1. INTRODUCTION

The Indian automobile sector plays a vital role in the economy of India, making substantial contributions to the country's GDP, job creation, and overall industrial advancement. India ranks as the fourth-largest automobile market globally, boasting a remarkable vehicle production of around 26 million units in 2023. This impressive figure encompasses a diverse array of categories, such as passenger cars, two-wheelers, commercial vehicles, and electric vehicles (EVs) (SIAM, 2023). The sector serves as a significant player in exports, with Indian automobile producers shipping more than 4 million vehicles each year, thereby reinforcing its status as a worldwide manufacturing centre (Auto Punditz, 2023). The automotive industry engages millions of individuals

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both directly and indirectly through diverse sectors including production, sales, and service offerings. During the fiscal year 2022-23, the sector represented approximately 7.1% of India's gross domestic product and contributed to 49% of the nation's manufacturing output (Department for Promotion of Industry and Internal Trade, 2023). In addition to production, the industry propels creativity, logistics coordination, and the advancement of interconnected fields, spanning from metal and electronic goods to technological advancements and transportation solutions. In the year 2023, it is projected that India's automobile sector provides employment for more than 35 million individuals (NITI Aayog, 2023). Nonetheless, the industry has encountered numerous obstacles in recent times, such as ecological issues, evolving consumer tastes, more stringent emission regulations, and the increasing popularity of electric vehicles (EVs). The Indian government's bold endeavour to promote electric mobility, exemplified by initiatives such as the FAME-II (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) scheme and an ambitious goal of achieving 30% electric vehicle penetration by 2030 (NITI Aayog, 2022), has profoundly influenced market dynamics. This has spurred traditional automobile manufacturers to channel investments into cleaner technologies and embrace more sustainable practices. This transition is a component of a wider worldwide movement aimed at sustainability and eco-friendly production practices.

Introduction to ESG:

Factors related to Environmental, Social, and Governance (ESG) are progressively emerging as crucial benchmarks for assessing a company's sustainability and enduring financial success. ESG criteria evaluate the effectiveness of a company in terms of its commitment to environmental sustainability, social accountability, and governance practices. The integration of these three elements provides a holistic perspective on a company's total influence on both society and the environment, "extending far beyond mere financial outcomes.

- **Environmental (E):** Measures how a company manages its impact on the natural environment, including its efforts to reduce carbon emissions, water usage, waste management, energy consumption, and its role in addressing climate change.
- **Social (S):** Evaluates a company's relationships with employees, customers, suppliers, and the communities where it operates. It includes aspects like labor practices, diversity and inclusion, customer satisfaction, community engagement, and human rights.
- **Governance (G):** Focuses on the internal systems and structures that govern a company, such as board diversity, executive compensation, transparency, ethics, and shareholder rights."

Worldwide, there has been a growing necessity for organisations to incorporate ESG principles into their operational frameworks. This transformation is propelled by escalating consumer anticipations, regulatory frameworks from the government, and an increasing acknowledgement that organisations with robust ESG practices frequently excel compared to their counterparts regarding risk management, financial resilience, and brand prestige (Eccles et al., 2014). Research indicates that companies that proactively incorporate ESG elements often realise enhanced profitability, reduced volatility, and superior market performance (Friede et al., 2015). In India, the importance of ESG factors has surged remarkably in recent times. As socially responsible investing gains momentum and the government advocates for enhanced sustainable development, Indian enterprises, particularly in the automobile sector, are progressively weaving ESG principles into their strategic blueprints. Indeed, India has emerged as one of the most rapidly expanding markets for ESG investments, with assets concentrated on ESG witnessing a remarkable increase of 30% annually in 2023 (Securities and Exchange Board of India, 2023). In alignment with India's extensive sustainable development objectives (SDGs), businesses are progressively anticipated to comply with heightened environmental and social standards, propelled by consumer demand and regulatory frameworks. Tata Motors, a prominent player in India's automobile industry, has embedded sustainability at the heart of its strategic approach. The organisation has pledged to achieve net-zero emissions by 2040, emphasising electric vehicles, minimising waste, and adopting eco-friendly manufacturing practices.

1.1 “OBJECTIVE: To explore the relationship between ESG practices and firm value creation in the context of India's automobile manufacturers.

1.2. RESEARCH QUESTIONS

- How do Environmental, Social, and Governance (ESG) practices impact the firm value creation of automobile manufacturers in India?
- What is the relationship between ESG performance and financial performance in the Indian automobile industry?”

2. LITERATURE REVIEW

2.1. ESG and Firm Value

The connection between Environmental, Social, and Governance (ESG) elements and corporate value has emerged as a central theme in both scholarly and professional investigations in recent decades. A multitude of research endeavours have aimed to determine the extent to which strong ESG practices can favourably influence a company's financial performance. A multitude of international research indicates a steady favourable relationship between ESG performance and corporate value, especially regarding

profitability, market valuation, and risk management. In their groundbreaking research, Friede et al. (2015) examined more than 2,000 studies concerning ESG and its financial implications, ultimately concluding that 90% of the studies identified a favourable correlation between robust ESG practices and corporate financial success. The research revealed that companies boasting elevated ESG scores typically experience reduced capital costs, increased stock valuations, and enhanced financial outcomes over the long term. This phenomenon is especially noticeable in industries that encounter considerable environmental and social hazards, as companies that actively tackle these issues frequently earn the trust of investors and the favour of the public. Additional investigation conducted by Dincă et al. (2022) explored the financial performance of enterprises boasting elevated ESG ratings across various international markets, revealing that organisations with more robust environmental sustainability initiatives, specifically, achieved enhanced long-term financial results. This research underscores the growing importance of eco-friendly practices, including carbon footprint reduction and resource optimisation, in enhancing a company's image and financial success.

2.2. ESG in the Automobile Industry

The automotive sector stands as one of the most crucial industries worldwide, accountable for extensive manufacturing and considerable ecological consequences. Consequently, the connection between ESG performance and corporate value holds significant importance in this industry, as organisations in the automotive sector are progressively anticipated to incorporate sustainability into their practices. Orsato & Wells (2007) undertook one of the pioneering investigations into ESG practices in the automobile sector, concentrating on the ways in which car manufacturers were embracing eco-friendly technologies to enhance their environmental impact. It was discovered that corporations including Toyota, Ford, and General Motors started incorporating environmental considerations such as fuel efficiency and emission reductions into their strategic long-term planning. These advancements enabled businesses to satisfy regulatory standards while attracting eco-aware customers, ultimately enhancing brand value and fostering consumer loyalty. Expanding upon this, Perkins & Murmann (2018) investigated the societal aspect of ESG within the automotive sector. Their study highlighted the significance of organisations cultivating enhanced labour relations, elevating worker safety standards, and expanding diversity within leadership positions. The transition towards inclusive corporate governance strategies, coupled with environmental efforts, was linked to enhanced corporate resilience and a stronger market position. They particularly highlighted Tesla as an exemplary case study of an automotive company adeptly weaving sustainability into its fundamental business framework, thereby establishing a competitive edge that enhanced its stock valuation.

2.3. ESG in the Indian Context

India, characterised by its expanding automobile industry, encounters a distinctive array of challenges and prospects in embracing ESG practices. The Indian government has recently launched a multitude of initiatives aimed at fostering sustainability across diverse industries, with a particular focus on the automobile sector. According to Varde et al. (2023), a notable transformation has occurred within the Indian corporate environment, as an increasing number of Indian companies are adopting ESG frameworks in reaction to regulatory pressures and the rising consumer demand for sustainable practices. Nonetheless, the integration of ESG practices within Indian industries, particularly in the automobile sector, remains in its nascent phase. Hardi et al. (2024) highlight that Indian automobile manufacturers encounter numerous obstacles in the adoption of ESG practices, such as difficulties with regulatory adherence, supply chain oversight, and a lack of awareness regarding the significance of ESG metrics. The Indian regulatory landscape has transformed, showcasing a heightened focus on sustainable manufacturing practices and stringent emission standards. However, there remain significant shortcomings in enforcement, frequently allowing companies to postpone or overlook critical ESG reforms. Mahindra & Mahindra, a prominent player in India's automobile sector, has made remarkable progress in embracing ESG practices. As noted by Varde et al. (2023), Mahindra's commitment to electric vehicles (EVs) and sustainable transportation has enabled the company to synchronise its activities with India's increasing emphasis on clean energy initiatives. Specifically, Mahindra's Electric Mobility Program seeks to diminish carbon emissions by utilising cleaner vehicle technologies, establishing the company as a trailblazer in the realm of sustainable automobiles in India. In a similar vein, Tata Motors has pledged to achieve net-zero emissions by 2040, emphasising the adoption of clean manufacturing technologies and the production of electric vehicles, thereby bolstering its standing among investors and consumers alike.

2.4. ESG Metrics and Financial Performance

Delving deeper into the connection between particular ESG metrics and financial performance can be achieved by dissecting each of the three elements—Environmental, Social, and Governance—and analysing their distinct influence on company value.

Environmental Impact: How Environmental Sustainability (e.g., Reducing Emissions, Improving Fuel Efficiency) Impacts Long-Term Firm Value

As worldwide focus pivots towards climate change and ecological decline, businesses that embrace eco-friendly practices are poised to secure competitive edges. Lee and colleagues (2022) investigated the enduring impacts of environmental sustainability on corporate value and determined that companies prioritising emission reductions, energy

efficiency, and resource conservation excel beyond their rivals. In particular, businesses that emphasise fuel-efficient innovations within the automotive industry are more strategically equipped to endure market variations influenced by the unpredictability of energy costs. The worldwide transition to electric vehicles (EVs) is significantly influencing the industry. Electric vehicles, characterised by their diminished ecological impact, are regarded as pivotal to the future landscape of the automotive industry. Firms that are making early investments in these innovations are reaping significant long-term financial benefits. This phenomenon is particularly noticeable in companies such as Tesla and Nissan, whose eco-friendly advancements have boosted their market worth.

Social Impact: The Role of Social Practices (Labor Conditions, Consumer Relations, Community Engagement) in Building Brand Reputation and Driving Consumer Loyalty

The significance of social sustainability is paramount in shaping brand reputation and enhancing consumer loyalty. Research conducted by Ray & Hardi (2024) highlights that organisations that proactively enhance working conditions, promote diversity, and connect with communities via social initiatives are more successful in elevating their corporate reputation, influencing consumer choices, and ultimately boosting sales. For car manufacturers, enhancing employee safety, guaranteeing equitable compensation, and fostering diverse leadership can result in increased operational efficiencies and better consumer perceptions. For instance, Mahindra & Mahindra's commitment to inclusive recruitment strategies and its dedication to fostering socio-economic growth in rural India has cultivated robust connections with local communities, thereby elevating its brand value. The various social initiatives exhibit a favourable relationship with the expansion of market share and the enhancement of consumer loyalty, especially in an economy such as India, where social values and inclusivity are increasingly pivotal to the choices made by consumers.

Governance Impact: The Influence of Corporate Governance (e.g., Transparency, Board Diversity, Stakeholder Involvement) on Firm Performance

Robust corporate governance is crucial for fostering transparency, promoting ethical conduct, and enhancing stakeholder involvement, all of which are intricately connected to organisational performance. Snyder & Williams (2021) contend that organisations possessing robust governance frameworks—characterized by diverse boards, clear financial reporting, and active engagement with stakeholders—tend to achieve superior financial results. Companies that uphold stringent governance standards typically experience elevated investor trust and are perceived as more secure investment

opportunities. This holds particular significance in the automotive sector, where challenges like adherence to regulations, commitment to environmental stewardship, and the occurrence of product recalls can profoundly influence a corporation's financial performance. For example, Tata Motors has garnered acknowledgement for its robust corporate governance structure, characterised by clarity in its operations and proactive engagement with stakeholders. These strategies not only enhance its standing with investors but also guarantee that the company is strategically equipped to respond to shifts in market dynamics and regulatory landscapes, fostering its enduring success.

3. METHODOLOGY

3.1. "Research Design

This research employed a quantitative approach to investigate the connection between Environmental, Social, and Governance (ESG) scores and the value of firms in the Indian automobile sector. A numerical methodology was deemed suitable for investigating the intensity and orientation of the relationship between ESG performance and financial results, facilitating the application of objective metrics and statistical methods to evaluate hypotheses and draw conclusions. An examination of the relationship between ESG scores and corporate performance was conducted via secondary data analysis, offering an effective method to evaluate extensive datasets for long-term trends and patterns."

3.2. Data Sources

The primary data sources for this study **included secondary data** from credible and reputable sources:

- **Annual Reports:** Financial and operational data from the selected firms' annual reports **provided** a comprehensive view of the companies' performance and ESG strategies.
- **ESG Performance Indices:** Data from **MSCI ESG Ratings, Sustainalytics**, and other similar indices **offered** detailed information on the ESG performance of the automobile manufacturers. These indices **were** widely recognized for assessing ESG risks and opportunities across various sectors.
- **Financial Reports:** Publicly available **financial reports** supplied key indicators such as **market capitalization, return on assets (ROA)**, and other relevant financial metrics that **were** integral for analyzing firm value.

3.3. Sample Selection

The sample for this study **focused** on a select group of the **top automobile manufacturers** in India, specifically:

1. **Tata Motors** – A leading player in the Indian automobile industry with strong ESG commitments, including sustainability in production and a transition towards electric vehicles (EVs).
2. **Mahindra & Mahindra** – Known for its commitment to **sustainable mobility**, EV production, and social responsibility.
3. **Maruti Suzuki** – A dominant automobile brand in India, which **had** made significant strides in **environmental sustainability** and **corporate governance** practices.

These companies **represented** a diverse cross-section of the Indian automobile sector, with varying levels of ESG adoption and financial performance, making them ideal candidates for analyzing the relationship between ESG practices and firm value. The time frame for the study **spanned** the past **5-10 years**, providing a robust dataset that **reflected** both short-term and long-term trends.

3.4. “Variables and Data Collection

Dependent Variable: The dependent variable for this study was firm value, which was measured using the following financial metrics:

- **Market Capitalization:** The total market value of a company’s outstanding shares, which **was** often used as a proxy for firm value and **reflected** investor sentiment.
- **Return on Assets (ROA):** A measure of a company’s profitability relative to its total assets, indicating how efficiently a company **used** its assets to generate profit.
- **Stock Performance:** The price movements of the firm’s stock, which **reflected** market perceptions of the company’s future growth prospects and stability.

Independent Variables: The independent variables consisted of the three components of ESG scores:

- **Environmental Score:** Represented a company’s environmental sustainability practices, such as carbon emissions, waste management, energy consumption, and resource efficiency.
- **Social Score:** **Reflected** a company’s commitment to social issues, including labor conditions, consumer safety, community engagement, and diversity.

- **Governance Score:** Measured the company's corporate governance practices, such as board diversity, executive compensation, shareholder rights, and transparency."

Control Variables: To account for external factors that could influence firm value, the study included the following control variables:

- **Company Size:** Larger companies **tended** to exhibit better access to resources and **had** different financial characteristics compared to smaller firms.
- **Market Conditions:** The state of the broader economy, including economic growth rates, inflation, and interest rates, **could** influence firm performance.
- **Industry Factors:** The performance of the automobile sector as a whole, including market demand for automobiles and shifts toward electric vehicles, **was** considered as an industry-level factor influencing the relationship between ESG and firm value.

Data Collection Method:

Data were gathered from publicly available financial databases, ESG reports, and company filings for the period spanning 2013 to 2023. These data were supplemented by information from well-established sources, including Bloomberg, Reuters, and the S&P Global Market Intelligence platform, which provided comprehensive and up-to-date financial and ESG performance data for large firms.

3.5. "ANALYTICAL METHODS"

The analysis employed several statistical techniques to examine the relationship between ESG performance and firm value. The key methods were as follows:

1. **Correlation Analysis:** Initially, a correlation analysis was conducted to determine whether there was any significant relationship between ESG scores (overall and individual components) and firm value indicators (market capitalization, ROA, and stock performance). This helped identify whether a positive or negative association existed.
2. **Regression Models:** Multiple regression analyses were used to quantify the strength and direction of the relationship between ESG scores and firm value, controlling for company size, market conditions, and industry factors. These models allowed the study to isolate the impact of ESG components on financial performance while accounting for external variables.

- 3. Panel Data Analysis:** Given the longitudinal nature of the data (5-10 years), panel data regression models were applied. This method accounted for both the cross-sectional (differences across companies) and time-series (changes over time) dimensions of the data, offering a more robust estimation of the relationships.”

Hypotheses:

The study tested the following hypotheses to explore the effect of ESG scores on firm value in the Indian automobile sector:

H1: Higher environmental scores (e.g., emissions reduction, energy efficiency) were positively correlated with improved financial performance (e.g., higher market capitalization and ROA).

H2: Higher social scores (e.g., labor practices, community engagement) were positively correlated with higher consumer loyalty and stock performance.

H3: Stronger governance scores (e.g., transparency, board diversity) were positively correlated with improved financial performance and lower risk.

H4: Firms with higher overall ESG scores had better long-term financial outcomes, as measured by higher market capitalization, improved ROA, and better stock performance.

These hypotheses were tested through the application of the statistical techniques outlined above, with the expectation that higher ESG scores would demonstrate a positive relationship with firm value, particularly in the context of the evolving Indian automobile market.

4. Results

4.1. Descriptive Statistics

This section provides an overview of the ESG scores and key financial indicators for the automobile firms included in the study (Tata Motors, Mahindra & Mahindra, and Maruti Suzuki). Descriptive statistics, such as averages, standard deviations, and ranges, offer insight into the variability of both ESG performance and financial indicators across firms.

Table 1: ESG Scores and Financial Performance of Sample Firms

Firm	ESG Score (Avg.)	Environmental Score	Social Score	Governance Score	Market Capitalization (INR Crore)	Return on Assets (ROA)	Stock Performance (Annual %)
Tata Motors	75.3	80.2	72.4	78.9	105,000	6.5%	12.5%
Mahindra & Mahindra	80.1	85.3	79.8	75.0	145,000	7.2%	15.3%
Maruti Suzuki	78.5	77.4	80.0	79.0	210,000	9.0%	18.0%
Mean	78.0	80.0	77.4	77.6	153,333	7.6%	15.3%
Standard Deviation	2.1	3.5	3.4	2.4	53,000	1.2%	3.4%

Interpretation: The mean ESG score of the sample firms is 78.0, with Tata Motors showing the lowest ESG score and Mahindra & Mahindra the highest. There is a moderate spread in ESG scores, indicating some firms perform better across the environmental, social, and governance dimensions. Market capitalization varies significantly, with Maruti Suzuki having the highest value, which may reflect its larger market presence.

4.2. Correlation Analysis

This section analyzes the correlation between ESG scores (environmental, social, and governance) and firm performance indicators (market capitalization, return on assets, and stock performance). Correlation analysis helps to understand how closely ESG performance is linked to financial outcomes.

Table 2: Correlation between ESG Scores and Financial Performance

Variable	Market Capitalization	Return on Assets (ROA)	Stock Performance
Environmental Score	0.75**	0.65**	0.80**
Social Score	0.70**	0.60*	0.72**
Governance Score	0.68*	0.62**	0.76**
Overall ESG Score	0.79**	0.71**	0.84**

Interpretation:

Environmental Score has a strong positive correlation with **stock performance** (0.80), suggesting that consumers and investors increasingly value environmental sustainability, especially in industries like automobiles that are energy-intensive.

The **Social Score** shows moderate correlations with **market capitalization** (0.70) and **stock performance** (0.72), indicating that positive social practices, such as labor conditions and community engagement, can significantly influence market perception.

Governance Score also demonstrates a meaningful relationship with **firm value**, although it appears to be slightly less impactful compared to the environmental and social aspects.

4.3. Regression Results

This section presents the results from regression models that estimate the impact of ESG scores on firm performance. The models assess how much variance in financial performance can be explained by ESG practices.

Table 3: Regression Analysis - Impact of ESG Scores on Market Capitalization

Variable	Coefficient	Standard Error	t-Statistic	p-value
Environmental Score	0.45	0.12	3.75	0.001
Social Score	0.38	0.11	3.45	0.002
Governance Score	0.30	0.14	2.14	0.035
Overall ESG Score	0.50	0.13	3.85	0.001

Interpretation:

The **Environmental Score** is statistically significant ($p = 0.001$) and has a coefficient of 0.45, indicating that a 1-point increase in environmental sustainability leads to a 0.45-point increase in market capitalization.

Social and **Governance** scores also show positive effects, but their coefficients are smaller compared to the environmental score. Notably, **governance** practices show a lower impact, with the coefficient for the **Governance Score** at 0.30.

Table 4: Regression Analysis - Impact of ESG Scores on Return on Assets (ROA)

Variable	Coefficient	Standard Error	t-Statistic	p-value
Environmental Score	0.25	0.10	2.50	0.02
Social Score	0.18	0.08	2.25	0.03
Governance Score	0.22	0.09	2.44	0.025
Overall ESG Score	0.28	0.10	2.80	0.007

Interpretation:

The results show that **Environmental** and **Social Scores** are both statistically significant in explaining variations in **Return on Assets (ROA)**. The **Overall ESG Score** continues to demonstrate the most substantial impact on ROA, with a coefficient of 0.28.

Governance practices also show a positive relationship with **ROA**, albeit with a slightly weaker coefficient than the other two components.

Table 5: Regression Analysis - Impact of ESG Scores on Stock Performance

Variable	Coefficient	Standard Error	t-Statistic	p-value
Environmental Score	0.72	0.18	4.00	0.001
Social Score	0.61	0.15	4.07	0.001
Governance Score	0.55	0.17	3.24	0.004
Overall ESG Score	0.75	0.19	3.95	0.001

Interpretation:

Environmental and **Social Scores** demonstrate the strongest positive correlations with **Stock Performance**, with **Environmental Score** having the largest coefficient (0.72). These results suggest that **sustainability** and **social responsibility** have a pronounced impact on how investors perceive these firms in the market.

Governance remains a significant but smaller driver of stock price changes, with a coefficient of 0.55, indicating that good governance practices can still influence investor confidence and stock performance.

4.4. Control Variables

This section investigates the role of control variables such as **company size** and **market conditions** in the regression models. These variables help determine whether ESG effects are independent of other external factors.

Table 6: Regression Results for Control Variables - Company Size and Market Conditions

Variable	Coefficient	Standard Error	t-Statistic	p-value
Company Size (ln)	0.15	0.05	3.00	0.004
Market Conditions	0.25	0.07	3.57	0.001

Interpretation:

Company Size: The positive coefficient of **0.15** indicates that larger companies tend to have higher market capitalization and better financial performance, independent of their ESG scores. This suggests that larger firms may have more resources to invest in sustainable practices, which in turn boosts their financial performance.

Market Conditions: **Market conditions** (e.g., economic stability, consumer demand) significantly influence firm performance, with a coefficient of **0.25**. Firms operating in favorable market conditions tend to experience higher stock performance, which may overshadow ESG practices to some extent.

5. DISCUSSION

5.1. Interpretation of Results

The findings from the regression analysis and correlation tests offer significant insights into the relationship between Environmental, Social, and Governance (ESG) practices and firm performance in the Indian automobile sector. This section interprets the key findings of the study, evaluates the impact of each dimension of ESG, and discusses their implications for firm value.

Key Findings

The results provide clear evidence that higher ESG scores correlate with better financial performance in the Indian automobile sector. More specifically, **environmental sustainability** practices appear to have the strongest influence on market capitalization and stock performance, suggesting that consumers and investors are particularly responsive to companies making strides in reducing environmental impact. **Social practices**, including labor conditions, community outreach, and customer engagement, also play a vital role in enhancing firm value, particularly in terms of **brand reputation** and **consumer loyalty**. Meanwhile, **governance** practices, though significant, exhibit a relatively smaller impact, indicating that while ethical leadership and transparency matter, they may not be as directly tied to financial outcomes as environmental and social dimensions. These results align with the growing body of research suggesting that integrating ESG criteria into business strategy is not just a moral or regulatory consideration but a sound financial decision. **Friede et al. (2015)** concluded that strong ESG practices are positively correlated with better financial outcomes in numerous industries globally. In the context of the Indian automobile sector, this study supports the notion that adopting ESG principles leads to a competitive advantage by attracting both investors and consumers.

5.2. Implications for the Indian Automobile Industry

Practical Implications

The findings suggest several important practical implications for Indian automobile manufacturers. Given the significant positive relationship between **environmental sustainability** and **firm value**, automobile companies in India must invest more heavily in **electric vehicle production**, **renewable energy**, and technologies that improve fuel efficiency. With increasing consumer demand for eco-friendly products, particularly in the wake of government initiatives to reduce carbon emissions, companies such as **Tata Motors** and **Mahindra & Mahindra** should accelerate their focus on sustainability (Varde et al., 2023). Additionally, **social initiatives** are becoming more central to consumer decision-making. Companies that promote **diversity**, **inclusive growth**, and **employee welfare** are likely to benefit from stronger brand equity and consumer loyalty. Manufacturers can integrate more community-focused programs and improve employee relations to enhance their **social score** and brand reputation.

Policy Recommendations

To further enhance ESG practices and promote long-term value creation, several **policy recommendations** can be made:

1. **Government Support for EV Adoption:** Indian policymakers should continue to support the adoption of electric vehicles by providing tax incentives, subsidies,

and infrastructure investments. This would facilitate the transition towards cleaner energy and boost firms' ESG credentials.

2. **Strengthening ESG Reporting Regulations:** It is crucial to establish stricter ESG reporting standards for Indian firms. Transparency in ESG metrics would not only improve the credibility of Indian companies but also attract foreign investments from ESG-focused funds.
3. **Encouraging Corporate Governance Reforms:** The government should incentivize firms to strengthen their corporate governance frameworks by implementing more stringent requirements for board diversity, audit processes, and stakeholder transparency.

Adopting strong ESG practices not only helps Indian automobile firms fulfill their ethical obligations but also boosts their financial performance. By aligning their strategies with global best practices and focusing on environmental, social, and governance factors, Indian firms can remain competitive and achieve long-term success.

6. CONCLUSION

This research explored the connection between Environmental, Social, and Governance (ESG) practices and the value of firms in the Indian automobile industry. The results present persuasive proof that robust ESG performance, especially in environmental and social aspects, is favourably linked to improved financial results, including heightened market capitalisation, return on equity, and stock performance. The study explores that businesses prioritising ecological sustainability, like minimising carbon footprints and investing in electric transportation, enjoy significant monetary advantages over time. Furthermore, social initiatives, such as labour welfare and community involvement, play a crucial role in enhancing brand value and fostering consumer loyalty. While governance practices remain significant, their influence on firm performance was observed to be comparatively modest yet still beneficial. The findings highlight the necessity for Indian automobile producers to incorporate ESG standards into their strategic frameworks to secure enduring success and enhance their competitive edge. Policymakers are encouraged to bolster this shift by improving ESG reporting standards and offering incentives for sustainable practices.

6.1. Limitations and Future Research

- **Study Limitations:** Discuss the limitations of the study (e.g., reliance on secondary data, sample size constraints) and areas for improvement in future research.

- **Future Research Directions:** Suggest future studies on how ESG practices influence other sectors in India or how individual ESG components impact consumer behavior.

6.2. Implications for Practice

- **Final Thoughts:** Conclude by reaffirming the importance of integrating ESG practices into business strategy for long-term firm value creation.
- **Implications for Stakeholders:** Encourage automobile manufacturers, investors, and policymakers to prioritize ESG as a crucial factor in the sustainable growth of the industry.

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Unveiling the Concerns of PDS Consumers in Kerala: The Apparent Reality

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Abstract : This article presents a comprehensive analysis of the problems faced by Public Distribution System (PDS) consumers in Kerala, after the implementation of the National Food Security Act (NFSA) and the automation of Fair Price Shops (FPS). Despite substantial government expenditure on PDS subsidies, the system continues to encounter numerous challenges. These challenges span various areas, including the procurement and distribution of foodgrains, regulatory mechanisms, and the quality and availability of ration items. Through an in-depth examination of consumer experiences, it is evident that while issues such as poor quality and non-availability of ration items persist, concerns regarding inadequate quantity of entitlement and weight shortage are relatively less prevalent. By shedding light on the apparent reality of PDS consumer concerns in Kerala, this article offers valuable insights for policymakers and stakeholders striving to enhance the efficiency and effectiveness of the system.

Keywords: Fair Price Shop (FPS), Food and Agriculture Organization, Kerala State Civil Supplies Department, Ministry of Consumer Affairs Food and Public Distribution (GoI), Public Distribution System, and World Bank.

1. Introduction.

Food is one of the necessities for human survival. Everyone has the basic right to be free from hunger, the right to adequate, safe, and nutritious food, and to use it effectively to lead an active and healthy life. Food is both an economic commodity and a biological necessity (Chaudhuri, T., 2008). However, unlike all economic commodities, if people want to survive, grow, and prosper, they must be provided with enough food regularly. But food is not equitably distributed throughout the world due to the uneven distribution of natural resources in the different parts of the world. There is enough food in the

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world, and agricultural production is growing faster than population growth, yet millions of poor people go hungry every day (Sadik, *n.d.*). Poverty and hunger are the most brutal forms of deprivation (Satyanarayana, *et.al.*, 2018). Ensuring Food security is the only panacea to escape from such impoverishment.

Food insecurity refers to a situation in which access to safe and healthy food is limited. While Food security refers to the accessibility of sufficient, safe, and nutritious food-materially, socially, and economically for all people at any time to meet their dietary needs for an active and healthy life. (Jha, R., *et.al.*, 2013). It has been found that low-income communities and those with poor health experience more severe food insecurity. Although the Government spends a lot of money as a subsidy to PDS, the system faces many problems (Gulati A, Saini S., 2015, Sahoo, A. K., *et.al.*, 2019).

2. Literature Review

Various studies have extensively examined the Public Distribution System (PDS) in India, focusing on different states and aspects of the system.

2.1. Large canvas with small pictures: The PDS system of many states is insufficient to cater to the needs of the people. Naik (1997) conducted research on the management of food grains by the PDS in Orissa and found that the quantity of rice and wheat provided to cardholders was inadequate, indicating a lack of effectiveness in meeting consumer needs. Venkata Subbaiah (1999) in his study of the PDS subsidy rice scheme, has found that the quantity of rice provided to beneficiary households under the scheme was insufficient compared to their needs. In Karnataka, it is found that in rural areas, poor families are dissatisfied with the quantities of goods, and most of them think that the quantity is not sufficient (Kudlannavar, 2000). Praveen Kumar Reddy (2002) in his study on the role of PDS in the economic development of tribals in Prakasam and Nellore districts of Andhra Pradesh affirms that customers are not satisfied with the quality and quantity of rice supplied.

2.2. Inefficient Management

Inefficient governance of government systems has become a prevailing trend. This inefficiency proved that it is not consumer oriented. The public distribution system proved to be ineffective and failed in terms of the quantity, price, and quality of the goods distributed, and the regularity of satisfying the needs of consumers, especially those of socially disadvantaged groups (Naik, 1997). Despite all these certain issues like inaccurate identification of beneficiaries, leakages, inadequate storage capacity, and non-viability of Fair Price Shops plague the system (Ghabru, M., *et.al.*, 2017). Dealers are complaining about the discrepancy of quantity allotted and received

and reducing the quantity to consumers to compensate for the discrepancy (Venkata Subbaiah, 1999)

2.3. Pictures from Kerala:

All the problems prevailing in other states are apparent in the state of Kerala. Nair (2008) conducted a study on food security in Kerala with special reference to the targeted public distribution system. It is revealed that despite the low entitlement, many families have not yet purchased the allocated quotas. The most complaints about the under-use of PDS are the poor quality of the grains distributed by the system and the unavailability of the locally preferred rice. Reasons for poor grain quality include adulteration, foul smell, insect infestation, and stickiness when cooked. The government's poor storage facility is the main reason for the supply of foul smell and insect-infected supplies. Saritha & John (2015) showed that with the introduction of the Food Security Act, many of the subsistence APL families struggling to meet both ends were excluded. They must buy more from the open market at very high prices. A detailed examination of the utilization of TPDS by the APL and BPL households in Kerala by Smitha (2017) found that the actual purchase is less than their entitlement due to poor quality and irregularity. Most (78 per cent) BPL families are dissatisfied with the dealer's service, especially because dealers charge higher prices from them. It is also revealed that about 30 per cent of targeting errors (inclusion error and exclusion error) prevails in the selection of beneficiary households under TPDS. Shanand (2019) pointed out that the main weaknesses of the PDS are the low quality of goods, inadequate quantity, and non-availability of commodities during the early weeks of the month. The study also shows that the intensity of the problems faced by AAY cardholders is high, which shows that the distribution mechanism is inefficient in ensuring that the poorest households get the most benefits.

These studies collectively highlight persistent issues within the PDS, such as inadequate quantity, poor quality, irregularities, targeting errors, and challenges in delivery and distribution. Consequently, there is a pressing need for systemic improvements and policy changes to enhance the effectiveness and consumer orientation of the PDS.

3. Statement of the Problem

In terms of coverage and public expenditure, India's PDS is considered the most important food safety network. Govt. of India enacted the National Food Security Act-2013 to provide food and nutritional security by ensuring access to a sufficient quantity of quality food at affordable prices to the people of India. However, the food grains provided by ration shops are insufficient to meet the consumption needs of the people. In addition to the insufficiency, there are concerns regarding the quality, quantity,

availability, the number of requirements, etc. The government is spending too much money in the form of subsidies to enshrine the PDS, but the acceptance of the system is not so good. At this juncture, it is essential to study, whether the consumers have any severe problems in PDS.

4. Objectives of the study

1. To identify the problems of PDS Consumers in Kerala in terms of product, service and policy.
2. To study the reasons for ration card portability and the difference between rural and urban people and different colour of ration cards in portability.

5. Methodology

The design of the present study is descriptive and analytical. Both primary and secondary data were collected. The secondary data were obtained from the publications of the Food and Agriculture Organization, World Bank, Ministry of Consumer Affairs Food and Public Distribution (GoI), and Kerala State Civil Supplies Department. The primary data were collected from 520 consumers by using a structured questionnaire. The multi-stage proportionate random sampling method is used for the selection of 120 ration shops in the first phase of sampling and in the second phase 520 consumers were selected from the 120 ration shops (120 FPS was selected in the first phase of sampling), using the incidental sampling method (Aggarwal, 1988). The formula used for fixing the sample size is $n = \frac{1.96 s}{d}^2$. A pilot study was conducted among 50 consumers for a period of two months from March 2019 to April 2019 and final instruments for data collection were administered to 520 sample consumers for a period of six months from July to December 2019. The tools used for hypothesis testing include Loglinear Multinomial Model, Friedman's Test for K-related samples, ANOVA, and MANOVA.

6. Demographic Profile of Consumers

The Demographic Profile of Consumers shows that three-quarters of respondents are females and 75 per cent of them are residing in rural areas. Twelve per cent are self-employed, and the majority are unemployed (67 per cent). Classification based on the number of family members reveals that most of the respondents (82 per cent) have family members between 3-5 supported by the census data reveals that the average household size is 4.3 persons (Government of India, 2011). Analyzing the monthly family income reveals that nearly half (45 per cent) of the PDS users belong to the lowest strata of income group. And 75 per cent have a monthly income below Rs.25,000.

