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Conference Proceedings of

10th REMSONS INTERNATIONAL RESEARCH CONFERENCE

On

Empowering Transformational Change in Business Landscape

31 AUGUST, 2024

Volume 10, August 2024 ISBN 978-93-5196-952-5

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Shri Ashok Saraf

President RSET, Chairman DSIMS & DSGS

President RSET and Chairman DSIMS and DSGS, Mr. Ashok Saraf, delivered the Presidential Address. He highlighted RSET's role in shaping more than 60,000 students. He reminisced about his father's (Shri Mahavirprasad Saraf) vision in establishing DSIMS to provide quality education through skill development initiatives. Mr. Saraf also addressed the role of Artificial Intelligence (AI) in shaping students' futures, acknowledging both the challenges and strategies to overcome them through business education.

Excerpts of Keynote Speech

Mr. Krishna Kejriwal (CMD, Remsons Industries Ltd.)

Chief Guest, Mr. Krishna Kejriwal, Chairman and Managing Director Remsons Industries Limited, delivered his insightful keynote speech. His address focused on the evolution of family businesses in India and the effect of globalization on it. He emphasized the shift towards professional structures in corporate management and the importance of adapting to dynamic environmental challenges. Some key words of the inaugural speech of Mr. Kejriwal were - automation, AI, data analytics in driving innovation and enhancing customer experiences, the shift towards customer-centric business models and personalized offerings. He cited example of Toyota's assembly line. He highlighted the importance of global market understanding and the need for flexible strategies in business. He stressed on the critical role of leadership in attracting and retaining talent, fostering emotional intelligence, and creating adaptable work environments. He concluded by narrating the evolution from intelligent leadership to collective leadership and collaborative culture for meaningful decision-making in today’s business world.

Report of Remsons Centre for Management Research (RCMR)

Dr. Sumana Chaudhuri (Chief Convener)

Presenting the Report of Remsons Centre for Management Research (RCMR) 2023-24, Dr. Sumana Chaudhuri mentioned that under the aegis of RCMR, the Institute faculty members have published several research articles in the Journals of National and International repute, listed in Scopus, ABS and ABDC indexed. Dr. Chaudhuri informed that RCMR has published Volume 6 Issue 1 of the ISSN Indexed Journal, 'The Management Quest', which consists of five peer-reviewed research papers and a book review.

Excerpts of Keynote Speech

By Guest of Honor

Dr. Sharad Kumar Saraf

CMD Technocraft Industries India Ltd
BoG Chairperson of IIT Mumbai & IIT Jammu

Dr. Sharad Kumar Saraf, Chairman and Managing Director of Technocraft Industries India Ltd & BoG Chairperson of IIT Mumbai and IIT Jammu, delivered a keynote address. He emphasised the importance of management education to keep the momentum up with India's *Amrit kaal* vision of *'Viksit Bharat'* and *'Atmanirbhar Bharat*,' while accentuating the importance of embracing technological change.

Dr. Sharad in his keynote speech covered several crucial aspects, including the definition of '*Empowerment'* in the business landscape as the ability to accept and implement transformational change. He cited examples of companies that failed to adapt to changing technologies, such as Polaroid and the advent of digital cameras. By sharing his personal experiences in embracing digital tools, he narrated the importance of being adaptable in the face of rapid technological advancements. He referred to Darwin's theory of evolution in the business world and emphasized that only the fittest can survive in a constantly changing environment and *Change* is the only constant parameter in the Universe. He lauded the role of MBA institutions which bestow different human values and principles and thereby prepare students to manage, lead and grow businesses in this evolving landscape.

From Editor's Desk

Dr. Sumana Chaudhuri

In the contemporary world, businesses confront a VUCA environment marked by volatility, uncertainty, complexity, and ambiguity, a term originally coined by the US Army War College post-Cold War era. Today, it aptly characterizes the modern business landscape. Thriving in this context demands agility, adaptability, and responsiveness. This broad management theory concept encompasses the capacity to swiftly seize market opportunities, sense environmental shifts, and adeptly respond to both imminent and latent challenges. It underscores the importance of detecting and analyzing threats and opportunities promptly, facilitating the adoption of necessary changes and actions. This calls for a complete recalibration of the business model leading to a transformation of the business strategy and processes.

The initial phase of business transformation entails assessing the necessity for change through a thorough analysis of the organization, market dynamics, and competitive landscape. Subsequently, companies formulate a vision, communicate it effectively, and empower stakeholders to enact it. This decision and planning phase serves as the cornerstone of the entire transformation process. Each step involves meticulous evaluation, underscoring the need for significant time and effort investment before implementation. To select and tailor transformations, companies must assess various alternatives across multiple criteria, considering the time available for decision-making. Rushed decisions can induce time stress, compromising decision quality, although research suggests swift strategic decisions can enhance business performance.

In this research conference, we aim to capture how companies have reshaped their operations during the pandemic and explore how factors such as decision-making speed, decision-making process structure, implementation process structure, and implementation scale influence the outcomes of these transformations.

Under the aegis of Remsons Centre for Management Research (RCMR), DSIMS and DSGS organized 10th Remsons International Research Conference (RIRC) on 31 August 2024. The conference was inaugurated by Shri Krishna Kejriwal, Chairman and Managing Director Remsons Industries limited and delivered his insightful inaugural speech. Keynote Speaker Dr. Sharad Kumar Saraf, CMD Technocraft Industries India Ltd, illuminated the audience with his thought provoking speech.

The 10th Remsons International Research Conference received good responses from academia and industry in terms of research paper contributions. After initial screening, based on merit, around 18 selected research papers by academicians, like Professors and Deans of various Management Institutes, research scholars and MBA students and by industry professionals had been presented in the Conference. The authors and participants deliberated and presented their perspectives on empowering

the stakeholders, embracing the rapidly evolving technology, and practicing the transformation strategies for sustainable business growth.

As a Session Chair, Prof. Dr. Pankaj Trivedi discussed the future research direction in the field of business and management.

Co-Convener Mr. Maneesh Gupta has beautifully summarized the proceedings of the research papers presented at the Conference.

Based on a fair evaluation by the Session Chair and blind reviewers, four papers of two different tracks were chosen as the Best Paper Awardees.

Conference Co-Convener Dr. Sunita Pujar and Ms. Pooja Goswami offered the vote of thanks respectively in the plenary session and in the afternoon session.

The Conference was a grand success, attracting authors, Ph.D scholars, paper presenters, and participants from Mumbai as well as other reputed Management Institutions and Universities, as well as industries across India. It has enabled academicians, researchers, and practicing managers to share their research findings, issues, concerns, doubts, and insights for the future vis-à-vis specific domains of knowledge and practice. We hope that the conference has not only provided a great intellectual and social interactive platform to the participants but also has given new perspectives from concrete facts. As a Chief Convener, I am deeply privileged to present the Conference Proceeding 2024 and hope that this compendium of research papers will be found useful by researchers, industry practitioners, and policymakers.

Paper Track

10th REMSONS INTERNATIONAL RESEARCH CONFERENCE
on
"Empowering Transformational Change in Business Landscape"

31 August 2024

11.20 AM to 1.30 PM

Session Chair - Dr. Pankaj Trivedi **Venue: 623**

SN	TIME	AUTHOR	TITLE
1	11.20 – 11.28 AM	MMahek Chhabria	Change in Leadership Style: Managing Gen Z Talent
2	11.30 – 11.38 AM	Charvi Hasmukh Shukla	Understanding The Impact Of Experiential Learning On Student's Learning Effectiveness: A Case-Based On Zillennials Student-Led Assessment Center
3	11.40 – 11.48 AM	Glancy Albuquerque & Rajeev Kamble	The Role of Financial Literacy in Promoting Gender Equality in the Workplace in Mumbai, India
4	12.00 – 12.08 PM	Moushumi Datta	COVID-19 Vaccine and Accessibility Issues Faced by People in Greater Mumbai
5	12.10 – 12.18 PM	Ravindra Dey	Influence Of Organizational Culture And Its Impact On Resilience Of Employees In An Organisation
6	12.20 – 12-28 PM	Samir Sham Keskar	The Role of Blockchain Technology in Transforming International Trade Facilitation
7	12.30 – 12.38 PM	Shubhangi Salokhe	Uncovering the Impact of Technology-driven Services on Boosting Farmer Producer Organizations (FPO) Growth
8	12.40 – 12.48 PM	Pankaj Kulkarni	Building a sustainable Brand
9	12.50 – 12.58 PM	Mansi Dangarwala	Internet of Things in Company Operations: Upside and Downside
10	01.00 – 01.08 PM	Nisha Dahiya	The Power of Narrative: Analysing the Role of Storytelling in Boosting Brand Value and Enhancing Consumer Engagement
11	01.10 – 01.18 PM	Amrita Aggarwal	Sectorial Analysis of Nutritional Intake by Women in Greater Mumbai
12	01.20 – 01.28 PM	Charvi Hasmukh Shukla	A Case Study Based on Dilemma Faced by Dadu's Canteen in the XLRI Jamshedpur Campus and Way Ahead

Lunch Break – 1.30. PM to 2.30 PM

Session - II

2.30 PM to 4.10 PM

SN	TIME	AUTHOR	TITLE
13	02.30 – 02.38 PM	Krunal Padiya & Chandrashekhar Kaushik	A study of customer perception and attitude toward protein supplements
14	02.40 – 02.48 PM	Jyotishree Mallela & Maneesh Gupta	Value at Risk Performance of Cryptocurrencies
15	02.50 – 02.58 PM	Sarthak P. Thakur	Environmental Degradation Due to the Rise of AI and Its Economic and Social Impacts
16	03.00 – 03.08 PM	Kritika Singh & Kusum Pawar	A Study on the Impact of Core Self-Evaluation on Work Engagement in Indian Railways
17	03.10 – 03.18 PM	M Ananya Prabhu, Bharathi & Caroleena Janefer	Customer Experience in Volatile Economic Conditions
18	03.20 – 03.28 PM	Manav Jha	A study on consumer perception of benefits of milk and milk based products
19	03.30 – 03.38 PM	Trupti Patil & Sharmila Bonnerjee	The Impact of Female Leadership on Organisations' Success
20	03.40 – 03.48 PM	Vaibhav Sonawane & Rajul Muradkar	Financial Image Classification for Enhanced Operational Efficiency
21	03.50 – 03.58 PM	Priya Choksi & Rohit Malhotra	A literature study on mortality models with special reference to Renshaw-Haberman model (RH) and its practical relevance
22	04.00 – 04.08 PM	Hemanshi Vaghasiya & Chandrashekhar Kaushik	Enhancing sales and customer experience at jewelry showroom through Visual Merchandising

4.15 PM – 5.00 PM

Observation, Comments and Summarization of Research Presentations
Prize Distribution
High Tea & Networking

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Change in Leadership Style: Managing Gen Z Talent

Mmahek Chhabria
Assistant Professor, Ghnashyamdas Saraf College of Commerce and Science, Mumbai

ABSTRACT

Leadership styles have evolved, and the differences between generations are notable. Baby boomers, born between 1946 and 1964, tend to adopt a more traditional, hierarchical leadership approach, while millennials and Generation Z prefer more collaborative and flexible leadership styles. When a democratic leadership style is leading change, they take an approach to ensure everyone is heard, feels included and engaged in the decisions, and works together as a team to implement the initiative. This type of leader can be a real asset during times of change. This research uncovers the specific characteristics of Gen Z, their needs and expectations from leaders, and the changing role of employers with the changing dynamics of employees. This study aims to understand the ways to create a progressive workplace for Gen Z A 2022 report conducted by The National Library of Medicine found that "the coronavirus pandemic is a major event impacting individuals of all generations, but the impact on Gen Z will persist over their lives, according to the generation effect, since Gen Zers are at the life stage when their long-lasting values are still being shaped.

Key Words: *Gen Z, Progressive workplace*

INTRODUCTION

In today's rapidly changing world, the expectations of leaders are evolving at an unprecedented pace. The traditional leadership styles and approaches that have been effective in the past may no longer be sufficient to navigate the complexities of the modern business landscape. As organizations face new challenges and opportunities, leaders must adapt and embrace new ways of thinking and leading. In recent years, transformational leadership has gained popularity as organizations recognize the importance of inspiring and motivating their employees. Transformational leaders are visionary, charismatic, and able to inspire their teams to achieve extraordinary results. They focus on developing their employees' potential and creating a positive organizational culture.

The Future of Leadership: Trends and Predictions for 2024 and Beyond

Looking ahead, the future of leadership is likely to be shaped by several key trends. Artificial intelligence is expected to play an increasingly important role in decision-making, with leaders relying on AI-powered tools to analyze data, make predictions, and automate routine tasks.

Sustainability is also expected to become a key focus for leaders as organizations recognize the importance of addressing environmental challenges. Leaders will need to develop strategies that balance economic growth with environmental stewardship and social responsibility.

Furthermore, the rise of remote work is likely to continue, requiring leaders to adapt their management practices to effectively lead virtual teams. This will require strong communication skills, the ability to build trust remotely, and the use of technology to foster collaboration.

How do leaders need to change?

- Encourage Gen Z to voice their opinions in an appropriate way
- Become more assertive themselves and challenge the status quo
- Focus of embedding diversity and inclusion in every aspect of the business
- Adapt communication style, methods and frequency to individual team members
- Provide ownership of specific pieces of work and more responsibility earlier
- Create a positive culture that celebrates achievement and encourages flexibility
- Compensate fairly and generously
- Manage upwards to protect employees from unrealistic and unreasonable expectations.