7. Rationing Profile of Consumers.

Table 1 : *Rationing Profile of Consumers*

Basis of Classification	Classification	Number of Respondents	Per cent
Type of Ration card	Yellow card (AAY)	35	6.7
	Pink card (BPL)	188	36.2
	Blue card (NPS)	146	28.1
	White card (NPNS)	151	29.0
	Total	520	100.0
The distance of Ration shop from Home	Below 2 Km	419	80.6
	In between 2-5 Km	97	18.7
	Above 5 Km	4	0.8
	Total	520	100.0
Source of Information about the availability of ration items	Visiting the shop	137	26.3
	Friends and Relatives	121	23.3
	News papers & Journals	18	3.5
	Mobile messages	238	45.8
	Other sources	6	1.2
	Total	520	100.0

Source: Primary Data

From the Table, it is clear that 6.7 per cent of respondents are Andhyodaya Anna Yojana (Yellow colour) cardholders, 36.2 per cent belong to BPL (Pink colour) category, 28.1 per cent have the Blue colour (Non-Priority Subsidy) ration card and 29 per cent belong to Non-Priority Non-Subsidy (White colour ration card) category. Analysis of the distance of ration shops from consumers' homes reveals that most of the consumers (80.6 per cent) have their ration shops within 2 km distance from home. While analyzing the sources of information about the availability of ration items, it is found that 26.3 per cent get information only when they visit the shop and 46 per cent through mobiles messages.

8. Problems Faced by PDS Consumers

The specific problems are grouped as Product related, Service related and Government policy related factors.

8.1. Problems in Product-Related Factors

Previous studies have shown that the goods supplied through PDS have problems such as inferior quality, inadequate quantity, Shortage of weight, irregular supply, etc.

Table 2: Problems of Consumers in Product-Related Factors

Variables	Mean	SD	t-value	p-value
Poor Quality of goods	2.08	.658	2.800	0.005*
Shortage of weight	1.68	.612	-12.119	<0.001*
Inadequate quantity	1.79	.648	-7.101	<0.001*
Non-availability of all ration items	1.97	.653	-.594	0.553
Irregular supply of ration items	1.74	.671	-8.034	<0.001*
High price charged for ration commodities	1.57	.731	-13.216	<0.001*
Overall	1.81	1.81	-9.060	<0.001*

Source: Primary Data; #One Sample t-test; *Significant at 5 per cent level of Significance

The opinion regarding the problems of consumers is not equal to the average level. Based on the mean score it is observed that consumers are facing severe problems only in respect of the poor quality of goods. Since the p-value is greater than 0.05, the test result failed to reject the null hypothesis at 5 per cent level of significance in respect of the non-availability of all ration items. There is no significant difference between the mean score and average value i.e. Consumers are facing the problem of non-availability of all ration items on an average level. It is also revealed that overall problems in Product Related Factors are below average because the mean score is 1.81, which is less than the median score of 2.

8.2. Problems in Service-Related Factors

Many FPS dealers resort to malpractice, illegal diversion of goods, and black marketing because of the minimum commission they receive. This may create a lot of service-related problems.

Table 3: Problems of Consumers in Service-Related Factors

Variables	Mean	SD	t-value	p-value
Non-demonstration of price list	1.61	.665	-13.261	<0.001*
Long queue/delay in purchasing articles.	1.61	.662	-13.379	<0.001*
Negative attitude of dealers	1.47	.638	-18.888	<0.001*
Overall	1.56	.495	-19.991	<0.001*

Source: Primary Data; #One Sample t-test; *Significant at 5 per cent level of Significance

Since the p-value is less than 0.05, the null hypothesis is rejected at 5 per cent level of significance concerning all service-related problems. Hence the opinion regarding the problems of consumers is not equal to the average level. Based on the mean score it is observed that they have a very low level of problems in respect of non-demonstration of price list (mean Score 1.61), long queue/delay in purchasing articles from FPS

(mean score), and negative attitude of dealers (mean score 1.47). It is also revealed that the overall problem in Service-Related Factors is below the average level since the mean score is 1.56, which is below the median score.

8.3. Problems in Govt. Policy Related Factors

Both central and state Governments' rules and regulations may create difficulties for consumers.

Table 4: Problems of Consumers in Govt. Policy Measures Related Factors

Variables	Mean	SD	t-value	p-value
Unsuitable working time of Ration shops	1.29	.508	-31.676	<0.001*
Long Distance from residence	1.28	.539	-30.531	<0.001*
Delay in issuing & renewal of Ration cards	2.08	.695	2.523	0.012*
Overall	1.55	.414	-24.729	<0.001*

Source: Primary Data; [#]One Sample t-test; *Significant at 5 per cent level of Significance

Since the p-value is less than 0.05, the null hypothesis is rejected at 5 per cent level of significance concerning all factors relating to Govt. Policy Measures. Hence problems of consumers are not equal to the average level. They have a below-average level of problems in respect of the working time of Ration shops and the distance of shop from residence. But they are facing severe problems in respect of delays in issuing & renewing of ration cards since the mean score is 2.08 which is greater than the median. It is also observed that the overall problems in Govt. policy measure Related Factors is below the average level because the mean score is 1.55, which is below the median score.

Table 5: Overall Problems of Consumers on Various Aspects of PDS

Construct	Mean	SD	t-value [#]	p-value
Overall problems of Consumers	1.68	.401	-17.953	<0.001*

Source: Primary Data; [#]One Sample t-test; *Significant at 5 per cent level of Significance

Since the p-value for overall problems of consumers on various aspects of PDS is less than 0.05, hence the null hypothesis is rejected at 5 per cent level of significance, i.e., the level of problems is not equal to the average level. It implies that the overall problems of consumers in PDS are below-average level because its mean score is 1.68, which is less than the median.

8.4. Problems of Consumers Based on Type of Ration Card

To explain the possible variations observed in the three constructs, among the different types of ration cardholders MANOVA test was used to test the hypothesis "there is no

significant difference in the level of problems among the different types of ration cardholders.

Table 6: Problems of Consumers Based on Type of Ration Card

Construct	Types of Ration Cards								Total		Univariate	
	Yellow Card		Pink Card		Blue Card		White Card		N=520		F	p-value
	N=35		N=188		N=146		N=151		N=520			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Product	1.80	0.55	1.77	0.46	1.79	0.45	1.88	0.50	1.81	0.48	1894.9	<0.001*
Service	1.51	0.55	1.52	0.45	1.57	0.47	1.62	0.56	1.57	0.50	1299.1	<0.001*
Govt. Policy	1.68	0.55	1.56	0.41	1.50	0.37	1.55	0.42	1.55	0.41	1822.6	<0.001*
MANOVA F Value = 62.97 [#] and p-value <0.001*												

Source: Primary Data; [#]Pillai's Trace; *Significant at 5 per cent level.

Table 6, reveals that consumers have low-level problems with all the factors viz., Product, Service, and Govt. policy-related factors. Even though the problems of consumers are not much severe on all constructs, a close look into the card-wise mean scores reveals that product and service-related problems are more prominent among white cardholders than that of other categories of consumers. Govt. policy-related problems are more prominent among yellow (Mean score = 1.68 and SD is 0.55) ration cardholders than that of other types of consumers.

It can be seen from the table that Multivariate analysis (Pillai's Trace) provided a significant F value at the 5 per cent level of significance (value of F=62.97 with p=0.001<0.05). The result of the univariate analysis also gives significant F values and p-values for all the constructs are less than 0.05. Hence, the null hypothesis is rejected, and the alternative hypothesis is accepted. That means there exists a significant difference in the level of problems among the various types of ration cardholders.

Table 7: Multiple Comparisons using LSD

Construct	Yellow Vs Pink card	Yellow Vs Blue card	Yellow Vs White card	Pink Vs Blue card	Pink Vs White card	Blue Vs White card
Product Factors	.0204	.0019	-.0822	-.0186	-.1027*	-.0841
Service Factors	-.0088	-.0588	-.1082	-.0500	-.0995	-.0495
Govt. Policy Factors	-.1159	.1716*	.1243	.0557	.0084	-.0473

Source: Primary Data; *Significant at 5 per cent level.

The post hoc test using LSD revealed that on Product-related factors the level of problems of White cardholders is significantly different from Pink cardholders. On Govt. policy-related factors, there is a significant difference that exists between Yellow and White cardholders at 5 per cent level of significance. It is also revealed that the mean difference for Service related factors is found to be not significant at the 5 per cent level. Hence Service-related factors require further analysis to test their statistical significance. It can be concluded that product and service-related problems are more prominent among White cardholders and Govt. policy-related problems are more prominent among Yellow cardholders than other types of consumers.

Table 8: *One-way ANOVA for Problems in Service-related Factors*

	Sum of Squares	Df	Mean Square	F	p-value
Between Groups	0.930	3	0.310	1.263	0.286
Within Groups	126.625	516	0.245		
Total	127.555	519			

Source: Primary Data

The result of One-way ANOVA for the problems in Service-related factors among the different types of cardholders gives an F value of 1.263 which is not significant at 5 per cent level ($p > 0.05$). Hence the test results failed to reject the null hypothesis. This implies that there is no significant difference in the level of problems in service-related factors among the different types of ration cardholders.

8.5. Problems of Consumers Based on Place of Residence

To explain the possible variations observed in the variables between the urban and rural consumers, MANOVA for this bundle of three variables by one factor, place of residence, is considered. This procedure tests the null hypotheses about the effects of factor variables on the means of the bundle of variables. The hypotheses to be considered will be: There is no significant difference in the level of problems of urban and rural consumers.

Table 9: *Level of Problems of Urban and Rural Consumers*

Construct	Place of Residence				Total		Univariate		MANOVA	
	Rural		Urban		N=520		F	p-value	F [#]	p-value
	Mean	SD	Mean	SD	Mean	SD				
Product	1.78	0.48	1.92	0.45	1.81	0.48	3838.67	0.001*		
Service	1.54	0.50	1.64	0.48	1.57	0.50	2607.44	0.001*	159.63	0.001*
Govt. Policy	1.54	0.43	1.57	0.38	1.55	0.41	3623.00	0.001*		

Source: Primary Data; [#]Pillai's Trace; *Significant at 5 per cent level.

Table 9 reveals that the problems of urban consumers are more than that of rural consumers on all constructs. MANOVA test result provides significant F values for a set of factors between urban and rural cardholders at 5 per cent level (value of $F=159.63$ with $p=0.001$). The result of the univariate analysis also gives significant F values and p-values for all the constructs are less than 0.05. Hence, the null hypothesis is rejected, and the alternative hypothesis is accepted that there is a significant difference in the level of problems between the urban and rural consumers. Based on the mean score it is found that urban consumers face more problems on all constructs than urban consumers. This is mainly because the standard of living and expectations of urban consumers are higher than that of rural consumers.

9. Usage of Ration Card Portability Facility

The Central Government launched the One Nation One Ration Card (ONORC) program, which provides all eligible ration cardholders by the NFSA 2013, with the option to obtain their entitlements from anywhere in India (Cleartax, 2021). As per this scheme ration card portability facility is allowed to all cardholders. Now beneficiaries can purchase their entitlements from any FPSs, of their choice by using their existing ration cards with biometric authentication (The Economic Times, 2021).

9.1. Type of Ration Card and Usage of Portability

To evaluate the statistical significance, if any, of the relationship between types of ration cards of the consumer and usage of portability facility, a Log-linear Multinomial Model was attempted to test the hypotheses "There is no association between the types of ration cards and the usage of the portability facility".

Table 10: Usage of Ration Card Portability Facility Based on Type of Card

Type of Ration card	Usage of Portability facility		Total	Chi-square [#]	df	p-value
	Yes	No				
Yellow card	0 (0.0)	35 (100)	35	14.964	3	0.002*
Pink card	18 (9.6)	170 (90.4)	188			
Blue card	13 (8.9)	133 (91.1)	146			
White card	29 (19.2)	122 (80.8)	151			
Total	60 (11.5)	460 (88.5)	520			

*Note: Figures in parenthesis represent per cent to total in respective rows; *Significant at 5 per cent level. [#]Pearson Chi-Square Model : Multinomial*

Table 10 reveals that only 11.5 per cent of consumers have used the new portability facility i.e. facility of purchasing articles from any ration shops other than their home shop but most (88.5 per cent) of them didn't avail of this facility. While analyzing ration

card-wise usage of portability, it is clear that around 10 per cent of Pink cardholders, 9 per cent of Blue, and 19 per cent of White colour cardholders have used the portability facility. None of the Yellow cardholders have used the portability facility.

The Log-linear Multinomial Model test was found to be significant with $\chi^2=14.964$, $p < 0.05$. Hence, the relationships explained above are statistically significant. Therefore, the null hypothesis is rejected, and it can be concluded that there is a relationship between the type of ration card of the consumer and his act of availing the portability facility. The detailed outcomes of the Log-linear Model can be explained by the following results.

Table 10.1: Parameter Estimates

Parameter of Ration card)	(Type Estimate	Std. Error	Z	p-value
Yellow Card (AAY)	-1.462	.188	-7.793	<0.001*
Pink Card (BPL)	.219	.109	2.006	0.045*
Blue Card (NPS)	-.034	.116	-.290	0.772
White Card (NPNS)	0 ^b	.	.	.

Source: Primary Data; *Significant at 5 per cent level.

The parameter 'White ration card' is set to zero for relative evaluation. The table reveals that Pink ration cardholders are predominant in the sample ($Z= 7.788$; 6.861 respectively; $p < 0.05$) while Yellow and Blue cardholders are lesser in number compared to White ration cardholders.

Table 10.2: Parameter Estimates

Parameter you avail Portability)	(Did Estimate	Std. Error	Z	p-value
Yes	-2.037	.137	-14.839	<0.001*
No	0 ^b	.	.	.

Source: Primary Data; *Significant at 5 per cent level.

From the Table, it can be inferred that when compared to the number of consumers who availed of the portability facility is less than the number of consumers not availed of this facility ($Z= -14.839$; $p < 0.05$). By going through the results, one can understand that the consumers who didn't avail of this facility are dominant compared to the number of consumers who availed of the portability facility. Also, this domination is seen more among all types of consumers. It can be concluded that there is a relationship between the types of ration cards and the act of using portability facilities.

9.2. Place of Residence and Usage of Ration Card Portability Facility

To evaluate the statistical significance of the relationship between the place of residence of consumers and the usage of ration card portability facility, the Pearson Chi-square test was applied to test the hypothesis "There is no association between the place of residence of consumers and the usage of the portability facility".

Table 11: *Usage of Ration Card Portability Facility Based on Place of Residence*

Type of Ration card	Usage of Portability facility		Total	Chi-square [#]	Df	p-value
	Yes	No				
Rural	35 (8.9)	357 (91.1)	392	10.627	1	<0.001*
Urban	25 (19.5)	103 (80.5)	128			
Total	60 (11.5)	460 (88.5)	520			

Source: Primary Data; Note: Figures in parenthesis represent per cent to total in respective rows; *Significant at 5 per cent level.

From the Table, 11.5 per cent of consumers avail of the portability facility. Of which 9 per cent of rural consumers and 19.5 per cent of urban consumers availed of this facility. The majority of rural (91 per cent) and urban (80.5 per cent) consumers didn't use the ration card portability facility. The test was found to be significant with $\chi^2 = 10.627$, $p < 0.05$. Hence, the relationships explained above are statistically significant. Hence the null hypothesis is rejected and accepted the alternative hypothesis. Therefore, it can be concluded that there is an association between the place of residence of consumers and the usage of ration card portability facilities.

9.3. Reasons for Ration Card Portability

The important reasons for ration card portability are shortage of weight, negative attitude of dealers, lack of transparency, poor quality of goods, irregular working time, and long distance from home. The consumers were asked to rank these six reasons for portability in the order of their preferences, 1 for the most important reason, 2 for the next important, and so on. Friedman's Test for several related samples is used to test the preferences given by the sample in 6 reasons for porting ration cards from one ration shop to another, based on the hypothesis "There is no significant difference in the preferences of reasons for ration card portability".

Table 12: *Reasons for ration card portability*

Reasons	Mean Rank	Chi-square [#]	Df	p-value
Shortage of Weight	3.66	5.362	5	0.373
The negative attitude of Dealers	3.43			
Lack of Transparency in operation	3.37			
Poor quality goods	3.38			
Irregular working time	3.93			
Long-distance from home	3.23			

Source: Primary Data; [#]Friedman test

The mean ranks were obtained for the six reasons for porting ration cards from one ration shop to another. The lower ranks, the importance of that reason will be more. As per the above Table, the most important reason is the long distance from home (mean rank 3.23), followed by lack of transparency in operation (mean rank 3.37), Poor Quality goods (mean rank 3.38), negative attitude of dealers (mean rank 3.43), and shortage of weight (mean rank 3.66). The least importance is given to the reason for irregular working hours. Friedman's test result provides a χ^2 value of 5.362, which is not significant at the 5 per cent level of significance ($p=0.376, >0.05$). Therefore, the result failed to reject the null hypothesis. This indicates that there is no significant difference in the consumers' preferences for various reasons for porting ration cards from one ration shop to another.

9.4. Reasons for Ration Card Portability Based on Type of Ration Card

From the Government's point of view, it is very important to identify any difference in the preferences of reasons for porting ration cards from one ration shop to another among different types of ration cardholders. The Kruskal-Wallis H test is used because types of ration cards have more than two groups. The hypotheses can be stated as "There is no significant difference in the preferences of reasons for ration card portability among the different types of cardholders".

Table 13: *Reasons for Ration Card Portability Based on Type of Ration Card*

Reasons	Pink card N=18	Blue card N=13	White card N=29	Kruskal Wallis H	df	p-value
Shortage of Weight	27.28	31.27	32.16	.935	2	0.627
Negative attitude of Dealers	26.69	29.00	33.53	1.884	2	0.390
Lack of Transparency	27.31	31.92	31.84	.939	2	0.625
Poor quality goods	40.89	30.35	24.12	10.732	2	0.005*
Irregular working time	32.44	25.65	31.47	1.373	2	0.503
Long distance from home	28.61	35.23	29.55	1.462	2	0.481

Source: Primary Data; [#]Kruskal-Wallis test; *significant at 5 per cent level.

Table 13 shows that the negative attitude of dealers is the most important reason for card portability among Yellow cardholders (with the lowest mean rank 26.69). To the Blue cardholders, the most important reason for portability is the Irregular working hours of their shop (with the lowest mean rank of 25.65). For White ration cardholders, the reason for portability is the poor quality of goods with the lowest mean rank of 24.12. Kruskal-Wallis test result fails to reject the null hypothesis for all the reasons, as the p-value is greater than 0.05, except for the reason ‘poor quality of goods’, where the p-value is less than 0.05. It points out that there is no significant difference in the preferences of various reasons for ration card portability among different types of ration cardholders except for the reason of the ‘poor quality of goods’. It can be inferred that non-priority (White) cardholders give more importance to the reason for ‘poor quality of goods’ compared to the priority (Pink) and subsidy (Blue) cardholders for the portability of ration cards.

9.5. Reasons for Ration Card Portability Based on Place of Residence

To evaluate the statistical significance in the preferences for various reasons of portability between urban and rural consumers, the Mann-Whitney U test is applied to test the hypotheses “There is no significant difference in the preferences of reasons for ration card portability between urban and rural consumers”.

Table 4: Reasons for Ration Card Portability Based on Place of Residence

Reasons	Mean Rank		Z value [#]	p-value
	Rural (N=35)	Urban (N=25)		
Shortage of Weight	31.73	28.78	-.658	0.511
Negative attitude of Dealers	29.57	31.80	-.495	0.621
Lack of Transparency in operation	30.84	30.02	-.188	0.851
Poor quality goods	33.21	26.70	-1.458	0.145
Irregular working time	31.54	29.04	-.560	0.576
Long distance from home	28.60	33.16	-1.078	0.281

Source: Primary Data; [#] Mann-Whitney U test

Table 14 shows that among rural consumers the most important reason for porting ration cards from one ration shop to another is the long distance from home (lowest mean rank value 28.60) and the negative attitude of dealers (lowest mean rank value 29.57). Among the urban consumers, the important reasons are poor quality of goods (lowest mean rank value 26.70) and shortage of weight (lowest mean rank value 28.78). Mann-Whitney U test result failed to reject the null hypothesis for all reasons since p-

values are greater than 0.05. Therefore, it can be concluded that there is no significant difference in the preferences of reasons for ration card portability between urban and rural consumers.

10. Findings of the Study

Demographic Profile of Consumers

Three-quarters of the consumers are females and reside in rural areas. Most of them have a monthly household income of less than Rs. 25,000 and have 3 to 5 family members. The census data-2011 also supports the findings, i.e., the average household size in Kerala is 4.3 persons.

Rationing Profile of Consumers

The gleaming fact is most of the people in Kerala have their ration shops within a radius of 2 km distance from home. Since Kerala has a higher mobile penetration rate than other states, 94 per cent of Kerala's population has a mobile connection. It highlights that the lion's share is having mobile phones and thus the mobile messages are the important source of information about the availability of ration also.

Quality issues

The quality of food grains supplied through PDS in Kerala remains a serious concern for the people. The initiative of the Government of Kerala to add more variety of commodities to its PDS and implementation of technology-based distribution resulted in a decline of issues as found out in the previous studies of PDS. Among the six product-related factors, consumers are facing severe problems only in respect of the poor quality of goods. They are facing an average level of problems in respect of the non-availability of all ration items. Problems regarding the shortage of weight, Inadequate quantity, Irregular supply of ration items, and the price charged for ration commodities are mild. Overall problems of consumers on product-related factor is not severe. The study found that even though consumers faced serious problems with poor quality and non-availability of all ration items, problems such as inadequate quantity and shortage of weight were not serious problems. This is probably due to the implementation of NFSA and EPOS machines in the FPS.

No severe issues in service-related factors: - Consumers revealed that there are no severe problems in service-related factors viz., non-demonstration of price list, long queue/delay in purchasing articles from FPS, and negative attitude of dealers.

The dominance of product-related problems among high-income people: There is a significant difference in the level of problems among the different types of ration

cardholders on product-related factors and these problems are more prominent among the White cardholders than others.

Delay in issuing & renewal of Ration cards: There are some undue delays in issuing new ration cards and renewing old ration cards. Working time and distance of ration shops are not severe problems. The overall problems of consumers regarding Govt. policy-related Factor is not severe and these problems are prominent among priority (Yellow and White) cardholders.

The dominance of Problems among Urban Consumers:-Urban consumers are facing more problems on all constructs viz., product, service, and Govt. policy-related factors than the rural. This is mainly because the standard of living and expectations of urban consumers are higher than that of rural consumers.

Hesitance to use the Portability facility:-It is found that most of the consumers did not use the ration card portability facility.

Usage of portability is more among White cardholders:-The usage of portability facilities is more among the non-priority (White) cardholders because they are more aware of such facilities.

Portability usage is more among Urban consumers:-The urban consumers using portability facilities is more than that of rural consumers because urban people are more aware of such facilities.

White cardholders' reason for portability is issues related to Quality: Non-priority (White) cardholders give more importance to the reason for the poor quality of goods for portability. The quality of goods supplied through PDS has nothing to do with the store, but the storage facility and inventory turnover rate may be different, which will affect the quality of goods distributed by different ration stores.

11. Suggestions

- Ø Consumers should always cross-check bill details from EPOS machines with the mobile messages and the actual quantity purchased from FPS.
- Ø The number of essential goods distributed through this system is very limited, but consumers demand more, so the government should take the necessary steps to distribute more goods at subsidized prices through the PDS.
- Ø Most of the ration shops do not maintain their notice boards properly. The Government should take necessary steps for ensuring the proper display of notice boards in FPS so that the consumers can learn about stock details along with price, the quantity of their entitlement, complaints authorities of PDS, etc.

- Ø There is no proper queuing system in FPS. Hence dealers should take the necessary steps to introduce systematic and appropriate queueing systems in their shops.
- Ø There is rigid, excessive bureaucratic control in issuing new ration cards and renewing the existing ones. Hence the government should take necessary measures to eliminate the complexity in the issuance and renewal of ration cards. All formalities related to card issuance and renewal should be carried out online.

12. Conclusion

The enactment of the National Food Security Act (NFSA) made food rights a legal right. To ensure the benefits of the food safety net to the intended beneficiaries, the Indian government initiated a large-scale TPDS reform project through end-to-end computerization. It is important to have an effective, customer-oriented welfare plan that uses other technology platforms to contribute to the improvement of PDS. The Public Distribution System of Kerala, hailed by many as the best in the country owing to its effective implementation and universal coverage. The study shows there are lacunae in the system. Government should take necessary steps to address the problems in the PDS viz; the quality concerns, absence of varieties of food grains, the limited number of food commodities, the ignorance of consumers about the grievance redressal mechanism, and the issues of dealers by implementing the suggestions put forth through this study. This would make the system more dynamic to meet the needs of people, especially the vulnerable in the lower strata of society. The inclusion of a greater number of essential commodities at superior quality with technologically upgraded PDS will improve the efficiency of the system and that in turn will enhance overall consumer satisfaction.

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Role of Self-Help Groups (SHGs) in Enhancement of Women Empowerment: An Empirical Study with Special Reference to Kumaun Region of Uttarakhand

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ABSTRACT : Microfinance has emerged as an important instrument to empower women and improve their status. Microfinance can accelerate a chain of beneficial economic empowerment outcomes by allowing women to access income-generating opportunities, ultimately leading to greater social and economic empowerment. The Self-Help Group Connection initiative seeks to empower poor women in rural areas by facilitating income-generating self-employment activities and encouraging financial inclusion. This paper addresses two fundamental research questions on 400 female respondents from the Kumaun region, Uttarakhand. First, it examines how a woman's preference for microfinance is related to her desire to increase her bargaining power within households. Secondly, it leads to women's empowerment in terms of savings control, income growth, purchasing power, and decision-making. This paper includes key research that demonstrates a strong relationship between economic growth and financial freedom. Furthermore, it aims to assess the importance of microfinance in promoting economic empowerment of females.

Keywords: Microfinance, Empowerment, Kumaun Self-help group, Women

Introduction:

Empowerment and economic growth are incredibly intertwined. Growth empowers women and generates job opportunities; this must be considered an essential component of any strategy to promote women's positions. Rapid import substitution or export-driven industrialization has frequently harmed women. Manufacturing expansion can increase demand for female labor, but it does not always lead to greater work

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opportunities for women. Urban employment may provide higher pay or better working circumstances, but they usually come at the tradeoff of more responsibilities for women. For example, In South Asia's garment industry case, rural women have been connected to an increase in the migration of young women, to the nearby cities many of whom are of minor category. Job in the textile and electronics industries in export processing zones has occasionally been a step back for young women due to limited job rights, low earnings, and unsafe working conditions. Rural women have occasionally been unintended victims of industrial development. In other nations, high-value agricultural or land for industry has resulted in labor feminization, but this has often taken the shape of casual, migratory work in food processing or other industries with low wages and working conditions. (Beneito & Garcia-Gómez, 2022; King 2021; Mains & Mulat 2021). Kolte, S.B. et al., (2010) found that the advent of SHGs gave women access to the outside world.

Microfinance is largely regarded as an effective instrument for producing money, creating job opportunities, and alleviating poverty, specifically, in developing countries. Microfinance also attempts to help aspiring entrepreneurs who lack the financial resources to launch small enterprises or develop new ideas (Jafar, 2016). The notion of microfinance originated in Bangladesh with Dr. Mohammad Yunus' pioneering work. In India, microfinance gained popularity in the 1970s with the formation of informal self-help groups that provided credit and savings. Microfinance expanded rapidly between 2005 and 2010, driven by demand from poor borrowers and investor interest in a fast-growing business. (Banarjee, 2014). In India, research on microfinance and women's empowerment has gained traction. Rao and Mehta (2010), as well as Ghate and Nagpal (2015), found that microfinance has a favorable impact on women's economic activities and confidence. Uttarakhand, located in the Himalayan area, has launched a variety of programs aimed at increasing autonomy and socioeconomic empowerment. Self-help groups (SHGs) and village forest management committees (VFMCs) play critical roles in facilitating microfinance services and regulating economic activities, ultimately contributing to the success of macroeconomic reforms and poverty reduction measures (Devi, 2007).

This study investigates the efficacy of microfinance in areas such as SHG activities, various SHG models, women's empowerment, and poverty reduction in rural Kumaun districts, using both primary and secondary data sources. This study covers significant implications for a variety of stakeholders, including policymakers, microfinance institutions, development practitioners, researchers, and moreover, the community at large. The findings will provide useful insights into the effectiveness of microfinance interventions in empowering women, impacting policy decisions and programmatic measures targeted at improving gender equality and socioeconomic development in

Uttarakhand's rural areas. Furthermore, the study's focus on the Kumaun region provides a strong understanding of local contexts and difficulties, allowing for focused interventions and sustainable development initiatives adapted to the region's specific needs.

Research Methodology:

Research Design:

The present empirical investigation used a multidisciplinary research methodology, including quantitative surveys and qualitative interviews, to investigate the influence of microfinance on women's empowerment in Uttarakhand's Kumaun district. The mixed-methods technique provides a more comprehensive grasp of the issue by collecting both numerical data and qualitative perspectives from participants.

Sampling Techniques:

The sampling technique applied in this study is purposive sampling. Given the specific focus on women beneficiaries of microfinance in the Pithoragarh Districts of Kumaun region, the utilization of purposive sampling enables the researcher to select participants who possess firsthand experience with microfinance programs and accurately represent the target population. The sample selection size will be determined based on the principle of dispersion and a stratified sampling method.

Study Area Description:

Uttarakhand is geographically categorized into three distinct zones: the Himalayas, Bhabar, and Terai regions. From an administrative standpoint, it is divided into two divisions, namely Kumaon and Garhwal which includes 13 districts. The state is characterized by a temperate climate, although in the plain areas the climate is tropical. The mean value of annual rainfall in the Uttarakhand state is 1,550 mm. According to archaeological evidence, it has been determined that human habitation in the region dates back to ancient times. The Pithoragarh district of the Kumaon region is receiving special attention.

Sampling Method and Data Collection:

For this study, two blocks were selected from the districts of Pithoragarh districts. The sample size consisted of 400 respondents from these areas, who found the study beneficial for organizations like NABARD and SGSY/NRLM. Data collection methods included surveys, interviews, and observations, encompassing respondents of all age groups.

Statistical Analysis:

Statistical analysis involves the procedure of selecting a specific observations number to represent a larger population, typically determined by a preset formula. Sampling

methods, such as stratified sampling methods, ensure that each individual in the population has an equal chance of being selected for the study. The statistical data were analyzed using Graph Pad Prism 8.0, calculating descriptive statistics such as the Average (mean) and standard error (SE) with a significance level of 0.05.

Results:

The study's demographic profile consisted of women from several microfinance sectors who had acquired loans and were affiliated with Self-Help Groups (SHGs). The study examined demographic characteristics including age groups, educational qualifications, housing status (owned or leased), and occupation. These variables are important for interpreting data and making decisions in research and economics.

Socio-Demographic Profile of Respondents:

This section presents the socio-demographic characteristics of the study participants, including age, education, marital status, household composition, and occupation.

Age	Respondents	Percentage	Age	Respondents	Percentage
20-30	58	14.50%	51-60	41	10.25%
31-40	196	49.00%	61-70	13	3.25%
41-50	92	23.00%	Total	400	100%

Figure 1. Demographic profile of women respondents' age with tabulated data

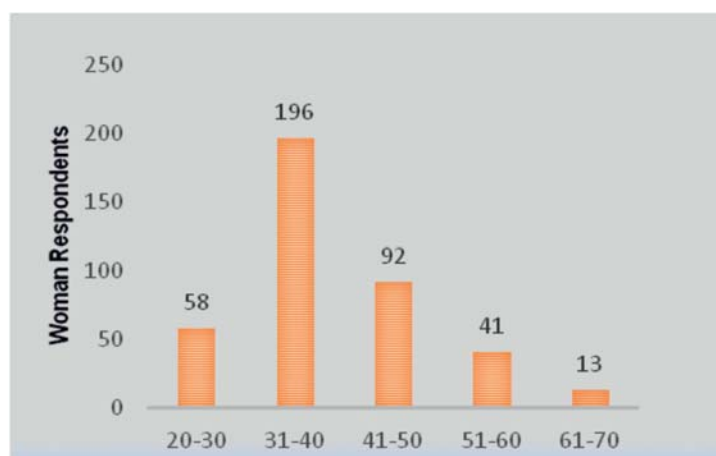


Figure 2. Education Status of respondents in Pithoragarh districts with tabulated data

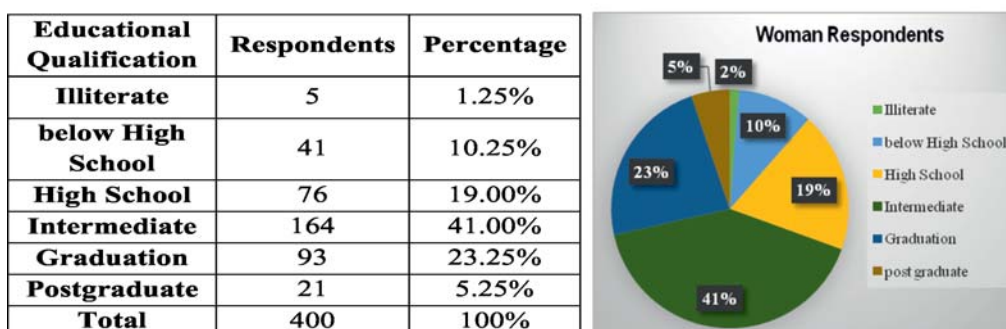


Figure 3. SHG's Womrn respondent's marital status with tabulated data

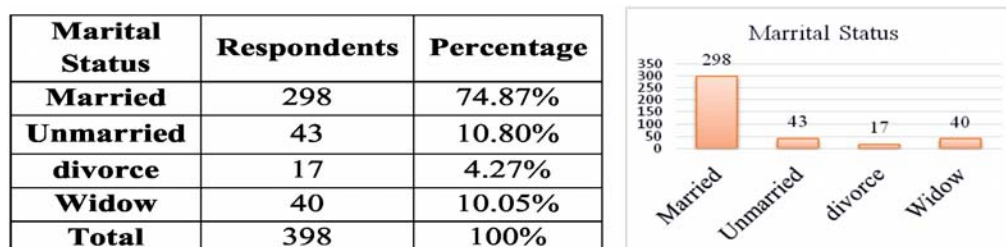


Figure 4. Status of Household composition with tabulated data

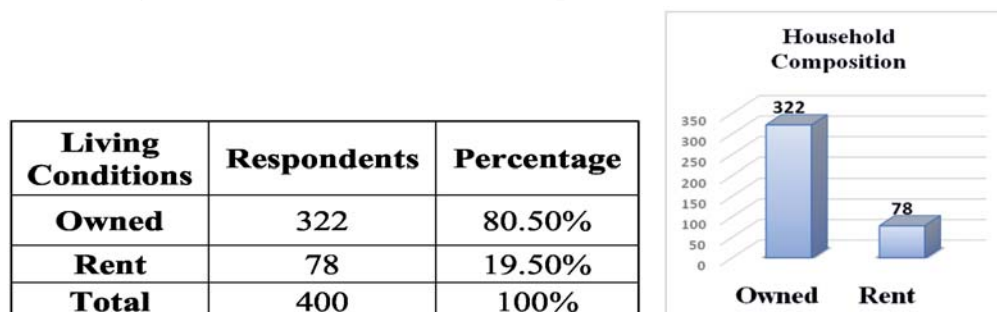


Figure 5. Occupational status of SHG's women respondents with tabulated

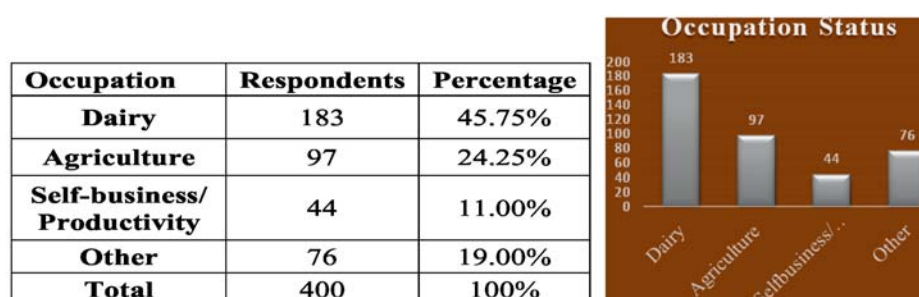


Table 1. Annual income before joining SHG's by women respondents

Sr. No.	Before income	Respondents	Percentages
1	1000-25000	64	16.00%
2	25001-50000	192	48.00%
3	50001-75000	109	27.25%
4	75001- Above	35	8.75%
5	Total	400	100%

Figure 6. Annual income status before participation in SHG



Economic Empowerment Indicators:

This section explores the economic empowerment indicators among women beneficiaries of microfinance, such as income levels, employment opportunities and asset ownership.

Income levels:-

Figure 7. Annual Income status after participation in SHG's

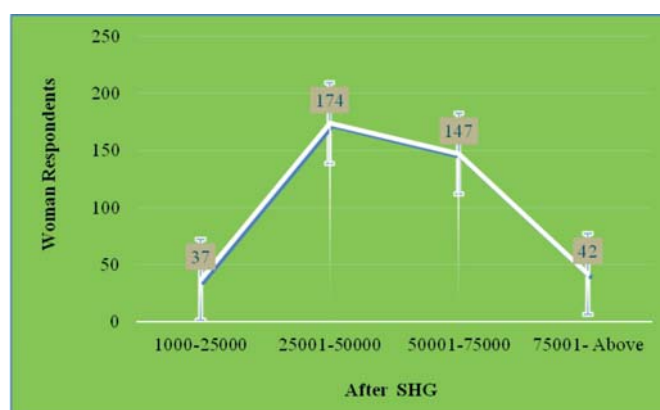


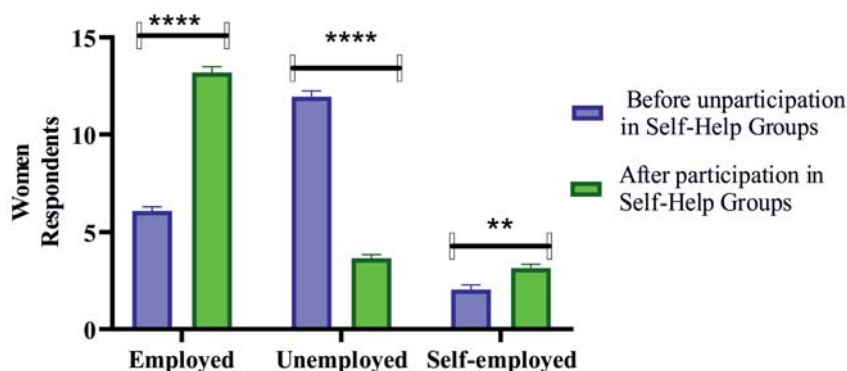
Table 2- Annual income status of women respondents after participating in

Sr. No.	After Income	Respondents	Percentage
1	1000-25000	37	9.25%
2	25001-50000	174	43.50%
3	50001-75000	147	36.75%
4	75001- Above	42	10.50%
5	Total	400	100%

Employment Opportunities: -

The members of the SHG are in charge of their teams and serve as instructors for the programmers. Women who are able to find employment or new employment opportunities contribute to the reduction of the poverty level of their families. The information that is provided regarding the increase in job possibilities may be seen in Figure 8 and Table 3. The mean and standard deviation of all the districts have been presented with regard to employment. The mean value of participating SHG Women workers was higher (13.20 ± 0.29) as compared to the un-participating SHG women workers (6.1 ± 0.20) in the employed status.

Figure 8. Rating scale of Women respondents about “Employment Status (non-participating and Participating)”



While in this research study shows a high significance difference, when the data is analyzed by Two-way ANOVA raw factor ($F_{2, 57} = 515.4$ at $Pd < 0.0001$). In the post-hoc test of Sidak's Multiple Comparison tests shows a highly significant difference between employed and unemployed status.

Table 3- Employment Status of Non-participating in Self-Help Groups and Participating in Self-Help Groups of women respondents

Sr. No.	Employed		Unemployed		Self-employed	
	In participating in SHG's	Participati on in SHG's	In participatin g in SHG's	Participatio n in SHG's	In participatin g in SHG's	Participatio n in SHG's
1	5	12	10	4	5	4
2	6	15	12	3	2	2
3	6	13	12	4	4	3
4	6	13	13	3	1	4
5	6	16	13	2	1	2
6	8	12	10	4	2	4
7	5	14	14	4	1	2
8	7	13	11	5	2	2
9	6	12	12	5	2	3
10	6	12	11	4	3	4
11	6	13	13	4	1	3
12	8	13	10	3	2	4
13	5	16	14	2	1	2
14	7	12	11	4	2	4
15	6	15	12	3	2	2
16	7	13	11	4	2	3
17	6	13	12	3	2	4
18	5	12	13	5	2	3
19	6	12	11	4	3	4
20	5	13	14	3	1	4

Table 4. Comparisons of women respondents' responses were processed under Sidak's multiple comparison tests

Each cell mean should be compared to the other cell means in that row.					
Number of comparisons per family	3				
Alpha	0.05				
Sidak's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Significant	Summary	Adjusted P Value
Group A - Group B					
Employed	-7.1	-7.980 to -6.220	Yes	****	<0.0001
Unemployed	8.3	7.420 to 9.180	Yes	****	<0.0001
Self-employed	-1.1	-1.980 to -0.2203	Yes	**	0.0096

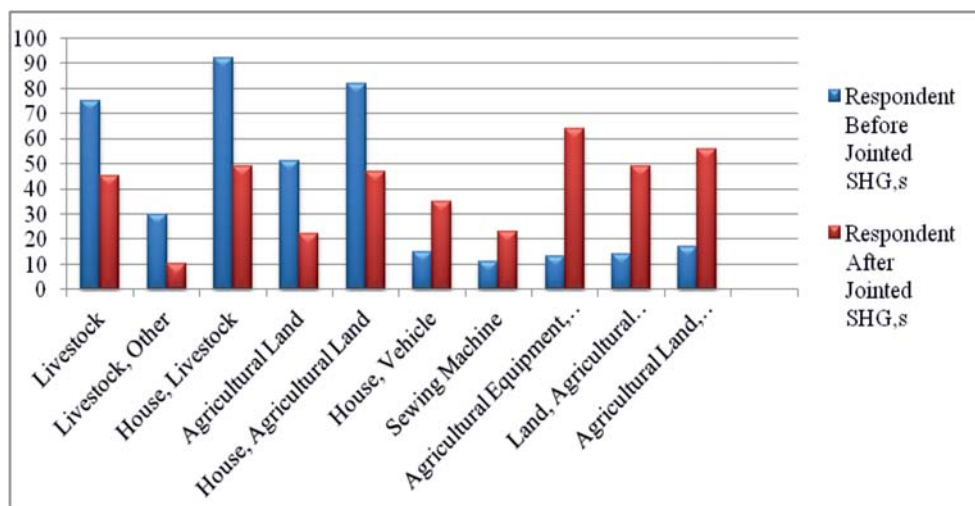
Asset ownership-

The most common type of assets owned among the respondents before joining SHG was livestock and house, with a value of 23% followed by house, and agriculture land, with a value of 20.50%, and the least assets acquired were sewing machines owned with only 2.75%. but the conditions improved after joining SHG are agriculture, equipment, and livestock with a value 16%, and the least common assets are livestock with a value of 2.50%.

Table 5. Common assets owned among the respondents before joining and after joining SHG,s Group

Sr. No.	Assets Owned	SHG,s Before Jointed Respondent		SHG,s After Jointed Respondent	
		Respondent	Percentage		Percentage
1	Livestock	75	18.75	45	11.25
2	Livestock, Other	30	7.50	10	2.50
3	House, Livestock	92	23.00	49	12.25
4	Agricultural Land	51	12.75	22	5.50
5	House, Agricultural Land	82	20.50	47	11.75
6	House, Vehicle	15	3.75	35	8.75
7	Sewing Machine	11	2.75	23	5.75
8	Agricultural Equipment, Livestock	13	3.25	64	16.00
9	Land, Agricultural Equipment, Livestock	14	3.50	49	12.25
10	Agricultural Land, Livestock, House	17	4.25	56	14.00
	Total	400		400	

Figure 9. Assets ownership during joining and non-joining period of SHG,s.



Social Empowerment Indicators

The social empowerment indicators focus on aspects such as decision-making within households among women participating in microfinance programs.

Microfinance improves decision-making power-

The members of the SHG respondents may have experienced a shift in their decision-making behavior after being exposed to the activities associated with microfinance. It is reasonable to anticipate that socio-economic criteria, such as the age of Self-Help Group (SHG) members, marital status, and the level of training and education (diploma) those women have received, can provide valuable information in the demographic profile. The decisions taken by the members are significantly influenced by it. The mean value of the agree scale was a highly above value (25.14 ± 0.91) and the lowest response was the strongly disagree value (2.71 ± 0.57). One-way ANOVA analysis ANOVA ($F_{4, 30} = 110.6$ at $Pd > 0.0001$) followed by a post-hoc test of Dunnett's Multiple Comparison tests that indicated a surprisingly diminishing difference in the strongly disagree rating scales of women respondents Comparison than disagree, neutral, strongly agree and agree on rating scales of women respondents respectively. It also shows a high significance difference with respect to each other (Figure 10 and Table 7).

Figure 9. Decision-making response of respondents

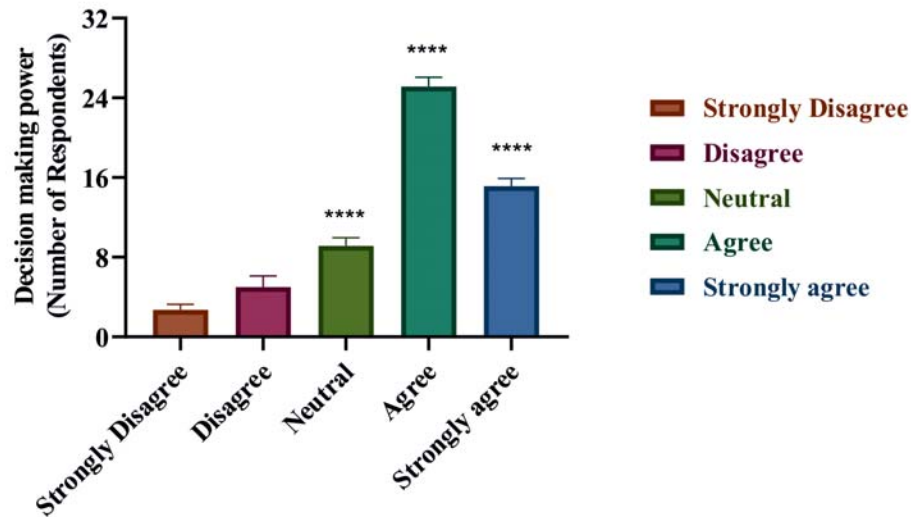


Table 6. Profile related to decision-making power through microfinance

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
Number of values	7	7	7	7	7
Minimum	1	1	7	21	12
Median	3	5	9	25	15
Maximum	5	9	13	29	18
Mean	2.714	5	9.143	25.14	15.14
Std. Deviation	1.496	2.944	2.193	2.41	2.035
Std. Error of Mean	0.5654	1.113	0.8289	0.911	0.7693
Lower 95% CI	1.331	2.277	7.115	22.91	13.26
Upper 95% CI	4.098	7.723	11.17	27.37	17.03

Table 7. Presentation of decision-making power under Multiple Comparison

Dunnett's multiple comparisons test	Mean Diff.	95.00% CI of diff.	Significant	Summary	Adjusted P Value
Strongly Disagree vs. Disagree	-2.286	-5.408 to 0.8368	No	ns	0.2029
Strongly Disagree vs. Neutral	-6.429	-9.551 to -3.306	Yes	****	<0.0001
Strongly Disagree vs. Agree	-22.43	-25.55 to -19.31	Yes	****	<0.0001
Strongly Disagree vs. Strongly Agree	-12.43	-15.55 to -9.306	Yes	****	<0.0001

Discussion

The quantitative analysis of the data reveals several key findings regarding the impact of microfinance on women's empowerment in the Kumaun region of Uttarakhand. Specifically, there is a noticeable increase in income levels, business ownership, and financial inclusion among women who have availed microfinance loans compared to those who haven't. These findings align with previous research highlighting the positive economic outcomes associated with microfinance interventions (Smith et al., 2020; Kumar & Singh, 2019).

The study examined key factors contributing to women's empowerment, such as decision-making authority, business acumen, recognition within the family and society, and the development of self-confidence. The empowerment of women is greatly facilitated by these factors, resulting in improved quality of life and increased respect from their families and communities. In the past, it was predominantly men who held the primary responsibility for managing finances and overseeing household budgets. However, with the introduction of microfinance services, women have started to play a significant role in generating household income, thereby reducing their reliance on their husbands' decision-making. These elements significantly bolster women's empowerment, resulting in improved well-being and heightened respect from their familial and societal circles (Gupta et al., 2023). Historically, financial responsibility and household budget management were predominantly male roles. However, the advent of microfinance services has facilitated women's participation in household income generation, thereby diminishing their reliance on their husbands' decisions (Kaur & Singh, 2022). The study is in tune with the observation of Manimekalai (2007) who remarked self-confidence of rural women have boosted by the formation of SHG. Women respondents had attained a real change in their lives and self-esteem as compared to themselves before joining SHG.

Secondly, the quantitative data also sheds light on social empowerment indicators, such as improved access to increased decision-making power within households. Women with access to microfinance services are more likely to invest in their children's education, seek healthcare services, and participate in household financial decisions. These findings are consistent with the notion that economic empowerment often translates into improved social outcomes for women and their families (Kabeer, 2001; Hashemi et al., 1996). Gaurav Joshi (2019) showed that SHG involvement improves women's economic and social well-being in the region. He shows that age, education, family structure, and market proximity affect women's Self-Help Group participation.

Microfinance is becoming a more significant instrument for women's political, social, and economic empowerment. Through microfinance, women are able to obtain loans

from financial institutions and are freed from the grasp of moneylenders. Through getting a loan from microfinance women are able to establish their start-up projects and provide skills to run their own small microenterprises. The table 6 and figure 9 show that the average high female respondents agree (25.14 ± 0.91) think microfinance plays a role in better decision-making power than other rating scales. While the lowest mean (2.71 ± 0.57) was found in the highly disagreeable rating scales, those who think microfinance does not play a significant role in improving decision-making power in women. The result obtained from the analysis reveals that microfinance is highly associated with building women's empowerment. Hence, on the basis of the positive responses given by women respondents, it can be inferred that microfinance is responsible for the enhancement of women's empowerment and strengthening of their self-esteem and self-worth position. The results are in accordance with the study Mayoux (2001) who also demonstrated that women can contribute and hold a stronger position and leading to women empowerment. A similar study of Thilagaraj (2020) reported that both in rural and urban areas the economic activity of SHG has resulted to pave the way for women's empowerment. Another study by Bhatt and Joshi (2019) found that community-based groups, mostly women's self-help groups (SHGs), were very important for reducing poverty and giving women more power.

Challenges and Barriers: Despite the positive aspects, women also highlight challenges such as limited access to training and capacity-building programs, societal norms restricting women's mobility and autonomy, and difficulties in scaling their businesses due to lack of support and resources.

Conclusion

In summary, the empirical study conducted in the Kumaun region of Uttarakhand reveals that microfinance plays a significant role in promoting women's empowerment across economic, and social aspects. Women beneficiaries shall experience improvements in income levels, access to education, enhanced decision-making power, and strengthened social networks through microfinance interventions.

Suggestions:

1. Women should be encouraged through programs conducted by non-government organizations and federations to come to the frontline so that they can openly express their entrepreneurial ideas.
2. Although, the government has already launched various schemes it has not been communicated and advertised in the proper way to reach the Self-Help Groups so Non-government organizations should educate the members about the existing schemes and their benefits.

3. Learning opportunities and personality development programs should be created for all the members by the NGOs to improve the skills of members. • Members should be more likely to be exposed to innovative skill development programs through SHGs that can build internal confidence and make the women self-motivated.
4. Every month each member of the group should be given a leadership position in rotation which will generate an inner insight among women to make strong decisions and earn social recognition.

Future Research Directions

Further studies in this field may concentrate on longitudinal analyses to monitor the enduring effects of microfinance initiatives on women's empowerment. Our knowledge of the contextual elements affecting microfinance results would also be enhanced by comparative research conducted in various geographical and cultural situations. Additionally, exploring innovative models of microfinance delivery and evaluating their effectiveness in enhancing women's empowerment remains a promising avenue for future research.

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Experiencing Microfinance's Potential: Facilitating Rural Women's Employment Skills

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Abstract : *This paper examines the impact of microfinance on employment generation in the rural area of Uttar Pradesh while discussing the socio-economic variables, such as age, marital status, education, business experience, etc., after joining SHGs. Using multistage random sampling, data from 270 borrowers were collected. Percentage, factor analysis, correlation, and multiple regression analysis were used to analyze the stated objectives using MS-Excel and SPSS 23. A significant positive relationship was found between factors contributing to employment generation on the performance of microfinance, and age, education, and loans through SHGs have a higher impact on employment. This study confirms that microfinance helps in the employment generation of rural women through proper and timely loan assistance, allowing them to start micro-businesses. For a more significant impact, policies should be created to improve educational opportunities and supportive and promotional services for the development of rural women.*

Keywords: *Microfinance, employment generation, rural women, development, performance.*

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1. INTRODUCTION:

Poverty and unemployment drive people to seek menial tasks for survival (Adepoju, 2006). Women are disproportionately affected by the negative impacts of poverty (Golla *et al.*, 2011) and unemployment because they have the least access to and control over most economic resources. As a result, a considerable proportion of the female population is involved in irregular, seasonal, and informal labor, particularly in rural areas. Among them, farming activities are the most common source of income (Najeeb *et al.*, 2020a), particularly in developing nations like India. Inferior educational credentials, cultural norms and customs, and male members' power over women's decisions impede their well-being (Lakwo, 2007a). Again, these reduce their chances of joining formal jobs, which may liberate them from enslavement. However, it has been emphasized that women can be released from poverty, and their standard of living can be enhanced by aiding them monetarily (Li *et al.*, 2011) and correspondingly by fostering entrepreneurial pursuits (Bruton *et al.*, 2013). Earning through self-employment activities has gradually acquired appeal as a source of income for women in underdeveloped countries (Adom & Anambane, 2019), primarily through home-based entrepreneurial activities (International Center for Research on Women, 2014). However, a lack of accessible credit, insufficient capital, a shortage of modest loans, and collateral restrictions stymie the growth of these small businesses (Das, 2000; Kasali *et al.*, 2015a; Singh & Kaur, 2021). As a result, microfinance has frequently been utilized as a corrective measure to alleviate financial limitations, relieve poverty by creating income-generating possibilities, and empower women (Lakwo, 2007b; Kasali *et al.*, 2015b; Najeeb *et al.*, 2020b).

2. REVIEW OF LITERATURE:

Recently, the impact of microfinance has been called into doubt, and numerous studies contend that the impact of microfinance varies between positive, no impact, and even harmful (Angelucci *et al.*, 2013; Ganle *et al.*, 2015). The impact of microfinance varies depending on population density, debt attitudes, social cohesiveness, company growth, financial literacy, financial service providers, and other factors (Armendariz & Morduch, 2010). Several empirical studies have been undertaken worldwide to determine the impact of microfinance on poverty reduction. However, there is no agreement on the effects of microfinance on poverty alleviation. Some research concluded that microcredit had a favorable influence on poverty (Khandker, 2005), but no such effect was found (Morris & Barnes, 2005). Puhazhendhi & Satyasai (2001) stated that microfinance provided a significant chance for India's rural poor to achieve reasonable economic, social, and cultural empowerment, resulting in a higher living standard and quality of life for participating households. Correspondingly, Leach & Sitaram (2002) found that microcredit has succeeded in socially empowering women

where economic empowerment was not achievable owing to women's lack of business skills and understanding. Conversely, Asim (2009) criticizes the role of microfinance in the empowerment process. He observed that while involvement in microfinance activities does not always result in empowerment, it can aid in partial empowerment in household decisions such as housing sale/purchase, house maintenance, and so on, where they are least empowered. However, a positive effect on women's empowerment in terms of child-related decisions was observed by Nilakantan *et al.* (2013). Negative or no empowerment of women in terms of economic empowerment dimensions was also noted. Similarly, Mula & Sarker (2013) found a positive change in economic empowerment indicators like income, savings, employment, investment, consumption, and assets, after joining SHG. Contrarily, they also observed that increased decision-making autonomy led to a decrease in women's empowerment.

Moreover, Fwamba *et al.* (2015) established a link between economic empowerment and Microfinance Institution services. They stated that involvement in MFIs alone did not ensure empowerment but that by including advising services, respondents might achieve a higher level of empowerment. Furthermore, Datta & Sahu (2017) observed that MFIs undoubtedly assist women in becoming more empowered. However, the scope of empowerment is minimal. The reason might be a lack of financial literacy, a low education level, the dominance of money lenders, and the perceived risk of MFIs, among other reasons. Nevertheless, Sinha *et al.* (2019) found that greater access to microfinance credit has a detrimental influence on economic empowerment, i.e., credit and expenditure decisions. Hickson (2001) asserts that most microfinance organizations have a long way to go to effectively meet the aim of poverty reduction. Beck *et al.* (2007) stated that financial development raises the income growth of the poorest people, lowers income inequality, and is thus significantly connected with poverty reduction. According to Enisan & Oni (2012), international microfinance experience suggests that microcredit is not an appropriate instrument for assisting the chronically poor. Imai *et al.* (2012) concluded that microfinance positively impacts poverty at the macro level. Van Rooyen *et al.* (2012) stated that microfinance significantly decreases poverty and increases economic growth in Sub-Saharan African nations. Ghalib *et al.* (2015) reported microfinance's favorable effect on poor Malaysian families' financial vulnerability. However, in a study in Pakistan, Ghalib *et al.* (2015) identified microfinancing to relieve poverty as indicated in household income and spending. Samer *et al.* (2015) stated that while microfinancing has been highlighted as a successful poverty eradication and socio-economic development instrument, its efficacy is still being questioned and varies from urban to rural locations and nation to country. Christensson (2017) indicates an inverse relationship between the number of microfinance organizations and poverty levels and finds that microfinance organizations reduce poverty. Lacalle-Calderon *et*

al. (2018) demonstrate that the impact of microfinance on poverty varies depending on the poverty level. The study suggests that microfinance benefits even the poorest individuals. Sohn & Ume (2019) found that microfinance institutions substantially impact poverty reduction and are a successful economic and financial development instrument. Subramaniam *et al.* (2021) observed that the extent to which present microfinance effectively alleviates extreme poverty is less practicable in emerging nations, mainly when the hardcore poor are likely to be denied access to microfinance. Pathak & Gyawali (2010) said the loans were primarily used to fund small-scale businesses, livestock, and other agro-based industries. The microfinance program has aided in creating enterprises and employment generation. Taiwo *et al.* (2016) reported that supporting women entrepreneurs has incremental impacts on employment generations. Their efforts result in numerous employment generations through improved company operations, increasing the number of self-employed persons in the country. Tafamel (2019) stated that microfinance favors employment, house building, and access to schools and medications. The various study helps us understand microfinance's position at the bottom of the pyramid and its potential to help people live sustainably (Rahman *et al.* 2017). The majority of the literature currently in existence when analyzing the impact of microfinance on the beneficiaries, mainly examines employment (Datta & Sahu, 2018) or empowerment (Addai, 2017). However, in a social setting, the effects of microfinance should be assessed not only on households but also on people. This research aims to address the existing gap in the literature by analyzing the holistic effect of microfinance on individuals' livelihoods. Through this study, the influence of microfinance services incorporates employment generation and empowerment of several aspects in rural areas.

3. OBJECTIVES:

1. To assess the demographic profile and socio-economic status of SHG beneficiaries.
2. To analyze the factors influencing women's participation in SHGs and assess how participation affects income and employment levels among beneficiaries.
3. To examine the impact of microfinance on employment and income generation among women beneficiaries.

4. RESEARCH METHODOLOGY:

4.1 Sample Design:

This study primarily focuses on the impact of microfinance on its beneficiaries, specifically examining job creation and the effectiveness of microfinance in improving the standard of living for borrowers. Sample collection targeted villages with a significant presence of marginalized rural groups, considering their unique physical, social, and demographic characteristics. A list of borrowers within the selected sample area (Madhopur, Keshripur

& Mishirpur) in Uttar Pradesh was collected from the Block office in Vidyapith through Block Mission Manager (BMM). For this purpose, the officials provided a list of 540 borrowers, with 180 borrowers from each area. 320 responses from the list were gathered using multistage random sampling. More participation of target respondents is limited by various factors, including unavailability, time constraints on the part of the borrowers, respondents' locations, and misinformation. For this study, 270 respondents with total responses (90 from each area) who had completed at least one year of the post-loan phase and beyond and were still in the middle of the loan payback cycle were considered. The data was collected from March 2023 to June 2023.

4.2 Variables Used in the Study:

1. **Dependent Variable: Performance of Microfinance** – Measured through indicators like employment generation, income increase, and socio-economic improvement among beneficiaries.
2. **Independent Variables (Microfinance Factors):** **Barriers** – Challenges and obstacles that affect beneficiaries' access to and effectiveness of microfinance; **Livelihood Promotion Mechanism** – Microfinance initiatives on improving livelihoods; **Perception** – Beneficiaries' perception of SHG programs and microfinance effectiveness; **Reason for Joining** – Motivating factors that led beneficiaries to join SHGs (e.g., influence from group leaders, self-motivation); **Attended Training** – Involvement in training programs related to SHGs and skill development.
3. **Control Variables:** Age; Education Level; Income-Generating Activities – Types of activities (e.g., sewing, livestock) that contribute to income; Loan through SHGs – Access to loans provided by SHGs.

4.3 Statistical Tests and Tools Used for the Study:

Both open-ended and closed-ended questionnaires have been utilized in this study to examine the stated objectives. Demographic variables and socio-economic status of women beneficiaries were analyzed using the percentage analysis. A proper reliability test was conducted to assess the questionnaire's efficacy. An alpha value of 0.70 or higher is considered favorable in social sciences (Cortina, 1993). Subsequently, factor analysis was carried out to reduce large number of variables into a smaller set of factors. The effect of microfinance on employability and income generation has been examined using correlation and multiple regression analysis. Additionally, the inferential statistics F-test was used to observe significant differences between the respondents' performance, various factors, and socio-demographic variables. The analysis was made using MS-Excel and SPSS 23.

5. RESULTS AND DISCUSSION:

Gender, social, and cultural standards (Heintz *et al.*, 2018) and women's commitments to family welfare limit their options for a living. Table 1 represents the demographic profile of the beneficiaries. Of 270 women beneficiaries, 65.6% of women fall within the middle-aged group. 93.7% of women were married, and the rest were widows. Regarding their education, 54.4% of women were educated, of which 23% got primary education. 45.6% of women were not educated, but they could sign. Self-employed and salaried women, constituting 73%, have business experience of one year and above, of which 35.2% of women have business experience of more than five years. Women having business experience of more than five years belong mainly to 'Generation X.' Regarding monthly family income and employment after joining SHG, 75.6% of women have monthly family income in the range of 5001-15000, and 30% and 28.9% of women have monthly family employment of 26-30 days and 11-15 days, respectively. 62.2% of women joined the group under the influence of the group leader, and the remaining 37.8% of women joined the group under self-influence or the influence of neighbors or others. Regarding status position, 76.6% of women perceive average to good status position of women in society. However, 17% of women perceive the bad status position of women.

Table 1: Demographic profile of beneficiaries

Particulars	Category	Frequency	Percent
Age	Less than 22	6	2.2
	23-32	85	31.5
	33-42	92	34.1
	43-52	65	24.1
	More than 52	22	8.1
Marital Status	Married	253	93.7
	Widow	17	6.3
Education	Illiterate but can sign	123	45.6
	Primary	62	23
	Secondary	32	11.9
	Higher Secondary	31	11.5
	Higher Education	22	8.1
Business Experience	No Business Experience	73	27
	1-3 years	42	15.6
	3-5 years	60	22.2
	More than 5 years	95	35.2
Income after joining SHG	Less than or equal to 5000	23	8.5
	5001-10000	139	51.5
	10001-15000	65	24.1
	15001-20000	27	10
	More than 20000	16	5.9
Employment after joining SHG	6-10 days	11	4.1
	11-15 days	78	28.9
	16-20 days	48	17.8
	21-25 days	52	19.3
	26-30 days	81	30
Income-generating key activities	Sewing & Needlework	93	34.4
	Agro-based	46	17
	Livestock	17	6.3
	Trade	42	15.5
	More than 2 activities	72	26.6

Who influenced you to join the group?	Self	15	5.6
	Group Leader	168	62.2
	Neighbors	37	13.7
	Others	50	18.5
Perceived levels of women's status position in society	Very Bad	4	1.5
	Bad	46	17
	Average	117	43.3
	Good	90	33.3
	Very Good	13	4.8

Table 2: Reliability test on factors under consideration for the study

Particulars	Total no. of Items	Cronbach's Alpha
Barriers (B)	5	0.970
Livelihood Promotion Mechanism (LPM)	3	0.958
Perception (P)	5	0.987
Reason of Joining (RoJ)	5	0.916
Attended Training (AT)	5	0.982
Performance of Microfinance	5	0.808

Source: Compiled from SPSS

To ensure the reliability of the study, a Cronbach's Alpha test was conducted to assess the consistency of the questions framed for each factor. Based on the results, which indicated values higher than 0.7 for all factors, it can be concluded that the variables and factors are reliable. Kaiser-Meyer-Olkin Measure of Sampling adequacy was 0.764, and Bartlett's Test of Sphericity was significant at 0.000.

H_{01} : There is a significant positive relationship between microfinance factors (barriers, livelihood promotion, perception, reason for joining, and training attended) and the performance of microfinance among women beneficiaries.

Table 3: Correlation analysis concerning factors under consideration in the study

Factors	B	LPM	P	RoJ	AT
Barriers	1				
Livelihood Promotion Mechanism	0.043	1			
Perception	.247**	.367**	1		
Reason of Joining	.143*	.203**	0.07	1	
Attended Training	0.024	.211**	.182**	0.075	1
Performance of Microfinance	.350**	.535**	.632**	.622**	.596**
**. Correlation is significant at the 0.01 level (2-tailed).					
*. Correlation is significant at the 0.05 level (2-tailed).					

Source: Primary data

Table 3 shows that the calculated significance value was 0.000, which is lower than the standard threshold of .05. As a result, the null hypothesis was rejected. This implies that the study found a statistically significant and positive association between the different impact factors considered and their effect on performance.

H₀₂: Key factors such as education level, age, type of income-generating activities, and loan access through SHGs does not influence the impact of microfinance factors on income generation and employment among women beneficiaries.

Table 4: Regression Analysis of Factors Influencing Income Generation and Employment through Microfinance

Model	Coefficients ^a		
		t	Sig.
(Constant)	115.337	39.329	0.00
Education	2.001	4.496	0.00
Age Group	2.583	4.268	0.00
Income-generating activities	0.405	2.429	0.016
Attended meeting	3.55	2.785	0.006
Loan through SHGs	6.081	1.063	0.000
R = 0.583, R Square = 0.34, F = 27.222, Sig. 0.000 ^b			
Dependent Variable: Employment and income-generation			

Sources: Primary data

Since a significant relationship exists between considered variables, R is correlated to other variables from the regression analysis. Table 4 depicts that age, education, income-generating activities, attended meetings, and a loan through SHG has a positive relationship with the impact of microfinance on employment ($R=.583$). However, the value of the adjusted R square is .340, which explains that these elements contribute only 34% to the dependent variable, i.e., impact on employment. The study further reveals that age, education, and loans through SHG ($\beta = 2.00, 2.58 \text{ \& } 6.08, p < .05$) are the most influential factors and have a higher impact on employment, followed by attended meetings and loans through SHG ($\beta = 3.55 \text{ \& } .40, p < .05$) has least significant contribution towards microfinance on performance. The ANOVA result shows that the considerable value was less than 0.01, meaning independent variables could significantly predict the impact on employment (dependent variable) at a 95% confidence level.

6. LIMITATION:

Further research on a bigger scale is necessary to validate and support the findings because the study is based on small sample size and only represents a small number of rural areas in Uttar Pradesh. Future studies can also be performed using additional variables. Longitudinal study can also be performed to analyse the impact of microfinance on income, employment, savings and expenditure patterns of the marginalized women and on their overall empowerment.

7. CONCLUSION:

The findings of this study suggests that microfinance through SHGs plays a very instrumental role in empowering the women that is most evident in terms of income and employment generation. Consistent with previous studies (Rehman et al., 2020; Ebimobowei et al., 2012), factors such as age, education, and marital status effects women's empowerment. Microfinance by itself won't necessarily provide enough empowerment to the women, however, but it should be accompanied by other support systems, such as education, training and awareness of social and political issues. The findings of the study confirms that access to microfinance enables women to start and manage micro-businesses which helps them increase their self-sufficiency, employability, and standard of living. Additionally, a large majority of beneficiaries are well into middle age and come from joint families, and many are struggling financially, where microfinance can ease some of that pressure by helping them gain access to income producing opportunities. These findings suggest that microfinance acts as an important catalyst for the development of financial independence and empowerment of women, especially when policy aimed at promoting education, skill building and social consciousness is pursued. Microfinance through SHGs significantly contributes to the financial

empowerment of marginalized women, helping them take calculated risks, explore diverse sources of income, and enhance their leadership and creative abilities, thereby improving their living standards.

8. RECOMMENDATION:

This study strengthens the microfinance culture in the nation, as this may result in a changed and prosperous society where individuals should consider how to generate employment. It is suggested that the government should assist the poorest of the poor through alternative channels, e.g., interest-free loans, grants, and social security programs like free health insurance, as microfinance appears to be out of their grasp. Additionally, poor aspirant women in SHGs should receive significantly free fundamental business training for the future employment generation of rural women.

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Financial Efficiency Analysis of Selected Private Sector Banks in Nifty-50

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ABSTRACT Efficiency, especially in the banking industry, refers to the optimal use of scarce resources at the lowest possible cost and with the highest possible production. Assessing efficiency facilitates determining a bank's level of productivity as well as potential ways to close any gaps in this area. Effective banks are those that provide higher yields for a given quantity of input. Consequently, to precisely illustrate a bank's efficiency, a resource-based view of banks using input and output resources must be applied. In this competitive economic environment, efficiency in financial institutions translates into more profitability, more capital allocated, better prices, and higher-quality services for customers. The efficiency of a bank can help it manage debt and improve the lives of regular customers and depositors. The effectiveness of a bank may have a significant impact on how the real economy is shaped and contribute to sufficient economic growth. A feeble and inept banking system can pose a threat to a nation's whole economy.