Problems with Gen Z in the Workplace: The Bottom Line

Gen Z is coming into the workplace with different styles, ideals, and demands. While employers and co-workers might initially see these as "problems" with Gen Z in the workplace, there's a lot we can learn from them that can actually make the workplace better for all.

For example, "money-hungry" Gen Z can help promote salary transparency and fair wages. Our attitudes about work and work-life balance can help set better boundaries and decrease burnout. When Gen Z talks about mental health, it can encourage everyone to get the support they need.

"Problems" with Gen Z in the workplace are only "problems" if we're stuck in the traditions of the workplace. To forge ahead and create a future-proof workplace, we must listen and adapt to the ideas of the workforce's next-biggest generation We might just create a better workplace for all.

Gen Z is the generation born between 1997 and 2012. Gen Z includes roughly 68 million people, and, like all generations, they bring their unique values and expectations to the workplace.

Since Gen Z is the future workforce, employers need to know what motivates them to be productive.

Purpose

Gen Z is often motivated by a sense of purpose and knowing their work has an impact. To help prioritize purpose in the workplace, leaders should help all employees understand how their contributions contribute to the company's goals.

83% of Gen Z respondents to a survey say they consider an employer's commitment to **diversity** and **inclusion** when they are deciding where to work. Since diversity and inclusion are so important for Gen Z, employers should prioritize creating this type of work environment.

Gen Z values **flexibility** and has increased motivation when they can set their schedules and have a work-life balance. **75%** of Gen Z say that they would choose a job with greater flexibility over a job with a higher-paying salary. Here are a few ways that employers can offer flexibility in their workplace:

- Providing **hybrid** or **remote** positions
- Not **micromanaging** employees
- Working with employees' personal schedules
- Allowing employees to take important personal phone calls or appointments during regular work hours

Gen Z has grown up around technology which makes them highly tech-savvy. 91% of Gen Z says that technology is a decisive factor when choosing a job. Technology has completely changed the way our society works and communicates, and Gen Z has all of the skill sets needed to help manage technology.

61% of Gen Z says they would consider leaving their current job if they were offered better benefits elsewhere. Gen Z are more motivated to work hard for a company that provides them with competitive benefits.

Here are the top three benefits that Gen Z is looking for when job-hunting:

- Health insurance
- Mental healthcare
- Financial support

While these benefits are a must-have for Gen Z, including additional **competitive benefits** to your package can help your Gen Z employees stay productive and also help your company attract and retain employees. Generation Z is the future of the workforce, so it is important for employers to know what will help motivate them to work with the company long-term. Employers should consider incorporating some of these values and expectations into their company to help attract and retain Gen Z workers.

Research Methodology:

Primary data was collected by designing a questionnaire, aimed at getting responses from Gen Z.
Secondary data was collected by referring to research papers, case studies, and websites. This study can be helpful to employers in devising and designing HR strategies, changing leadership style, and getting better employee engagement and retention.

Sample Size:
The sample size was restricted to 120 responses in Malad area, Mumbai, Maharashtra.

OBJECTIVES OF THE STUDY

1. To understand Gen Z and their specific characteristics.
2. To evaluate specific requirements and changing behavior of Gen Z towards leadership style.
3. To study the challenges faced by leaders to maintain Gen Z
4. To suggest ways to manage Gen Z in corporate set-up.

LIMITATIONS OF STUDY

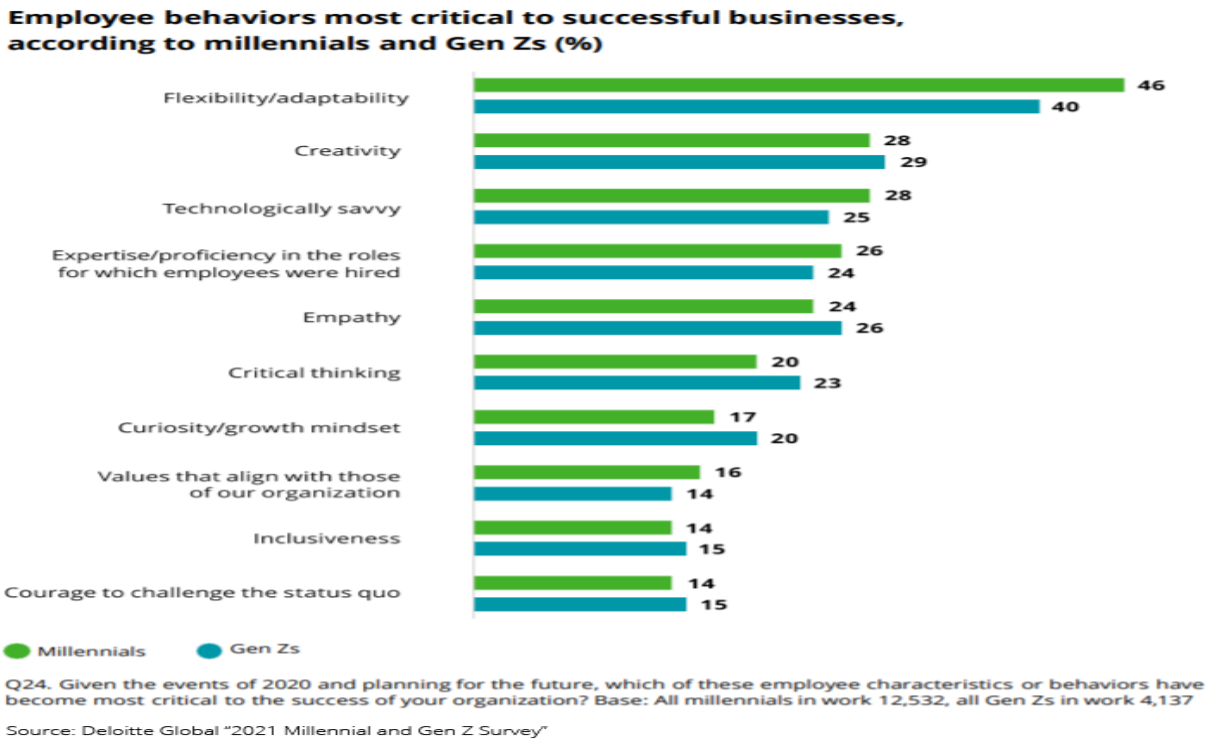
- The study was restricted to a specific region of Malad
- The study focuses on Genz and their priorities towards leadership style, all other factors related to job satisfaction were ignored.
- The study is restricted to a specific period and restricted to 120 responses.
- The study does not involve advanced statistical tool, basic percentile method is used.
- There is a gap in the number of responses since few answers were kept open at the discretion of respondents.

REVIEW OF LITERATURE

A 2022 report conducted by The National Library of Medicine found "the coronavirus pandemic is a major event impacting individuals of all generations, but the impact on Gen Z will persist over their lives, according to the generation effect, since Gen Zers are at the life stage when their long-lasting values are still being shaped."

A recent McKinsey study reveals that this generation is driven by a "search for truth." Having grown up witnessing life-altering socio-economic events such as the Great Recession, the COVID-19 pandemic, climate change, and the feverish rise of technology (and now GenAI), Gen Z has had a turbulent transition to adulthood that has made it disillusioned with the status quo in all aspects of life. Harvard Business Review describes Gen Z as a generation that's disconnected, impatient, and demanding immediate action for issues it cares about. As this generation begins to shape society significantly and bring its values and priorities to the workplace, leaders must reconsider their leadership styles if they want their organizations to flourish and effectively manage and support Gen Z in becoming future leaders.

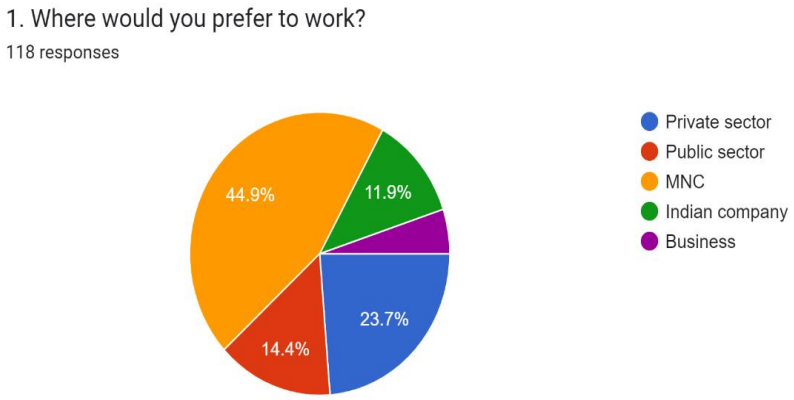
Gen Z is born between 1995 and 2015 (Bassiouni & Hackley, 2014; Koulopoulos & Keldsen, 2014; Tulgan, 2013). This generation has distinct characteristics compared to Millennials because they were born and are growing up in different social and economic conditions. Growing up, they faced economic difficulty with recession and uncertainty (Annis, 2017; Berkup, 2014; Stillman & Stillman, 2017; Tulgan 2013). Therefore, they are more realistic than Gen Y. They are also more risk-averse than earlier generations. They have lower expectations, are cautious, and are less entitled (Tulgan 2013). They value stability (Annis 2017). (Dwidienawati & Gandasari, 2018) stated that this generation puts importance in competitive salaries. They get bored easily, therefore, they expect to have different job roles and flexibility. They want instant success and require a company to provide them with personal development. They are self-reliant but still need guidance and frequent feedback and tap in the back (Stillman and Stillman 2017), however, they do not like micromanagement. They also need superiors that they respect to work effectively (Dwidienawati and Gandasari 2018).

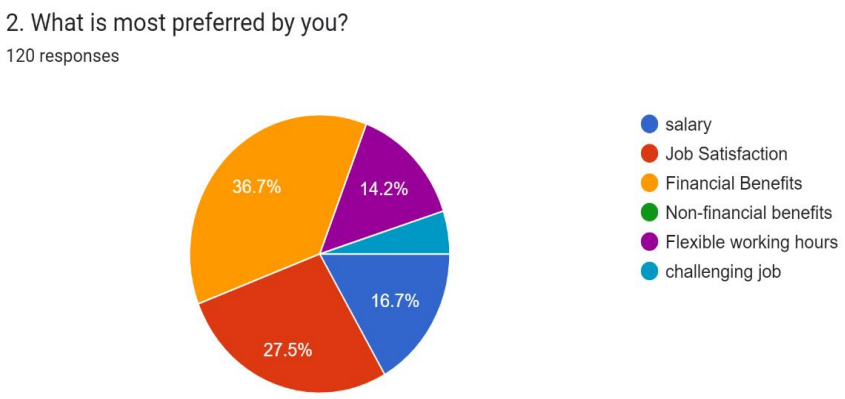


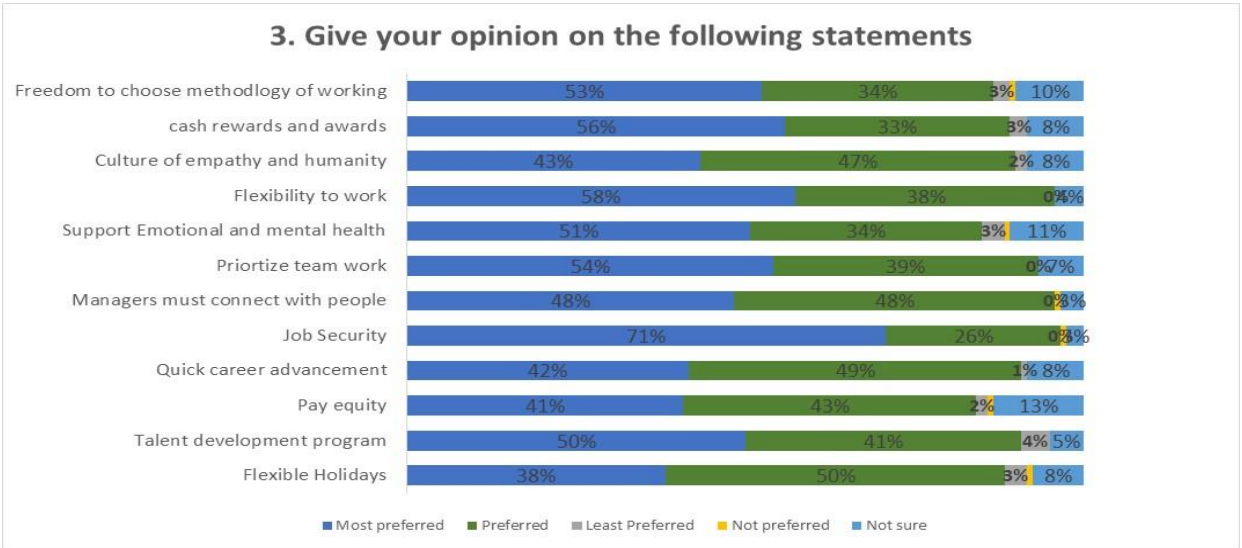
Methods of Data Collection:

- Primary data was collected by designing a questionnaire, aimed at getting responses from Gen Z.
- Secondary data was collected by referring to research papers, case studies, and websites.

Data Analysis & Interpretation:

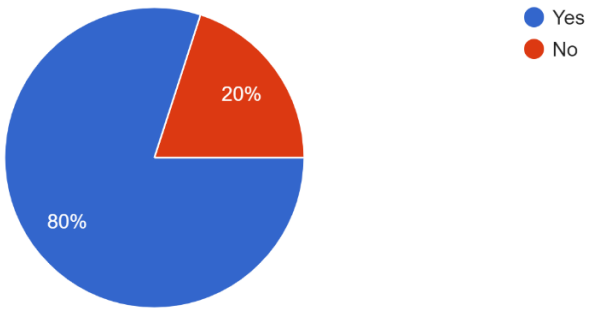






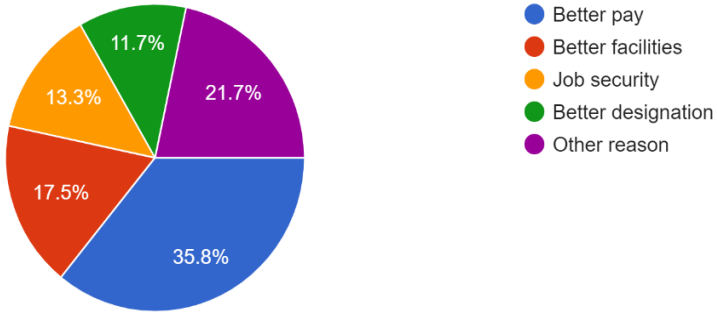
4. Would you prefer to stay in specific organization for long term offering better financial incentives?

120 responses



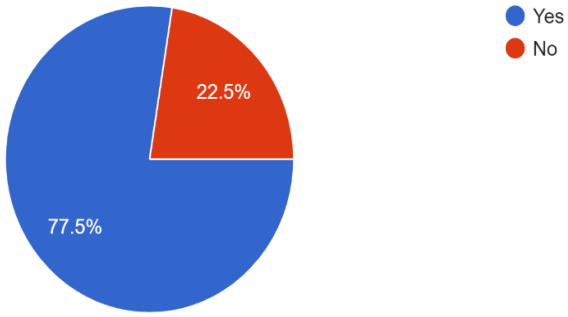
5. If No for above question, What factors would you consider to switch the job?

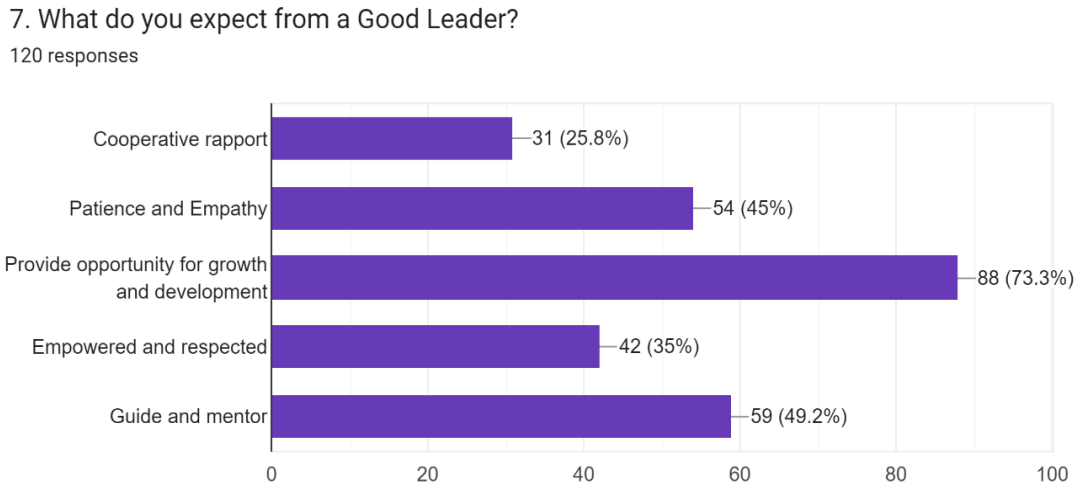
120 responses



6. Do you agree managing work life balance is more important than financial returns?

120 responses





FINDINGS OF THE STUDY

- 44.9% of respondents prefer to work for MNCs, whereas 11.9% prefer to work for Indian Companies. This proves that more preference to given to MNCs as compared to Indian companies, this could be due to better infrastructure and better pay expectations.
- 36.7% of respondents consider financial benefits as an important factor, 27.5% prefer job satisfaction and 16.7% consider salary as an important element. Job satisfaction remains an important factor as compared to other financial benefits.
- 80% of respondents prefer to stay in a specific organization for the long-term offering better financial incentives. Financial incentives plays an important role in employee retention.
- 35.8% of respondents can shift jobs if offered better pay, whereas 11.7% consider designation as an important factor for shifting a job.
- 77.5% consider work-life balance as a crucial determinant of staying in the job. Respondents expect positive work-life balance as one of the important determinants for shifting jobs.
- 73.3% of respondents expect a good leader to provide opportunity for growth and development, whereas 45% believes that a good leader must have the quality of being patient and empathetic. Gen Z looks for better growth and development opportunity as compared to other factors that affects job satisfaction.
- 49.2% of respondents consider that a good leader should be a Guide and Mentor.
- 25.8% believe leaders should be able to maintain good rapport with subordinates.
- Freedom to work, cash rewards, empathy, teamwork, job security, and emotional and mental health are prioritized by Gen Z.

SUGGESTIONS

- Gen Z would like to work with an organisation that provides a financial benefit, But in the long run they need to check, Whether the cultural norms suit them.
- The leader should always have the power to be a good listener and should be a patience person
- The company must provide paid leave to employee after their long-term project.
- Gen-z's believe in working smartly, Giving importance to mental health along with physical health, and having flexibility in timings and holidays because they believe more in getting the work done, not the particular place from where it is being done. WFH is a great relief for when they are not in the right mental space but still manage to get the work done.

- Good leader should be a good listener
- A good leader should connect with most of them and try to understand their situation from their perspective also
- A leader should recognise the hardwork of his/her colleagues and energize them instead of ignoring them and belittling them.
- A leader must bring out maximum capabilities of his employees ,maintain a healthy working environment
- If the salary and the mental health is good from the job then there is better employee retention.
- A good leader should be patient and give their team members time to prove them.
- Employees should be treated well
- Every Organisation Should Provide Freedom To Communicate And Reduce the work pressure .
- Genz must have freedom, Work from home opportunity should be provided, sufficient break and paid leave options must be there
- Employees who manage work properly he/she should get opportunity for promotion.
- There should good stress to reward ratio and a employee should be given a project at a time and should not be bombarded with various projects at a time. The company should support the employee at the time of crisis or inflation. The should be clear communication between the employer and the employee.

PROPOSED OUTCOMES

This study can be helpful to employers in devising and designing HR strategies, changing leadership style and getting better employee engagement and retention. The study can be a base for any further studies on leadership style and GenZ behavior.

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Understanding the Impact of Experiential Learning on Student's Learning Effectiveness: A Case based on Zillennials Student-Led Assessment Center

Charvi Hasmukh Shukla
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ABSTRACT

Assessment center popularly known as AC involves one- or two-day long series of activities and are being recently used in the business school curriculum to encourage experiential skill-based learning among zillennials. However, what we still do not know is concerning the effectiveness of such real-life experiences of business school students in the changing landscape. Purpose: This paper aims at understanding the relationship between experiential learning and student's learning effectiveness based on a business school course of organizing a student-led assessment center using the experiential learning theory. Methodology: A pilot survey-based study with a purposive sample of students with an experience of conducting an assessment center. Findings: It was found to have a strong positive relationship between experiential learning and student's learning effectiveness for students who took the course and conducted a student-led assessment center. Implications: The results support the view that more experiential learning opportunities should be added to MBA student's curriculum to increase their learning effectiveness and support talent management to be a hands-on learning opportunity for better results. Originality: This paper tests the model of experiential learning and student's learning effectiveness on a unique case of conducting a student-led assessment center and highlights the requirement of experiential learning activities in a business school as well as state prominent future research directions.

Keywords: *Experiential learning, Student's learning effectiveness, Assessment center, Talent management, Zillennials, Experiential learning theory*

INTRODUCTION

Assessment center popularly known as AC involves one- or two-days long series of activities like in-basket, group discussion, interviews, presentations, and others which are used in business to assess leadership behaviour and forecast competencies within an individual (Knott et al., 2018). AC is not just used in business but is also used to develop students. Such student-led ACs have recently been used in the learning in terms of business school courses for HR students and aims to understand the impact of conducting an AC on student's learning effectiveness which isn't previously been studied in the literature. This paper will answer two research questions. RQ 1: Is there any association between demographic variables and the study variables? RQ 2: What is the relationship between the experience of the business school curriculum and encouraging experiential skill-based learning (Bartel et al., 2000). To develop a wide range of competencies in students Tan et al., (2021) have emphasised on active experimentation and creating new experiences on doing. Experiential learning focuses on converting experiences into knowledge. In this paper, I take an HR course offered at business schools to students pursuing their MBA degree with an HR specialization. The course requires students to conduct an assessment center in the course duration as an experiential activity to gain real-life experience. The student serves as an assessor in an AC and invites other non-course students to participate in the AC as assessees. They recreate a similar experience of AC which is conducted in an organization and provide feedback

reports towards the end of the assesses. The objective of this paper is to understand the wide practice of experiential conducting an AC as an experiential activity on a student's learning effectiveness. In the next four sections I'll be discussing the theoretical background, methodology followed, findings of the study, and implications.

THEORETICAL BACKGROUND AND HYPOTHESES

Assessment centers are not just used in business but is also used to develop students. While student's AC is a new phenomenon (Herd et al., 2019) it prepares students for real world by building better learning outcomes and sharpens their skill sets (Knott et al., 2018). An assessor in AC is responsible not only for conducting an AC, but also manage the whole process of reaching to the D-Day of AC. As a general practice, each assessor has one or two participant assessees to observe. They take notes of the candidate behaviour and after completion of the exercise make an attempt judgement for that candidate (Steuer, 1992). Mostly these courses offer a diagnostic AC to allow students to tailor the activities as per their needs and allows goal setting to get good grades as per the path they design (Cronin, 1995). AC is conducted in a highly controlled environment and at times is denoted as an ideal scenario (Bommer, 2010) for assessing a candidate. The course of student-led AC considered for this study also tries to recreate commonly used workplace activities of employee selection or leadership development (Sturre et al., 2022). For example, in the study by Guachalla and Gledhill (2019), they focused on an AC that replicated the recruitment process followed in the travel and tourism sector. Another study by Hoover et al. (2010) focused on a course designed to develop interpersonal skills within their MBA students and used a fully developed AC to increase the learning outcomes.

As per Kolb (1984), experiential learning happens through four modes of learning. These modes start with concrete experience which leads to reflective observation which further extends to abstract conceptualization and finally, the outcome is seen as active experimentation. For years cognitive learning practices have been used in the academic field to impart learning among students. However over a decade, a shift has been observed in the learning practices with a more robust choice of using experiential learning practices to engage students (Burgess, 2012). The study by Yang (2009) focused on experiential learning activity of providing a website design pedagogy to their enrolled students for the website development course curriculum. A similar approach is found in the study by Radford et al., (2015) which focused on a marketing course and integrated ELT to offer a framework for designing an experience-based interactive pedagogy for teaching macro marketing.

Experiential Learning

The importance of learning through doing has always been given more weightage. By doing an individual gets the necessary experience themselves (Spackman, 2006). In this study the term experiential learning also referred to as EL is defined as a process of learning from actual experience. As per Kolb (1984) EL is a knowledge creation process gained through experience. In education philosophy EL is a source of business education which aims at addressing the real-life problems (Spackman, 2006) by providing students an opportunity to learn by doing rather than just books. EL is a form of constructive active learning that particularly guides the learners to process information as per the active real environment (Bell & Bell, 2020). When the learners make decisions on the know-how of a process in practice through undergoing simulation or co-

creation of a similar real-life environment the learner is in a better position to resolve the problems (Olivares et al., 2020). Management education is one such field that often faces the issues of preparing their students for complex business world problems (Memar et al., 2020). MBA students are hence encouraged to gain hands-on experience through internships and learn through case study pedagogy. Involvement in these meaningful activities provides better understanding to the students and helps to base more realistic expectations from the outside world. (Caza et al., 2015). EL not only supplements the learning process but actively allows students to conceptualize the process as per their different ways of learning (Rohm et al., 2018).

In today's dynamic world organizations need people who are ready to adapt to different situations swiftly. Allowing MBA students to experience an event has been found to be stronger evidence of learning effectiveness rather than just memorizing lessons (Joardar et al., 2019). The last few decades have seen prominent use of student-centric approaches like EL to be relevant in management education (Tomkins &Ulus, 2015). This approach provides students with a sense of the concept's application in practice. A similar notion was used by Bell & Bell (2020) in their study took the case of a university that provided an active EL opportunity to their students by enabling them with a project to develop a business idea and a plan. The project was found to provide students a hook kept them engaged in the learning process and improve their experiential learning skills. In another study by Foltice and Rogers (2020) it was found that participants with EL experience had a significantly better post-learning equity of the course. Waller et al. (2016) in their study talked about the need to further assess the impact of EL on learning in the moment. Through this study I aim at filling in the gap highlighted in the body of literature.