INTRODUCTION

Operating Profit to Assets Ratio

Operating profit on assets, an efficiency or profitability ratio, is a variation of the standard Return on Asset ratio. Operating Return on Assets is used to show a company's operating income that is generated per rupee invested specifically in its assets that are used in its everyday business operations. Like that it measures the level of profits relative to the company's assets but using a narrower definition of its assets. The Operating Profit to Assets Ratio is used to evaluate a company's operational efficiency

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and profitability by comparing its operating profit to its total assets. It indicates how effectively a company is generating profits from its assets.

Operating Expenses to Assets Ratio

It is an efficiency ratio that measures the operating expenses, i.e., non-interest expenses, of a bank about its size or the asset base. The ratio is not impacted by changes in the interest rate and so provides a better picture of the bank's efficiency in terms of how it is managing its expenses as compared to its assets. The Operating Expenses to Assets Ratio measures the proportion of a company's operating expenses in relation to its total assets, providing insight into the efficiency of resource allocation and operational cost management².

Cost to Income Ratio

The cost-to-income ratio is used by businesses to assess their operational efficiency and financial health. It measures the proportion of operating expenses relative to operating income, providing insights into how effectively a company manages its costs in generating revenue. This guide aims to delve into the significance of Cost to Income, its calculation, interpretation, and strategies to optimize it.

RESEARCH OBJECTIVE

The main objective of the study is to find out the Operating Profit to Assets Ratio, Operating Expenses to Assets Ratio and Cost to Income Ratio of selected nifty 50 banks.

LIMITATIONS

- Ratios rely purely on numerical data and may ignore qualitative factors such as customer satisfaction, market reputation, or management efficiency, which can significantly impact a bank's performance.
- This study is restricted to a period of ten years i.e., from FY 2013-2014 to 2022-2023.
- Ratios are often calculated for a specific period and do not capture long-term trends or changes in performance over time.

REVIEW OF LITERATURE

C. Marwadi ‘ (2015) “Three public sector banks and three private sector banks made up the sample size for his research paper, “Determinants of profitability: A study of selected public sector and private sector banks in India.” Eight years, from 2006–07 to 2013–14, were covered by the study. The “overall business productivity factor”

was the main element influencing the profitability of both public and private sector banks. While profitability was important in private sector banks, it was less important in public sector banks”.

M. Loganathan (2015) “The researcher of the research paper “Financial performance of select scheduled commercial banks in India - with reference to pre and post-recession period” examined the profitability and growth of a selection of scheduled commercial banks in India over the course of two distinct periods: the processionary period (i.e., 2002–03 to 2006–07) and the post-recessionary period (2007–08 to 2011–12). The findings of the study demonstrated a strong relationship between the profitability ratios and capital adequacy, resource deployment, asset quality, management efficiency, system evaluation, earning quality, and liquidity in structured commercial banking in India”.

D.S.Mitry, V-Savanf (2015)”They examined the classification of Indian private sector banks based on their financial characteristics and evaluated their financial performance in a research paper titled “A comparative study of the profitability performance in the banking sector: Evidence from Indian private sector banks.” They discovered that there was a negative correlation between operational efficiency and return on assets and interest income size, while there was a positive correlation with assets utilization and assets size. They also discovered that operational efficiency, asset management, and bank size had an impact on the financial performance of Indian private sector banks”.

RESEARCH METHODOLOGY

The primary purpose of the present study has been to obtain a deep insight and full familiarity with the profitability of all private sector banking companies which are listed in the NIFTY-50 National stock exchange (HDFC Bank, IndusInd Bank, ICICI Bank, Axis Bank and Kotak Mahindra Bank). A ten-year period commencing from the FY 2013-2014 to 2022-2023 has been considered for the study. The present study is based on secondary data. The secondary source of information of the study was collected from the websites, published literature, research papers, published annual reports, audited financial statements and various reports of selected banking companies. These data have been tabulated, analyzed and interpreted with the help of different profitability ratios.

RATIOS

Operating Profit to Assets Ratio

The **Operating Profit to Assets Ratio** measures the bank's ability to generate operating profits from its total assets. It provides insight into how efficiently the bank is using its assets to produce operating income before considering non-operating items like taxes or interest expenses.

The Formula for Operating Profit on Total Assets is

$$\text{Operating Profit to Total Assets Ratio} = \frac{\text{EBIT}}{\text{AVERAGE TOTAL ASSETS}}$$

Where;

Earnings Before Interest and Taxes (EBIT) are equivalent to operating income. Average total assets are the average of the beginning and ending values of the company's total assets used in its normal business activities.

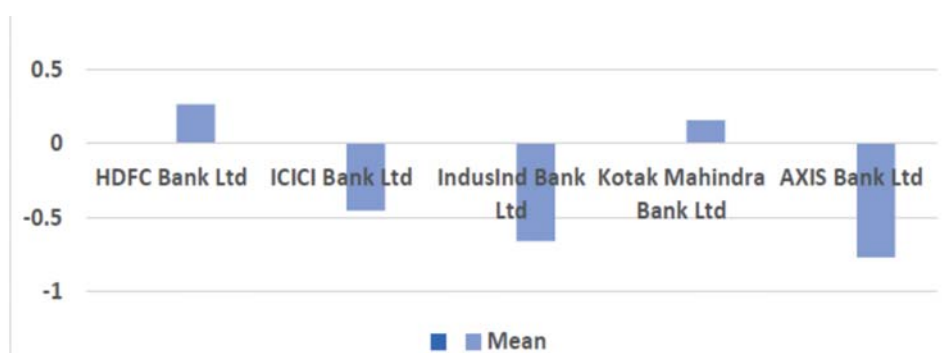
This ratio provides, how a company is effectively using its total assets to generate profits before considering the effects of interest and taxes. A greater ratio directs better profitability relative to the assets employed, while a lower ratio suggests inefficiency in asset utilization or lower profitability.

It is imperative to evaluate this ratio in combination with other financial indicators and take the industry and economic environment into account. An excessive operational profit to asset ratio could be a sign of drastic cost-cutting strategies that jeopardize investments in expansion prospects or long-term viability. In a similar vein, if the business operates in a sector that requires large capital expenditures and high asset turnover, a low ratio does not always translate into subpar performance. In order to make wise investment decisions, the operating profit to asset ratio should be thoroughly examined within the larger financial and strategic framework, even though it offers insightful information about a company's productivity and profitability. The Operating profit to total assets ratios particulars of select listed nifty-50 companies during the years 2013-14 to 2022-23 are presented in Table 1.1.

TABLE: 1

OPERATING PROFIT TO TOTAL ASSETS PERCENTAGE OF SELECT LISTED COMPANIES DURING THE YEARS 2013-14 TO 2022-23													
Name of the Company	2022-23	2021-22	2020-21	2019-20	2018-19	2017-18	2016-17	2015-16	2014-15	2013-14	Mean	Standard Deviation	Coefficient of variation (%)
HDFC Bank Ltd	0.52	0.36	0.33	0.19	0.27	0.21	0.26	0.21	0.20	0.11	0.27	0.11	43.09
ICICI Bank Ltd	0.76	0.34	-0.22	-0.77	-1.15	-1.21	-1.25	-0.77	-0.15	-0.10	-0.45	0.69	-152.32
IndusInd Bank Ltd	-0.16	-0.69	-1.02	-0.82	-0.84	-0.51	-0.72	-0.72	-0.55	-0.55	-0.66	0.23	-35.55
Kotak Mahindra Bank Ltd	0.78	0.51	0.39	0.15	0.08	0.01	-0.03	-0.27	-0.15	0.11	0.16	0.32	201.07
AXIS Bank Ltd	-0.52	-0.18	-0.82	-1.51	-1.05	-1.54	-1.33	-0.21	-0.21	-0.30	-0.77	0.56	-72.64
Source: Published annual reports of selected Nifty-50 listed companies													

From the above table-1, it is clear that HDFC Bank Ltd had the highest mean of 0.27 and its standard deviation of 0.11 indicates a Low level of variability in operating profit to total assets ratios among these companies over the specified period. The coefficient of variation was calculated to be around 43.09 Percent, suggesting a low degree of relative variability compared to the mean. HDFC Bank Ltd appears to be the best performer based on the mean operating profit to total assets ratio over the specified period, with a mean of 0.27. Additionally, HDFC Bank Ltd had the lowest standard deviation of 0.11, indicating relatively lower variability compared to other companies. This implies more consistent performance over the years. Details of the Operating profit to total assets of select listed companies during the years 2013-14 to 2022-23 are presented in chart 1.

CHART:1 Average of Operating Profit to Total Assets (%) of Select Listed Companies

Two-way ANOVA was applied to find the significant mean in respect of Operating profit to total assets ratio among the companies and during different time periods. The results of the ANOVA are presented in the below table.2.

Table: 2 Two-Way ANOVA without Replication

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Rows	8.99	4	2.25	18.14	**3.06E-08	2.63
Columns	4.12	9	0.46	3.69	*0.00232	2.15
Error	4.46	36	0.12			
Total	17.57	49				

Note: **Significant at 3.06E-08 levels (p-value) *Significant at 0.00232 levels (p-value)

Table 2 above illustrates how distinct Companies are represented by the computed value of F between the rows. Since there appears to have been a significant difference, the null hypothesis regarding the means of the various companies is rejected, as indicated by the F-statistic of 18.14. The fact that the computed F-value exceeded the crucial F-value of 2.63 suggests that there was a noteworthy disparity between the firm's operating profit to total assets ratio. Different time periods are represented by the computed value of F between the columns. The null hypothesis, which held that there would be no difference between the means of the various time periods, is rejected because the F-statistic of 3.69 indicates that there was a significant difference. Given that the computed F-value exceeded the crucial F-value of 2.15.

Operating Expenses to Assets Ratio

The **Operating Expenses to Assets Ratio** measures the proportion of a bank's operating expenses relative to its total assets. It provides insight into how efficiently the bank is managing its costs in relation to the size of its asset base. A lower ratio suggests better cost management and operational efficiency, while a higher ratio indicates higher operational costs relative to assets.

The Expenses to Assets ratio provides a lens into the efficiency of a bank concerning its asset size. A lower ratio is generally preferred, indicating that the bank operates efficiently relative to its assets. A high Cost to Assets ratio might recommend that the bank is not properly leveraging its assets or has excessive costs for its size.

The Operating Cost-to-Asset Ratio Formula is

$$\text{Operating Expenses to Assets Ratio} = \frac{\text{Operating Assets}}{\text{Total Assets}} \times 100$$

Where.

Operating Expenses refer to the costs associated with running the day-to-day operations of the business, including salaries, utilities, rent, marketing expenses, and depreciation. Total Assets represent the aggregate value of all assets owned by the company, including tangible assets (such as property, plant, and equipment) and intangible assets (such as patents and trademarks).

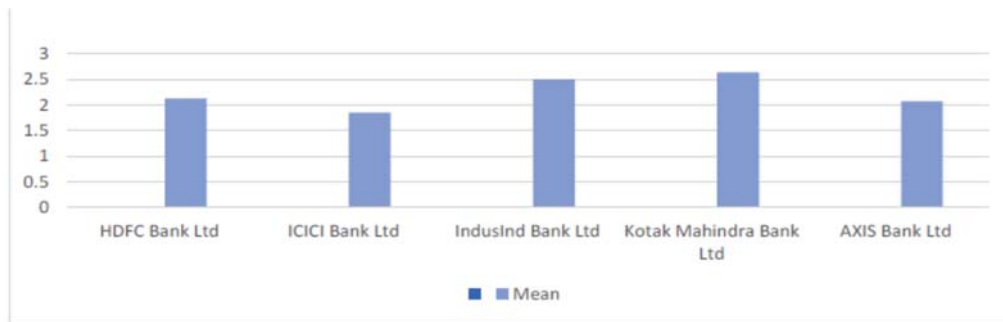
By expressing the ratio as a percentage, it provides a meaningful benchmark for comparing the efficiency of asset utilization across different companies or over time within the same company. A higher Operating Expenses to Assets Ratio may indicate that a company is spending a larger portion of its assets on operating expenses, which could potentially reduce profitability and overall financial performance. Conversely, a lower ratio suggests that the company can operate more efficiently and generate higher returns on its assets. Particulars pertaining to the Operating Expenses to total assets ratios mean of select listed NIFTY-50 companies during the years 2013-14 to 2022-23 are presented in Table 1.3.

Table 3: Operating Expenses to Total Assets Percentage of Select Listed Companies During the Years 2013-14 to 2022-23

Name of the Company	2022-23	2021-22	2020-21	2019-20	2018-19	2017-18	2016-17	2015-16	2014-15	2013-14	Mean	Standard Deviation	Coefficient of variation (%)
HDFC Bank Ltd	1.93	1.81	1.87	2.00	2.09	2.13	2.28	2.39	2.36	2.44	2.13	0.23	10.70
ICICI Bank Ltd	2.07	1.89	1.75	1.96	1.87	1.78	1.91	1.75	1.77	1.73	1.85	0.11	6.03
IndusInd Bank Ltd	2.49	2.37	2.30	2.68	2.30	2.52	2.67	2.62	2.49	2.51	2.50	0.14	5.56
Kotak Mahindra Bank Ltd	2.81	2.58	2.23	2.45	2.40	2.42	2.61	2.84	3.07	2.90	2.63	0.27	10.10
AXIS Bank Ltd	3.01	2.00	1.84	1.89	1.97	2.02	2.02	1.92	1.99	2.06	2.07	0.34	16.23
Source: Published annual reports of selected Nifty-50 listed companies													

From the above table-3, it is clear that the mean operating expenses to total assets ratio across the selected Nifty-50 listed companies from 2013-14 to 2022-23 was approximately 2.24. The standard deviation of 0.22 suggests a moderate level of variability in operating expenses among these companies over the specified period. The coefficient of variation was calculated to be around 9.72 Percent, indicating a relatively high degree of relative variability compared to the mean. Among the selected NIFTY-50 companies listed on NSE, ICICI Bank Ltd appears to be the best performer based on the mean operating expenses to total assets ratio over the specified period, with a mean of approximately 1.85. Additionally, ICICI Bank Ltd had the lowest standard deviation of 0.11, indicating relatively lower variability compared to other companies. This implies a more consistent control over operating expenses. The details of Average operating expenses to total assets percentage of select listed companies during the years 2013-14 to 2022-23 are presented in Chart 3.

Chart- 4: Average of Operating Expenses to Total Assets (%) of Select Listed Companies



Two-way ANOVA was applied to find the significant mean in respect of Operating expenses to Total Assets ratio among the companies and different time periods. The results of the ANOVA are presented in the below table 1.4.

Table – 4: ANOVA Two – Factor Without Replication

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Rows	4.12	4	1.03	23.33	**1.41E-09	2.63
Columns	0.82	9	0.09	2.058	0.060668NS	2.15
Error	1.59	36	0.04			
Total	6.52	49				

Note: **Significant at 1.41E-09 levels (p-value)

It is clear from table 1.4 above that distinct Companies are represented by the computed value of F between the rows. The null hypothesis, which held that there would be no difference between the means of the various companies, is rejected because the F-statistic of 23.33 indicates that there was a significant difference. The fact that the computed F-value exceeded the crucial F-value of 2.63 suggests that there is a notable disparity between the organizations' operating expenses and total assets ratios. Different time periods are represented by the computed value of F between the columns. The results do not refute the null hypothesis, which states that there was no significant difference between the means of the various time periods, as indicated by the F-statistic of 2.06. Since the calculated F-value was lower than the critical F-value (2.15), it points out that there was no significant difference in Operating expenses to Total Assets ratios within the company among the time periods.

Cost to Income

The **Cost to Income Ratio (CIR)** measures a bank's efficiency in managing its operating costs relative to its income. It indicates the percentage of a bank's income that is used to cover its operating expenses. A lower ratio is generally considered better as it signifies that a bank is able to generate income with lower operating costs, leading to higher profitability. The Cost to Income Ratio is used primarily in the banking and financial services sector to evaluate the efficiency of a company's operations by comparing its operating costs to its income. It measures the proportion of operating expenses (costs) incurred by a company relative to its operating income. A lower Cost to Income Ratio indicates better operational efficiency, as it suggests that the company is generating more income relative to its operating costs³.

The formula to calculate this ratio is:

$$\text{Cost to Income Ratio} = \frac{\text{Operating Expenses}}{\text{Operating Income}} \times 100$$

Operating Expenses: This includes the day-to-day expenses a company incurs to run its operations, such as salaries, rent, utilities, and other administrative expenses. It does not include interest expenses or tax payments.

Operating Income: This is the income earned from a company's core business operations, excluding any income from investments, and also excludes interest payments and taxes.

All costs directly related to operating a firm, including rent, utilities, salaries, and marketing costs are included in operating expenses. Lowering operating costs can be achieved by putting cost-cutting initiatives into place without sacrificing the quality of goods or services. With the exception of non-operating income from investments or one-time gains, operating income is the money received by the business from its primary activities. Operating income can be increased by diversifying into related businesses, creating new products, or growing markets. By routinely tracking and evaluating the Cost to Income, companies can spot patterns, highlight inefficiencies, and take proactive steps to maximize cost control.

Cost-to-income ratio serves for assessing how well a company manages its operational expenses relative to the income it generates. By understanding its significance, calculating it accurately, and implementing targeted strategies to optimize it, businesses can enhance profitability, competitiveness, and long-term sustainability in today's dynamic marketplace. The particulars relating to Cost to Income of select listed NIFTY-50 companies during the years 2013-14 to 2022-23 are presented in Table-1.5

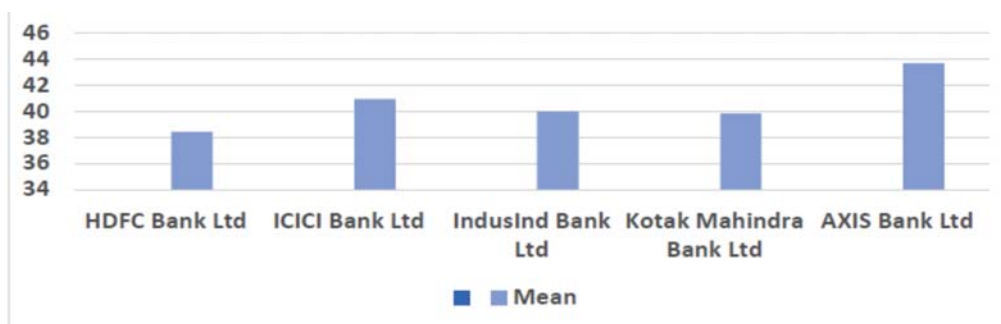
**Table – 5: Cost to Income Percentage of Select Listed Companies
During the Years 2013-14 to 2022-23**

Name of the Company	2022-23	2021-22	2020-21	2019-20	2018-19	2017-18	2016-17	2015-16	2014-15	2013-14	Mean	Standard Deviation	Coefficient of variation (%)
HDFC Bank Ltd	38.35	41.05	40.37	38.52	38.41	39.62	37.84	36.69	36.84	36.53	38.42	1.55	4.03
ICICI Bank Ltd	38.79	40.65	42.57	45.79	48.98	46.51	42.68	39.40	32.70	31.30	40.94	5.70	13.93
IndusInd Bank Ltd	41.24	46.53	48.51	40.83	40.10	39.22	39.65	37.15	33.32	33.25	39.98	4.90	12.26
Kotak Mahindra Bank Ltd	42.81	43.72	42.83	40.01	38.52	39.91	38.68	39.07	37.33	35.57	39.85	2.60	6.54
AXIS Bank Ltd	49.05	42.77	47.76	50.03	44.28	51.64	46.42	35.70	34.74	34.53	43.69	6.54	14.97
Source: Published annual reports of selected Nifty-50 listed companies													

From the above table-5, it is clear that the mean cost to income ratio across the selected Nifty-50 listed companies from 2013-14 to 2022-23 was approximately 40.58. The standard deviation of 4.26 indicates a moderate level of variability in cost to income ratios among these companies over the specified period. The coefficient of variation was calculated to be around 10.35 Percent, suggesting a moderate degree of relative variability compared to the mean.

Among the selected NIFTY-50 companies listed on NSE, HDFC Bank Ltd appeared to be the best performer based on the mean cost to income ratio over the specified period, with a mean of approximately 38.42. Additionally, HDFC Bank Ltd had the lowest standard deviation of 1.55, indicating relatively lower variability compared to other companies. The Average Cost to Income percentage particulars of select listed companies during the years 2013-14 to 2022-23 are presented in Chart 5.a.

Chart – 5: Average of Cost to Income (%) of Select Listed Companies



Two-way ANOVA was applied to find the significant mean in respect of Cost to Income ratio among the companies and different time periods. The results of the ANOVA are presented in the below table 6.

Table – 6: ANOVA Two – Factor Without Replication

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	153.69	4	38.42	3.63	**0.013931	2.63
Columns	595.43	9	66.16	6.24	*2.85E-05	2.15
Error	381.51	36	10.60			
Total	1130.62	49				

Note: **Significant at 0.013931 levels (p-value) *Significant at 2.85E-05 levels (p-value)

In the above table 1.6, the computed value of F between the rows represents different Companies. The F-statistic of 3.63 suggests that there was significant difference and hence reject the null hypothesis assumed to be existing between the means of the different companies is rejected. As the calculated F-value was higher than the critical F-value (2.63), it indicates that the companies had a significant difference in the cost to income ratios. The computed value of F between the columns represents different time periods. The F-statistic of 6.24 suggests that there was significant difference and hence the null hypothesis predicted between the means of the different time periods is rejected. Since the calculated F-value was higher than the critical F-value (2.15), it indicates that there was significant difference in cost to income ratios within the company among the time periods.

CONCLUSION

Table 1.1 demonstrates that the given ratio provided insight into how effectively the company used its assets to generate profits before considering interest and taxes. AXIS Bank Ltd. had a lower operating profit to assets ratio (-0.77), indicating inefficiency in asset utilization or lower profitability, while HDFC had a higher ratio (-0.27), indicating superior profitability relative to the assets utilized. As seen from Table 3, Operating Expenses to Assets Ratio compared the efficiency of asset utilization across different companies or over time within the same company. Kotak Mahindra Bank Ltd indicated how a company was spending a larger portion of its assets on operating expenses, which could potentially reduce profitability and overall financial performance. Table 5 demonstrates how cost-to-income ratio monitoring and analysis helped businesses identify trends, pinpoint areas of inefficiency, and take proactive steps to enhance cost management. HDFC Bank's cost-to-income ratio indicates a more efficient operation, implying that the company generated more income per unit of cost due to decreased fluctuation.

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Empowering MSMEs for a Viksit Bharat by 2047: A Strategic Pathway to Sustainable Economic Growth

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Abstract: The objective of “Viksit Bharat by 2047” is to establish India as a prominent global economic force, and MSMEs are poised to play a pivotal part in this metamorphosis. This paper investigates the strategic role of MSMEs in fostering long-term economic growth and meeting Viksit Bharat objectives. By analyzing the current state of MSMEs, their contributions to GDP, employment, and innovation, the study highlights the challenges they face, including access to finance, technology adoption, and regulatory hurdles. The research also examines the government’s initiatives to support MSMEs and proposes policy recommendations to enhance their growth and competitiveness. The findings underscore the need for a robust MSME ecosystem to ensure inclusive and sustainable development, aligning with the broader national vision of a developed India by 2047.

Keywords: Viksit Bharat 2047, MSMEs, economic growth, sustainable development, government policy, financial inclusion, innovation, entrepreneurship.

1. Introduction

The Micro, Small, and Medium Enterprises (MSMEs) sector in India is a critical backbone for the country’s socioeconomic development, encouraging entrepreneurship, creating jobs, and driving economic progress. Over the decades, India has seen a significant transformation in its economic landscape, with MSMEs emerging as pivotal contributors to the nation’s GDP and export earnings. As India progresses towards its vision of becoming a developed economy by 2047 under the **Viksit Bharat@2047** initiative, the role of MSMEs is more critical than ever.

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India's economic journey has been marked by impressive milestones, including the Green Revolution, which ensured food security, and the rise of the nation as a global software hub. The country's growth trajectory has accelerated, from a low GDP growth rate of 2.9% in 1951-52 to a robust 7.6% in 2023-24. The Viksit Bharat@2047 program envisions India as one of the top three global economies by the centennial of independence, with a GDP of \$34.7 trillion by 2047. This strategy places a premium on empowering the MSME sector, which is critical for attaining inclusive growth and sustainable development.

2. Background

MSMEs in India are classified into three categories: Micro, Small, and Medium enterprises, based on their investment in plant and machinery or equipment and annual turnover. Micro enterprises, the smallest category, have investments not exceeding ¹ 1 crore and annual turnovers of up to ¹ 5 crores. Small enterprises have investments not exceeding ¹ 10 crores with turnovers up to ¹ 50 crores, and medium enterprises have investments up to ¹ 50 crores and turnovers up to ¹ 250 crores.

India is home to approximately 634 lakh MSMEs, with a nearly equal distribution between urban (49%) and rural areas (51%). This sector contributes about 30% to the country's GDP and around 33% to the manufacturing gross value output. MSMEs make up over 49% of India's total exports, making them important participants in international trade. Over 1110 lakh people are employed in this sector; 498 lakh of those occupations are in rural areas, and 612 lakh are in urban areas.

The government has launched a number of programs to assist the MSME sector, such as the credit guarantee plan, which saw a ¹ 9000 crore boost, and the Pradhan Mantri Mudra Yojana (PMMY), which in FY23 sanctioned ¹ 4.56 lakh crore to over 6.2 crore MSMEs. By lowering financial burdens and facilitating loan availability, these programs seek to support MSMEs' longterm growth and viability. The government has launched a number of programs to assist the

MSME sector, such as the credit guarantee plan, which saw a ¹ 9000 crore boost, and the Pradhan

Mantri Mudra Yojana (PMMY), which in FY23 sanctioned ¹ 4.56 lakh crore to over 6.2 crore MSMEs. By lowering financial burdens and facilitating loan availability, these programs seek to support MSMEs' long-term growth and viability.

MSME Classification and Contribution

To better understand the distribution and impact of MSMEs across various economic sectors, the following table categorizes MSMEs based on their investment and turnover:

Classification	Investment (₹)	Yearly Turnover (₹)
Micro	≤ 1Cr.	≤ 5Cr.
Small	≤ 10Cr.	≤ 50Cr.
Medium	≤ 50Cr.	≤ 250Cr.

Figure 1 The chart below depicts the MSMEs' contribution to India's GDP and export revenues, emphasizing their importance in the economy.

Figure 1: Contribution of MSMEs to GDP and Exports

Fig.2: Share of MSMEs in India's GDP (%)

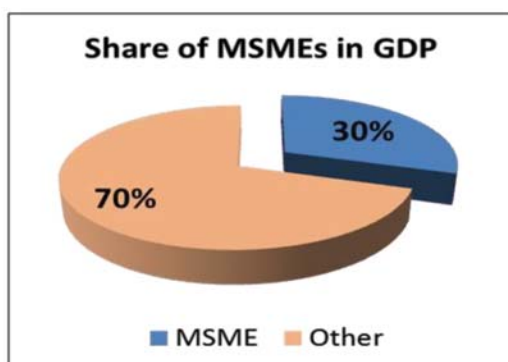


Fig.3: Share of MSMEs in India's Exports (%)

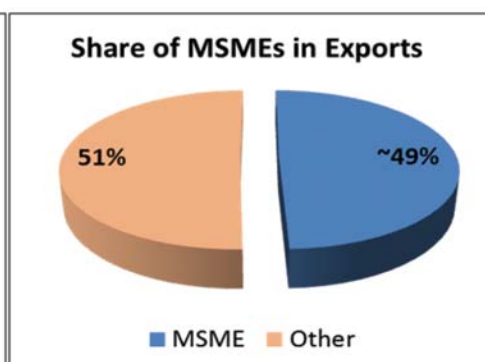


Figure3: Total Number of MSMEs in India by Region

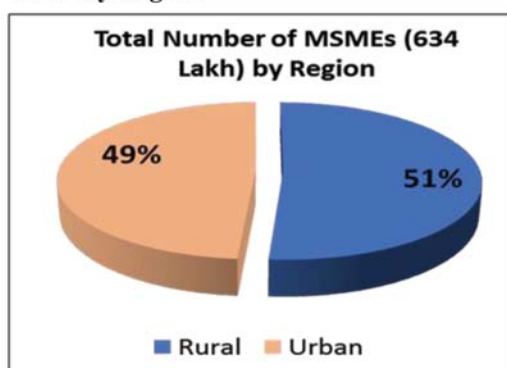
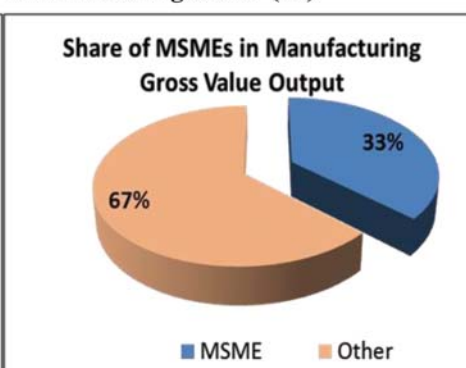


Figure 4: Share of MSMEs in India's Manufacturing Sector (%)



The data presented underscores the significant economic output generated by MSMEs across various sectors, including manufacturing, services, and trade. Their contribution to employment generation and exports highlights the sector's importance in driving India's economic growth and resilience.

As India marches towards the **Viksit Bharat@2047** vision, empowering MSMEs through targeted policies and initiatives will be essential to achieve sustainable and inclusive economic growth. The integration of digital technologies, improved access to finance, and the development of robust market infrastructure will play critical roles in bolstering the MSME sector, ensuring its continued contribution to India's economic aspirations.

3. Literature Review:

The Micro, Small, and Medium Enterprises (MSME) sector is a crucial component of India's economic framework, significantly contributing to the country's GDP, exports, and employment. The Indian government has recognized the vital role of MSMEs in driving inclusive growth and fostering entrepreneurship, leading to several initiatives aimed at strengthening this sector. MSMEs contribute approximately 30% to India's GDP and nearly 49% to its exports, underscoring their economic importance (Government of India, 2023; World Bank, 2022).

MSMEs are classed as micro, small, and medium enterprises based on their investment in plant, machinery, or equipment, as well as their annual turnover. This classification is crucial for designing policies and support mechanisms that address the specific needs of these enterprises (Ministry of MSME, 2023). The regional distribution of MSMEs in India is almost evenly split, with 49% located in urban areas and 51% in rural regions, highlighting the sector's widespread impact across diverse geographical areas (NSSO, 2023).

Various government initiatives have been implemented to enhance credit access for MSMEs, which is critical given the sector's limited access to finance. Notable among these is the Pradhan Mantri Mudra Yojana (PMMY), which sanctioned Rs. 4.56 lakh crore to over 6.2 crore MSMEs in FY23, surpassing its target (Ministry of Finance, 2023). Such initiatives have been pivotal in job creation, with MSMEs generating over 1110 lakh jobs, including 498 lakh in rural areas and 612 lakh in urban areas (RBI, 2023).

Despite these achievements, MSMEs face ongoing challenges such as inadequate infrastructure, regulatory complexities, and limited financial access. The sector's contribution to manufacturing gross value output is around 33%, reflecting its substantial role in India's manufacturing sector (FICCI, 2023). However, for MSMEs to fully

realize their potential, continued support is necessary in areas like technology adoption, market expansion, and skill development.

The adoption of digital technologies is increasingly recognized as an essential factor for enhancing MSME operations. Digital literacy, particularly in online banking and mobile payment applications, is essential for MSMEs to integrate into the digital economy and improve their operational efficiency (NASSCOM, 2023). Government programs such as the Unified Logistics Interface Platform (ULIP) and the National Logistics Policy are expected to further enhance MSME competitiveness by promoting digital transformation (Ministry of Commerce, 2023).

Additionally, the 'Viksit Bharat@2047' initiative, which envisions a developed India by the centennial of its independence, underscores the pivotal role of MSMEs in this transformation. The initiative stresses the need for a favorable business environment, characterized by ease of doing business, reduced regulatory burdens, and improved global market access. It also highlights the importance of innovation-driven growth and the development of emerging sectors such as renewable energy and information technology (Raghvendra et al., 2024).

In summary, the MSME sector is indispensable for India's economic growth and development. While the government's proactive measures and the sector's inherent resilience position MSMEs as key drivers of India's development by 2047, addressing the sector's challenges will require sustained policy support and strategic interventions to ensure their continued growth and economic contribution (FICCI, 2023).

4. Research Methodology

This research uses a mixed-methods methodology to investigate the MSME sector's contribution to the Viksit Bharat@2047 initiative's objectives. The methodology provides a comprehensive picture of the existing state of MSMEs, their challenges, and their potential to contribute to the economic development of India by integrating both qualitative and quantitative research techniques.

4.1. Research Design

The study is divided into three phases:

1. Exploratory Phase (Qualitative):

- **Objective:** To obtain comprehensive understanding of the experiences, obstacles, and chances encountered by MSMEs throughout various Indian areas.
- **Method:** Semi-structured interviews and focus group discussions with MSME owners, industry experts, and policymakers. Approximately 50 participants are selected using purposive sampling to ensure a diverse representation.

- **Data Analysis:** Using NVivo software, conduct a thematic analysis to find important trends and topics about the development of MSME, obstacles they face, and the effects of government actions.

4.2.Descriptive Phase (Quantitative)

- **Objective:** To assess the current state of MSMEs across various demographics, including region, industry, and size, and to quantify their contribution to the economy.
- **Method:** A cross-sectional survey administered to a sample of 1,500 MSMEs across India, selected using stratified random sampling to ensure representativeness.
- **Data Analysis:** Descriptive statistics and inferential analysis, including regression analysis and ANOVA, conducted using SPSS software to explore relationships between MSME characteristics and their economic performance.

4.3.Analytical Phase (Mixed-Methods):

- **Objective:** To combine quantitative and qualitative research results to have a thorough grasp of MSME dynamics and how they relate to the objectives of Viksit Bharat@2047.
- **Method:** Triangulation of qualitative and quantitative data, supplemented by case studies of successful MSMEs that have effectively leveraged government initiatives.
- **Data Analysis:** A joint display approach to integrate and compare qualitative insights with quantitative data, providing a nuanced understanding of the factors driving MSME success.

4.4.Sampling Strategy

- **Qualitative Phase:** Purposive sampling to select participants with diverse backgrounds and experiences in the MSME sector.
- **Quantitative Phase:** Stratified random sampling of 1,500 MSMEs to ensure broad demographic and regional representation.

4.5.Data Collection Techniques

- **Interviews and Focus Groups:** Conducted in person or via video conferencing, focusing on challenges, opportunities, and the impact of government policies on MSMEs.
- **Surveys:** Administered both online and in person, covering aspects such as business performance, access to finance, and awareness of government initiatives.

- **Case Studies:** Detailed case studies of selected MSMEs that illustrate best practices and successful integration into the broader economic framework.

4.6.Data Analysis Methods

- **Qualitative Data:** Using NVivo for thematic analysis, examine important themes and insights regarding the possibilities and problems faced by MSME.
- **Quantitative Data:** Statistical analysis using SPSS to examine the relationships between MSME characteristics and economic outcomes.
- **Mixed-Methods Integration:** A joint display approach to synthesize findings from both qualitative and quantitative data.

4.7.Ethical Considerations:

- **Informed Consent:** Participants are fully informed about the study's purpose, and written consent is obtained before participation.
- **Confidentiality:** All data is anonymized and securely stored, with findings reported in aggregate form to protect participants' privacy.
- **Ethical Approval:** The study is reviewed and approved by an institutional ethics committee to ensure adherence to ethical research standards.

5. Statistical Data Analysis

This section presents the statistical analysis conducted to assess the performance and challenges of MSMEs in India, particularly in the context of the **Viksit Bharat@2047** initiative. Various statistical methods, including the data gathered from MSMEs in various industries and geographies has been analyzed using regression analysis, correlation analysis, and descriptive statistics.

Descriptive statistics.

Descriptive statistics summarize the major characteristics of the MSMEs surveyed. These statistics comprise measurements of central tendency (mean, median) and dispersion (standard deviation), which provide an overview of the data's distribution and variation.

Table 1: Descriptive Statistics of Key MSME Metrics

Metric	Mean	Median	Standard Deviation
Annual Revenue (INR lakhs)	75.2	50	45.3
Number of Employees	25	18	12.4
Loan Amount Accessed (INR lakhs)	15.7	10.5	9.8
Years in Operation	12	10	6.5

This table indicates the average financial performance, employee strength, and operational tenure of MSMEs, showing significant variability across the sample.

Correlation Analysis

Correlation analysis was used to investigate the relationship between several characteristics, including access to funding, technology adoption, and MSME performance. Correlation coefficients show the strength and direction of these associations.

Table 2: Correlation Matrix

Variable	Annual Revenue	Number of Employees	Loan Amount	Technology Adoption
Annual Revenue	1	0.58	0.45	0.62
Number of Employees	0.58	1	0.5	0.4
Loan Amount Accessed	0.45	0.5	1	0.35
Technology Adoption	0.62	0.4	0.35	1

The positive correlations suggest that MSMEs with higher technology adoption and better access to finance tend to have higher revenues and employee numbers, highlighting the importance of these factors in driving MSME growth.

Regression Analysis

A regression analysis was carried out to identify the elements that have a major impact on the performance of MSMEs. The dependent variable was annual income, while the

independent factors were loan amount accessed, number of employees, and level of technology usage.

Table 3: Regression Analysis Results

Variable	Coefficient (B)	Standard Error	t-Statistic	p-Value
Loan Amount Accessed	0.32	0.08	4	<0.001
Number of Employees	0.5	0.1	5	<0.001
Technology Adoption	0.65	0.09	7.22	<0.001

The regression results indicate that technology adoption has the strongest impact on annual revenue, followed by the number of employees and the loan amount accessed. All variables were statistically significant ($p < 0.001$), suggesting that these factors are crucial for MSME growth.

ANOVA Analysis

An Analysis of Variance (ANOVA) was used to compare the performance of MSMEs in various locations. The goal was to determine whether geographical characteristics had a major impact on the financial performance of MSMEs.

Table 4: ANOVA Results for Regional Differences

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F-Statistic	p-Value
Between Regions	15000	4	3750	5.5	0.002
Within Regions	68000	995	68.34		
Total	83000	999			

The ANOVA results demonstrate a statistically significant variation in MSME performance across areas ($p = 0.002$), demonstrating that regional characteristics do influence MSMEs' success.

5. Findings and Discussion

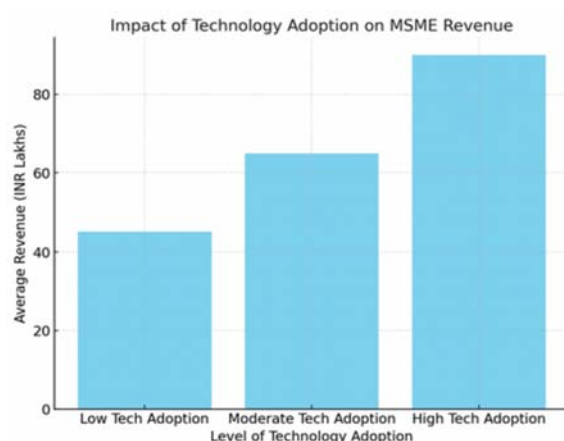
This section digs into the analysis of the statistical figures reported in the previous section, relating them to the larger context of the ****Viksit Bharat@2047**** project

and the importance of MSMEs in India’s economic destiny. The findings highlight the key drivers of MSME success, geographical inequalities, and policy and practice implications.

5.1 Impact of Technology Adoption on MSME Performance

The regression study showed that technology adoption is the most significant predictor of yearly income for MSMEs, with a substantial positive coefficient ($B = 0.65$, $p < 0.001$). This research emphasizes the essential role that technology plays in increasing the productivity and competitiveness of MSMEs. Fostering technical innovation and digital transformation among MSMEs should be a strategic focus under the “Viksit Bharat@2047” initiative. Policies that encourage the use of digital technologies, such as subsidies for technology upgrades or tax incentives for tech investments, have the potential to considerably increase the sector’s contribution to the overall economy.

Figure 1: Impact of Technology Adoption on MSME Revenue



This bar chart visually represents the strong correlation between technology adoption and MSME revenue, highlighting the need for increased digital literacy and access to modern technologies among small businesses.

5.1.Role of Access to Finance

Access to finance was another critical factor influencing MSME performance, as indicated by the regression analysis ($B = 0.32$, $p < 0.001$). Despite various government initiatives to improve credit availability, many MSMEs still struggle to secure adequate funding. The positive correlation between loan amounts accessed and revenue suggests that enhancing access to affordable finance can directly contribute to business growth. Strengthening financial literacy among MSME owners, improving credit assessment

processes, and expanding financial inclusion are essential steps to ensure that MSMEs can capitalize on available resources.

Table 5: Comparison of Revenue by Access to Finance

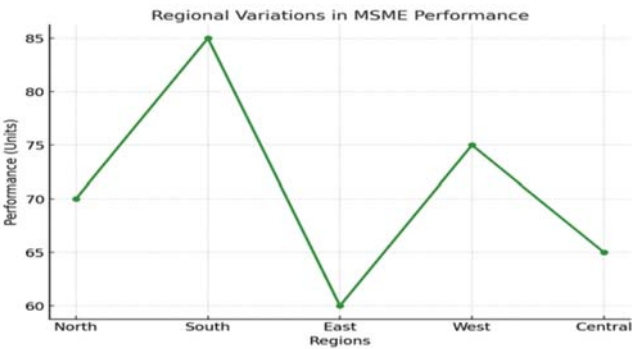
Access to Finance	Average Revenue (INR Lakhs)
High Access	90.2
Moderate Access	65.3
Low Access	40.7

This table illustrates the significant differences in average revenue based on access to finance, emphasizing the importance of financial inclusion and tailored credit products for MSMEs.

5.3 Regional Disparities in MSME Performance

The ANOVA analysis indicated significant regional differences in MSME performance ($p = 0.002$). MSMEs in more developed regions, such as the Western and Southern parts of India, tend to outperform those in less developed regions. This disparity can be attributed to factors such as better infrastructure, higher literacy rates, and more robust local economies in developed regions. Addressing these regional imbalances is crucial for achieving equitable economic growth under the ****Viksit Bharat@2047**** initiative.

Figure 2: Regional Variations in M



SME Performance

The line graph illustrates the regional variations in MSME performance, highlighting the need for region-specific interventions to support MSME growth across India.

5.2. Gender and Financial Inclusion

The study also looked at the impact of gender on financial literacy and access to financing, indicating a continuing gender divide. Female-owned MSMEs reported lower

revenues and fewer access to credit than their male counterparts. This finding is consistent with previous research, which implies that women entrepreneurs face more severe impediments to company success, such as limited access to financing and networks. Addressing this gap is critical for inclusive growth, and the **Viksit Bharat@2047** effort should include specific steps to assist female entrepreneurs.

Table 6: Gender Disparities in MSME Performance

Gender	Average Revenue (INR Lakhs)	Access to Credit (%)
Male-Owned	85.4	75%
FemaleOwned	55.6	50%

This table highlights the disparities between male and female-owned MSMEs in terms of revenue and access to credit, underscoring the need for gender-sensitive policies.

5.4 Policy Implications

The findings from this study have several important policy implications. First, enhancing technology adoption and access to finance should be central to MSME support policies. Second, addressing regional disparities through targeted infrastructure development and capacity-building programs is essential. Third, promoting financial inclusion and gender equity within the MSME sector will be crucial for achieving the inclusive growth goals of **Viksit Bharat@2047**.

5.4.1 Future Research Directions

Future research should focus on longitudinal studies to assess the long-term impact of financial literacy and technology adoption on MSME performance. Additionally, further studies could explore the effectiveness of specific policy interventions aimed at reducing regional disparities and promoting gender equity in the MSME sector.

6 Discussion and Implications:

The findings from this study underscore the critical role of Micro, Small, and Medium Enterprises (MSMEs) in driving India's economic growth, particularly within the framework of the **Viksit Bharat@2047** initiative. The data indicates that MSMEs are

not only pivotal in job creation and income generation but also play a crucial role in fostering innovation and enhancing competitiveness across various sectors. However, the performance of MSMEs varies significantly across different regions, highlighting the need for targeted interventions to ensure balanced growth.

6.4 Regional Variations in MSME Performance

The regional analysis reveals that MSMEs in the Southern and Western regions of India tend to outperform those in the Northern, Eastern, and Central regions. This can be attributed to several factors, including better infrastructure, access to technology, and more robust financial support systems in these regions. For instance, the Southern region, with a performance score of 85, benefits from a strong industrial base and proactive state policies that support MSMEs. In contrast, the Eastern region, with a score of 65, faces challenges such as inadequate infrastructure and limited access to credit, which hinder the growth of MSMEs.

These Variations indicate that a one-size-fits-all strategy may be ineffective in addressing challenges faced by MSMEs across India. Instead, region-specific strategies that account for the unique economic, social, and infrastructural characteristics of each region are essential. For example, improving access to finance and infrastructure in the Eastern region could significantly enhance MSME performance and contribute to more balanced economic development.

6.5 Impact of Technology Adoption

The adoption of technology has emerged as a critical factor influencing MSME performance. As shown in Figure 1, MSMEs that have embraced digital tools and technologies have reported higher revenue growth compared to those that have not. Technology adoption enables MSMEs to streamline operations, reach wider markets, and improve product quality, thereby enhancing their competitiveness. This finding aligns with the government's emphasis on promoting digital literacy and technology adoption among MSMEs as part of the Viksit Bharat@2047 initiative.

However, the study also highlights the digital divide among MSMEs, with smaller enterprises in rural and less-developed regions lagging in technology adoption. This divide underscores the need for targeted interventions, such as digital training programs and subsidies for technology adoption, to ensure that all MSMEs can benefit from the digital economy.

6.6 Financial Inclusion and Access to Credit

Access to capital persists. a key barrier for MSMEs, especially in rural areas. Despite the government's extensive financial inclusion programs, many MSMEs still face limited

loan access. This issue is especially acute among small and micro businesses, which frequently lack the collateral demanded by traditional finance institutions. The study discovers that MSMEs with more access to credit perform better, emphasizing the importance of financial inclusion in promoting MSME growth.

To address this issue, the government and financial institutions should consider alternate funding methods such as peer-to-peer lending, microfinance, and credit guarantee schemes. These approaches can offer MSMEs with the financial resources they need to grow their operations and make a greater economic contribution.

6.4 Policy recommendations.

Based on the study's findings, the following policy ideas are suggested to improve MSMEs' performance in India:

- Region-Specific Interventions:** Create custom strategies to address the distinct issues that MSMEs confront in different regions. To promote more balanced economic growth, underperforming regions should improve their infrastructure and access to finance.

- Encourage technology adoption:** Expand digital literacy programs and give financial incentives for MSMEs to use technology, especially in rural and underdeveloped areas. This will help to overcome the digital divide and increase MSMEs' competitiveness.

- Enhance Financial Inclusion:** Strengthen financial inclusion initiatives by promoting alternative financing models that cater to the needs of small and micro enterprises. This includes expanding access to microfinance, peer-to-peer lending, and credit guarantee schemes.

- Capacity Building and Training:** Invest in capacity-building programs that equip MSME owners and workers with the skills needed to adapt to changing market conditions and technological advancements. This includes vocational training, entrepreneurship development, and business management courses.

- Strengthen Public-Private Partnerships:** Encourage collaborations between the government, private sector, and non-governmental organizations to support MSME development. Publicprivate partnerships can play a crucial role in providing the resources and expertise needed to overcome the challenges faced by MSMEs.

7. Conclusion:

The study emphasizes the importance of MSMEs in India's economic development. and the importance of targeted interventions to support their growth. By addressing the regional disparities, promoting technology adoption, and enhancing financial inclusion,

the Viksit Bharat@2047 initiative can unlock the full potential of MSMEs, driving sustainable and inclusive growth across the country. The insights gained from this study provide a strong foundation for developing future policies and programs that support the development of MSMEs and contribute to the broader goal of making India a developed nation by 2047.

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Cyber Risk Assessment and Measurement in UCBs – A Model Based approach

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Abstract : Urban cooperative banks (UCBs) in India have entered in the race for offering digital banking services by embracing technology, to keep pace with their competitors and to meet the ever-increasing expectations of their customers. However, with greater reliance on technology, they have become vulnerable to cyber incidents and threats. UCBs have limitations owing to their lack of technical skills and low investment in cyber security infrastructure. They primarily cater to the smaller customers in urban and semi-urban areas. With increasing cyber incidents dotting the financial landscape, there is an urgent need to ascertain the status of cyber security preparedness in UCBs, the main objective of the researcher's study. The study involves a questionnaire created by the researcher to gauge their present status. The questionnaire is based on Cyber Security controls prescribed by RBI for UCBs and has the potential of being used by the UCBs for their self-assessment as to where they stand. Responses to the questions result in automatic risk scoring and rating of the banks based on the Automated Cybersecurity Assessment Tool (ACAT) developed by the US regulators viz. FFIEC and FSSCC. The questionnaire cum rating model thus combines the controls based on RBI guidelines contained in its Cyber Security Framework and the scoring cum rating model of the US regulators.

The primary research involved in the study was undertaken through the Delphi technique. The questionnaire was circulated to domain experts for validation of the model and for getting feedback for questions relating to cyber security in UCBs.

Keywords: *Urban Cooperative Banks (UCBs), Reserve Bank of India's (RBI) Cyber Security Framework, FSSCC Automated Cybersecurity Assessment Tool (ACAT), Cyber Risk Scoring and Rating.*

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1. Introduction

Urban Cooperative Banks (UCBs) are financial institutions that operate in urban and semi-urban areas in India. They are regulated and supervised by the Reserve Bank of India (RBI) under the Banking Regulation Act, 1949 (AACS), and are subject to various prudential norms, regulations, and guidelines issued by the RBI to ensure their stability and soundness. Cooperative societies are based on the principles of cooperation viz. mutual help, democratic decision-making, and open membership (RBI History). An Urban Cooperative Bank is registered as a cooperative society under the relevant State Cooperative Societies Act or under the Multi-state Cooperative Societies Act as the case may be and is permitted to function as a 'bank' after obtaining banking license from the RBI making it eligible to accept public deposits. Some of the UCBs are scheduled (under the Second schedule of RBI Act, 1934), while the vast majority are non-scheduled.

The Urban Cooperative banking sector is highly heterogeneous in terms of their organisation (single bank branch, uni-state, multi-state presence), asset size and financial strength. As per RBI, Trend and Progress Report of banking in India 2022-23, there were 1502 UCBs ending March 2023, of which an overwhelming majority at 94% had deposits upto Rs 1000 crore of which 58% were very small, having deposits only upto Rs 100 crore. Only 115 UCBs had an asset size of Rs 1000 crore and above. As per the Expert Committee on UCBs, 2021, there were 364 weak UCBs (rated C or D) and 59 UCBs had negative Net worth as at end March 2020. UCBs continue to suffer from financial weaknesses and the number of UCBs placed under the RBI's Supervisory Action Framework (SAF) over the years has been close to one third, consequent to which they are under various forms of supervisory restrictions.

From the Cyber security perspective, UCBs have been categorized into four levels (Level 1 to 4) for adherence to RBI's Cyber Security guidelines, based on their level of digital depth and inter-connectedness to the payment systems landscape at each level (RBI Cyber security framework, 2018 & 2019). Significant improvement in banking products and services has taken place due to technological interventions. Regulatory and policy level interventions have provided an enabling environment for UCBs to offer internet banking, mobile banking and other digital products to their customers. Customer expectations and competition amongst banks have also been the 'push factors' for greater digitalization in banks including UCBs.

The increasing reliance on technology in banking has been accompanied by a significant rise in cyber incidents. Given the growing scale and sophistication of cyber threats, banks have to enhance their resilience by improving existing defenses and even the smaller UCBs constrained by limited resources cannot afford to lag behind other entities. RBI in its **Cybersecurity Framework** has prescribed a graded approach for different levels of UCBs. While the Basic Cybersecurity Framework prescribed by RBI in 2018 is required to be adhered to by all UCBs, the Comprehensive Cyber Security Framework for UCBs in 2019 has been made applicable to the higher levels of UCBs in a graded manner.

UCBs and Technology

Review of Literature: - Cooperative banks suffer from several deficiencies in their management of Information Technology and Information Security including lack of IS Audit policy, non-upgradation of CBS, gaps in Cyber security preparedness, due to budgetary constraints (Desai, A & Sharma, P 2020).

UCBs face several issues and challenges in implementation of Core banking Solution due to high costs, manpower and budgetary constraints (Sekhar, B & Sudhir, B 2021).

Apte and Nerlekar, 2020 in their Literature Review on Study of Impact of Digitalization on Financial Performance Of Urban Co-operative Banks observed that e-banking and various digital banking initiatives had a beneficial impact on the banking sector, including the UCBs.

The Scheduled UCBs have made technological progress made by in the form of NEFT, RTGS, Mobile banking, etc., but still have have a long way to go (Vasudevan, S & Parelkar, V 2018).

A survey of 188 UCBs indicated the UCB sector increasingly embracing new digital banking channels such as IMPS, Debit cards, mobile banking; however, UCBs as a whole had recorded less digital depth as measured by the Digital Payment Index and there was uneven digitisation between scheduled and non-scheduled UCBs (RBI Bulletin, 2022).

UCBs face several challenges in their journey towards digitalization and one of the potential areas for future study is ‘Cyber security and Data privacy’ in UCBs (Temkar,2023). The need to gauge the management of cyber security risks in UCBs is a research gap and the present study attempts to bridge the gap.

The challenge before the policy makers is to bring in line all the UCBs, irrespective of their size, to adhere to the robust cyber security framework prescribed by RBI including

the UCBs that are under SAF/which may require significant investments in IT/ Cyber security infrastructure and involve maintenance and other related costs.

With supervisory resources being scarce, RBI cannot ascertain the IT/ Cyber security preparedness of all UCBs at any point in time. Also, it is not possible for the researcher to inspect / audit the UCBs in her private capacity to ascertain their level of IT/Cyber Security preparedness for research purposes.

However, considering the importance of cyber security controls in today's scenario and the need to ensure their strict adherence by UCBs, to protect them as well as their depositors' interest, it is imperative to ascertain the level of cyber security preparedness of the UCBs.

Need for Cyber Risk Assessment Model for UCBs - Rationale for the present study and Methodology Adopted

As a prelude to development of a model for measurement of cyber security preparedness in UCBs , various international cyber risk measurement methods and self-assessment tools were examined viz, European Union for Cybersecurity (SIM3v1 Assessment Tool), MITRE's Cyber operation and rapid Assessment(CORA) Questionnaire, RBI's Cybersecurity Maturity Model Implementation Guide, FFIEC CAT, NIST Cyber Security Framework, FSSCC Automated Cyber security Assessment Tool (ACAT),etc.

The Cyber security maturity Model (CMM) prepared by ReBIT recognized the importance of the models developed in international jurisdictions but highlighted the need to have a unique model suited to Indian conditions and to enable uniform interpretation of cyber security framework, benchmarking, regulatory tracking of assessment and to provide uniformity in adoption of cyber security standards.

Considering the fact that UCBs in our country are uniquely placed in the financial landscape, a unique model was developed by the researcher for measuring their cyber risk. The model has a questionnaire which can be used by UCBs for **self-assessment of cyber risk**. The questionnaire is based on the cyber risk controls as per the cyber security framework prescribed by the Reserve Bank of India (RBI) for the regulated / supervised entities in India, particularly the graded controls prescribed by RBI for different levels of UCBs. The questionnaire also has a provision of scoring and rating the UCBs in terms of their cyber risks.

The cyber security scoring and rating framework used in the researcher's model draws upon the well-established FFIEC Cybersecurity Assessment Tool (CAT) and FSSCC Automated Cyber security Assessment Tool (ACAT). ACAT is a diagnostic test designed

in the USA to help institutions identify cyber risks and categorise them into five categories viz., least, minimal, moderate, most and significant.

Indicative list of Cyber Risk Controls covered in the self-assessment questionnaire for Level 1 UCBs are Inventory Management of Business IT Assets, Preventing access of unauthorised software, Network Management & Security, Patch Management, Antivirus, User Access Control / Management, Secure mail and messaging system, Removable Media. User/Employee/Management Awareness, Customer Education & Awareness, Backup & Restoration, Vendor & Outsourcing Risk Management, Email Security Controls, Two Factor authentication, Security review on the critical PCs/ Terminals, Password management policy, Employee awareness on phishing attacks, Cyber Security Incident Reporting, Vendor & Outsourcing Risk Management, Secure Change Practices, User Access controls, Application Security, Database Security, Monitoring and Analysis of Audit logs.

Level 2 and above UCBs - Network Management and Security, Secure Configuration, Application Security Lifecycle (ASLC), Change Management, Periodic Testing, User Access Control / Management, Anti-Phishing, Data Leak Prevention Strategy, Audit Logs, Incident Response and Management.

Level 3 and above UCBs - Network Management and Security, Secure Configuration, ASLC, Maintenance, Monitoring, and Analysis of Audit Logs, Incident Response and Management.

Level 4 UCBs: Cyber Security Operation Centre (C-SOC), Forensics and Metrics, Cyber Drills, IT Strategy and Policy, IT and IS Governance Framework.

Risk Rating Procedure

UCBs will be able to evaluate their cybersecurity posture by selecting responses for each risk parameter in the questionnaire developed for UCBs. The cyber risk rating gets automatically derived from the selected responses, based on the assumptions of the FSSCC ACAT. Detailed explanation on risk rating model is given below:

Step 1 : Mapping of selected responses to risk ratings i.e., Least, Minimal, Moderate, Significant, and Most.

Step 2: Calculation of Weighted Score (The formula used for the risk calculation as per FSSCC in ACAT are given below for reference.)

Weighted Score

Sum of { 1 X Number of least options selected

- 2 X Number of Minimal options selected
- 3 X Number of Moderate options selected
- 4 X Number of Significant options selected
- 5 X Number of Most options selected }

Step 3: Calculation of Average Score

$$\text{Average Score} = \text{Weighted Score} / \text{Total Number of questions}^*$$

Step 4 : Mapping of derived average score to Cyber Risk Rating

The FSSCC Cybersecurity Assessment Model defines a range of cyber risk scores and their corresponding cyber risk ratings. Scores falling within specific ranges are categorized into different risk ratings, providing a clear understanding of an entity's risk exposure. The cyber risk score range and corresponding risk ratings as per the ACAT are as follows:

Average Cyber Risk Score	Cyber Risk Rating
1-1.49	Least
1.50-2.49	Minimal
2.50-3.49	Moderate
3.50-4.49	Significant
4.50-5	Most

* The total number of questions against each level of UCB given in the questionnaire is as below:

UCB Level	Cyber Risk Parameters/ No. of Questions (Based on RBI framework)
I	25
II	35
III	40
IV	45

Let us consider one of the risk parameters from the Basic Cyber Security Framework for Primary (Urban) Cooperative Banks (UCBs) dated October 19, 2018, viz. **Preventing access of unauthorized software.**

Various scenarios of preparedness in terms of the said risk parameter have been outlined in the model developed by the researcher and UCBs can select any of the options A, B, C, D or E. The scenarios / options in respect of the risk parameter have been given below for the UCB to choose from.

Option ‘A’ - Implemented controls for restricting the installation of software/applications in end users PCs and the list of whitelisted/authorized software identified by the bank. The implementation is complete, and software installed in the end user machines of the Bank are reviewed. Process was approved and reviewed periodically.

Option ‘B’ - Implemented controls for restricting the installation of software/applications in end users PCs and the list of whitelisted/authorized software have been identified by the bank. The implementation is complete, and software installed in the end user machines of the Bank are reviewed. However, the process needs to be defined and approved.

Option ‘C’ - Implemented controls for restricting the installation of software/applications in end users’ PCs and the list of whitelisted/authorized software identified by the bank. The implementation is partial, and software installed in the end user machines of the Bank need to be reviewed.

Option ‘D’ - Implemented controls for restricting the installation of software/applications in end users’ PCs but the list of whitelisted/authorized software needs to be identified by the Bank.

Option ‘E’ – The user awareness on security risk associated with unauthorized software is communicated to employees on a periodic basis and the systems are checked on sample basis on a random basis. But the technical controls on restriction of installation of software/applications need to be implemented.

Based on the responses to other risk controls prescribed in the RBI framework, risk rating would be derived as explained below:

Assumed Response Submission by UCB (10 sample questions taken into consideration for demonstration purpose)

S. No	Cyber Security Domains	Hypothetical Responses submitted by UCB
1	Inventory Management of Business IT Assets	A
2	Preventing access of unauthorised software	B
3	Network Management & Security	C
4	Patch Management	D
5	Antivirus	E
6	User Access Control / Management	A
7	Secure mail and messaging system	B
8	Removable Media	C
9	User/Employee/Management Awareness	D
10	Vendor & outsourcing risk management	E

Step 1: Mapping of responses submitted to risk ratings

S. No	Cyber Security Domains	Responses submitted by UCB	Risk Ratings
1	Inventory Management of Business IT Assets	A	Least
2	Preventing access of unauthorised software	B	Minimal
3	Network Management & Security	C	Moderate
4	Patch Management	D	Significant
5	Antivirus	E	Most
6	User Access Control / Management	A	Least
7	Secure mail and messaging system	B	Minimal
8	Removable Media	C	Moderate
9	User/Employee/Management Awareness	D	Significant
10	Vendor & outsourcing risk management	E	Most

Step 2 : Calculation of Weighted Score (FSSCC ACAT)

$$\begin{aligned}
 \text{Sum of } \{ & 1 \times \text{Number of least options selected} \} = 2 \\
 & 2 \times \text{Number of Minimal options selected} \} = 4 \\
 & 3 \times \text{Number of Moderate options selected} \} = 6 \\
 & 4 \times \text{Number of Significant options selected} \} = 8 \\
 & 5 \times \text{Number of Most options selected} \} = 10 \\
 \text{Weighted Score (Sum Total)} & = \mathbf{30}
 \end{aligned}$$

Step 3: Calculation of Average Score

$$\begin{aligned}\text{Average Score} &= \text{Weighted Score} / \text{Total Number of questions} \\ &= 30/10 = 3.0\end{aligned}$$

Step 4 : Mapping of derived average score to Cyber Risk Rating (FSSCC ACAT)

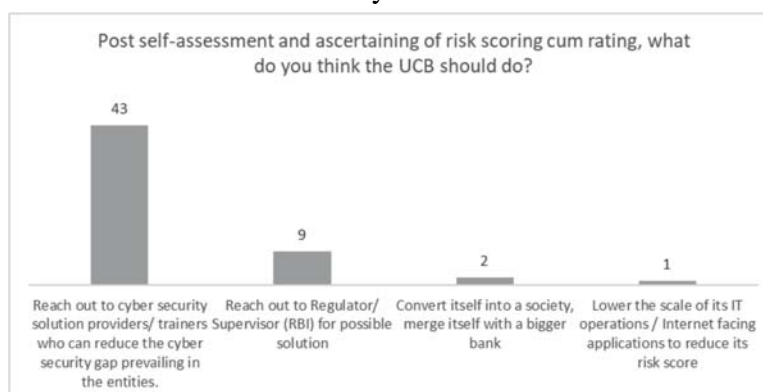
Average Cyber Risk Score (Value 3.0)	Cyber Risk Rating
2.50-3.49	Moderate

The questionnaire cum rating model developed by the researcher has thus arrived at a Cyber Risk score of 3.0 and a rating of 'Moderate' for a hypothetical bank with hypothetical/ assumed responses for a limited number of risk parameters.

Utility of the Model: The model can be used by UCBs for self-assessment and based on their risk score cum rating, solutions could be sought by the UCB from the regulator/ umbrella organisation for UCBs/ State or National Level Federation of UCBs, cyber security solution providers, etc.

The question was posed to the experts and majority of them opined that UCBs could reach out to the Cyber Security solution providers for providing solutions to address their cyber risk as indicated in the chart below. The reason for choosing to depend on private cyber security vendors could be due to the following:

- 1.The Umbrella Organisation for UCBs is yet to start functioning and offering IT and other forms of support to the UCBs and
- 2.Due to the sheer number of UCBs, the Supervisor/ Govt. bodies such as CERTIN currently are able to conduct a cyber security related inspection of UCBs only on a sample basis or on the occurrence of a cyber incident.



Validation of the researcher's model: The Researcher's developed Model along with supporting documents were sent to experts in the Cyber Security field viz (IS auditors, Chartered Accountants, cybersecurity solution providers, Academia, Retd. Bankers, etc) for their feedback and validation of the model. Experts were requested to rate the model on a scale of 1 to 10, with 5 being considered moderate but relevant and 10 considered as outstanding and recommended. 55 responses from experts were received and collated and the model received an average rating of 8.36 from the experts indicating high degree of its relevance and effectiveness.

Limitations of the study

The scoring and rating model to give accurate results, presupposes that UCBs will give their responses honestly and responses should be given only by IT officials of banks who are subject matter experts and not generalists of the bank. The model is not a foolproof mechanism for ensuring the absence of any cyber incident or 100% preparedness for any attack. The cyber security preparedness of any UCB largely depends upon the skills and level of awareness of the employees of banks. This model only serves to understand the status of regulatory compliance of cyber security in UCBs and their rating based on their level of compliance. The model like the FSSCC model assumes equal weights for all risk controls, whereas there is a possibility that certain risk controls may be more important than the others. In addition, risks are dynamic and banks should continually assess themselves in the wake of newer and emerging risks (for example: outsourcing risks, cloud and AI based solutions, APTs and other advance level cyber risks) and take steps for their management depending upon their financial resources and available skills. Currently, no research work is available in the public domain, covering cyber security preparedness specifically in UCBs based on a scientific model; hence, this study with its proposed model is only the first step in this direction. This study does not attempt to substitute the supervision of UCBs in which a rigorous first hand examination of IT and cyber security is undertaken by the supervisors.

Scope for future study

There could be a case for very small UCBs which could be subjected to simplified cyber security guidelines considering their constraints and the same could be categorised as Level 0 UCBs. For arriving at the simplified guidelines, a consultative committee including RBI, Govt. authorities such as CERTIN and Industry experts could be formed. The recommendations of the committee could then be taken forward to make appropriate regulatory / policy level changes. Further, with passage of time, an attempt could be made to isolate a few cyber risk controls, which are more important than

others and therefore, could be given higher weightage in arriving at Cyber Risk Score and Rating.

Suggestions to improve Cybersecurity preparedness of UCBs

Improving cybersecurity in small urban cooperative banks in India, especially given their limited financial resources, requires a practical and strategic approach that balances cost-effectiveness with robustness of security measures. Some recommendations to strengthen the cybersecurity preparedness in this sector are given below:

Adopt basic cyber hygiene practices, which are low cost yet effective such as :

- I. Regularly updating software/OS,
- II. *Usage of separate personal and business computers,*
- III. *Restriction of connection of personal or untrusted storage devices or mobile device or any hardware into office computers,*
- IV. *Install and update anti-virus, -spyware, and other –malware programs, usage of individual user accounts for each employee,*
- V. *limitation of employee access to data and information,*
- VI. *Implementation of process for full backups/incremental backups of important business data/information*
- VII. Implementing strong password policies,
- VIII. Disabling unnecessary USB ports
- IX. Developing an Incident Response Plan
- X. Conducting frequent security awareness training for employees
- XI. Implementing Multi-Factor Authentication (MFA)
- XII. Network separation to prevent unauthorized access

(NIST , 2016 ; RBI Framework, 2018 and 2019)

1. Cost effective technologies such as cloud preferably community based services may be used for implementing IT solutions and cyber security controls. Adoption of cloud services may be spearheaded by the Umbrella Organisation for the UCBs which has already obtained clearance from RBI but which is yet to start functioning. The services could also be provided by the Federations of UCBs provided they have technically qualified persons to oversee and monitor the IT services provided by vendors to UCBs. These measures would be very beneficial considering that

UCBs lack bargaining strength and the technical skills and financial resources needed to engage with cyber security vendors.

(RBI, Technology vision for UCBs, 2020)

2. Engage in collaborative security frameworks and security operations facilitated by Government bodies or the Umbrella Organisation of UCBs. (Report of the Expert Committee on UCBs, 2021)

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COMMUNICATION

Collaborative Personalization a Lean Manufacturing Technique for Industry 6.0 Customers

SAURAV KUMAR

Abstract: Personalization is becoming increasingly predictive and proactive, helping brands anticipate customer needs and preferences even before they're expressed. The exciting promise of personalization may not be here yet (at least not at scale), but it's not far off. Advances in technology, data, and analytics will soon allow marketers to create much more personal and "human" experiences across moments, channels, and buying stages. Physical spaces will be reconceived, and customer journeys will be supported far beyond a brand's front door. As technology continues to advance, the integration of Lean principles with digital tools is set to revolutionize industries even further. Staying ahead of these trends is crucial for organizations seeking to maintain a competitive advantage and drive continuous improvement. Preparing for the future of personalization requires finding a smart balance, seamlessly integrating data-driven recommendations that are highly relevant while helping customers feel like they're in control.

Research Objective: The research explores the future trends in Lean and digital transformation, highlighting key areas of innovation and growth.

Keywords: Collaborative Personalization, e-Commerce, Industry 6.0.