Student's Learning Effectiveness

In this section, I have talked about student's learning effectiveness as one of the major learning outcomes (Hu & Hui, 2012). Learning happens in multiple ways which range from seeing to reflecting to doing. It can also influence their learning styles (Rajaram & Collins, 2013). Kolb (1984) proposed that learning outcomes can be improved by matching learning activities with learner's styles of learning. Further literature has also shown how learning effectiveness gets influenced by the learning environment and learning techniques implemented (Rajaram & Collins, 2013). In this study student's learning effectiveness is referred as the learning outcome derived from the experimental activity through which a student's experience of that particular course gets impacted. As per experiential learning theory, people tend to learn by experiencing things. To maximize one's learning effectiveness it is vital for students to engage in the learning activities and internalize the whole experience (Hu & Hui, 2012). Researchers have found that one's learning effectiveness is a combinational effect of two factors which are namely individual and social that are driven toward goal attainment (Zaccone & Pedrini, 2019). This process is supplemented by using both traditional as well as online modes (Nayar & Koul, 2020) of learning to boost students' participation in the learning process (Sun et al., 2018). New forms of learning like experiential learning or web-based learning are relevantly newer concepts and need to be explored further in depth to understand what role these inputs play in affecting learning effectiveness and other outcomes (Aboobaker & K.H, 2022). For example, in The Student by Li and Liang (2020) they highlighted about the need to design courses keeping in mind the audience at the receiving end to create a conducive learning environment for the students. Students are the central character in higher education (Sun et al., 2017) as they are on the reviewing end of the learning process. Student's learning effectiveness has a long-lasting impact on the learners and has been a core

critical area of research because of its important implications on the learning outcomes field (Zaccone & Pedrini, 2019).

Conceptual Framework

Previous researchers have also tried to establish a relationship between gender and the study variables (Fowler & Thomas, 2015). In the study by Hsu et al. (2022), they found that when students are offered experiential learning females have a better learning effectiveness than males. Business games as a learning activity also highlighted that across genders the experience of the course was significantly different (Garber et al., 2017). However, in the search, I did not come across a study that tested the relationship association of the demographic variables like gender and both the study variables EL and student's learning effectiveness.

Hypothesis 1a: There is a significant association between experiential learning and gender.

Hypothesis 1b: There is a significant association between gender and student learning effectiveness.

Further, this study attempts to extend the body of literature by introducing another demographic variable like age to test if there is any association between the age of the learner and the study variables.

Hypothesis 2a: There is a significant association between age and experiential learning.

Hypothesis 2b: There is a significant association between age and student's learning effectiveness.

Main challenges postulated in front of teachers is to provide meaningful experience for learners (Quesada-Pineda & Haviarova, 2014). Underpinning the study in ELT, I study the impact of experiential learning of conducting an AC on students' learning effectiveness for a course at the business schools. Previous scholarly work suggests that students taking up experiential courses reported positive learning outcomes (Rayburn et al., 2018) like increased learning effectiveness (Hui et al., 2008). Introduction of one such experiential activity was using MIT App platform which was found to have a significantly improved impact on student's learning effectiveness from the course (Hsu et al., 2021). Several of these previous studies have highlighted the relationship between experiential learning and learning effectiveness (Cheng et al., 2019) but this model is yet to be tested in relevance to the AC paradigm. In this study, I test the EL model for a course driven by student-led AC as an active learning practice to see if it impacts the student's learning effectiveness which is shown in Figure 1.

Hypothesis 3: There is significant positive impact of experiential learning on student's learning effectiveness.

METHODOLOGY

Sample

The purpose of this study is to understand the relationship between experiential learning and a student's learning effectiveness. The data is gathered from MBA students from a particular business school using a purposive sampling technique. Only those students who are specializing in HR degree in India and have an experience of conducting an assessment center for a course are

approached to fill a survey form. A total of 52 responses are collected from this study. The questionnaire (details shown in Table 1) had 18 questions and was circulated among the students via email.

TABLE 1

Details Of variables Of The Study

Variable	Construct	Description	Measure	Source
Demographic variables	Gender	Male Female Others	-	
	Age	Below 26 26-30 31-35 36 and above	-	
Independent variable	Experiential learning	It is an adapted scale and shows the strength of one's belief that a learning experience will fulfill user's intrinsic motives	Experiential learning	Tang et al. (2014)
Dependent variable	Student's learning effectiveness	It is an adapted scale which helps to examine the effect of student's learning effectiveness through simulation/ experiential programs	Simulation Learning Effectiveness Scale (SLES)	Pai (2016)

Measure

The 18-item questionnaire was adapted from Tang et al. (2014) and Pai (2016) which compromised on the questions of experiential learning and student learning effectiveness respectively. Tang et al. (2014) scale had 4 items on experiential learning which was used post changing a few words in the questionnaire. Example- Learning experience from an assessment center has had a good effect on me, Conducting an assessment center had sufficient knowledge support for my learning, and others. While Pai (2016) scale had 12 items on student's learning effectiveness which was used post changing a few words in the questionnaire. Example- Made me more aware of the need to make an effort to practice as an assessor, Gave me opportunities to participate in decision making, Makes me more confident about the assessor's role, and others. Reliability is the measure of internal consistency of the construct in the study. A construct is reliable if the Alpha (α) value is greater than 0.7 (Hair et al, 2013). Construct reliability was assessed using Cronbach's Alpha. The results revealed that the Experiential learning scale of four items (α =0.915) and Student's learning effectiveness scale with twelve items (α =0.951) were found reliable. Reliability results are summarized in the Table 2.

TABLE 2

Reliability Statistics

Constructs	No. of items	Alpha (α)
Experiential learning	4	0.915
Student's learning effectiveness	12	0.951

Data Analysis Technique

Previously research scholars have used various statistical packages to perform analysis of data collected through surveys. So, in this study, I have used "Statistical Package for Social Sciences" (SPSS) to perform all the statistical data analysis. For Hypothesis 1 and 2 Chi-square analysis is performed to check the association between the variables while for Hypothesis 3 a regression analysis was performed.

FINDINGS AND INTERPRETATION

Respondent Profiling

In the study, demographic variables captured are Gender and Age. Following are the descriptive statistics of the demographic variables shown in Table 3.

TABLE 3

Demographic Statistics Of The Respondents

Variables	Characteristics	N	%
Gender	Male	18	34.6
	Female	34	65.4
	Others	0	0
Age	Below 26	31	59.6
	26-30	18	34.6
	31-35	0	0
	36 and above	3	5.8

Descriptive Analysis

The descriptive statistic for Experiential learning reveals an overall mean score of 6.4135 (SD= 0. 87711). This shows a positive perception of experiential learning among business management students as the scale ranges from strongly disagree (1) to strongly agree (7). The descriptive statistic for Student learning effectiveness reveals an overall mean score of 4.2212 (SD= 0. 73503). This also shows a positive perception of student learning effectiveness among business management students as the scale ranges from strongly disagree (1) to strongly agree (5).

Hypotheses Testing

To verify the hypotheses above stated Chi-square statistics were used to examine the association between the categorical variables 1a: Gender and Experiential learning, and 1b: Gender and Student's learning effectiveness. It was found that there is an insignificant association at 5% significance level between both gender and experiential learning at ($\chi 2$ =9.253, df=9, p= 0.414), and gender and student's learning effectiveness of respondents at ($\chi 2$ =20.599, df=22, p= 0.546). Hence, H1a and H1b were not supported. So, we can say that there is no association between gender and the study variables which means that gender is not related to experiential learning and student learning effectiveness. Again, like Hypotheses 1 Chi-square statistics were used to examine the association between the categorical variables 2a: Age and Experiential learning, and 2b: Age and Student's learning effectiveness. In this case, it was found that there is an insignificant association at a 5% significance level between both age and experiential learning ($\chi 2$ =15.198, df=18, p= 0.648), while there is a significant association between age and student's learning

effectiveness of respondents at ($\chi 2$ =63.750, df=44, p= 0.027). Hence, H2a was not supported but H2b was supported. So, we can say that although age was not related to experiential learning of the participants, but age had an association with students' learning effectiveness. This means that the learning effectiveness has different impacts on different age groups of students.

To test the impact of experiential learning on student's learning effectiveness linear regression was performed. The first step in the process was to check the correlation between the two study variables. Using Pearson product correlation, it was found that there is a statistically highly positive correlation between experiential learning and student learning effectiveness (r=0.797, p<0.001). Hence H3 was supported. This shows that an increase in use of experiential learning would lead to a high level of student's learning effectiveness. In the second step, I ran a linear regression analysis in SPSS and found that the F statistics is also significant at (1,51) = 87.031, p<0.05. The findings indicate that experiential learning has a significant and positive impact on student's learning effectiveness. Further, the R2 = 0.635 indicates that the model explains 63.5% of the variance in student's learning effectiveness. H3 evaluated whether there is a significant impact of experiential learning on student's learning effectiveness.

TABLE 4
Regression Analysis

Hypotheses	Regression Weights	β	t	p-value	Results
H3	EL → SLE	0.668	9.329	0.000*	Supported
R^2 = 0.635					
F (1,51) = 87.031					
Note, *p<0.05. EL: Experiential Learning, SLE: Student's Learning Effectiveness					

The results in Table 4 reveals that experiential learning has a significant and positive impact on student's learning effectiveness (β=0.668, t=9.329, p=0.00). Hence H3 was supported. These findings suggest that there is a positive relationship between both study variables. And the regression equation derived from the study is: Y= 0.062 + 0.668X i.e. Student's learning effectiveness= -0.062 + 0.668 (Experiential learning). Table 5 provides a summary of all the hypotheses tested in this study.

TABLE 5

Summary Table For Hypotheses Tested

Hypotheses	Factors	p-value	Result
H1a	Gender → EL	0.414*	Not Supported
H1b	Gender → SLE	0.546*	Not Supported
H2a	Age → EL	0.648*	Not Supported
H2b	Age → SLE	0.027*	Supported
H3	EL → SLE	0.000*	Supported

Note, *p<0.05. EL: Experiential Learning, SLE: Student's Learning Effectiveness

DISCUSSION

Conclusion

Real learning tends to happen through encountering challenging experiences Learning through experience enhances critical competencies in an individual (Foltice and Rogers, 2020). The

learning-by-doing philosophy of Kolb (1984) stands true. Experiential learning is one such branch of learning that follows the rule of active learning to improve learning outcomes for the learner. Here understanding student's learning outcomes is crucial as it is a developmental process of learners encouraging them to grow and increasing their learning effectiveness. The objective of this study was to understand the relationship between experiential learning and a student's learning effectiveness for MBA students specializing in HR course. For this course, the students conducted an assessment center which acts as an experiential learning opportunity for them and provides a simulation of real-life organization. The findings of the study showed that not only there is a positive relationship between experiential learning and student learning effectiveness, but it also showed that there is an association between age and student learning effectiveness. While other these two hypotheses were supported other three hypothesis which examined the association between other demographic variable like gender were not supported. So, based on the findings above I conclude that gender does not play any role in influencing a learner's experiential learning experience of their learning effectiveness. Age has a significant relationship with students' learning effectiveness, and it can be commented from eh findings that a student's age can influence their learning outcome from the whole experiential learning experience of conducting an assessment center.

Theoretical and Practical Implications

This study contributes to the literature based on experiential learning theory from a lens of business education. Further, this study also fills the gap arising due to the lack of body of literature in evaluating assessment centers for students as an experiential learning activity. Today assessment center is a vital source of learning to prepare students for the outside world. Specifically talking in terms of HR students who often in their job roles have to deal with people who lack the necessary exposure required to be organization-ready because of this not only do they underperform but also tend to make wrong decisions in workplaces. These wrong decisions related to hiring, training, and promotion can cost organizations a lot if not taken care of. This study will act as a base in the business school curriculum to encourage incorporating more real-life simulation activities to be included in MBA courses. The assessment center is one such experiential learning opportunity that allows students to step in the shoes of assessors and closely experience the nuances of selecting and promoting talent in the workplace. Business schools should encourage educators to integrate student-led assessment centers into their courses and offer students an opportunity to increase their learning effectiveness. Further educators should also take into account the age group of students registering for their course and provide necessary assistance to ensure an optimal level of learning effectiveness throughout the various age groups.

Future Direction and Limitations

This study was a cross-sectional study and hence does not account for the changes in a learner's outcomes over some time. Future researchers can conduct a longitudinal study and note if time plays any role in influencing a learner's effectiveness. Next, this study focuses on a single course offered by the business school for which students have to conduct an assessment center. Here given the fact that the students in such courses are a handful future researchers can replicate this model on to other course offering similar experiential learning opportunities to the students with a larger sample of respondents. Further, future researchers can also introduce age as a moderator and check its influence on the model. Apart from age, other variables like past knowledge, learning styles, learning models, and personality types can also be introduced into the model to test their impact

on it using more robust multivariate methods. And lastly, other theories like- self-determination theory and learning theories can be used to better explain the model.

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The Role of Financial Literacy in Promoting Gender Equality in the Workplace, Mumbai

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ABSTRACT

This research investigates the impact of financial literacy on promoting gender equality within workplaces in Mumbai, India. Despite significant gender disparities, with only 27% of women in India being financially literate, this study explores how enhancing financial knowledge can elevate women's roles in employment. Using a survey method, the study assesses the correlation between financial literacy and workplace participation among both men and women in the IT, HR, and finance sectors. A total of 100 participants, comprising both men and women from diverse professional backgrounds, were surveyed to gather insights on their financial literacy levels and its influence on career progression and participation. The findings reveal a significant correlation between financial literacy and the empowerment of women in the workplace. Enhanced financial literacy equips women with the necessary skills for financial decision-making and boosts their confidence to pursue higher positions and responsibilities. The study concludes that improving financial literacy is a crucial step toward achieving gender equality in the workplace. It highlights the need for targeted financial education programs and initiatives to bridge the literacy gap, empowering more women to actively participate and excel in their professional careers.