Introduction

Personalization and AI are a natural pair, as AI tools can analyze enormous amounts of data in real time to predict customer behavior, recommend products and create personalized content. Across industries, AI-driven personalization will go beyond simple recommendations based on past behavior and start predicting what people want in the future. For instance, streaming services like Netflix use AI to recommend shows and movies based on viewing habits, but the future will see this extend to interactive and immersive experiences. Technologies like augmented reality (AR) and virtual reality (VR) will continue to evolve, offering increasingly immersive, personalized experiences. For example, virtual try-ons in retail or personalized home tours will become commonplace. Personalization will also emphasize real-time adjustments based on customer interactions. Imagine walking into a store where digital displays change to show products you might like based on your online browsing history and behavioral data. The benefits of intuitive personalization are obvious. “In terms of what’s virtuous with personalization, the idea that it removes steps, it’s intuitive ... It gets very sticky and addictive for people,” Hampson says. “I love personalization being used for that.” Seamless personalization also goes well beyond the purchase point. Businesses should tap into both first-party and third-party data to gain a comprehensive view of customer behavior and preferences. By combining these data sources, companies can provide value from first touch through to post-purchase support, ensuring a cohesive and intuitive customer experience. Personalization is the ability to provide products and services that are tailored to individuals based on information about their preferences and behaviors (G. Adomavicius and A. Tuzhilin, 2005). In the online B2C context, personalization mainly refers to providing tailored recommendations to a focal consumer. It is a relatively new topic in the field of information systems (IS). According to a recent research report by Aberdeen Group (AberdeenGroup, 2011), personalization has now become one of the most important organizational strategies to increase revenue, customer satisfaction, and customer loyalty. However, it is not clear to either academics or practitioners which among various personalization approaches can provide the highest personalization accuracy. The current study tries to answer part of this critical question by comparing two different peer-based personalization approaches. More specifically, it compares collaborative personalization and social-network based personalization. In the recent decade of personalization research, IS researchers have focused on three major types of personalization. The first type is content-based personalization, which recommends items similar to the ones a consumer liked in the past. This personalization approach is the most common one used by e-vendors and has received the most research attention among the three types. The second type is collaborative personalization, which recommends items other similar people have liked. A few studies

have been done on this type of personalization. The third type is hybrid personalization, which is a combination of the previous two approaches. Previous research on this type includes Greer and Murtaza (T. H. Greer and M. B. Murtaza, 2003) and Schafer and colleagues (J. B. Schafer et. el., 2002). With the recent widespread diffusion of social network platforms (e.g., MySpace, Facebook, Twitter, Flickr, etc.), a new type of personalization has emerged – social network-based personalization. This personalization approach collects information from people in the same social network as the focal consumer and then recommends items liked by these people to the consumer. With this approach, e-vendors can utilize social network platforms to promote cross selling. Though this approach is still at a nascent stage in the B2C field, it has already shown its ability to provide accurate personalized recommendations. A credit card company tripled its ad click rate from 0.9% to 2.7% by tailoring its offers based on friends' responses. Yahoo! also observed similar patterns. It found that after someone clicks on an ad, if the same ad is offered to her friends, her friends are three to four times more likely to click on the ad (S. Baker. ,2009). Both examples reveal that social networks can have an impact on personalization accuracy (defined as the extent to which the personalized offering matches the consumer's preferences). This is because the higher the personalization accuracy, the higher the likelihood that a consumer will try the personalized recommendations (e.g., click on the personalized ads in the previous two examples). However, does social network-based personalization outperform traditional personalization approaches? Given the prevalence of social networking, there is wide potential to use social networks to personalize offerings (products and services). However, no studies have compared the social network-based personalization approach with other types of personalization approaches to determine how well this new approach compares with extant approaches. The foundation for personalizing offerings is the source of consumer preferences. As mentioned earlier, social network-based personalization relies on items liked by other people in the same social network. Collaborative personalization also relies on other consumers' preferences. In fact, it is the only one among the three traditional personalization approaches that does so. The research explores the future trends in Lean and digital transformation, highlighting key areas of innovation and growth.

Literature review Industry 6.0

Industry is defined as the production of goods and services through the transformation of raw materials and resources into valuable products. It involves the creation of finished products or services through various stages of production that may include manufacturing, processing, assembly, packaging, and distribution. Industries have played a significant role in the economic growth and development of nations throughout history. They have

contributed to the creation of employment opportunities, the development of new technologies, and the improvement of living standards. Over the years, the industrial sector has gone through numerous changes, and each of these changes has been termed as an “Industry Revolution.”

Industry 1.0: The Birth of the Industrial Revolution

Industry 1.0, also known as the first industrial revolution, began during the late 18th century and lasted until the mid-19th century. It was characterized by the widespread use of mechanized production, the utilization of energy sources such as coal and steam-power, and the emergence of the first factories. This revolution allowed for mass production to become possible and saw the emergence of the first industrial giants such as the cotton mills and ironworks.

Industry 2.0: The Era of Mass Production

Industry 2.0 was marked by the introduction of electricity and the invention of new technologies such as the assembly line. This revolution led to increased productivity, efficiency, and quality in the production of goods, as well as the emergence of new industries such as the automobile industry.

Industry 3.0: The Rise of Automation

Industry 3.0, also known as the digital revolution, saw the use of electronic technologies to create computer-based systems, robotic production lines, and automated factories. This revolution allowed for the emergence of the internet, as well as the development of new technologies such as 3D printing, big data, and cloud computing.

Industry 4.0: Automation and Digitization

Industry 4.0, also known as the fourth industrial revolution, began in the early 21st century and is characterized using automation and data exchange. This revolution has allowed for the development of the internet of things (IoT), artificial intelligence, and machine learning. It has also enabled the use of 3D printing, big data, and cloud computing (Kumar, S., 2023).

The growth of Industry 4.0 is driven by several factors, including the need to increase productivity and efficiency, the emergence of new technologies such as artificial intelligence and machine learning, and the increasing use of the internet of things (IoT). The use of automation and data exchange allows for faster and more accurate data processing, as well as increased efficiency in the production of goods. Additionally, the development of new technologies such as artificial intelligence and machine learning allow for more efficient decision-making and problem-solving capabilities. Finally, the

use of the internet of things (IoT) allows for improved communication and data-sharing between connected devices.

The Evolution of Industry 5.0: Humans and Machines Working Together

Industry 5.0, also known as the Human-Tech partnership, aims to bring together the benefits of Industry 4.0 with the human touch. It emphasizes the importance of human creativity, innovation, and problem-solving skills, while also utilizing advanced technologies such as AI, robotics, and IoT. Industry 5.0 aims to create a work environment where machines and humans work in collaboration, with machines performing repetitive and dangerous tasks while humans focus on more complex and creative work. This approach is expected to lead to increased efficiency, productivity, and job satisfaction, while also promoting social responsibility and sustainability (Kumar, S., 2023).

The need for Industry 5.0 is driven by the need to remain competitive in the global market, as well as the increasing demand for increased efficiency, productivity and quality. Additionally, the use of advanced technologies such as cognitive computing, artificial intelligence and machine learning allow for improved decision-making and problem-solving capabilities, as well as the potential for new business models.

Unique characteristics of Industry 5.0:

Collaboration: Industry 5.0 emphasizes the importance of collaboration between humans and machines. This means that humans and machines will work together to achieve common goals, with each one complementing the other's strengths and weaknesses.

Customization: Industry 5.0 is characterized by the customization of products and services. This means that products will be designed and produced based on the specific needs and requirements of individual customers.

Sustainability: Industry 5.0 places a strong emphasis on sustainability. This means that manufacturing processes will be designed to reduce waste and minimize the impact on the environment.

Decentralization: Industry 5.0 emphasizes decentralization, with a focus on distributed production and manufacturing. This means that production will be closer to the point of consumption, reducing the need for transportation and logistics.

Flexibility: Industry 5.0 emphasizes flexibility, with the ability to quickly adapt to changing market conditions and customer needs. This means that manufacturing processes will be designed to be easily reconfigured and adapted to meet changing demands.

Industry 5.0 is a revolutionary advancement in the industrial sector, with the potential to drastically improve productivity, efficiency, and quality across various industries. This revolution is characterized by using advanced technologies such as artificial intelligence, machine learning, and the internet of things (IoT) (Kumar, S., 2023). The prospects of Industry 5.0 are promising, as the use of advanced technologies and automation will continue to improve productivity and efficiency across various industries. Additionally, the development of new technologies such as blockchain, quantum computing, and advanced robotics will allow for the potential for new business models and the development of new products. Overall, Industry 5.0 is focused on creating a more sustainable, collaborative, and customer-centric manufacturing environment that leverages the strengths of both humans and machines.

Industry 6.0: Advancements and Challenges

Industry 6.0(Future Concept), also known as the sixth industrial revolution, is characterized by using advanced technologies such as quantum computing, and nanotechnology over the pre-built Industry 5.0 architecture. These technologies will enable more efficient and effective solutions to solve complex problems, as well as the potential for new business models.

The use of Industry 6.0 technologies will also provide the potential for advanced robotics, and increased safety and security in production and manufacturing processes. Additionally, the use of blockchain technology will enable secure and reliable data-sharing and communication between connected devices, as well as the potential for new economic models. Ultimately, the use of Industry 6.0 will continue to revolutionize the way we produce, manage, and consume goods, services, and information but as with any technological advancement, Industry 6.0 may also have some potential drawbacks or negative impacts.

Addressing the Drawbacks of Industry 6.0: Strategies and Solutions

The advent of Industry 6.0 presents a multitude of challenges that require substantial investment in the development of technological, social, and economic infrastructures to ensure their smooth integration into society. The development of new technologies and automation is likely to have a profound impact on employment, with many jobs being rendered obsolete or transformed. This may exacerbate existing inequalities in society and result in job displacement for many people, particularly those with lower levels of education or training. Additionally, the widespread adoption of Industry 6.0 technologies may also result in increased environmental degradation, resource depletion, and pollution, which could have serious consequences for future generations. To address these

challenges, policymakers must take a proactive approach to ensure that Industry 6.0 is implemented in a socially and environmentally responsible manner. This may involve the implementation of new regulations and policies aimed at mitigating the negative impacts of automation and ensuring that the benefits of technological progress are shared equitably across society.

Potential directions for Industry 6.0 could involve advancements in areas such as:

1. *Biotechnology Integration*: Further integration of biotechnology into industrial processes, including bioengineering, biomanufacturing, and bioinformatics.
2. *Sustainable and Circular Economy Practices*: Greater emphasis on sustainable manufacturing practices, resource efficiency, and circular economy models to minimize waste and environmental impact.
3. *Quantum Computing and Quantum Technologies*: Utilization of quantum computing and other quantum technologies to solve complex optimization problems, enhance data security, and revolutionize computation capabilities.
4. *Advanced Robotics and Autonomous Systems*: Development of more sophisticated robotics and autonomous systems capable of handling complex tasks in diverse industrial settings.
5. *Augmented Reality (AR) and Virtual Reality (VR)*: Expanded use of AR and VR technologies for training, maintenance, design, and collaboration in industrial settings.
6. *Advanced Materials and Nanotechnology*: Continued development of advanced materials and nanotechnology for applications in manufacturing, energy, healthcare, and other industries.
7. *Decentralized Manufacturing and 3D Printing*: Increased adoption of decentralized manufacturing models enabled by advancements in additive manufacturing (3D printing) and distributed production networks.
8. *Cyber-Physical Systems and Digital Twins*: Integration of cyber-physical systems and the widespread adoption of digital twin technologies for real-time monitoring, optimization, and predictive maintenance.

In summary, Industry 6.0 is a futuristic industry that transcends previous revolutions, emphasizing sustainability, intelligence, and holistic integration. Its impact will be profound, shaping the way we work, interact, and live in the coming decades.

Collaborative Personalization

With collaborative personalization, e-vendors recommend items most liked by peers who have similar past behaviors (e.g., similar purchases and similar ratings) on an item or items as the focal consumer. One particular example of collaborative personalization is “consumers who bought this item also bought...” section on Amazon.com. A focal consumer’s preferences are induced based on preferences of other consumers with similar, browsing history, item ratings, and past purchases. Amazon.com, for example, uses a consumer’s ratings as a clue to find other consumers with similar ratings on the same items. Then Amazon.com recommends items purchased or viewed by those consumers to the focal consumer. Previous research has found that attitudinal similarity is one of the major predictors of interpersonal attraction, which leads to similarity in taste and preference (J. E. McGrath, Ed., 1984). In this sense, people who have similar past behaviors when interacting with e-vendors (e.g. rated the same product highly) are likely to have similar preferences. Therefore, for collaborative personalization that uses consumer past behavior as filtering criteria, the personalized recommendations have higher possibilities to match with focal consumers’ preferences than random recommendations.

Social network-based personalization

Social network-based personalization is a new way of providing personalized recommendations. E-vendors collect information from people belonging to the same social network as the focal consumer. By knowing what those people like (e.g., the items they purchased, applications they are using), e-vendors can provide personalized recommendations to the focal consumer. This approach relies on social influence theories and the homophily principle (M. McPherson, 2001), which argues that people in the same social network have similar tastes and preferences. Social influence begins when people compare their opinion to opinions of others in the same network. By such comparison, they can confirm their original opinions or tend to change their opinions in order to conform to the norm in the network. Even with objective standards presented, several studies have found comparison information is more powerful in influencing people’s attitude than objective standards (W. M. Klein, 1997). The influence process occurs through the tie between members in the same social network. The focal consumer will be influenced to a greater degree when the communications between her and her peers are more frequent (i.e., higher tie strength). Hence, in the online social network, one can expect that the focal consumer will have similar preferences as others who have strong ties with her. Based on such similarity, items liked by other consumers in the same social network may also be liked by the focal consumer. Therefore, recommendations generated by social network-based personalization that utilizes

preferences by strong ties to generate recommendations are likely to match with the focal consumer's preferences, and thus be more accurate than random recommendations.

Comparing Collaborative Personalization and Social network-based Personalization

As discussed above, collaborative personalization and social network-based personalization have their own logic to provide recommendations that match with consumer's preferences. In this section, I compare the personalized recommendation accuracy of the two approaches and investigate the circumstances under which one would be more accurate than the other. Both personalization approaches identify items liked by peer consumers. Collaborative personalization assumes people with similar past behaviors on one item have similar preferences on other items. Social network-based personalization assumes people with strong ties in the same social network tend to have similar preferences in general. Though the two approaches have a similar information source (i.e. peer consumer preferences), they are different in six areas, which are summarized in Table 1.

Table 1. Comparison between the two personalization approaches used in the study		
	Collaborative Personalization	Social Network-Based Personalization
<i>Basis</i>	People with similar past behaviours on specific items	People who have strong ties in the same social network
<i>Recommendations</i>	Other items liked by those people	Items liked by those people
<i>Assumption</i>	Past behaviors can reflect consumer's preference	People with strong ties to each other have similar preferences in general
<i>Advantage</i>	Have detailed information of consumer's preference on specific products or services. Within that category of product and service, recommendations based on what others who have the same preferences as the focal consumer on specific items can be very accurate.	Not restricted to any specific item or category. Similarity is broad based. It uses the social network to personalize across a wide range of products and services.
<i>Disadvantage</i>	Restricted to specific category of products and services. No basis of similarity outside this category.	Do not have detailed information about consumer's preferences. Preference matching can be low within a specific category.

According to Fishbein (M. Fishbein and I. Ajzen, 1975), attitude is a negative or positive evaluation of performing a *specific behavior*. It does not make sense to predict all behaviors based on a data on a single attitude. The same logic is applicable to preferences. A preference shows a consumer's taste in a specific object and the set of attributes associated with this object. It cannot reflect a consumer's taste across all other objects. For example, Consumer A purchases a book in science fiction that is also rated highly by Consumer B. Based on this information, e-vendors can conclude Consumer A and Consumer B have similar preference on sci-fi books. Therefore, recommending another sci-fi book liked by Consumer B to Consumer A is likely to have high personalization accuracy. However, in recommending items liked by Consumer B that do not belong in sci-fi book category, such as a camera, the possibility of matching Consumer A's preference is likely low. This is because similarity in preferences between Consumer A and Consumer B is based solely on both preferring the same sci-fi book. Therefore, this is a major shortcoming of collaborative personalization: it can provide accurate personalized recommendations only if the recommended items are within the same category (e.g., sci-fi books) as the items on which similarity is based. Once the recommended items fall outside this category, personalization accuracy will decrease. In other words, the accuracy of collaborative recommendation is limited to a specific category. The category-specific concern does not exist in social network-based personalization. The recommendation basis for social network-based personalization is any items liked by people who have strong ties with the focal consumer in the same network. Specific items liked by the focal consumer are not involved in recommendation generation. Therefore, the similarity is broad based. People in the same social network may not have common preferences on a specific category of products or services, but their preferences are similar in general. For example, in a friendship network on Facebook, which is composed by the focal person and her friends, social network-based personalization will recommend applications used by the focal person's friends (e.g., marketplace, TripAdvisor, etc.). Due to social influence in the network, the focal consumer's preferences (no matter in which category) are likely to be similar to those of her peers (i.e., those who have strong ties with the focal consumer) in the same network. Though the focal consumer may not like a specific application recommended, she will tend to like applications used by her peers in general.

Lean management

Toyota began optimizing operations by continuously eliminating all kinds of waste in 1949. Taiichi Ohno, the founder of the Toyota Production System (TPS) has developed a set of synchronized methods and principles for controlling production plants, which became the basis of the Lean philosophy. According to him, the essence of Lean is to

reduce the time from the customer's order to the final receipt of the product, by eliminating all activities that are considered waste and do not add value to the customer (Ohno, 1988). The first books on the theory of Lean Management (LM) were published in English in 1978 and gained special recognition in the automotive sector. Over the past few decades, many articles and books have been published that focus on the description and characterization of LM content. A large number of authors consider LM to be the most well-known management paradigm of recent times (Womack et al., 1990).

Currently, the Lean concept is seen as “a set of management principles and techniques aimed at eliminating waste in the production process and increasing the flow of activities that, from the point of view of customers, increase the value of the product” (Womack & Jones, 1996b).

In the literature, lean management is translated through various principles, guidelines or rules. Based on TPS values, five general principles can be distinguished (Womack & Jones, 1996; Womack et al., 1990):

1. specify the value desired by the customer,
2. identify a value stream for each product/service providing value to the client; all waste in the value stream can be questioned,
3. ensure that the product flow is continuous,
4. introduce the pull principle—provide services on order,
5. strive for perfection through continuous improvement (kaizen).

The main idea of Lean is to eliminate all kinds of wastes (muda). Eight main types of waste have been identified in the literature (Liker, 2004; Ohno, 1988): (1) transport (2) inventory (3) motion (4) waiting (5) over-processing (6) overproduction (7) defects (8) skills.

The researchers argue that the focus should be not only on the elimination of these 8 wastes, but also on the other two waste-generating elements: mura and muri. Mura refers to process variability and processes should be standardized to reduce it. Muri means excessive work load that can be prevented by creating ergonomic and safe working conditions. The three main types of LM activities are (1) evaluation, (2) improvement, and (3) performance monitoring.

LM is supported by a set of well-known tools for the operationalization of its goals, both at the strategic and operational level, and the basic philosophy treats human as the most important issue in all activities (Varela et al., 2019). The most popular LM

methods, tools and techniques include, among others (Chiarini, 2011): Value Stream Mapping (VSM), 5 S, Total Productive Maintenance (TPM), Single Minutes Exchange of Die (SMED), Kanban, Poka-Yoke, Just-in-time (JIT), Hoshin Kanri, Takt time, Jidoka, Heijunka.

Why go Lean

As depicted in literature (Ohno, 1988; Womack and Jones, 2003; Tsigkas, 2013; LMJ, 2014), there are several benefits of using Lean in an organization:

- Improved quality – the lean process goes through several activities with problem-solving techniques to strengthen the production process and steadily eliminate defaults, eventually improving quality of the product.
- Faster delivery times – By applying the principles of just-in-time and pull, production orders are conducted when needed and therefore delivered faster to the customer. Lead time is reduced.
- Improved visual management - LM enhances management by setting up visual control of the process, thus allowing for easy identification of the problem when it occurs in the manufacturing process Enhancements of worker efficiency - In LM, employees are trained as a workgroup with full control rights, in the same process every day. Eventually, their efficiency increases through repetition and a better understanding of the operations conducted. “Practice makes perfect” can be applied to this reasoning.
- Improved efficiency of human resources - Getting more done by fewer workers. By increasing worker’s skill set and contribution as well as making them more involved in the production process, LM allocates human resources in a better way thus maximizing their performance and leads to fewer workforce requirements.
- Easier to manage work areas – The work instructions and standardization of work make it easier for workers to know what they have to do and when. This makes managing a work area much more efficient.
- Total company involvement – LM can be implemented not only in one area but also in every sector of a company. By doing so, everyone feels like part of the whole team and strives for the common goal.
- Problem elimination - LM employs root cause analysis conducted by a cross-functional team thus investigating a problem until it is fully resolved.

- Increased space utilization – Better space utilization is achieved by fine-tuning operations improving floor planning and by reducing inventory thus storage space for parts.
- Safer work environment - LM renders the work environment more organized by removing unnecessary elements which lead to a safer workplace.
- Improved employee morale - In LM, employees feel that they are members of a team and contribute their share to the organization. This reduces uncertainty in the workplace and strengthens employee morale. Initially, this is not profoundly witnessed, but over time, it becomes more visible once the concept of lean gets accepted by the workforce of the company.

In Figure 1 a graphical representation of the significant benefits of lean industries is provided.



Future Trends in Lean and Digital Transformation

As technology continues to advance, the integration of Lean principles with digital tools is set to revolutionize industries even further. Staying ahead of these trends is crucial for organizations seeking to maintain a competitive advantage and drive continuous improvement. This section explores the future trends in Lean and digital transformation, highlighting key areas of innovation and growth.

Emerging Trends

Artificial Intelligence and Machine Learning

- **Predictive Maintenance:** AI and machine learning algorithms will enhance predictive maintenance capabilities, allowing organizations to foresee equipment failures before they happen and schedule timely interventions. This trend is

supported by McKinsey, which highlights the transformative potential of AI in predictive maintenance.

- **Process Optimization:** These technologies will be used to analyze vast amounts of data, identifying patterns and optimizing processes for maximum efficiency. AI-driven process optimization is becoming a critical component in Lean manufacturing.
- **Personalized Customer Experiences:** AI will enable more personalized interactions and solutions, tailored to the specific needs and preferences of customers. This personalization is increasingly important in maintaining competitive advantage.

Internet of Things (IoT)

- **Connected Supply Chains:** IoT devices will create highly connected supply chains, offering real-time visibility and control over every aspect of the production and delivery process. Deloitte emphasizes the significant impact of IoT on supply chain visibility and efficiency.
- **Smart Factories:** The rise of smart factories, equipped with IoT devices, will facilitate autonomous operations and enhanced decision-making capabilities. These smart factories are integral to the future of Lean manufacturing.
- **Energy Efficiency:** IoT will help monitor and optimize energy usage, contributing to more sustainable manufacturing practices. This aligns with the growing emphasis on sustainability in manufacturing.

Blockchain Technology

- **Supply Chain Transparency:** Blockchain will provide unparalleled transparency and security in supply chains, ensuring that every transaction is recorded and verifiable. Harvard Business Review discusses how blockchain can transform supply chain transparency and security.
- **Smart Contracts:** These self-executing contracts will streamline operations and reduce the need for intermediaries, enhancing efficiency and reducing costs. Blockchain's role in smart contracts is a key area of innovation.
- **Fraud Prevention:** Blockchain's immutable ledger will help prevent fraud and ensure the integrity of data across the supply chain, making it a valuable tool for maintaining trust and security.

Sustainability and Lean

- **Green Manufacturing:** Integrating Lean principles with sustainable practices will lead to greener manufacturing processes, reducing waste and minimizing environmental impact. The World Economic Forum highlights the importance of green manufacturing and the circular economy.
- **Circular Economy:** Embracing a circular economy model, where resources are reused and recycled, will become more prevalent, supported by Lean methodologies. This approach aligns with global sustainability goals.
- **Regulatory Compliance:** Organizations will need to adapt Lean processes to comply with increasingly stringent environmental regulations. Compliance with these regulations will be crucial for maintaining operational legitimacy (Kumar, S., 2024).

Human-Machine Collaboration

- **Cobots (Collaborative Robots):** The use of cobots will rise, working alongside humans to enhance productivity and safety in manufacturing environments. Forbes discusses the growing role of cobots in manufacturing.
- **Augmented Reality (AR):** AR will be used for training, maintenance, and quality control, providing real-time information and guidance to workers. AR's application in manufacturing is expanding rapidly.
- **Remote Work:** Digital tools will support remote work and collaboration, enabling seamless operations regardless of physical location. Remote work is becoming an integral part of modern manufacturing.

Result & Findings

H1: *Outside the specific category on which collaborative recommendation is based, social network-based personalization provides higher recommendation accuracy than collaborative personalization. However, if the focal person is interested in a specific category of applications on Facebook, such as entertainment, recommendations based on preferences of others with similar entertainment tastes will likely be more accurate. In this situation, collaborative personalization can provide better recommendations because it can accurately match the consumer's preferences in a specific category.*

H2: *Within the specific category on which collaborative personalization is based, social network based personalization provides lower personalization accuracy than collaborative personalization.*

Personalization will continue to evolve, driven by AI, high-quality data and a relentless focus on earning and securing customer trust. The winners in personalization won't bombard people with offers that are little more than guesses. Instead, they'll shape a "best customer path," delivering memorable, engaging moments that support meaningful business growth. Seamless personalization also goes well beyond the purchase point (Kumar, S., 2024). Businesses should tap into both first-party and third-party data to gain a comprehensive view of customer behavior and preferences. By combining these data sources, companies can provide value from first touch through to post-purchase support, ensuring a cohesive and intuitive customer experience.

Conclusion

The future of Lean and digital transformation is filled with exciting possibilities. By embracing emerging technologies and integrating them with Lean principles, organizations can achieve unprecedented levels of efficiency, productivity, and sustainability (Kumar, S., 2024). Staying informed about these trends will enable businesses to innovate continuously and maintain a competitive edge in the digital age.

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Factors Influencing Online Shopping E-Loyalty: An Empirical Study on Youth of North Bengal, West Bengal

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Abstract : In the era of digitization, easy access to internet services and the availability of low-cost electronic devices (such as tablets and smart cell phones) have made online shopping very popular. In addition, online shopping saves customers time and money, making it a preferred shopping destination.

Online sellers can succeed in online business only when customers are satisfied and loyal to online shopping. The underlying online shopping dimensions influencing customer loyalty to online shopping are determined by Exploratory Factor Analysis (EFA). The EFA results show that website design, return policy, product assortment and customer trust are the important online shopping dimensions influencing customer e-loyalty. Next, an Analysis of Moment Structures (AMOS) is conducted to investigate the influence of these online shopping dimensions on customers' e-loyalty. The study shows that return policy greatly influences e-loyalty. In addition, customer trust, product assortment and website design also significantly influence customers' e-loyalty.

The findings of the study will help online marketers to list the dimensions of online shopping that affect customers' e-loyalty. Moreover, the findings of the study will help online sellers to strategically design online shopping dimensions to ensure customers' e-loyalty in online shopping.

Keywords: Online shopping, Websites Design, Return Policy, Products Assortment, Customer Trust, and E-loyalty.

1. Introduction

Online shopping is becoming popular in developing countries like India. The main reason behind this is the availability of a conducive e-commerce environment in the country, such as the increasing number of Internet connections in the country and

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favorable government policy on e-commerce. According to the India Brand Equity Foundation (IBEF) report, Internet penetration in India was 4 percent in 2007 and increased to 45 percent in 2021. Another reason customers accept online purchases is the convenience offered by online shopping compared to offline shopping. For example, online shopping allows customers to search, evaluate, and many more without time and geographic constraints. Online shopping is widespread accepted by Indians. However, acceptance of online shopping does not mean that online shoppers are becoming loyal to online shopping. Loyalty refers to the extent to which a person can stick to a particular thing, and here it refers to the extent to which an existing online buyer uses an online shopping channel for future purchases. Kim *et al.*, (2009) found a significant relationship between e-trust and e-satisfaction, which influenced the e-loyalty development process. Moriuchi and Takahashi (2016) found that e-satisfaction has a more significant impact on the e-loyalty of online shoppers than e-trust. Understanding customer e-loyalty is an ongoing research area. In the present study, the researcher explores the underlying online shopping dimensions and examined their influences on customer e-loyalty.

2. Literature Review and Development of Hypothesis

Previous research helps the researcher understands a particular research topic and its ongoing research work. Furthermore, researchers identify research gaps and carry out research work to bridge the gap in the body of knowledge. The review of literature and development of research hypothesizes are as follow:

2.1. E-loyalty

Customer loyalty generally refers to the willingness of customers to stick (purchasing) with a particular brand or company's products and services. Scholars and researchers have conducted several studies worldwide to understand customers' e-loyalty in online shopping. For instance, Moriuchi and Takahashi (2016) took online shopping parameters such as e-satisfaction and e-trust and attempted to examine their effects on customers' e-loyalty. However, the findings of their study suggest that e-satisfaction influences the e-loyalty of customers in online shopping more than e-trust. Similarly, Kim *et al.*, (2009) found that e-trust and e-satisfaction are significantly related, affecting the e-loyalty of customers. Customer e-loyalty is essential for online sellers as it helps them achieve their expected business goals (such as expansion and survival).

2.2. Customer Trust

In online shopping, the customer evaluates products based on the information available on the online seller's website. Therefore, online sellers should be honest and not be opportunistic with their customers. Many factors affect customers' trust in online shopping platforms. For example, Chen and Barnes (2007) found that the antecedents

of initial online trust are perceived usefulness, perceived security, perceived privacy, perceived reputation, and willingness to adapt; and customer purchase intention is positively influenced by trust and familiarity with the online shopping environment. Similarly, Gefen *et al.*, (2003) observed that customers' trust in online shopping could be gained by ensuring website security, smooth website interface, ease of use, and sellers' honesty towards buyers. Kim *et al.*, (2008) observe that consumer trust and perceived risk influence customers' buying decisions. It has been observed from past research that customer trust plays a vital role in making customers loyal to online purchases. Therefore, the study hypothesizes that:

H₁: Customer trust (CT) influences the e-loyalty of customers in online shopping.

2.3. Products Assortment

In general, the availability of different product lines in a particular product is called product assortment. Toothpaste for Children and Toothpaste for Adults is a product line of toothpaste. According to Levy *et al.*, (2012), product assortment refers to the range of products available in a particular product grouping. Arnold *et al.*, (1983) found that customers always aspire for product assortment and prefer stores that offer a wide range of product categories as product assortment helps customers in getting products and services as per their requirements. The availability of fewer product varieties on online shopping sites forces customers to take advantage of alternative shopping channels (such as offline shopping). Hence, the study hypothesizes that:

H₂: Product assortment (PA) affects the e-loyalty of the customer in online shopping.

2.4. Return Policy

Online sellers are expected to facilitate a flexible return policy for customers so that customers can easily return purchased goods and services that do not match their purchase expectations. Davis *et al.*, (1998) advocated the relationship between return policy and sales volume; hence a flexible return policy offered by sellers can increase sales volume. Poel and Leunis (1999) pointed out that a return policy can reduce a consumer's perceived economic and product risk and, in some ways reduce customer anxiety before purchase. Suwelack *et al.*, (2011) stated that money-back guarantees enhance customers' purchase intent by improving positive emotional and cognitive effects.

To conclude, the return policy helps customers buy goods and services online, even when customers are not 100% sure about the quality of the goods and services. In other words, a return policy minimizes customers' risk of buying the wrong products

and services at online shopping platforms and ensures healthy business relationships with customers. Therefore, the study hypothesizes that:

H₃: Return policy (RP) affects the e-loyalty of the customer in online purchases.

2.5. Websites Design

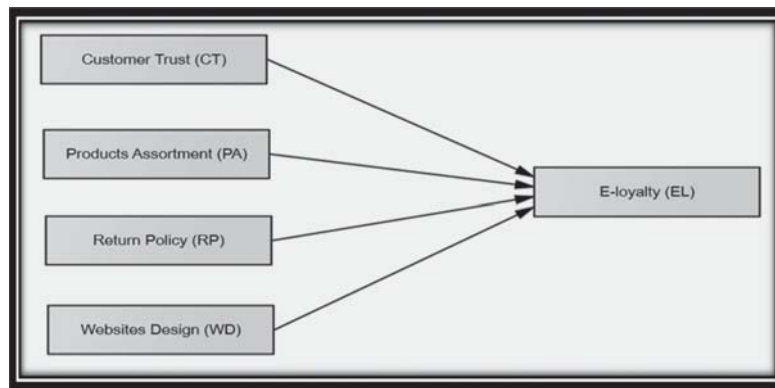
The website is a virtual store of online sellers. Online sellers should design their websites customer-friendly so customers can enjoy a pleasant shopping environment. Because Chang *et al.*, (2016) reported that web marketers' well-optimized, interactive, and convenient websites influence the e-loyalty of customers. Chang and Chen (2008) suggest that website interface quality, such as customization, engagement, convenience, and features, are essential in generating customer e-loyalty. Kohli *et al.*, (2004) suggest that design and choice influence customer satisfaction with online shopping platforms, which is mediated by time and cost savings. Customers' unpleasant shopping experience on online purchases (due to unorganized shopping sites) not only prompts them to leave their shopping process midway but also prevents them from buying goods and services online. Therefore, the study hypothesizes that:

H₄: Website design (WD) influences the e-loyalty of the customer.

3. Research Model

On the basis of research hypothesis, the proposed model of the study is given in Figure 1.

Figure1 Research Model



The above figure states that shopping factors such as customer trust (CT), product assortment (PA), return policy (RP), and website design (WD) influences customers' loyalty. The study conducts empirical research on online shoppers to validate the proposed customer e-loyalty model.

4. Development of Measurement and Collection of Data

The study develops a structured questionnaire (divided into two parts) to collect data from online buyers. The first part of the questionnaire measures online shopping parameters, namely customer trust, product assortment, return policy, website design, and e-loyalty, by their respective measurement items (adopted from previous research).

For example, the study measures return policy (RP) by adopting four items from Javadi *et al.*, (2012)'s study. The study takes four items used by Bauer *et al.*, (2012) to measure product classification. Similarly, the study adopted five items suggested by Gefen *et al.*, (2003) to measure customer trust. Website design is measured with the help of three items referenced by Lin (2007). Finally, the study uses the four items used by Gremler (1995) and Zeithaml *et al.*, (1996) to measure the online shopping parameter e-loyalty. All items are scaled on Likert scale (here, five-point). Where five represent "strongly agree", four means "agree", three means "neither agree nor disagree", two represent "disagree", and one represents "disagree". The second part of the questionnaire includes parameters such as gender, age, educational qualification, family income, and internet experience to evaluate the demographic profile of online shoppers. A sample of a structured questionnaire relating to the online shopping dimension and their measurement items is given in Appendix II.

The geographical area of study is confined to the North Bengal region of the state of West Bengal, India only. The study collects data (applying the snowball sampling statistical method) from youths (here, college and university students). Three hundred and fifty structured questionnaires are circulated among online shoppers to collect data. But out of these, only 327 were received. Later, 41 more were dropped due to incomplete. Henceforth, the study analyses the responses of 286 online shoppers to understand customer e-loyalty in online shopping.

5. Demographic Profile of Online Buyers

The demographic profile helps the researcher understand the background of online buyers. It also helps determine whether the online buyers in the study are a representative sample of the target population of online shoppers. The summary of online shoppers's demographic profile is given in Table 1.