Keywords: *Gender Equality, Financial Literacy, Workplace Participation, Mumbai*

1. INTRODUCTION

The gender gap in financial literacy remains a critical barrier to achieving gender equality in India. As of 2023, only 27% of the Indian population is financially literate, and the rate among women is significantly lower than men, highlighting the urgency for targeted interventions (YourStory, 2023). Financial literacy is a pivotal factor in empowering women economically, enabling them to make informed decisions, manage resources effectively, and participate fully in economic activities. Studies have shown that closing the gender gap in financial literacy can lead to substantial economic benefits, including an estimated 27% increase in India's GDP (International Monetary Fund, 2018).

The Global Gender Gap Report 2024 by the World Economic Forum underscores persistent economic disparities, with India ranking 127th out of 146 countries, particularly in economic participation and opportunity, scoring just 39.8% (World Economic Forum, 2024). This report highlights significant barriers women face in achieving economic parity, including limited access to financial education and resources. Government initiatives like Pradhan Mantri Jan-Dhan Yojana and the National Centre for Financial Education have made strides in promoting financial inclusion, yet the challenge remains formidable (Financial Express, 2023). Additionally, private sector initiatives, such as those by Home Credit India, are essential in addressing specific financial literacy needs among women (Financial Express, 2023).
Socio-cultural factors further complicate the landscape, influencing financial behaviors and access to financial literacy. Age, income, marital status, and geographic location are significant determinants that affect women's ability to acquire and utilize financial knowledge (DBS Bank India-CRISIL report, 2024). Addressing these multifaceted issues requires a comprehensive approach that integrates educational, economic, and policy interventions.

This study aims to explore the impact of financial literacy on gender equality in Mumbai's workplaces, focusing on how enhanced financial knowledge can elevate women's roles in employment. Utilizing Structural Equation Modelling (SEM) and Confirmatory Factor Analysis (CFA), this research will analyze data from professionals in the IT, HR, and finance sectors. These advanced statistical methods will help uncover the intricate relationships between financial literacy and workplace participation, highlighting the role of financial education programs in empowering women.

By examining these dynamics, the study seeks to provide insights into effective strategies for bridging the financial literacy gap, thereby promoting gender equality and fostering socio-economic development. This research contributes to the broader goal of socio-economic equity by identifying actionable pathways to enhance financial literacy among women, ultimately enabling them to achieve greater economic participation and empowerment.

2. REVIEW OF LITERATURE

Financial Knowledge and Gender Disparities

Financial knowledge is a crucial component of financial literacy, encompassing the understanding of basic financial concepts such as interest rates, inflation, and risk diversification. Numerous studies have documented a significant gender gap in financial knowledge worldwide. Lusardi and Mitchell (2014) found that women generally exhibit lower levels of financial knowledge than men, which affects their ability to make informed financial decisions. In India, the Reserve Bank of India (2021) reported that only 24% of women were financially literate. Recent data indicates some improvement, with overall financial literacy rates rising to 27%, but the gender gap persists (YourStory, 2023).

The Financial Knowledge and Attitude (FKA) framework provides a comprehensive approach to understanding financial literacy by combining knowledge with attitudes towards financial management (Atkinson & Messy, 2012). The Global Gender Gap Report 2024 by the World Economic Forum highlights that India ranks 127th out of 146 countries in economic participation and opportunity, emphasizing the substantial barriers women face in achieving economic parity (World Economic Forum, 2024). Financial knowledge is a key factor enabling women to navigate these barriers, as it equips them with the skills necessary for effective resource management and economic engagement. Higher financial knowledge (FK) levels are positively correlated with increased workplace participation among women in Mumbai.

H1: There is a significant positive relationship between financial knowledge (FK) and workplace participation among women in Mumbai.

Financial Behavior and Economic Empowerment

Financial behavior refers to the practical application of financial knowledge, including budgeting, saving, investing, and managing debt. Improved financial behavior is linked to better economic outcomes and greater financial stability. Lusardi and Tufano (2015) demonstrate that individuals with better financial behaviors are less likely to incur high-interest debt and are more adept at planning for retirement.

In the Indian context, the Reserve Bank of India (2021) and other financial institutions have implemented programs to enhance financial behaviors among women. These initiatives include financial literacy workshops and educational programs that focus on practical financial skills. Such programs have shown promising results, with participants demonstrating improved financial behaviors that contribute to their economic empowerment.

The Financial Literacy Index (FLI) framework is used to measure the effectiveness of financial literacy programs and their impact on financial behavior (OECD, 2020). This framework considers various

dimensions of financial behavior, including saving, budgeting, and investing, providing a holistic view of financial literacy.

H2: Improved financial behavior (FB) significantly enhances women's career advancement in the workplace.

Financial Attitude and Workplace Equality
Financial attitude encompasses an individual's confidence and optimism towards managing financial matters. A positive financial attitude is crucial for financial empowerment, as it influences financial decisions and behaviors. The DBS Bank India-CRISIL report (2024) highlights that younger women from urban areas with higher income levels exhibit more positive financial attitudes compared to older women from rural areas.

Positive financial attitudes are associated with greater financial confidence and assertiveness, which can translate into perceptions of gender equality in the workplace. Women with a positive financial attitude are more likely to feel empowered to negotiate salaries, seek promotions, and participate in leadership roles. This contributes to a more inclusive and equitable workplace environment.

The FKA framework also highlights the importance of financial attitudes in shaping financial behaviors and outcomes. Attitudes towards financial management, such as confidence and optimism, play a significant role in financial decision-making and economic empowerment (Atkinson & Messy, 2012).

H3: Positive financial attitude (FA) is associated with perceived gender equality in the workplace.

Integration of Theoretical Models

Financial Knowledge and Attitude (FKA) Framework
The Financial Knowledge and Attitude (FKA) framework, developed by Atkinson and Messy (2012), emphasizes that both financial knowledge and attitudes are critical for financial literacy. Financial knowledge includes understanding basic concepts like interest rates and inflation, while financial attitude involves confidence and optimism in managing finances. This framework shows that financial literacy influences economic participation and empowerment.

H1: There is a significant positive relationship between financial knowledge (FK) and workplace participation among women in Mumbai.

Financial Literacy Index (FLI) Framework
The Financial Literacy Index (FLI) framework, utilized by the OECD (2020), measures financial behavior such as budgeting, saving, and investing. This framework helps in understanding how financial education programs enhance financial behaviors and contribute to overall financial literacy and economic empowerment.

H2: Improved financial behavior (FB) significantly enhances women's career advancement in the workplace.

Financial Attitude and Workplace Equality
Financial attitude, a component of the FKA framework, involves individuals' confidence and optimism towards managing financial matters. Positive financial attitudes lead to better financial outcomes and can promote gender equality in the workplace by empowering women to negotiate salaries and seek promotions.

H3: Positive financial attitude (FA) is associated with perceived gender equality in the workplace.

Research Gap:

Category	Research Gap	Opportunities
Financial Knowledge	Limited understanding among women.	Develop targeted literacy programs on basic financial concepts.
Financial Behavior	Poor application of financial knowledge.	Conduct workshops to enhance practical financial skills like budgeting and saving.
Financial Attitude	Lack of confidence in financial decision-making.	Implement empowerment programs to build confidence and positive financial attitudes.
Workplace Participation	Underrepresentation in senior roles.	Use financial literacy as a tool to promote career advancement and leadership.
Socio-Cultural Factors	Barriers to access and participation due to socio-cultural norms.	Create community-based interventions and inclusive financial education.
Education Program Impact	Limited research on program effectiveness.	Evaluate and improve financial education programs through rigorous research.
Theoretical Model Integration	Sparse use of comprehensive frameworks like FKA and FLI in India.	Apply and adapt these frameworks to Indian contexts for deeper insights.

Conclusion for Research Gap

The identified research gaps highlight critical areas needing attention to improve financial literacy among women in India. Targeted programs focusing on financial knowledge, behavior, and attitude, combined with community-based interventions to address socio-cultural barriers, can significantly enhance women's economic participation and empowerment. Evaluating the effectiveness of financial education programs and integrating comprehensive theoretical frameworks like FKA and FLI will provide deeper insights and more effective strategies to bridge the gender gap in financial literacy.

Novelty and Contribution:

This study uniquely integrates the Financial Knowledge and Attitude (FKA) and Financial Literacy Index (FLI) frameworks to provide a comprehensive analysis of financial literacy among women in Mumbai. By focusing on the interplay between financial knowledge, behavior, and attitude, the research offers novel insights into how financial literacy impacts workplace participation and career advancement. The study's contribution lies in its identification of targeted interventions and education programs that address socio-cultural barriers, thereby promoting gender equality and economic empowerment for women. This approach not only fills a critical research gap but also provides actionable strategies for policymakers and educators.

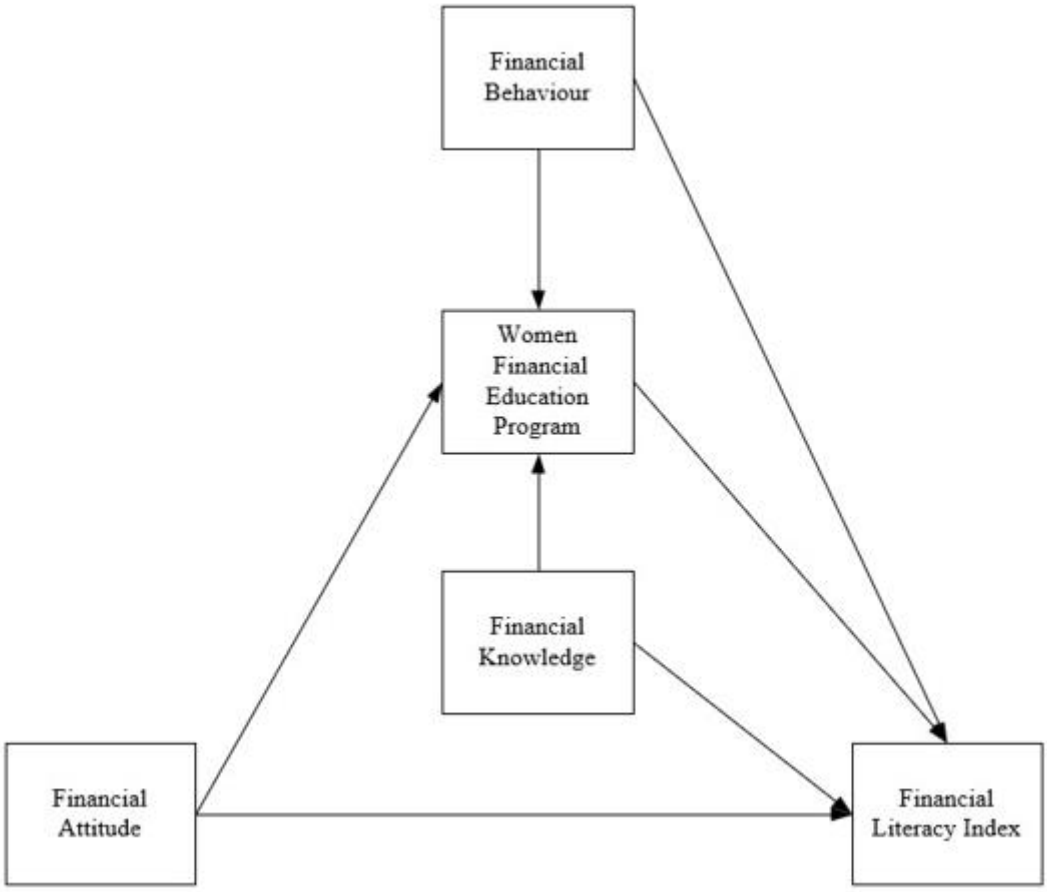

Figure 3. Research Model

Conclusion for Review of Literature

The literature highlights significant gaps in financial knowledge, behavior, and attitude among women in India, underscoring the need for targeted financial literacy interventions. Integrating the Financial Knowledge and Attitude (FKA) and Financial Literacy Index (FLI) frameworks reveals that enhancing financial knowledge (FK) and behavior (FB) can boost women's workplace participation and career advancement, while a positive financial attitude (FA) fosters empowerment and gender equality. Addressing socio-cultural barriers through education programs is essential for closing the gender gap in financial literacy, ultimately promoting greater economic participation and empowerment for women in Mumbai.

3. METHODOLOGY

3.1. Population and Sample

Mumbai hosts a significant IT, HR, and finance workforce. Approximately 150,000 to 200,000 professionals are employed in the IT sector by major companies like TCS, Infosys, and Wipro (Statista, 2023). The HR sector, supported by numerous events and summits, employs tens of thousands of professionals (India HR Leadership Summit, 2024). The finance sector, being the city's backbone, employs around 100,000 to 150,000 professionals across banks and financial institutions (GlobalData, 2023; QuintEdge, 2024).

Sample Size Calculation

Cochhran's Formula is used to calculate the necessary sample size for a given population size and the acceptable margin of error. The formula is:

$$n_0 = \frac{Z^2 \cdot p \cdot (1-p)}{e^2}$$

Where: n = sample size, N= population size, e = margin of error. For this study, with a 95% confidence level and an 8.25% margin of error:

$$n = \frac{n_0}{1+\frac{n_0-1}{N}}$$

Given $N = 200,000$:

$$n = \frac{100}{1+\frac{99}{200,000}} = \frac{100}{1+0.000495} \approx 99.95$$

Thus, the estimated sample size required for the study is approximately 100 persons.

Source and Validity of Data

The data for these calculations are derived from publicly available sources, including reputable reports and articles. The validity of this data relies on the accuracy and reliability of these sources.
In terms of data collection, the survey was conducted during the months of May 2024 to July 2024. Total 100 respondents participated voluntarily, without any financial incentives. However, they were encouraged and supported throughout the survey process to ensure their responses were comprehensive and timely.

Table 1. presents the characteristics and demographics of the participants

Service Type	**No. of Firms**
Technology and Communication	5
Banking and Financial Services	5
Training and Development	2
IT Consulting	2
HR Technology	2
Financial Technology	1
Insurance	1
IT Services	1
Demographics	**Numbers**
Gender	53 Females, 47 Males
Education	5 Doctorates, 30 Postgraduates, 65 Graduates
Experience	25 (10 years), 75 (less than 10 years)

3.2. Research Instrument and Measurements

The research data were collected using an only survey-based questionnaire. To ensure the validity of the questionnaire, all items were adopted or adapted from past valid studies. The primary reason for using measurements from different sources is to avoid or minimize common method variance (CMV) bias. As Chang (2010) explained, collecting different measurements from different sources is the best way to avoid

or reduce CMV bias. Therefore, measures for independent and dependent variables were collected from different sources.

Before finalizing the questionnaire for data collection, expert opinions were obtained, as suggested by Goodrich (2013). Expert opinion is crucial to ensure face validity. Three experts were consulted: two subject specialists and one experienced professional from the industry.

The questionnaire items were measured using a five-point Likert scale ranging from "strongly disagree" to "strongly agree". Structural Equation Modeling (SEM) was employed to design the questionnaire and assess the inter-reliability and validity of the scale. SEM allows for the examination of the relationships between multiple variables simultaneously, ensuring that the constructs are measured accurately and reliably.

The survey consisted of three sections. The first section provided information about the research. The second section contained questions related to demographics, while the third section included questions related to the variables under consideration.

4. RESULTS

4.1. Data Normality

Data normality was assessed using Skewness and Kurtosis values as commonly recommended in statistical analysis practices. The assumption is that for data to be considered normally distributed, Skewness should be between -1 and +1, and Kurtosis should be within a range of -3 to +3. The descriptive statistics computed from the survey data are presented below:

Table 2. Data normality test and descriptive statistics

Variables	Min	Max	Mean	S.D.	Skewness	Kurtosis
Financial Attitude	1	5	3	1.35	-0.03	-1.34
Financial Knowledge	1	5	3	1.30	-0.01	-1.34
Financial Behavior	1	5	3	1.29	0.04	-1.28
Workplace Financial Education Programs	1	5	3	1.23	0.06	-1.21
Financial Literacy Index	1	5	3	1.29	-0.02	-1.29

N = 100.

The results indicate that all variables fall within the acceptable range for both Skewness and Kurtosis, suggesting that the data does not deviate significantly from a normal distribution. Furthermore, the mean values are moderately centered towards the middle of the range, which indicates a trend towards moderate agreement across the variables.

4.2. Sampling Adequacy

The study utilized Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity to determine sampling adequacy. The KMO results show that the value of the KMO index is 0.968, which is well above the acceptable threshold (>0.6), implying that the correlation matrix is not an identity matrix and is suitable for structure detection by factor analysis. The Bartlett's Test of Sphericity results further confirmed the appropriateness of the data for factor analysis with a chi-square value of 2665.41, which is significant ($p < 0.001$).

Table 3. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.968
Bartlett's Test of Sphericity	Approx. Chi-Square	2665.41
	Df	190
	Sig.	0

N = 100.

4.3. Tests for Validity and Reliability Assessment

Cronbach's Alpha Test for internal consistency indicates that all sections exhibit high reliability. "Workplace Financial Education Programs" and "Financial Attitude" have Cronbach's Alpha values of 0.919 and 0.964 respectively, suggesting that the items within these sections are highly consistent in explaining their respective constructs. Similarly, "Financial Knowledge" and "Financial Behavior" have Cronbach's Alpha values of 0.940 and 0.932 respectively, indicating strong reliability. "Financial Literacy Index" has a Cronbach's Alpha value of 0.899, also indicating good reliability.

Table 4. Cronbach's Alpha Test for internal consistency

Variables	Cronbach's Alpha
Financial Attitude	0.965
Financial Knowledge	0.940
Financial Behavior	0.932
Workplace Financial Education Programs	0.919
Financial Literacy Index	0.899

N=100.

Cohen's Kappa Analysis demonstrates that the items used in each section are appropriately measured, with substantial agreement in most sections, confirming the reliability of the measures.

Table 5. Cohen's Kappa Analysis for reliability of the measures

Variable	Kappa Range	Interpretation
Financial Attitude	0.463 - 0.475	Moderate agreement to Moderate agreement
Financial Knowledge	0.300 - 0.325	Fair agreement to Fair agreement
Financial Behavior	0.200 - 0.425	Slight agreement to Moderate agreement
Workplace Financial Education Programs	0.200 - 0.338	Slight agreement to Fair agreement
Financial Literacy Index	0.287 - 0.312	Fair agreement to Fair agreement

Lawshe's Content Validity Ratio summary table provides a concise overview of the Content Validity Ratio (CVR) for each variable, indicating the level of expert agreement on the essentiality of the items within each section.

Table 6. Lawshe's Content Validity Ratio (CVR) Summary Table

Variable	Number of Items	CVR Range	Interpretation
Workplace Financial Education Programs	5	0.340 - 0.560	Moderate validity
Financial Attitude	4	0.300 - 0.480	Moderate validity
Financial Knowledge	4	0.340 - 0.440	Moderate validity
Financial Behavior	4	0.420 - 0.500	Moderate validity
Financial Literacy Index	3	0.380 - 0.520	Moderate validity

Given the results from the KMO measure, Bartlett's Test of Sphericity, Cohen's Kappa analysis, Cronbach's Alpha, and Lawshe's CVR, the dataset is both valid and reliable. These findings support proceeding with factor analysis to uncover the underlying dimensions of Financial Attitude, Financial Knowledge, Financial Behavior, and Workplace Financial Education Programs at the workplace.

4.4. Factor Analysis

The exploratory factor analysis (EFA) conducted in this study serves as a robust method for identifying the underlying structure of interrelated variables pertinent to empowering women at work. The EFA results, displayed in Table 7, highlight both factor loadings and the Average Variance Extracted (AVE) for each category.

Our analysis reveals that all items across various categories—ranging from Financial Attitude to Workplace Financial Education Programs—demonstrated significant factor loadings, ranging from 0.759 to 0.962. These high loadings substantiate the relevance and contribution of each item to their respective constructs, indicating strong associations within the framework. Importantly, none of the items exhibited a factor loading below 0.759, ensuring that all items were retained in the subsequent analysis and underscoring the robustness of our evaluative framework.

The AVE results further validate the constructs, with values ranging from 0.633 to 0.876, indicating a substantial proportion of variance explained by the latent factors within each category. This not only confirms the constructs' reliability but also supports their convergent validity, as the constructs capture the intended dimensions effectively.

Despite Financial Literacy Index presenting a slightly lower AVE value of 0.651, suggesting less variance captured by this construct, the high factor loadings within this category indicate a strong association with its respective factors. This nuanced interplay between AVE and factor loadings provides deeper insights into the dynamics of Financial Attitude within the workplace, illustrating the complexity and interdependence of these constructs.

Table 7. Exploratory Factor Analysis

Variables	Items	Loadings	AVE
Financial Attitude	How important do you believe it is to save for the future?	0.962	
	How do you feel about taking financial risks for potential higher returns?	0.917	0.876
	How often do you think about your financial future?	0.953	
	How do you view your ability to manage your finances?	0.91	
Financial Behavior	Do you regularly save a portion of your income?	0.907	
	Do you follow a personal budget?	0.799	
	How often do you review your financial statements?	0.926	0.775
	How often do you pay your bills on time?	0.884	
Financial Knowledge	How well do you understand the basic concepts of interest rates and inflation?	0.928	
	How knowledgeable are you about different types of financial products?	0.832	0.800
	How well do you understand the importance of credit scores?	0.918	
	How well do you understand the concept of risk and return in investments?	0.895	

Variables	Items	Loadings	AVE
Workplace Financial Education Programs	Have you participated in any financial education programs at your workplace?	0.805	0.633
	How effective do you find the financial education programs offered at your workplace?	0.812	
	How often are financial education programs offered at your workplace?	0.774	
	Do you feel more confident in your financial decisions after attending workplace financial education programs?	0.773	
	Would you recommend the financial education programs at your workplace to your colleagues?	0.813	
Financial Literacy Index	How would you rate your overall financial literacy?	0.797	
	How confident are you in making financial decisions?	0.861	0.651
	Do you feel prepared to handle unexpected financial expenses?	0.759	

Confirmatory Factor Analysis (CFA) was employed to rigorously assess the reliability and validity of the measurement model. The objective was to ensure that the selected measurement items reliably measure the latent constructs (categories) they are intended to represent. The analysis was conducted using AMOS. The key results of this analysis are presented in Table 8 below:

Table 8. Validity Analysis

Variables	CR	AVE	MSV	1	2	3	4	5
1. Financial Attitude	0.966	0.876	0.49	**0.936**				
2. Financial Behavior	0.932	0.775	0.518	0.65*	**0.88**			
3. Financial Knowledge	0.941	0.8	0.49	0.7*	0.68*	**0.894**		
4. Workplace Financial Education Programs	0.896	0.633	0.518	0.6*	0.72*	0.66*	**0.796**	
5. Financial Literacy Index	0.848	0.651	0.384	0.55*	0.5*	0.62*	0.58	**0.807**

N = 100.; diagonal values in bold are square root of AVE; * $p < 0.001$.

Composite Reliability (CR) values were computed for each category, representing the reliability of the measurement items within that category. The CR values range from 0.848 to 0.966. Notably, all CR values exceed the recommended threshold of 0.70, indicating strong internal consistency and reliability of the measurement constructs. Average Variance Extracted (AVE) values, ranging from 0.633 to 0.876, signify the proportion of variance captured by the measurement constructs relative to the measurement error. AVE values exceeding 0.50 suggest that the constructs explain more variance than measurement error, indicating good convergent validity. Maximum Shared Variance (MSV) values, ranging from 0.384 to 0.518, represent the maximum amount of shared variance between the constructs. The MSV values are lower than the corresponding AVE values, demonstrating discriminant validity, indicating that the constructs are distinct from each other.

Furthermore, the values of the square root of AVE were higher than the correlation values of the constructs, and the Heterotrait-Monotrait Ratio (HTMT) values were less than 0.90. The HTMT values ranged from 0.71 to 0.82 (see Table 9), which indicated excellent discriminant validity.

Table 9. HTMT Analysis

Variables	1	2	3	4	5
1. Financial Attitude	-				
2. Financial Knowledge	0.818	-			
3. Financial Behavior	0.822	0.761	-		
4. Workplace Financial Education Programs	0.778	0.721	0.71	-	
5. Financial Literacy Index	0.818	0.771	0.76	0.729	-

N = 100.

The CR values, AVE values, and MSV values confirm the reliability and validity of the measurement model. The values of the square root of AVE being higher than the correlation values of the constructs, along with HTMT values less than 0.90, confirm excellent discriminant validity. These results validate the distinctiveness of each construct and support the robustness of the measurement model, providing a solid foundation for subsequent structural equation modeling and hypothesis testing in the context of empowering women.

*4.5. **Measurement Model Fitness***

This study undertook Confirmatory Factor Analysis (CFA) to appraise the measurement model composed of five pivotal latent constructs: Financial Attitude, Financial Knowledge, Financial Behavior, Workplace Financial Education Programs, and Financial Literacy Index. The model's fit was evaluated using a suite of indices known for their robustness in depicting model congruence. These indices include the Chi-square to Degrees of Freedom ratio (χ^2/df), the Root Mean Square Error of Approximation (RMSEA), the Incremental Fit Index (IFI), the Tucker-Lewis Index (TLI), and the Comparative Fit Index (CFI).

The Chi-square to Degrees of Freedom ratio was found to be 2.843, which is slightly above the recommended maximum of 3, but still within an acceptable range. The RMSEA stood at 0.136, higher than the ideal benchmark of 0.08, suggesting that the model may need some improvement. The IFI, TLI, and CFI indices were 0.892, 0.870, and 0.891, respectively, which are below the desirable 0.90 mark, indicating that the model does not perfectly align with theoretical expectations but is still within a reasonable range.

In summation, while the measurement model demonstrates some acceptable fit to the data, there are areas that may require further refinement to enhance its congruence with the theoretical constructs. These results provide a basis for evaluating the constructs and suggest that the measurement items, though generally suitable, could benefit from further validation and potential adjustments in future studies.

Table 10. Measurement model

Measurement Model	χ^2	DF	χ^2/df	RMSEA	IFI	TLI	CFI
5-Factor Hypothesized Model	454.831	160	2.843	0.136	0.892	0.870	0.891
Model Fit Criteria			<3.00	<0.08	>0.90	>0.90	>0.90

N = 100.