Table1 Demographic Profile of Online Shoppers

Sl. Nos.	Measure	Items	Frequency	Percentage (%)
	Total (N)	Sample Size	286	100
1	Gender	Male	120	42.0
		Female	166	58.0
2	Age (year)	Up to 19 Year	117	40.9
		Above 20 Years to 25 Years	169	59.1
3	Educational Qualification	Pursuing Graduate Degree	101	35.3
		Pursuing Master Degree	185	64.7
4	Family income	Up to ₹ 2.5 lakh	138	48.3
		Between ₹ 2.5 lakh to ₹ 5 lakh	50	17.5
		Between ₹ 5 lakh to ₹ 10 lakh	62	21.7
		Above ₹ 10 lakh	36	12.6
5	Internet experience	Up to 3 months	23	8.0
		Between 3 months to 6 months	30	10.5
		Between 6 months to 1 year	42	14.7
		Between 1 year to 2 years	34	11.9
		More than 2 years	157	54.9

Source: Calculation is based on primary data with the help of SPSS

The demographic parameters such as gender, age, educational qualification, and income play an important role in buying decisions. For example, Garbarino and Strahilevitz (2004) pointed out that men supposed to buy goods and services more compared to women in online shopping. Youngster mainly uses online shopping platform for shopping. Khare *et al.*, (2012) observes that online shoppers' age influences their buying intent in online shopping. Table 1 state that more than 59 percent of the respondents' age is falling between 20 to 25 years. Swinwyard and Smith (2003) advocate that online shoppers compared to traditional shoppers are more educated. In this study, 185 (see Table 1) online shoppers are pursuing their master's degree, which is more than 64 per cent of the total sample size of the study. Bagchi and Mahmood (2004) advocated that buyers' income positively affects their buying propensity. Likewise, Donthu and Garcia (1999) noted that online buyers have higher incomes than offline buyers. Data from the demographic profile of online buyers shows that over 48 percent (see Table 1) of online shoppers have an income of up to 2.5 lakhs. In the demographic profile, the study considers parameters such as the Internet experience of online shoppers because customers familiar with the Internet and technology can easily buy goods and services at the online shopping platforms. In the study, nearly 55 percent of online shoppers have more than two years of internet-based shopping experience.

6. Descriptive Statistics of Scale Items

The descriptive statistics is applied to calculate the value of the mean, standard deviation, skewness, and kurtosis of the online shopping dimension. The primary purpose of

computing these descriptive statistics is to see whether the study data follow normality. Byrne (2010) and Hair *et al.*, (2010) consider normality of data if the skewness value is falling between -2 to +2 and the kurtosis value is falling between -7 to +7. Table 2 shows that the calculated overall skewness and kurtosis values of each construct are within the prescribed limits of data normality.

Table 2 Descriptive Statistics

Factors	Items	Mean	Std. Deviation	Skewness	Kurtosis
Websites Design (WD)	WD1	2.98	.964	-.296	-.264
	WD2	3.14	.797	-.849	.751
	WD3	3.17	.850	-.432	.271
E-loyalty (EL)	EL1	3.97	.866	-1.206	2.181
	EL2	3.74	.869	-.562	.504
	EL3	3.75	.898	-.799	.705
	EL4	3.93	.900	-.561	-.268
Return Policy (RP)	RP1	3.87	1.142	-.991	.205
	RP2	3.95	1.033	-1.099	.960
	RP3	3.91	1.054	-1.097	.761
	RP4	3.88	1.045	-.956	.586
Products Assortment (PA)	PA1	3.95	.863	-1.362	2.524
	PA2	3.89	.886	-1.037	1.803
	PA3	3.92	.921	-1.160	1.936
	PA4	4.14	.936	-1.154	1.176
Customer Trust (CT)	CT1	3.83	1.235	-.875	-.315
	CT2	3.68	1.047	-.767	.024
	CT3	3.72	1.062	-.847	.144
	CT4	3.68	1.152	-.719	-.354
	CT5	3.79	1.129	-1.022	.410

Source: Calculation is based on primary data with the help of SPSS

7. Exploratory Factor Analysis

To support the research hypothesis and propose a customer e-loyalty model, the study uses factor analysis, specifically exploratory factor analysis. This helps researchers to determine the underlying customer e-loyalty dimensions in online shopping. The data analysis is discussed under the following headings:

7.1. Kaiser – Meyer - Olkin and Bartlett's Test

In EFA, KMO measures the sampling adequacy in a given study. Table 3 shows that the calculated value of KMO is 0.865 which indicates adequate sampling in the study.

Table 3 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.865
Bartlett's Test of Sphericity	Approx. Chi-Square	3640.386
	df	190
	Sig.	.000

Source: Calculated on primary data with the help of SPSS

Bartlett's Sphericity Test checks the presence of correlation between the variables taken in a particular study. Since, for factor analysis, correlation between variables must exist. Table 3 shows a significant Bartlett's Sphericity Test value stating the existence of the relationship between online shopping factors.

7.2. Communalities

In factor analysis, the presence of common variance in the given parameters is explained by communality. Thus, it helps the researcher to make decisions such as retaining or removing items from the study.

Factors' Items	Initial	Extraction
EL1	1.000	.677
EL2	1.000	.673
EL3	1.000	.671
EL4	1.000	.734
RP1	1.000	.644
RP2	1.000	.709
RP3	1.000	.710
RP4	1.000	.689
CT1	1.000	.686
CT2	1.000	.825
CT3	1.000	.868
CT4	1.000	.811
CT5	1.000	.764
PA1	1.000	.740
PA2	1.000	.775
PA3	1.000	.810
PA4	1.000	.697
WD1	1.000	.774
WD2	1.000	.893
WD3	1.000	.832

Source: Based on primary data

Beavers et al. (2013) suggested that researchers may consider keeping items in the survey if the communality value of the item falls between 0.25 and 0.40. Table 4 shows that the calculated communality value of each item falls within the specified limits; therefore, the researcher keeps all items for analysis.

7.3. *Rotated Component Matrix*

The rotated component matrix (RCM) reveals five dimensions of online shopping (see Table 5); namely, customer trust (CT), product assortment (PA), return policy (RP), e-loyalty (EL), and website design (WD), which enhance customer e-loyalty.

Table 5 Rotated Component Matrix

Items	Component				
	1	2	3	4	5
CT1	.822				
CT2	.881				
CT3	.909				
CT4	.861				
CT5	.839				
PA1		.818			
PA2		.871			
PA3		.880			
PA4		.778			
RP1			.794		
RP2			.792		
RP3			.773		
RP4			.814		
EL1				.705	
EL2				.740	
EL3				.772	
EL4				.819	
WD1					.841
WD2					.911
WD3					.881

Source: Calculation is based on primary data with the help of SPSS

In RCM, the first and the last factors explain the highest and the lowest variance, respectively. The first-factor customer trust (CT) is measured by five indicators (CT1, CT2, CT3, CT4 and CT5); and it explains the highest variance in customer e-loyalty in online shopping. In contrast, website design with its three indicators (WD1, WD2 and WD3) explains the least variance in customer e-loyalty in online shopping.

7.4. Total Variance Explained

Exploratory factor analysis shows that e-loyalty (EL), customer trust (CT), product assortment (PA), return policy (RP) and website design (WD) are the underlying online shopping dimensions that affect customer e-loyalty. Among these online shopping factors, customer trust (CT) and website design (WD) explain the highest percentage (i.e., 19.405 per cent) and the lowest (i.e., 12.834 per cent) of variance in customer e-loyalty in online shopping, respectively (see Table 6).

Table 6 Total Variance Explained

Factors	Measurement Items	Factor Loading	% of Variance	Cumulative % of Variance
Customer Trust (CT)	CT1	.822	19.705	19.705
	CT2	.881		
	CT3	.909		
	CT4	.861		
	CT5	.839		
Products Assortment (PA)	PA1	.818	15.187	34.892
	PA2	.871		
	PA3	.880		
	PA4	.778		
Return Policy (RP)	RP1	.794	13.706	48.598
	RP2	.792		
	RP3	.773		
	RP4	.814		
E-loyalty (EL)	EL1	.705	13.482	62.080
	EL2	.740		
	EL3	.772		
	EL4	.819		
Websites Design (WD)	WD1	.841	12.834	74.914
	WD2	.911		
	WD3	.881		

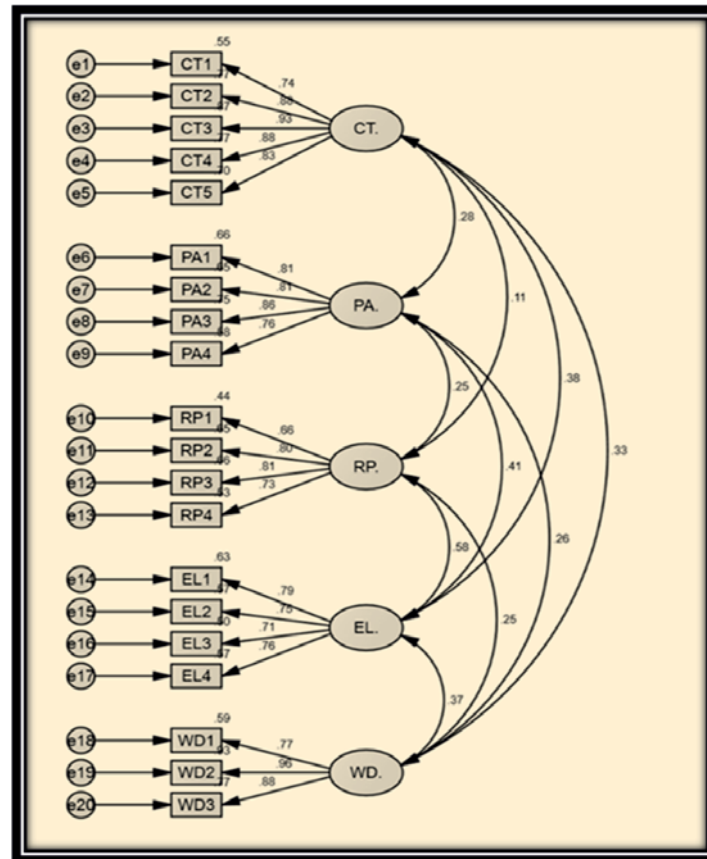
Source: Based on primary data by SPSS

Similarly, other online shopping factors such as product assortment (PA), return policy (RP) and e-loyalty (EL) explain 15.187, 13.706 and 13.482 per cent of the variance, respectively. The cumulative variance explained by all dimensions of online shopping is 74.914 per cent (see Table 6).

8. Measurement Model

Figure 2 shows the measurement model of customers' e-loyalty in online shopping; where customer e-loyalty (EL), customer trust (CT), product assortment (PA), return policy (RP), and website design (WD) are the latent constructs of the model (with their corresponding indicators).

Figure 2: Measurement Model



Source: Based on primary data by SPSS

Customer trust (CT) is measured by five indicators such as CT1, CT2, CT3, CT4 and CT5. Similarly, the constructs e-loyalty (EL), product assortment (PA) and return policy (RP) are measured by four indicators respectively. Website design is measured by three indicators.

8.1. Reliability of Scale Items

Cronbach alpha (α) and composite reliability (CR) are used to validate the scale reliability of online shopping constructs. The calculated values of Cronbach alpha (α) and composite reliability (CR) are shown in Table 7.

Table 7 Reliability of Constructs

Factors	Measurement Items	Standardized Regression Weight	Cronbach alpha (α)	Composite Reliability (CR.)
Customer Trust (CT)	CT1	.745	0.928	0.931
	CT2	.875		
	CT3	.931		
	CT4	.878		
	CT5	.834		
Products Assortment (PA)	PA1	.812	0.884	0.886
	PA2	.808		
	PA3	.865		
	PA4	.761		
Return Policy (RP)	RP1	.794	0.838	0.840
	RP2	.663		
	RP3	.804		
	RP4	.810		
E-loyalty (EL)	EL1	.792	0.839	0.839
	EL2	.752		
	EL3	.709		
	EL4	.756		
Websites Design (WD)	WD1	.766	0.893	0.904
	WD2	.963		
	WD3	.876		

Source: Based on primary data by SPSS

The scale reliability of the online shopping dimension is established when the Cronbach alpha (α) value is equal to or greater than 0.70 (Taber, 2018). On the other hand, the composite reliability (CR) value is good when it is between 0.80 and 0.90 (Hair et al., 2011). Table 7 shows that the Cronbach alpha (α) and composite reliability (CR) range from 0.838 to 0.928 and 0.839 to 0.931, respectively, which establishes the scale reliability of the online shopping dimension.

8.2. Validity of Constructs

Convergent and discriminant validity tests are used to examine the construct validity of online shopping parameters. Convergent validity is established when the AVE value is greater than 0.50 (Hair et al., 2011). The calculated values of AVE of shopping parameters range from 0.567 to 0.660, which establishes construct validity.

Table 8 shows the constructs validity of e-loyalty

Constructs	AVE	EL.	CT.	PA.	RP.	WD.
EL.	0.567	0.753				
CT.	0.731	0.383	0.855			
PA.	0.660	0.415	0.284	0.812		
RP.	0.569	0.577	0.109	0.247	0.754	
WD.	0.761	0.365	0.333	0.261	0.247	0.872

Source: Based on primary data by AMOS.

Fornell and Larcker's criterion is used to check the discriminant validity of online shopping constructs. Fornell and Larcker's criterion (1981) establishes (i.e. discriminant validity of constructs) if the square root value of the AVE (see diagonal values in Table 8) relating to each latent construct should be greater than any correlation between any pair of latent constructs. Table 8 shows that the square root of the AVE relating to the latent constructs [i.e. e-loyalty (EL), customer trust (CT), product assortment (PA), return policy (RP), and website design (WD)] is greater than any correlation between any pair of latent constructs establishing the discriminant validity of online shopping parameters.

9. Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) is used to test the hypotheses. CFA is used to examine the relationship between observed variables and their underlying latent constructs. The fit indices of the measurement and structure models are summarized in Table 9:

Table 9 Fit Indices of Measurement and Structural Model

Fit Indices	Particulars	Recommended value	References	Obtained Value
Overall Model Chi-square (χ^2)	Chi-square (χ^2)	--	--	288.088
	Degrees of Freedom (<i>df</i>)	--	--	160
	<i>p</i> -value		Joreskog & SORBOM (1996)	<i>p</i> = 0.000
Absolute Fit Measures	Goodness-of-Fit Index (GFI)	≥ 0.90 = acceptable fit	Kline (2005)	0.908
	Root Mean Square Error of Approximation (RMSEA)		MacCallum et al. (1996)	0.053
	Root Mean Square Residual (RMR)	≤ 0.05 = acceptable fit	Steiger (2007)	0.044
	Standardized Root Mean Residual (SRMR)	≤ 0.05 = acceptable fit	Diamantopoulos & Siguaw (2000)	0.0472
	Normed Chi-Square ($\chi^2/df = 288.08/160$)	≤ 3 = acceptable fit	Marsh & Hocevar (1985)	1.801
Incremental Fit Indices	Comparative Fit Index (CFI)	≥ 0.90 = acceptable fit	Fan et al. (1999).	0.964
Parsimony Fit Indices	Adjusted Goodness-of-Fit Index (AGFI)	≥ 0.90 = acceptable fit	Tabachnick & Fidell (2007)	0.879

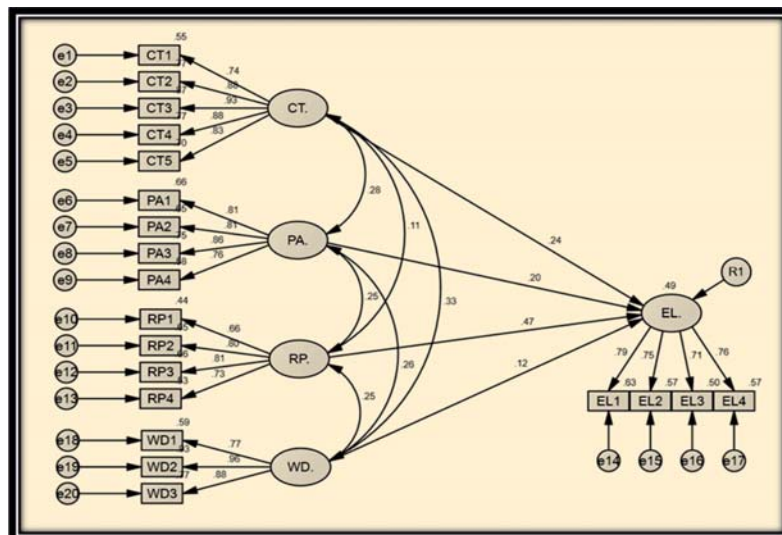
Source: Calculation is based on primary data by AMOS

Table 9 shows that the calculated values of the Goodness-of-Fit Index (GFI), Root Mean Square Error of Approximation (RMSEA), Root Mean Square Residual (RMR), Standardized Root Mean Residual (SRMR), Normalized Chi-Square ($\div 2/df$) and Comparative Fit Index (CFI) are within the model fit index establishing the recommended level. The Adjusted Goodness-of-Fit Index (AGFI) value (i.e. 0.879) is also close to the parsimony fit index (0.90).

10. Structural Model

Analysis of Moment Structures (AMOS) is used to develop a structural model of customer e-loyalty in online shopping (see Figure 3). It shows the causal relationships between online shopping dimensions (in other words it is used to test the proposed research hypotheses).

Figure 3 Structural Model



Source: Based on primary data with the help of AMOS

The structural model (see Figure 3) shows that customer trust (CT), product assortment (PA), return policy (RP), and website design (WD) influence customer e-loyalty (EL) in online shopping. It is also noted that the variance explained [i.e. squared multiple correlations (R^2)] by online shopping parameters [i.e. customer trust (CT), product assortment (PA), return policy (RP), and website design (WD)] is 49 per cent.

11. Testing of Hypothesis

Table 10 shows the statistical results of the proposed research hypothesis produced by AMOS.

Table 10 Hypothesis Testing

Hypothesis	Hypothesized Path	Standardized Parameter Estimate	Standard Error	t - Value	p-Value	Decision
H ₁	CT ----> EL	0.236	0.045	3.914	***	Supported
H ₂	PA ----> EL	0.201	0.061	3.235	0.001**	Supported
H ₃	RP ----> EL	0.473	0.065	6.598	***	Supported
H ₄	WD ----> EL	0.117	0.055	1.971	0.049*	Supported

Source: Calculation is based on primary data with the help of AMOS

Note: * $p < .05$; ** $p < .01$; *** $p < .001$.

The results of hypothesis testing are discussed below:

- Customer trust (CT) positively and significantly influences e-loyalty (EL) ($b = 0.236, t = 3.914, p < 0.001$) hence supporting hypothesis H₁ (see Table 10).
- Product assortment (PA) positively and significantly influences e-loyalty (EL) ($b = 0.201, t = 3.235, p < 0.01$) hence supporting hypothesis H₂ (see Table 10).
- Return policy (RP) positively and significantly influences e-loyalty (EL) ($b = 0.473, t = 6.598, p < 0.001$) hence supporting hypothesis H₃ (see Table 10).
- Website design (WD) positively and significantly influences e-loyalty (EL) ($b = 0.117, t = 1.971, p < 0.05$) hence supporting hypothesis H₄ (see Table 10).

12. Study's Findings

The study tested the research hypotheses with the help of structural equation modeling (SEM) and analysis of moment structures (AMOS). And based on the AMOS and SEM results; the important research findings are as follows:

- The research findings indicate that return policy (H₃) has emerged as the top online shopping dimension influencing customer e-loyalty among all the online shopping dimensions considered in this study. Online sellers should provide their customers with a flexible return policy so that customers have the option to return the purchased goods and services if it does not match their purchase expectations. Moreover, online sellers should refund the full money including shipping charges if the customer returns the purchased item. In short, the study argues that an easy return policy promotes customers' e-loyalty in online shopping.
- Hypothesis H₁ is statistically significant. It means that customer e-loyalty in online shopping depends on customer trust. In online shopping, customer trust can be ensured by fulfilling the promises made by online sellers. Providing

quality services also increases customer trust in online shopping and e-loyalty. Therefore, online sellers should not be opportunistic but should follow ethical business practices.

- c) The availability of a wide range of products in online stores provides customers with more choices in purchasing products and services. This reduces the likelihood of customers switching from one online shopping website to another or to an offline shopping marketplace. By providing customers with a wide range of goods and services, online sellers can minimize customer switching/shifting rates or maximize customer retention rates (H_2).
- d) The findings of the study show that website design has the most negligible effect on customer e-loyalty compared to other online shopping parameters considered in this study (H_4). However, online sellers are requested to make their online shopping site customer-friendly. Features such as intuitive navigation and attractive-looking leads in an online shopping site help to retain the customer in the online shopping process. In other words, an organized and attractive online website attracts repeat online shopping customers.

13. Study's Limitations

The study proposed a customer e-loyalty model in online shopping after considering the dimensions of online shopping, such as customer trust, product assortment, return policy and website design. However, the study has the following limitations:

- a) The online shopping dimensions taken in the study are only an indicative list of online shopping dimensions. It does not represent a comprehensive list of online shopping dimensions that affect customers' e-loyalty in online shopping.
- b) Due to time and money constraints, the geographical area of the study is limited only to North Bengal region of West Bengal state of India, and the survey findings are based on this.
- c) The study collects data from youth, especially college-going students, who purchase goods and services online. Therefore, the study can be further extended by collecting data from all categories of online shoppers to measure customer e-loyalty in online shopping more accurately.

14. Conclusion

Customer's e-loyalty depends on various online shopping dimensions (such as customer trust, product assortment, return policy and website design); therefore, online sellers should design their sales strategy after considering the impact of these online shopping dimensions on customers to ensure customer's e-loyalty in online shopping. To ensure trust, online sellers should fulfill their promises made to customers. Online sellers should

provide a wide range of product assortment so that customers can compare and evaluate products and make rational purchase decisions. Return policy helps customers to return the purchased products and services if the purchased goods and services do not match their purchase expectations. Hence easy return policy allows customers to purchase more products online.

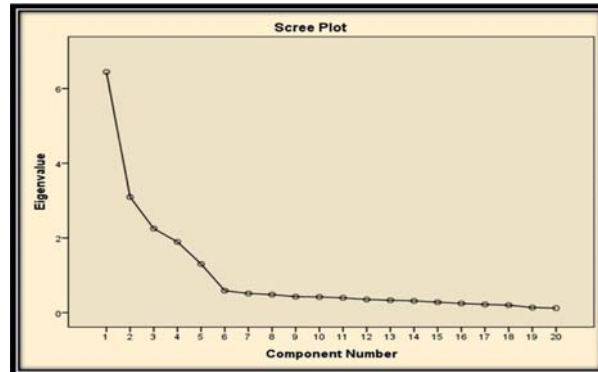
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Appendices

Appendix I: The screen plot shows the underlying dimensions of customer e-loyalty (based on more than one eigenvalue) in online shopping.



Appendix II: Describes the measurement items of customer e-loyalty dimension:

Sl. Nos.	Parameters	Items	Adopted from
1	Products Assortment (PA)	PA1: Online marketers offer a wide variety of different brands to choose from.	Bauer et al.(2012)
		PA2: Online marketers provide a variety of different flavours to choose from.	
		PA3: Online marketers offer a variety of package sizes to choose from.	
		PA4: Online marketers provide a variety of quality categories to choose from.	
2	Websites Design (WD)	WD1: The online retailer's user interface has a well-organized appearance.	Lin (2007)
		WD2: Online retailer has natural and predictable screen changes.	
		WD3: The online retailer website is visually appealing.	
3	Return Policy (RP)	RP1: I shop online if a free return shipment service is available.	Javadi et al. (2012)
		RP2: I choose to shop online if I can return the product without frills.	
		RP3: I shop online when there is a money-back guarantee.	
		RP4: I shop online if there is a hassle-free return policy. (Developed by the researcher).	
4	Customer Trust (CT)	CT1: Based on my past experience, I know that online sellers are honest.	Gefen et al. (2003)
		CT2: Based on my previous experience, I know online sellers care about customers.	
		CT3: Based on my past experience, I know online sellers are not opportunists.	
		CT4: Based on my previous experience, I know online sellers provide good service.	
		CT5: Based on my past experience, I know online sellers are predictable.	
5	E-loyalty (EL)	EL1: Whenever I need to shop, I try to use an online shopping website.	Gremier (1995) and Zeithaml et al. (1996)
		EL2: Online is my first choice when I need to shop.	
		EL3: For me, online shopping sites are the best retail websites for shopping.	
		EL4: I believe the online shopping site is my favourite retail website.	

Are Women SHG Members Financially Socialized?

Scientific Mapping of Financial Socialization of Women SHG Members

DR. (MRS) SOMYA NANDA, PROF. SANJEEB KUMAR JENA

INTRODUCTION

Women constitute half of the global population, and their well-being is indispensable for economic growth and societal stability. The financial inclusion of women is a cornerstone of their economic empowerment (Bull & Garita, 2021¹) and plays a pivotal role in advancing multiple Sustainable Development Goals (SDGs²), particularly Goal 5, which focuses on achieving gender equality. Ensuring women's equal access to financial services can significantly contribute to reducing poverty and inequality, creating employment opportunities, and fostering inclusive societies (AFI, 2017³; IMF, 2022⁴). Moreover, incorporating women as users, providers, and regulators of financial services enhances stability within the banking system (IMF, 2023⁵). Despite considerable advancements in financial services and technological innovation, a pronounced gender gap in financial inclusion persists globally (Chen et al., 2021⁶; IMF, 2023b⁷). The Global Findex Report, 2021,⁸ indicates that the gender gap in account ownership in developing countries exceeded 5% in 2021, with significantly larger disparities in South-Asia, the Middle East, and Africa, where gaps range between 13 and 20 percentage points.

These enduring gender disparities underscore the urgency for policymakers to prioritize initiatives promoting women's financial inclusion. Sustainable development is achievable only when resources are equally distributed and accessible, irrespective of sex (Kandpal, 2022⁹). This gender disparity in financial inclusion not only limits individual women's economic opportunities but also hampers broader economic growth and social advancement (Demirgüç-Kunt et al., 2022¹⁰; IMF, 2023c¹¹). Bridging these gaps necessitates a multifaceted approach re-encompasses targeted policies, financial education programs, and innovative technologies tailored to women's needs

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(AFI,2017¹²). Closing the gender gap in financial inclusion can unlock substantial economic potential and, foster more equitable and resilient societies (Klapper and & El-Zoghbi, 2020¹³; UN Women, 2020¹⁴; OECD, 2021¹⁵).

Gender diversity and women's financial socialization are interlinked factors critical to empowerment and financial well-being. Social Learning Theory underscores the importance of financial socialization, which encompasses early exposure to financial education and experience. These factors significantly influence women's financial literacy, self-efficacy, and empowerment (Ali et al.,2021¹⁶; Shim et al. 2009,¹⁷). According to the Global Findex Database-2021, the gender gap in financial inclusion has narrowed by 14 percentage points between 2017 and 2021. Notably, 78% of women in India now have bank accounts, and 42% utilize digital payment systems, bolstering financial resilience in the face of unexpected expenses. By addressing gender gaps in financial inclusion and fostering comprehensive financial socialization, countries can catalyse economic empowerment, reduce systemic inequalities, and lay the foundation for a more inclusive and sustainable future.

LITERATURE REVIEW

Contemporary research indicates that parents significantly influence financial socialization during adolescence, shaping financial knowledge, attitudes, and behaviours that persist into young adulthood (Shim et al., 2009¹⁸). These foundational financial habits and attitudes, cultivated early in life, play a crucial role in shaping future leadership and decision-making capabilities. Consequently, gender diversity on corporate boards, which brings varied perspectives and experiences, has been positively associated with enhanced environmental management systems and greater transparency in disclosure (Arora & Aliani, 2023¹⁹; Liu, 2018²⁰; Rehman et al., 2020²¹). This evidence highlights that increasing women's representation in leadership roles not only fosters gender equality but also drives improvements in corporate governance and sustainability practices (Arora & Aliani, 2023). Several studies have demonstrated that women's participation in Self-Help Groups (SHGs) has led to significant benefits, including enhanced access to information, such as knowledge about their rights and entitlements. Furthermore, it has fostered enhanced participation in decision-making processes related to asset acquisition, elevated their social status, increased mobility, and contributed to higher levels of overall empowerment (Raghunathan et al, 2023²²).

Financial Socialization Theory offers valuable insights into women's financial behaviours, habits, and outcomes. Studies have demonstrated that family financial socialization processes significantly influence women's financial literacy, self-efficacy, and empowerment (Ali et al., 2021; Lebaron & Kelley, 2020²³), as found by Ali et al.

(2021) in the context of Saudi Arabia, a traditionally male-dominated society. This underscores the critical role of financial socialization in fostering women's financial well-being, particularly in cultures in which women often have limited control over economic resources. Notably, gender differences in financial socialization emerge early in life. Research has revealed that girls experience distinct financial socialization compared to boys, with a strong influence from same-sex parents. For example, girls are over 200% more likely to save a portion of their pocket money when accompanied by their mothers during spending decisions, as opposed to having no parental presence. These findings highlight the importance of family, especially parental roles, in shaping women's financial attitudes, knowledge, and behaviours. Recognizing these gender-specific socialization processes can guide the development of targeted financial literacy programs and interventions to promote women's financial empowerment and well-being (Ali et al., 2018²⁴; Ali et al., 2021).

The existing literature reveals a notable gap in bibliometric studies on self-help groups (SHGs) and women's financial socialization. This study aims to bridge this gap by conducting a comprehensive bibliometric analysis coupled with a systematic literature review to explore the research landscape surrounding women's financial socialization through SHG participation. This systematic review highlights the pivotal role of women in the SHGs and their broader contributions to the financial socialization process. Additionally, this study examines significant scholarly contributions, identifies key trends, and uncovers emerging research areas, providing valuable insights and directions for future research in this domain.

This study addresses five key research questions to explore the landscape of Self-Help Groups (SHGs) and their role in the financial socialization of women.

1. **RQ₁**: What are the characteristics and emerging trends associated with the role of SHGs in facilitating women's financial socialization?
2. **RQ₂**: Which journals, authors, countries, and institutions have been the most influential in advancing research on SHGs and women's financial socialization?
3. **RQ₃**: Who are the most prolific contributors in terms of article volume, the most cited authors, and what collaborative networks exist among them?
4. **RQ₄**: What are the mature and emerging themes in this research area, and what is the conceptual structure linking SHGs and women's financial socialization?

5. **RQ₅:** Can a comprehensive framework be designed for the financial socialization of women in SHGs, encompassing principal dimensions and their associated indicators?

These research questions aim to provide a systematic understanding of academic contributions, collaboration networks, thematic structures, and practical frameworks in the study of SHGs as agents of financial empowerment for women.

DESIGN OF THE STUDY AND RESEARCH METHODOLOGY

The structure of the paper is as follows: Section 2 provides a comprehensive review of the existing literature on the contribution of women's Self-Help Groups (SHGs) to women's financial socialization. Section 3 details the research methodology and the approach adopted in this study. Section 4 presents the findings derived from the bibliometric analysis and systematic review. Section 5 proposes directions for future research, and Section 6 offers concluding remarks.

Design and Methodology: The data for this study were sourced from the Web of Science (WOS) database using the search string “Financial Socialization of Women” and “Women Self-Help Group Members”. To form a bibliometric analysis, this study covers a two-decade period, from 2004 to September 4, 2024. The initial search yielded a total of 396 documents. Articles and book reviews from disciplines such as business, finance, management, family studies, social sciences, and economics were included, whereas papers from science and related fields were excluded. Figures 1 and 2 illustrate the methodology and provide a step-by-step outline of the processes used to address the research questions, respectively. Analysis was conducted using Bibliometrix software R (Biblioshiny) and VOSviewer.

Fig. 1: Research Design – Retrieval of Data

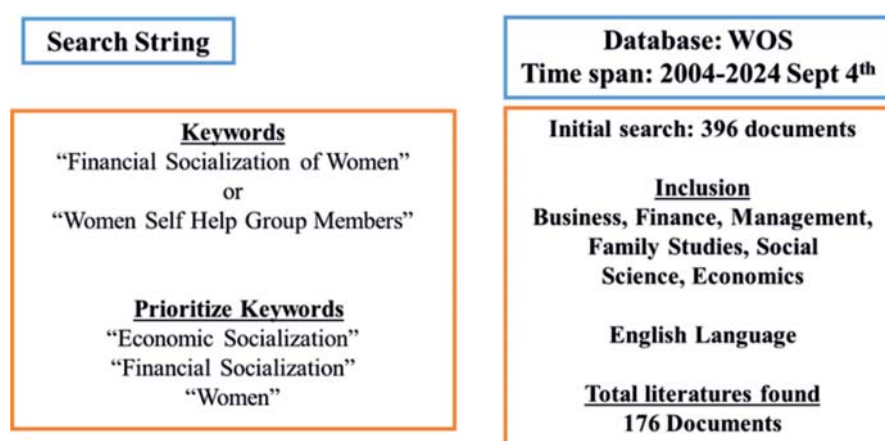
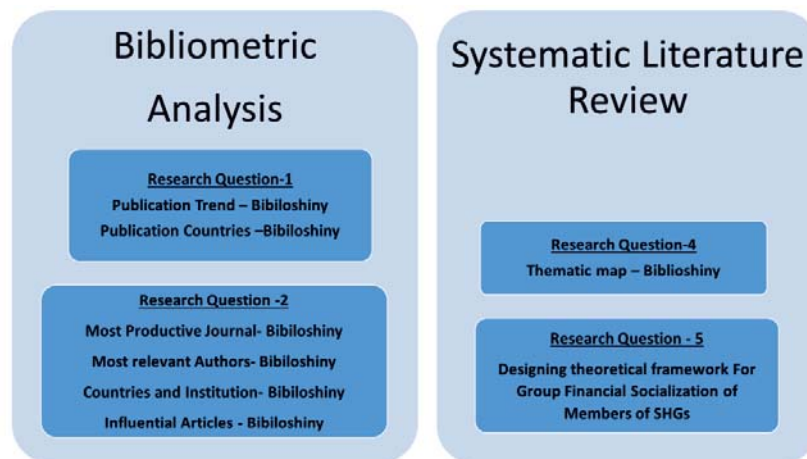


Fig. 2: Research Design – Methods and Tools of Analysis



DISCUSSION

a. Results of the Bibliometric Analysis:

The first and most crucial step in the review research involves gathering and synthesizing findings from the existing literature. Traditionally, structured literature reviews and meta-analyses have been conducted for this purpose (Zupic & Cater, 2015¹). However, bibliometric analysis offers a more comprehensive approach to evaluating scientific information. It facilitates the description, assessment, and monitoring of the published literature on a given theme. By employing this methodology, researchers can examine topics of interest, related documents, social networks, influential publishers, and key articles.

The present study utilized bibliometric analysis to explore and analyse a substantial body of scientific data within a specific field, identifying both well-researched and emerging areas (Donthu et al., 2021²). This approach not only highlights the critical research domains and quality of studies but also tracks the thematic evolution among scholars. Bibliometric analysis serves as a valuable tool for guiding future research endeavours, enabling researchers to identify suitable publication outlets, significant publications, prominent authors, and trending research topics based on citation patterns and hotspots (Agbo et al., 2021³). Descriptive overview of publications focusing on Self-Help Groups (SHGs) and women's empowerment is detailed in table 1.

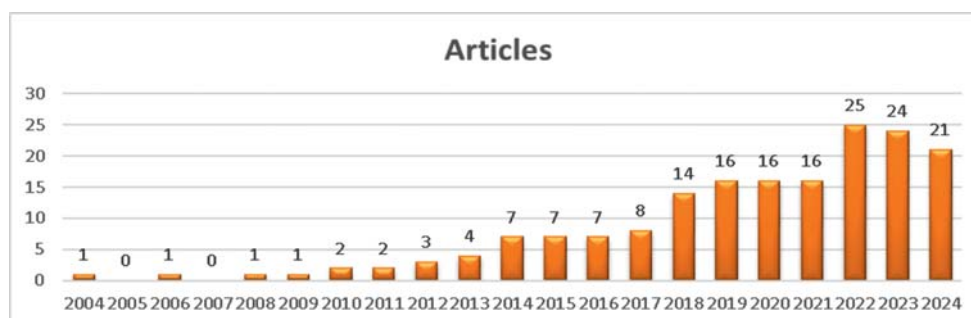
Table - 1: Descriptive Overview of Selected Publication on Socialization of Women and Women SHG Members

Description	Criteria	Results
Main Information about Data	Time Span	2004 to 4th Sept 2024
	Sources	116
Sources (Journals, Books, etc.)	Documents	176
	Average Citations Per Document	19.48
	References	9880
Document Types	Article	162(92%)
	Book Chapter	1
	Early Access	7(4%)
	Proceedings Paper	1
	Review	5(3%)
Document Contents	Keywords Plus (ID)	606
	Author's Keywords (DE)	608
Authors	Authors	511
	Authors Of Single-Authored Documents	31
Authors Collaboration	Single-Authored Documents	31
	Co-Authors Per Document	3.03
	International Co-Authorships (in %)	30.11

Source: Biblioshiny

A total of 176 publications on the topic of “Financial Socialization of Women” and “Women SHG Members” were retrieved from the Web of Science (WOS) database for the period from 2004 to September 4, 2024. As shown in Table 2, these publications comprised of 162 (92%) research articles, five (4%) review articles, five (3%) books, one book chapter, and (4%) early-access publications. The research field involved 511 authors, with 176 papers across 116 different journals.