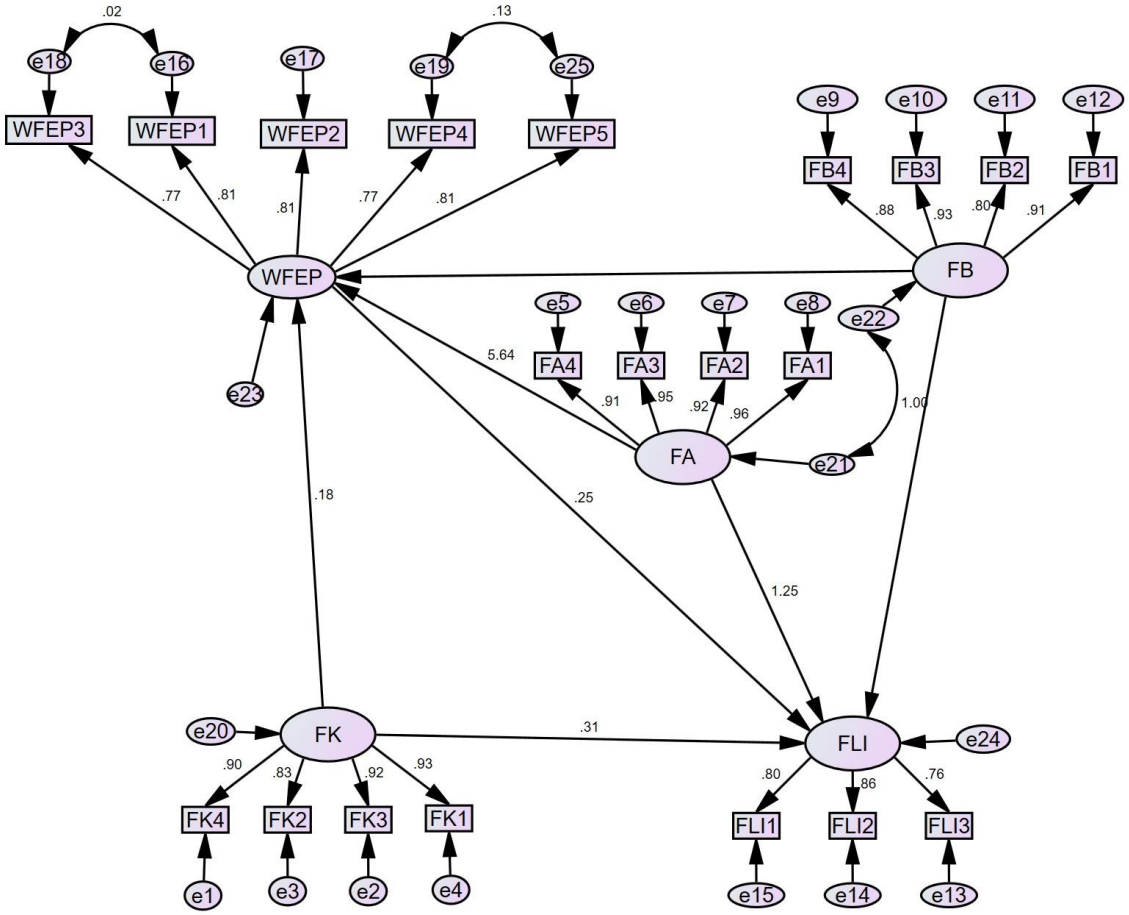

Figure 4. Measurement model

*4.6. **Hypotheses Testing***

The study hypotheses with direct and mediating effects were tested using the structural equation modeling (SEM) technique. Our study hypothesized three direct relationships, one indirect/mediating relationship. The direct effect results are presented in Table 8 and showed significant and positive relationships supporting the hypotheses. The results of these analyses are detailed below:

Direct Effects

The direct effect results are presented in Table 11 and showed a significant and positive relationship between Financial Attitude and Financial Literacy Index ($\beta = 0.9057$; $T = 28.171$; $p < 0.001$), affirming that Financial Attitude significantly enhances Financial Literacy Index. This finding supports the acceptance of hypothesis H1. A significant relationship was also found between Financial Behavior and Financial Literacy Index ($\beta = 0.9145$; $T = 22.242$; $p < 0.001$), suggesting that Financial Behavior significantly influences Financial Literacy Index, confirming hypothesis H2. Similarly, Financial Knowledge was found to positively influence Financial Literacy Index ($\beta = 0.9094$; $T = 22.916$; $p < 0.001$), confirming hypothesis H3.

Table 11. Test of Hypotheses (Direct Effect)

Relationships	Estimate	T	p
H1: Financial Attitude→ Financial Literacy Index	0.9057	28.171	<0.01
H2: Financial Behavior→ Financial Literacy Index	0.9145	22.242	<0.01
H3: Financial Knowledge → Financial Literacy Index	0.9094	22.916	<0.01

Indirect Effects

The indirect effect analysis indicated that Financial Attitude positively impacts Workplace Financial Education Programs through Financial Knowledge and Financial Behavior. The results suggest that Financial Knowledge and Financial Behavior act as mediators in the relationship between Financial Attitude and Workplace Financial Education Programs.

Table 12. Test of Hypotheses (Indirect Effect)

Relationships	Indirect Effect	S.E.	LLCI	ULCI	P-value
Financial Attitude → Workplace Financial Education Programs → Financial Literacy Index	1.393	0.01	1.374	1.413	< 0.001
Financial Behavior → Workplace Financial Education Programs → Financial Literacy Index	-1.154	0.01	-1.173	-1.134	< 0.001
Financial Knowledge → Workplace Financial Education Programs → Financial Literacy Index	0.043	0.01	0.024	0.063	< 0.001

The direct and indirect effect results affirm the proposed hypotheses, demonstrating significant and positive relationships among Financial Attitude, Financial Knowledge, Financial Behavior, and Workplace Financial Education Programs. These findings underscore the importance of these constructs in empowering women and provide a robust foundation for further analysis and hypothesis testing

Calculating FLI and Interpretation

Based on the given path coefficients and average scores for WFEP, FK, FA, and FB, the Financial Literacy Index (FLI) is calculated as follows:

Calculation Details

1. **Average Scores:**
   - **WFEP**: Average = 0.794
   - **FK**: Average = 0.895
   - **FA**: Average = 0.935
   - **FB**: Average = 0.88
2. **Path Coefficients:**
   - **WFEP → FK**: 0.18
   - **FK → FLI**: 0.31
   - **FA → FLI**: 1.25
   - **FB → FLI**: 1.00
3. **FLI Calculation:**

$$\text{FLI} = (\text{path}_{\text{WFEP}\to\text{FK}} \times \text{avg}_{\text{WFEP}} \times \text{path}_{\text{FK}\to\text{FLI}}) + (\text{avg}_{\text{FK}} \times \text{path}_{\text{FK}\to\text{FLI}}) + (\text{avg}_{\text{F}}$$

$$\text{FLI} = (0.18 \times 0.794 \times 0.31) + (0.895 \times 0.31) + (0.935 \times 1.25) + (0.88 \times 1.00)$$

$$\text{FLI} = (0.0443) + (0.2775) + (1.16875) + (0.88)$$

$$\text{FLI} = 2.3705$$

The Financial Literacy Index (FLI) is approximately **2.37**

INTERPRETATION

The calculated FLI of 2.37 indicates a moderate to high level of financial literacy among the respondents. This value reflects the cumulative impact of workplace financial education programs, financial knowledge, financial behavior, and financial attitude on overall financial literacy.

- **Workplace Financial Education Programs (WFEP)**: These programs have a positive but moderate direct impact on financial knowledge and an indirect impact on financial literacy through enhancing financial attitudes and behaviors.
- **Financial Knowledge (FK)**: High financial knowledge significantly contributes to financial literacy, indicating that understanding financial concepts is crucial for informed decision-making.
- **Financial Behavior (FB)**: Good financial behaviors, such as budgeting and saving, directly enhance financial literacy, emphasizing the importance of practical financial skills.
- **Financial Attitude (FA)**: A positive financial attitude has the strongest impact on financial literacy, suggesting that confidence and optimism in managing finances are critical for overall financial well-being.

Additionally, the analysis revealed no significant differences in financial literacy scores across genders, indicating that both men and women benefit equally from improvements in financial knowledge, behavior, and attitudes.

DISCUSSION

Key Findings

The study indicates a moderate to high level of financial literacy among respondents. Financial knowledge (FK) significantly contributes to financial literacy, with a path coefficient of 0.31. Financial behavior (FB) demonstrates a strong positive impact on financial literacy, as evidenced by a path coefficient of 1.00. Among the variables, financial attitude (FA) has the most substantial influence on financial literacy, with a path coefficient of 1.25. Workplace financial education programs (WFEP) exhibit a moderate direct impact on financial knowledge, with a path coefficient of 0.18, and a significant indirect impact on financial literacy through financial attitudes. Furthermore, the study reveals no significant difference in financial literacy scores across genders, suggesting that both men and women benefit equally from improvements in financial knowledge, behavior, and attitudes.

The demographic assessment reveals positive views on gender equality, particularly pronounced among women. While financial decisions are commonly shared, there is a tendency for higher individual financial responsibility among males. The data indicates a predominance of respondents with Bachelor's or Master's degrees, with a noticeable trend of more women pursuing advanced degrees. A positive correlation is observed between financial literacy and workplace success for women. Financial responsibility is generally balanced; however, some males show a preference for making financial decisions independently. Perceptions of workplace equality are mixed and appear to be influenced by gender.

Theoretical Contributions

This study contributes to the existing body of literature by integrating the Financial Knowledge and Attitude (FKA) and Financial Literacy Index (FLI) frameworks. The findings underscore the critical role of financial attitudes and behaviors in shaping financial literacy, extending beyond the traditional focus on financial knowledge alone. By demonstrating the indirect impact of workplace financial education programs on

financial literacy through financial attitudes, this research highlights the interconnectedness of knowledge, behavior, and attitudes in achieving financial literacy.

Practical Implications

The study's findings have several practical implications for policymakers, educators, and organizations. Firstly, enhancing financial literacy requires comprehensive programs that address not only knowledge but also attitudes and behaviors. Organizations should implement workplace financial education programs that focus on practical financial skills and foster positive financial attitudes. Policymakers should consider integrating financial literacy into broader educational curricula to ensure early and consistent exposure to financial concepts. Moreover, the lack of gender differences in financial literacy scores suggests that these programs can be uniformly applied across genders, promoting inclusivity and equality in financial education.

LIMITATIONS AND FUTURE RESEARCH:

Despite its contributions, this study has certain limitations. The sample size was relatively small, and the study focused on a specific geographic area (Mumbai), which may limit the generalizability of the findings. Additionally, the cross-sectional nature of the study does not allow for causal inferences. Future research should consider larger, more diverse samples and longitudinal designs to better understand the causal relationships between financial knowledge, behavior, attitudes, and literacy.

FUTURE RESEARCH AGENDA

Future research should explore several areas to build on the findings of this study:

1. **Broader Geographic Scope:** Investigate financial literacy in different regions of India to compare and contrast findings.
2. **Longitudinal Studies:** Conduct longitudinal studies to establish causal relationships between financial education interventions and changes in financial literacy over time.
3. **Detailed Gender Analysis:** While this study found no significant gender differences, future research could delve deeper into gender-specific financial behaviors and attitudes to identify any nuanced differences.
4. **Program Effectiveness:** Evaluate the long-term effectiveness of various financial education programs, particularly those targeting different age groups and socio-economic backgrounds.
5. **Technological Integration**: Explore the role of digital financial education tools and their effectiveness in enhancing financial literacy among different demographic groups.

By addressing these areas, future research can further elucidate the dynamics of financial literacy and develop more effective strategies to promote financial well-being across diverse populations.

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Influence of Organizational Culture and its Impact on Employees' Happiness

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ABSTRACT

Organizational culture plays a very important role for empowering transformation change in any organization. Organizational culture also plays a pivotal role in shaping employee happiness, which is essential for organizational success. Organizational culture is defined as the collective values, beliefs, and norms shaping the organizational environment, comprising dimensions of achievement, affiliation, and power. Employee happiness is construed as a multifaceted construct encompassing subjective, emotional, career, and social dimensions of well-being. This quantitative study, based on data from 127 respondents via an online survey featuring 32 questions, utilizes SPSS software to analyze the correlation between organizational culture and employee happiness. Employing Karl Pearson's correlation analysis, regression analysis, independent sample t-tests, and one-way ANOVA, the study derives results and concludes. The analysis refutes assumptions about organizational power's effect on employee happiness. Achievement and affiliation correlate positively with happiness, underlining recognition of achievements and social connections. Despite finding no gender disparities, the study underscores the importance of addressing diverse needs across different generations.

Keywords: *organization culture, achievement, affiliation, power, happiness, change*

1. INTRODUCTION

In the realm of workplace dynamics, the concept of happiness has emerged as a critical factor shaping employee experiences and organizational outcomes. As the intensity of work increases, so does the significance of fostering a positive work environment conducive to employee well-being (Hughes et al., 2007). Lyubomirsky et al. (2010) highlights the transformative power of happiness within organizations, noting that companies with higher levels of employee happiness often exhibit superior financial performance and heightened customer satisfaction. Consequently, there is a growing recognition among scholars and senior executives alike that cultivating happiness in the workplace isn't just a moral imperative but a strategic necessity.

Contrary to common misconceptions, happiness in the workplace isn't solely contingent upon material rewards or sensual pleasures. Gavin (2009) argues that while financial incentives and comfortable working conditions can influence well-being, they do not constitute the essence of happiness. Instead, research suggests that autonomy and freedom within the workplace have the most profound impact on employee happiness. Organizational culture, which represents the internal work environment and the treatment of employees by their bosses and peers, plays a crucial role in this regard. An effective organization should have a culture that takes into account employee happiness and encourages employee satisfaction (Qureshi et al., 2022). The primary aim of this dissertation is to delve into the intricate dynamics between organizational culture and employee happiness, exploring how different cultural dimensions impact various facets of employee well-being.