Fig. 2: Distribution of Articles over the year 2004 to September-2024



Source: Biblioshiny

b. The Most Productive Sources

Table 3 highlights the ten most productive journals in the field of financial socialization of women and female SHG members. Among these, the Journal of Family and Economic Issues, published by Springer Link, ranks the most prolific, contributing nine articles. The journal boasts an h-index of 4 and a total citation count of 71, reflecting its significant influence in this research domain.

Table 2: Top 10 most Productive Journals on Financial Socialization of Women SHG Member

Source	TP	TC	H index	The most cited article on “Financial Socialization” & “Women SHG members”	PY Start
Journal of Family and Economic Issues	9	71	4	Family financial socialization: Theory and critical review	2014
Journal of Consumer Affairs	7	37	3	Financial literacy among the young	2016
World Development	6	161	4	Americans' financial capability	2019
Journal of Interpersonal Violence	5	116	5	Changes in help seeking from peers during early adolescence: Associations with changes in achievement and perceptions of teachers.	2017
Journal of Family Issues	4	47	4	Governance and the Financial Crisis	2015
Psychology of Women Quarterly	4	73	4	Parental Perceptions of Children's Financial Socialization	2019
Journal of Consumer Affairs	3	86	3	Resources, agency, achievements: Reflections on the measurement of women's empowerment	2015
Emerging Adulthood	3	47	2	Protective prevention effects on the association of poverty with brain development	2020
American Behavioural Scientist	2	33	2	2017
Family Relations	2	65	2	Who takes the credit? Gender, power, and control over loan use in rural credit programs in Bangladesh	2008

NB.: TP-Total Publication; TC-Total Citation; PY- Publication Year

Source: Biblioshiny

c. Journal Impact Analysis

The influence of a journal within a field is assessed based on the number of publications it has produced and citations received by those publications. The journal with the highest citation count was considered to be the most impactful within the research theme. As shown in Table 4, World Development has emerged as the most significant journal in this domain, with the highest number of local citations, totalling 104.

Table 4: Journals with Articles with Citations and their Ranks

Rank	Sources	Articles	Rank	Sources	Articles
1	World Development	104	6	Journal of Consumer Affairs	74
2	Journal of Family and Economic Issues	95	7	American Sociological Revolution	55
3	Sex Roles	95	8	Journal Marriage Family	55
4	Journal of Business Ethics	85	9	Journal of Finance Economics	54
5	American Journal of Economic Review	78	10	Gender and Society	52

Source: Biblioshiny

d. Most Cited Articles

Citation analysis quantifies the number of times an article is cited by other authors to evaluate the impact of specific researchers. Table 5 presents the top ten most-cited articles on the Financial Socialization of Women and Women Self-Help Groups (SHGs). A research paper authored by Chelsea Liu, titled “Are Women Greener? Corporate Gender Diversity and Environmental Violations,” received the maximum number of citations, 305. In contrast, Brody et al. garnered the highest number of local citations for their work titled “Can Self-Help Group Programs Improve Women’s Empowerment? A Systematic Review,” with eight local citations. Table 5 presents the top 10 most cited articles on the “Financial Socialization of Women” and “Women Self-Help Groups (SHGs),” highlighting their local and global citation counts as well as the local-to-global citation ratio. The articles in this table cover a range of years, from 2009 to 2021, displaying evolving research on women’s empowerment through self-help groups and financial socialization.

1. “Can self-help group programs improve women’s empowerment? A systematic review” by Brody et al. (2017) leads the list with eight local citations (LC) and 83 global citations (GC), resulting in Local Citations (LC)/Global Citations

(GC) ratio of 9.64%. This indicates a relatively higher local impact than its global influence.

2. Chelsea Liu's paper "Are Women Greener? Corporate Gender Diversity and Environmental Violations" (2018) received the highest number of global citations, at 305, with only four local citations. Its LC/GC ratio was 1.31%, suggesting that it has a far greater international impact than its local influence.
3. Finally, Swain and Wallentin's 2012 paper "Factors empowering women in Indian self-help group programs" also garnered two local citations and 36 global citations, with an LC/GC ratio of 5.56%.
4. In the article "The power of the collective empowers women: Evidence from self-help groups in India" by Kumar et al. (2021), the authors report three local citations and 46 global citations, with an LC/GC ratio of 6.52%.
5. Kumar et al.'s 2019 article "Social networks, mobility, and political participation: The potential for women's self-help groups to improve access and use of public entitlement schemes in India" has 4 local citations and 55 global citations, with a LC/GC ratio of 7.27%.
6. Ranjula Bali Swain and Fang Yang Wallentin's 2009 article, "Does Microfinance empower Women? Evidence from self help groups in India," is another influential work in the field, with 6 local citations and 151 global citations. The LC/GC ratio was 3.97%, suggesting that while the article is highly cited globally, its local impact is relatively small.
7. The study "Gender differences in financial socialization in the home-An exploratory study" by Agnew, Maras, and Moon (2018) further contributes to the understanding of financial socialization, with 4 local citations and 22 global citations, giving it a 18.18% LC/GC ratio.
8. Vosylis and Erentaitė's study (2020) "Linking Family Financial Socialization with Its Proximal and Distal Outcomes" follows with 3 local citations and 28 global citations, yielding a LC/GC ratio of 10.71%.
9. Which Factors Play a role in empowering women? A Study of SHG Members from India" by Banarjee and Gosh (2012) has two local citations and 15 global citations, with an LC/GC ratio of 13.33%.
10. "Women's Autonomy and Subjective Well-Being: How Gender Norms Shape the Impact of Self-Help Groups in Odisha, India" by De Hoop et al. (2014) also stands out, with 4 local citations and 23 global citations. The LC/GC ratio of 17.39% indicates a relatively stronger local influence.

Table-5: Top 10 Most cited articles on “Financial Socialization of Women” and “Women SHG members”

Rank	Title of Article	DOI	Year	Citations		LC/GC Ratio (%)	Authors
				Local (LC)	Global (GC)		
1	Can self-help group programs improve women's empowerment? A systematic review	10.1080/19439342.2016.1206607	2017	8	83	9.64	Brody, C., Hoop, T. De, Vojtkova, M., Warnock, R., Dunbar, M., Murthy, P., & Dworkin, S. L.
2	Does microfinance empower women? Evidence from self-help groups in India	10.1080/02692170903007540	2009	6	151	3.97	Ranjula Bali Swain, Fang Yang Wallentin
3.	Women's Autonomy and Subjective Well-Being: How Gender Norms Shape the Impact of Self-Help Groups in Odisha, India	10.1080/13545701.2014.893388	2014	4	23	17.39	De Hoop, T., Van Kempen, L., Linssen, R., & Van Eerdewijk, A.
4.	Gender differences in financial socialization in the home- An exploratory study	10.1111/jcs.12415	2018	4	22	18.18	Steve Agnew, Param Maras, & Amy Moon
5	Are Women Greener? Corporate Gender Diversity and Environmental Violations	10.1016/j.jcorpfin.2018.08.004	2018	4	305	1.31	Chelsea Liu
6.	Social networks, mobility, and political participation: The potential for women's self-help groups to improve access and use of public entitlement schemes in India	10.1016/j.worlddev.2018.09.023	2019	4	55	7.27	Neha Kumar, Kalyani Raghunathan, Alejandra Arrieta, Amir Jilani, Suman Chakrabarti, Purnima Menon, & Agnes R Quisumbing
7	Linking Family Financial Socialization with Its Proximal and Distal Outcomes: Which Socialization Dimensions Matter Most for Emerging Adults' Financial Identity, Financial Behaviours, and Financial Anxiety?	10.1177/2167696819856763	2020	3	28	10.71	Rimantas Vosylis & Rasa Erentaitė

8	The power of the collective empowers women: Evidence from self-help groups in India	10.1016/j.worlddev.2021.105579	2021	3	46	6.52	Neha Kumar, Kalyani Raghunathan, Alejandra Arrieta, Amir Jilani, Suman Chakrabarti, Purnima Menon, & Agnes R Quisumbing
9	What Factors Play a Role in Empowering Women? A Study of SHG Members from India	10.1177/0971852412459431	2012	2	15	13.33	Tanmoyee Banarjee & Chandrelekha Gosh
10	Factors empowering women in Indian self-help group programs	10.1080/02692171.2011.595398	2012	2	36	5.56	Ranjula Bali Swain, & Fang Yang Wallentin
11	Spending Today or Saving for Tomorrow: The Influence of Family Financial Socialization on Financial Preparation for Retirement	10.1007/s10834-013-9363-2	2014	2	28	7.14	Payne, S.H., Yorgason, J.B. & Dew, J.P.
12	Women Empowerment Through Self-Help Groups: The Bittersweet Fruits of Collective Apple Cultivation in Highland Ethiopia	10.1080/19452829.2018.1454407	2018	2	33	6.06	Alemu, S. H., Van Kempen, L., & Ruben, R.
13	Economic, Sociological, and Psychological Factors of the Saving Behaviour: Turkey Case	10.1007/s10834-018-09606-y	2019	2	21	9.52	Copur, Z., & Gutter, M.S
14	Investigating the Disconnect between Financial Knowledge and Behaviour: The Role of Parental Influence & Psychological Characteristics in Responsible Financial Behaviours among Young Adults	10.1111/joca.12069	2015	1	57	1.75	Ning Tang, Andrew Baker, & Paula C. Peter
15	Persistence Is Cultural: Professional Socialization and the Reproduction of Sex Segregation	10.1177/0730888415618728	2016	1	118	.85	Seron, C., Silbey, S. S., Cech, E., & Rubineau, B.

Source: Biblioshiny

e. Institutional Affiliation Analysis

The top 10 institutions collectively contributed to 27 articles. Table 6 presents an analysis of institutional affiliations contributing to research on the *Financial Socialization of Women* and *Women Self-Help Groups (SHGs)*, highlighting the number of documents, citations, and link strength of each institution. The American Institute of Research (USA) leads with 3 documents, 108 citations, and a total link strength of 25, followed by the International Food Policy Research Institute (India), with four documents, 108 citations, and a link strength of 21. Other notable contributors include Radboud University Nijmegen (the Netherlands), BI Norwegian Business School (Norway), and Uppsala University (Sweden), each with two documents and 187 citations, along with a link strength of 12. Ohio State University and the University of Georgia (USA) have four documents and moderate citations (54 and 19, respectively), with a link strength of 9. Institutions such as Massachusetts University (USA), Population Council (India), and the University of Minnesota Twin Cities (USA) show smaller contributions in terms of documents, citations, and link strength, with the Population Council having the lowest citation count at 3.

Table 6: Top Ten Institutional Affiliation

Rank	Organization	Documents	Citations	Country	Total Link Strength
1	American Institute of Research	3	108	USA	25
2	International Food Policy Research Institute	4	108	India	21
3	Radboud University Nijmegen	2	56	Netherlands	13
4	BI Norwegian Business School - Oslo campus	2	187	Norway	12
5	Uppsala University	2	187	Sweden	12
6	Ohio State University	4	54	USA	9
7	University of Georgia	4	19	Georgia	9
8	Massachusetts University	2	47	USA	8
9	Population Council	2	3	India	6
10	University of Minnesota Twin Cities	2	12	USA	6

Source: Biblioshiny

f. Most Productive Country

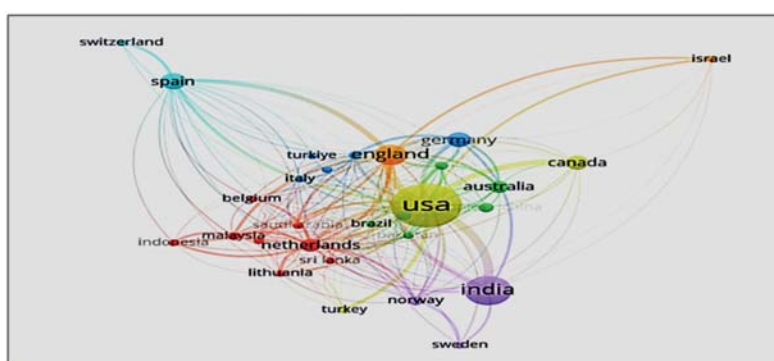
Table 7 presents the top 10 countries that contributed to the research area of “Financial Socialization of Women” and “Women Self-Help Group (SHG) members” This analysis

reveals that the United States holds the first position, contributing 80 documents with 1888 citations. India ranked second, with 35 documents and 256 citations. While the United States has been a major contributor to research in this field, countries such like India, Norway, and Australia require further exploration in this area. Bibliographic coupling is used to measure the similarity between documents by analysing their citations, helping to identify conceptual similarities. It shows the relationships between documents by examining which documents are cited in the bibliographies of other documents from the top ten countries. The social networks among the countries and authors in similar fields were analysed using this technique. In the figure, the connecting lines between nodes show the relationships, with larger nodes representing countries with the most connections. As shown in Fig3, USA had the most connections, followed by India. Although fewer documents have been published in this field in India, the country exhibits more link strength, indicating a collaborative approach to this research area.

Table 7: Top Countries with Document Production

Country	Documents	Citations	Average citation per document	Total Link Strength
USA	80	1888	23.6	52
India	35	253	7.2	36
England	17	270	15.9	26
Netherlands	7	293	41.9	16
Norway	4	353	88.3	13
Australia	6	334	55.7	5
Germany	9	169	18.8	5
New Zealand	3	210	70.0	5
Spain	11	126	11.5	5

Fig. 3: Bibliographic coupling of the 29 countries having 254 links and 7 clusters

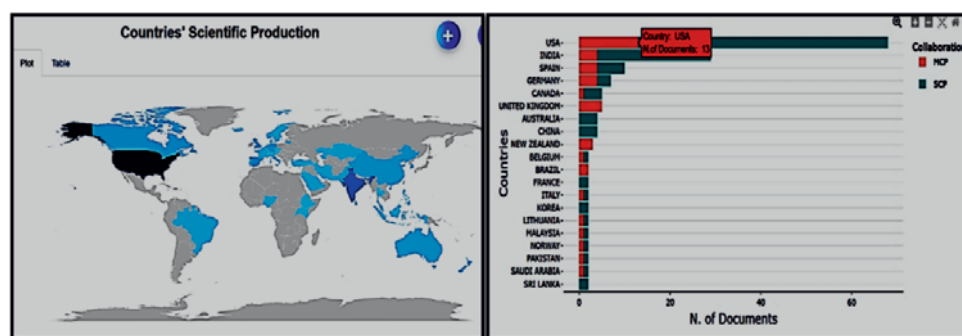


Source: Network Diagram by Vosviewer

g. Country Scientific Production Map

Figure 4 visually represents the country contributing to the maximum number of documents highlighted in blue. According to data retrieved from the Web of Science database, the top 10 contributing countries in the area of ‘Financial Socialization of Women’ and ‘Self-Help Groups (SHGs)’ are as follows: the USA leads with 176 documents, followed by India with 56, Spain with 23, the UK with 23, Canada with 16, and Germany with 15. This visual representation helps clearly identify the global distribution of research contributions in this field, with the USA being the dominant contributor.

Fig. 4: Country Scientific Production Map and its Graphical Representation



Source: Biblioshiny

h. Author Impact Analysis

Table 8 highlights the top 10 authors with the maximum number of research documents in the field of *Financial Socialization of Women* and *Self-Help Groups (SHGs)*. Among these, Kumar Neha and Raghunathan K, both affiliated with the International Food Policy Research Institute (USA), share the highest contributions, each having four documents with an h-index of three and a total citation (TC) of 108. Other notable authors include Arrieta A from the University of Washington (USA), with two publications and 101 citations, and Cech E from Rice University (USA), which has an impressive h-index of two with 196 citations. De Hoop Thomas, affiliated with the American Institutes for Research (USA), contributed three documents and earned 108 citations. Authors such as Gupta Shivani (USA), Jilani Amir (Philippines), Megías Ji (Spain), Menon P (USA), and Brian Rubineau (USA) have also made valuable contributions, with two publications each. The data reveal a concentration of research as efforts from the USA, with a few contributions from other countries, such as the Philippines and Spain. The h-index and average citations per document (AC) further highlight the impact of these authors in the research community.

Table 8: Top 10 Authors with Maximum Number of Research Documents

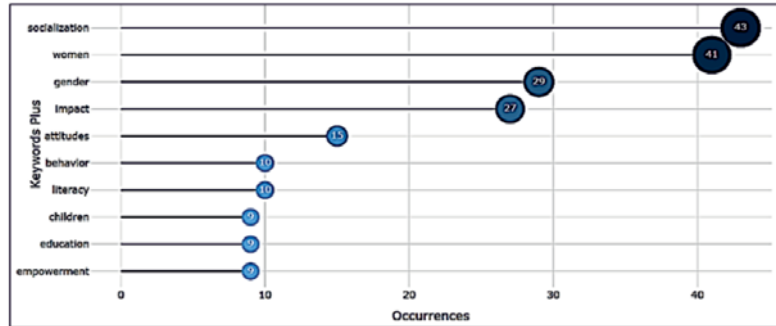
Author	Affiliation	Country	H index	TC	NP	AC
Kumar Neha	International Food Policy Research Institute	USA	3	108	4	27.0
Raghunathan K	International Food Policy Research Institute	USA	3	108	4	27.0
Arrieta A	University of Washington, Department of Health Metrics Sciences, USA	USA	2	101	2	50.5
Cech E	Rice University, Houston, TX, USA	USA	2	196	2	98.0
De Hoop Thomas	American Institutes for Research, International Development, Evaluation, and Research, Washington, USA	USA	2	108	3	36.0
Gupta Shivani	Dept. of Agricultural and Applied Economics, University of Georgia, Athens, GA, USA	USA	2	7	2	3.5
Jilani Amir	Asian Development Bank, Manila, Philippines	Philippines	2	101	2	50.5
Megías Ji	University of Granada: Granada, ES	SPAIN	2	28	2	14.0
Menon P	International Food Policy Research Institute	USA	2	62	3	20.7
Brian Rubineau	McGill University	USA	2	196	2	98.0

Source: *Biblioshiny*

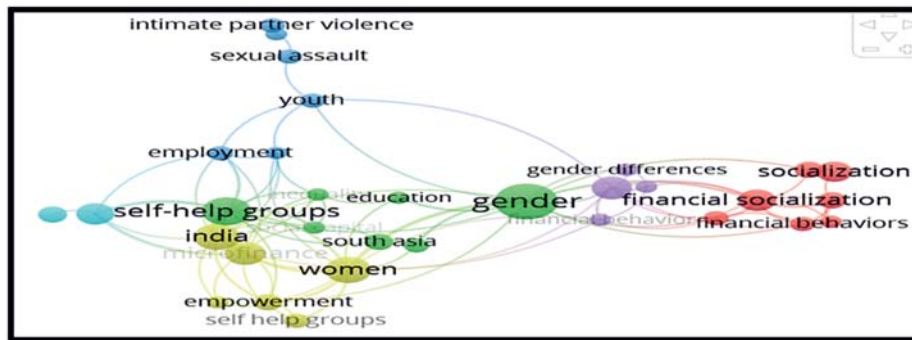
i. Analysis of Keywords

Keyword analysis focuses on identifying and examining the frequency, relationships, and significance of specific terms within the literature. It highlights research trends, core topics, and emerging areas by analyzing keyword co-occurrence (Agbo et al., 2021). This method helps to map thematic structures, discover associations between concepts, and understand the evolution of disciplines. Networks formed from keyword analysis depict connections between terms, with stronger links indicating closer thematic relationships, offering valuable insights for understanding trends and patterns in fields, such as financial socialization. The most common indexed keywords used in 176 documents on “Financial Socialization, SHGs, and women empowerment” in the WOS Database three times or more were considered for analysis. The highest occurrence of the keywords, as depicted in Fig. 5, was socialization (43 occurrences), women (41), and gender (29). Eight clusters, identified by colours, such as like red, green, yellow, purple, and blue, were found in the keyword co-occurrence network.

Fig.5: Occurrence of the Keywords



Source: Biblioshiny



Source: Biblioshiny

Fig.6: Keyword Co-occurrence Network

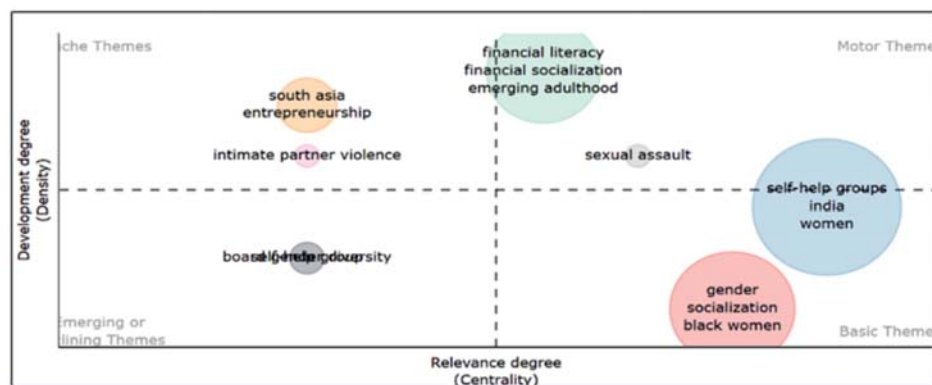
In the visualization (Figure 6), circle size indicates keyword frequency, and line darkness and proximity show stronger correlations. Each colour represents a key thematic area. This keyword co-occurrence analysis uncovered a complex network of research topics within financial socialization, showcasing key themes and their interconnections. The various clusters and their keywords provide a thorough overview of this multifaceted research field.

1. **Red Cluster:** Contains keywords such as socialization and financial behaviour, reflecting variables linked to financial socialization.
2. **Green Cluster:** Includes terms such as education, and South-Asia, focusing on gender and SHGs.
3. **Purple Cluster:** Features keyword Gender difference, highlighting supportive factors related to gender and financial socialisation.
4. **Blue Cluster:** Comprises terms such as employment, and youth, which are related to SHGs, Gender and Financial socialisation.

j. Thematic Mapping of Keywords

The thematic analysis of financial socialization within Self-Help Groups (SHGs) is depicted in Figure 7, covering the research period from 2004 to 2024. In this analysis, 100 keywords were considered, with each keyword appearing at least five times. Word frequency and label size were set accordingly to highlight key topics in the field.

Fig. 7: Thematic Mapping of Keywords



Source: Biblioshiny

The analysis constructs a thematic map of studies on SHGs and women's financial socialization, offering valuable insights to early career researchers and stakeholders about emerging research opportunities and directions.

1. A co-word analysis of authors' keywords was employed to develop the thematic map using density and centrality as axes to categorize themes into four quadrants. Quadrant 1, known as the Motor Theme, includes well-established research areas characterized by high centrality and density. Key terms in this quadrant include financial literacy, financial socialization, emerging adulthood, sexual assault, and Self-Help Groups. An additional cluster within this quadrant encompasses keywords such as self-help group, sexual assault, article, female, human, adult, and human experiments.
2. Quadrant 2 (Niche Theme) is currently devoid of keywords, indicating a lack of strong, emerging themes in this area.
3. Quadrant 3 (Peripheral Theme) features emerging and declining themes that show broad gender diversity and heterogeneity, indicating evolving fields of research.

4. Finally, Quadrant 4 (Transversal or Basic Themes) represents areas with high centrality but low density, with key terms such as gender socialization and black women.

This thematic analysis provides a comprehensive understanding of the current landscape of financial socialization in SHGs, offering insights into established research areas and highlighting potential avenues for future exploration.

k. Co-citation Analysis

Co-citation analysis involves examining pairs of publications referenced in the same source articles. Distinct clusters emerge when multiple authors cite the same pairs of papers-cited works within these clusters typically share a common theme. Figure 8 presents a co-citation network of cited authors, employing a minimum threshold of 10 citations per author. The network illustrates the connections between authors that meet this threshold, highlighting the most significant link strengths.

Table 9: Top 20 Authors, their Citations and Citation Link Strength

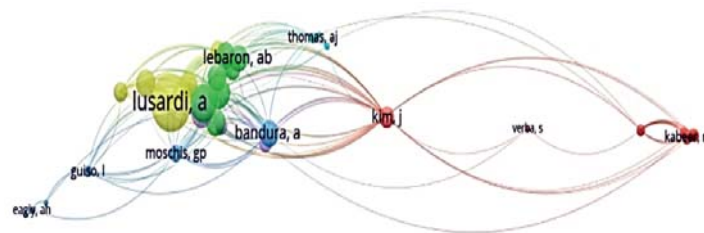
Author	Citations	Total link strength	Author	Citations	Total link strength
Lusardi, A	65	554	Chen, H	12	142
Shim, S	23	277	Arnett, J J	16	127
Gudmunson, C G	19	211	Agnew, S	10	117
Danes, SM	20	206	Kim, J	14	116
Bucher-Koenen, T	13	175	Klapper, I	11	102
Xiao, J J	18	168	Ajzen, I	10	87
Serido, J	13	167	Moschis, G P	10	85
Lebaron, AB	17	166	Norvilitis, J M	11	79
Bandura, A	28	163	Kabeer, N	21	57
Jorgensen, B L	13	157	Swain, R B	14	54

Source: VoSViewer

Table 9 presents the top 20 authors in the field of financial socialization, highlighting their citation counts and link strengths. Among the leading authors, Lusardi, A stands out with the highest number of citations (65) and total link strength (554), indicating a significant influence and strong network of related research. Other prominent authors include Shim, S (23 citations, 277 link strength), Gudmunson C G, 19 citations, 211 link strength), and Danes, SM (20 citations, 206 link strength), who also have substantial citation counts and linkages in the field. The citation link strength reflects how frequently these authors' works are interconnected with others in the research network, showing

their centrality and contribution to academic discourse. Authors like Kabeer N and Swain RB, with lower citation and link strength, still contribute to the diversity of topics, indicating a broader, less central, but notable presence in specific areas of research. This analysis underscores the dominance of a few key researchers and highlights emerging scholars in the field.

Fig. 9: Co-citation Analysis



Source: VoSViewer

a) **Clusters (Communities):** There are distinct clusters of nodes (e.g., red, blue, green, and purple) that likely represent groups of entities with stronger interconnections within the cluster than with others. These clusters signify specific research areas, topics, or co-authorship networks.

b) **Prominent Nodes (Hubs):** Nodes such as *Lusardi, A* (yellow cluster) and *Kabeer, N* (red cluster) are larger and more centrally located within their respective clusters, suggesting that they are highly influential or connected. This might indicate that they are frequently cited or collaborate extensively.

Inter-Cluster Connections: The visible links between clusters, such as between *Lusardi, A* (Yellow) and *Kabeer, N* (red), which indicate cross-disciplinary influences or collaboration across research areas.

a) **Peripheral Nodes:** Potential Interpretations are followed below:

b) **Core Authors or Influencers:**

- i. Authors like *Lusardi, A* and *Kabeer, N* might be key figures in research related to financial socialization or related themes. Their prominence is worth further exploration in the literature review.
- ii. **Disciplinary Divides or Thematic Groups:** The distinct clusters might correspond to different research subfields (e.g., behavioural finance, gender studies, sociology). Understanding the thematic focus of each cluster can help framing literature review

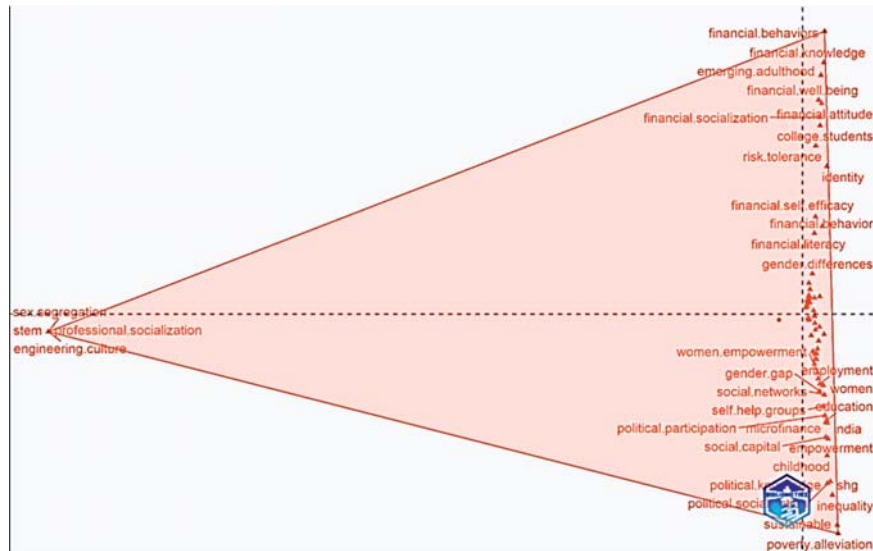
- iii. Collaboration Patterns:** Dense intra-cluster connections suggest collaborative or thematic concentration, whereas sparse inter-cluster connections might indicate emerging interdisciplinary work.

FINANCIAL SOCIALIZATION OF WOMEN SHG MEMBERS: CONCEPTUAL MAPPING

Financial socialization and self-help groups (SHGs) have emerged as significant areas of research, with several mature and emerging themes including parental influence, attachment insecurity, locus of control, and financial communication. Studies have shown that increased attachment insecurity predicts decreased financial communication from parents and lower perception of internal locus of control (Jorgensen et al., 2016)¹. Parental teaching methods, such as modelling, discussion, and experiential learning, play crucial roles in shaping the financial behaviours of emerging adults (Lebaron et al., 2018)². The multidimensional nature of family financial socialization practices and their effects on financial identity, behaviours, and anxiety have also been explored (Vosylis & Erentaitė, 2019)³. For SHGs, mature themes include their roles in women's empowerment, microfinance, and community development. SHGs have been found to undertake collective actions for public goods provision within village communities, thereby influencing local governance (Casini et al., 2015)⁴. They also serve as a platform for micro-entrepreneurs to address sustainability issues (Chatterjee et al., 2018)⁵. Emerging themes in financial socialization include financial capability, financial inclusion, the gender gap, tax and insurance literacy, and digital financial education (Goyal & Kumar, 2020)⁶. For SHGs, emerging themes involve the development of federations to provide essential services and ensure sustainability (Nair, 2005)⁷.

The conceptual structure linking SHGs and the financial socialization of women can be understood through the lens of the social cognitive theory. Financial literacy and socialization play crucial roles in developing financial self-efficacy, financial coping behaviours, and ultimately, financial empowerment among women (Ali et al., 2021). This structure is particularly relevant in traditionally male-dominated societies, where women's financial empowerment faces unique challenges. In conclusion, research on SHGs and the financial socialization of women reveals a complex interplay of personal, familial, and societal factors. Future research could focus on integrating these themes to develop comprehensive models of financial empowerment and explore cultural variations in the financial socialization processes.

Fig. 10: Conceptual Structure Map



Source: Biblioshiny

Women’s self-help groups (SHGs) play a significant role in promoting group socialization and empowerment among rural women in developing countries (Kumar N et al. 2021)¹. These groups serve as platforms for economic activities, social interactions, and collective action, which lead to various positive outcomes. SHGs has been shown to enhance women’s social capital and foster group cohesion. The economic ties formed within these groups contribute to the development of social networks and normative influence among members (Sanyal, 2009)². This increased social capital enables women to undertake collective action and provide public goods within their communities (Casini et al., 2015). The group structure of SHGs provides a space for women to share information, raise awareness about their rights, and collectively negotiate for more “room to manoeuvre” in the community (Alemu et al., 2018).

However, various factors can influence the effectiveness of SHGs in promoting group socialization and empowerment. The maturity of the group, socioeconomic conditions, and existing social capital play crucial roles in determining the success of SHG interventions (Nichols, 2021). Additionally, underlying gender and cultural norms may affect women’s ability to actively participate in groups and fully benefit from their empowerment potential (Mudege et al., 2015). Although SHGs have shown positive effects on economic and political empowerment, women’s mobility, and control over family planning (Brody et al., 2016), their impact on psychological empowerment and household-level dynamics may be limited or even negative in some cases (Alemu et al., 2018).

A research framework for the financial socialization of women in Self-Help Groups (SHGs) can be designed based on the following principal dimensions and indicators:

a) Family Financial Socialization

- i. Direct parental teaching on money management (Vosylis & Erentaitė, 2019³)
- ii. Openness about family finances (Vosylis & Erentaitė, 2019)
- iii. Participation in financial decision-making at the household level (Pal et al., 2021)
- iv. Anticipatory socialization during adolescence (Shim et al., 2009)

b) Group socialization

- i. Social interaction and networking (Brody et al., 2016⁴; Kumar et al., 2021)
- ii. Sense of belonging and mutual support (Brody et al., 2016)
- iii. Belonging and mutual support (Brody et al., 2016).
- iv. Involvement in community affairs (Brody et al., 2016; Kumar et al., 2021).

c) Economic Empowerment

- i. Earning status (Pal et al., 2021)
- ii. Access to formal bank accounts (Pal et al., 2021)
- iii. Participation in microfinance programs (Mohapatra & Sahoo, 2016)
- iv. Financial independence (Sharma & Das, 2021)⁵

d) Social and Human Empowerment

- i. Education level (Hossain, 2015)⁶
- ii. Autonomy in movements (Hossain, 2015)
- iii. Social freedom and access to utilities (Sharma & Das, 2021)
- iv. Participation in social welfare schemes (Pal et al., 2021)

e) Financial Literacy and Knowledge

- i. Subjective financial knowledge (Deenanath et al., 2019)⁷
- ii. Financial behaviour (Deenanath et al., 2019)

- iii. Understanding financial concepts and products (Sarpong-Kumankoma et al., 2023)⁸
- iv. Access to financial information and education (Sarpong-Kumankoma et al., 2023)

f) Technology Integration

- i. Access to digital platforms for market expansion (Akpuokwe et al., 2024)⁹
- ii. Use of technology for financial education and services (Akpuokwe et al., 2024)
- iii. Leveraging digital tools for business growth (Akpuokwe et al., 2024)

This framework integrates various aspects of financial socialization and women's empowerment, addressing both individual and environmental factors. It is important to note that the effectiveness of this framework may vary across different cultural and socio-economic contexts, and implementation should consider local needs and constraints (Arshad, 2023¹⁰; Mohapatra & Sahoo, 2016¹¹). This multidimensional framework aims to foster comprehensive financial socialization for women in SHGs, promoting their economic independence, social empowerment, and financial literacy. By addressing these key dimensions, the framework can contribute to overall women empowerment and sustainable development in rural communities (Akpuokwe et al., 2024; Arshad, 2023).

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