Organizational culture is conceptualized as the shared values, beliefs, and norms that characterize an organization, encompassing dimensions of achievement, affiliation, and power. The power dimension revolves around the distribution and utilization of authority, influence, and control within the organization, where status, competition, and rivalry are given importance. Achievement culture emphasizes goal attainment, performance excellence, and results-driven behaviors, encouraging innovation,

competitiveness, and continuous improvement. Affiliation culture prioritizes relationships, teamwork, and collaboration, fostering a sense of belonging and social cohesion among employees, where trust, communication, and mutual support are fundamental principles.

Employee happiness is interpreted as a multifaceted construct, comprising subjective, emotional, career, and social dimensions of well-being as per Boniwell's (2012) research. Subjective Well-being includes cognitive and affective components reflecting overall life satisfaction and fulfillment. Social Well-being emphasizes meaningful connections, empathy, and quality interpersonal relationships. Emotional Well-being focuses on self-awareness and emotional regulation, involving the ability to recognize, understand, and manage one's emotions effectively. Career Well-being is anchored in fulfillment from meaningful work, job satisfaction, and a sense of purpose.

1.1 STATEMENT OF THE PROBLEM

This study aims to investigate the correlation between organizational culture and employee happiness, examining how factors such as interpersonal dynamics (affiliation), success recognition (achievement) and power distribution influence overall well-being, while also exploring disparities in happiness across gender and generational line.

1.2 PURPOSE AND SCOPE OF THE STUDY

The purpose of this study is to investigate the relationship between organizational culture and employee happiness, examining how various dimensions of culture influence well-being and exploring differences across gender and generational lines.

The scope of this study includes a comprehensive examination of organizational culture's influence on employee happiness, drawing from diverse literature and empirical research. Using a combination of qualitative and quantitative methods, the research will gather data to illuminate the relationship between organizational culture and employee well-being.

1.3 RESEARCH QUESTIONS

1. How does the level of power within an organization relate to employee happiness?
2. Is there a difference in employee happiness based on perceived levels of achievement within the workplace?
3. What impact does affiliation with colleagues or groups have on employee happiness?
4. Are there differences in employee happiness among different gender and generational groups within the organization?

2. LITERATURE REVIEW

2.1 ORGANIZATIONAL CULTURE

The terminology surrounding organizational culture has seen significant evolution in academia. Scholars, including Deshpande & Farley (2004), Ravasi and Schultz (2006), and Xiaoming and Junchen (2012), generally agree that it encompasses a system of shared values, beliefs, and behaviors among employees.

Tharp (2009) observed common themes in definitions of organizational culture. They universally highlight sharing within groups as fundamental, emphasize its social construction based on organizational context and events, and suggest its multidimensional nature, encompassing cognitive and symbolic elements.

Culture, a core aspect of human existence, encompasses diverse ways of life entrenched in tradition and transmitted across generations. Within organizations, culture manifests as a system of shared values, norms, and behaviors, shaping interactions and influencing functioning (Schein, 2010). Schein defines organizational culture as a pattern of shared basic assumptions learned by groups to address challenges and ensure cohesion, encompassing artifacts, values, and assumptions emerging from member interactions.

Organizational culture's significance lies in its role as a stabilizing force, shaping employee behavior and influencing management decisions (Shah, 2015). Schein emphasizes its role in mergers and acquisitions, advocating for cultural analysis as central to decision-making to ensure compatibility and facilitate successful integration (Schein, 2010). Understanding and managing organizational culture are crucial for fostering employee engagement, satisfaction, and overall organizational performance (Schein, 2010).

2.2 EMPLOYEE HAPPINESS

While the concept of "happiness" may not immediately align with "work" for many, there's a long-standing belief that happiness at work is integral to overall happiness. Visionaries like Confucius, Thomas Edison, and Steve Jobs have all emphasized the connection between loving one's work and life satisfaction (Klein, 2015). With workplace happiness influencing overall well-being (Wang & Yang, 2016), understanding its dynamics becomes essential. Employee happiness has gained prominence as a critical concern in organizational management, highlighting its pivotal role in organizational success (Awada, Johar, & Ismail, 2019; Suwaidi 2019).

In organizations, factors at the organizational, job, and event levels contribute to employee happiness. This includes aspects such as organizational culture, HR practices, and the overall psychological climate, all of which play significant roles in shaping employees' sense of happiness and satisfaction. (Carr et al., 2003; Othman et al., 2018).

Various research shows a strong relationship between employee happiness and factors like organizational commitment and employee engagement as well. Affective commitment, reflecting emotional attachment to the organization, and engagement, characterized by vigor, dedication, and absorption in work, are both closely aligned with employee happiness (Meyer & Allen, 1991; Mowday et al., 1979; Kahn, 1990; Macey & Schneider, 2008; Ficarra et.al., 2021).

3. RESEARCH METHODOLOGY

3.1 RESEARCH DESIGN

This study adopts a quantitative research design to provide empirical evidence regarding the impact of organizational culture on employee happiness. The primary objective of quantitative research is to develop and test mathematical theories, models, and hypotheses related to phenomena.

3.2 RESEARCH VARIABLES

In this study, organizational culture, characterized by power, achievement, and affiliation, serves as the independent variable, while employee happiness, measured across subjective, emotional, career, and social well-being dimensions, acts as the dependent variable.

3.3 HYPOTHESIS

A hypothesis is a statement that can be verified through scientific investigation. The goal of this study is to determine how organizational culture impacts Employee happiness. To achieve this, the following hypotheses were proposed:

H01a: There is no significant difference between Power and Employee happiness.
H01b: There is no significant difference between Achievement and Employee happiness.
H01c: There is no significant difference between Affiliation and Employee happiness.
H01d: There is no significant difference between Employee happiness among genders
H01e: There is no significant difference between Employee happiness among generations

3.4 RESEARCH METHOD

3.4.1 INSTRUMENTS

Organizational Culture

Organizational culture was assessed using the Organizational Culture Questionnaire (OCQ), consisting of 12 items derived from McClelland's Motivation Theory.

The items were categorized as follows:
Power: Items 3, 6, 9, 12
Affiliation: Items 2, 5, 8, 11
Achievement: Items 1, 4, 7, 10

Participants used a five-point Likert scale (1=Strongly Disagree to 5=Strongly Agree) to indicate their agreement with each statement.

Employee Happiness

Employee Happiness was assessed using The Happiness Scale (HS–RHMJ) developed by Himanshi Rastogi and Janki Moorjani (2017). This scale comprises 62 items divided into five areas: Subjective Well-being, Social Well-being, Career Well-being, Emotional Well-being, and Spiritual Well-being. For this study, we focused on the first four areas, excluding spiritual well-being. Based on a face validity test, questions were selected from each area: 4 questions from Social Well-being, 4 from Subjective Well-being, 6 from Career Well-being, and 6 from Emotional Well-being. In the questionnaire provided in the annexure, the statements are arranged as follows:

Items 13-18: Career Well-being
Items 19-22: Subjective Well-being
Items 23-26: Social Well-being
Items 27-32: Emotional Well-being

Participants used a five-point Likert scale (1=Strongly Disagree to 5=Strongly Agree) to indicate their agreement with each statement.

3.4.2 PARTICIPANTS

The study sample consisted of 127 respondents: 74 females and 53 males. To analyze generational differences, participants were divided into three age groups: below 30, 30-40, and above 40. Additionally, work experience was categorized into five groups: less than 1 year, 1-3 years, 3-5 years, 5-7 years, and more than 7 years.

3.4.3 DATA COLLECTION

A questionnaire was developed and transformed into a Google form for online distribution. The survey link was shared via WhatsApp with family, friends, acquaintances, and colleagues. Responses were digitally recorded during data collection. Both primary and secondary data sources were used. The questionnaire, containing 32 items, was the primary data collection tool and was distributed digitally to gather quantitative data from 127 participants. Secondary data included research papers and relevant internet publications.

4. RESULTS AND DISCUSSIONS

4.1 ANALYSIS OF DATA

Table 1 shows that out of 127 respondents, 58.3% were women and 41.7% were men. Age-wise, 17.3% were 30-40 years old, 33.1% were above 40, and 49.6% were below 30. Experience-wise, 24.4% had less than 1 year, 22% had 1-3 years, 3.9% had 3-5 years, 4.7% had 5-7 years, and 44.9% had more than 7 years of experience. Data analysis was conducted using SPSS. Initially, a reliability test was performed, followed by correlation, ANOVA, and Independent T-tests to verify the hypotheses.

Reliability analysis

Data reliability was tested using the reliability test as shown in Table 3. Cronbach's

The alpha reliability index was used to evaluate the internal consistency of each construct. The Reliability for the sample was found to be 0.925.

Correlation and regression analysis

H01a: There is no significant relationship between Power and Employee Happiness.

To investigate the hypothesis that there is no significant relationship between Power and Employee Happiness, we utilized the Pearson correlation coefficient and R^2. The Pearson correlation coefficient between Power and Employee Happiness was found to be 0.104 with a corresponding p-value of 0.242, based on a sample size of 127. This indicates that Power and Employee Happiness may have a weak positive correlation, but the relationship is not statistically significant at the traditional significance threshold of 0.05. The R-squared value, which measures the proportion of variance in Employee Happiness explained by Power, was calculated to be 0.0109. This indicates that only approximately 1.09% of the variability in Employee Happiness can be accounted for by variations in Power. (Refer to Table 4)

Therefore, based on these findings, we fail to reject the null hypothesis, suggesting that there is no significant relationship between Power and Employee Happiness.

H01b: There is no significant relationship between Achievement and Employee Happiness

The Pearson correlation coefficient between Achievement and Employee Happiness was determined to be 0.561, with a corresponding p-value of which is less 0.001, based on a sample size of 127. This indicates a strong positive correlation between Achievement and Employee Happiness, which is statistically significant. Furthermore, the calculated R-squared value of 0.314 suggests that approximately 31.4% of the variability in Employee Happiness can be explained by variations in Achievement. (Refer to Table 4)

Therefore, considering these results, we reject the null hypothesis and conclude that there is a significant relationship between Achievement and Employee Happiness.

H01c: There is no significant relationship between Affiliation and Employee Happiness.

The Pearson correlation coefficient between Affiliation and Employee Happiness was calculated to be 0.593, with a corresponding p-value less than 0.001, based on a sample size of 127. This strong positive correlation suggests a significant relationship between Affiliation and Employee Happiness. Furthermore, the obtained R-squared value of 0.35 indicates that approximately 35.1% of the variability in Employee Happiness can be attributed to Affiliation. This substantial proportion underscores the influence of Affiliation on Employee Happiness. (Refer to Table 4)

Given these findings, we reject the null hypothesis, indicating that there is indeed a significant relationship between Affiliation and Employee Happiness.

H01d: There is no significant difference between Employee Happiness among Genders.

The hypothesis was tested using an Independent Samples Test, comparing the mean happiness scores between male and female employees. The mean happiness score for Male employees was 3.88 with a standard deviation of 0.64, while for Female employees, it was 3.90 with a standard deviation of 0.65, suggesting slightly less variability in male scores and indicating a slightly higher average happiness score among Females compared to Males. The Levene's Test for Equality of Variances, which assesses whether the variances of happiness scores are equal between genders, yielded a p-value of 0.845. Since this value is greater than 0.05. This suggests that there is no significant difference in the variances of happiness scores between male and female employees, and the assumption of equal variances is upheld for further analysis. The t-test for Equality of Means was then conducted assuming equal variances, yielding a t-value of -0.231 and a p-value of 0.818. Additionally, the test was conducted without assuming equal variances, resulting in a t-value of -0.232 and a p-value of 0.817. In both cases, the p-values are greater than 0.05, indicating that there is no significant difference in the mean happiness scores between male and female employees. (Refer to Table 5)

Therefore, based on the results of the Independent Samples Test and the Levene's Test, we fail to reject the null hypothesis. This suggests that there is no significant difference in Employee Happiness between genders in the studied population.

H01e: There is no significant difference between Employee Happiness among Generation.

The ANOVA test revealed a significant difference in Employee Happiness among generations, with an F-value of 5.512 and a significance level of 0.005. Post hoc Tukey HSD tests were then conducted to identify specific differences between generations. The mean differences were calculated as follows:

- Between Generation Z and Generation Y: -0.2693302
- Between Generation Y and Generation X: -0.1321248
- Between Generation Z and Generation X: -0.4014550

The corresponding p-values for these mean differences are:

- Generation Z and Generation Y: 0.192
- Generation Y and Generation X: 0.700
- Generation Z and Generation X: 0.004

The results show that there is no statistically significant difference in Employee Happiness between Generation Z and Generation Y ($p = 0.192$), or between Generation Y and Generation X ($p = 0.700$). However, a significant difference was found between Generation Z and Generation X ($p = 0.004$). (Refer table 6 and 7)

Therefore, based on these findings, the null hypothesis, which states that there is no significant difference between Employee Happiness among different generations, is rejected.

4.2 DISCUSSIONS AND INTERPRETATIONS

Power and Employee Happiness:

Despite common beliefs, the analysis shows that having power in an organization doesn't necessarily equate to greater happiness among individuals. The weak correlation between power and happiness suggests that factors beyond hierarchical structures influence workplace contentment. Moreover, happiness in the workplace is influenced by a multitude of factors beyond just one's position or level of authority. Elements such as job satisfaction, work-life balance, supportive work environments, and opportunities for personal and professional growth can all significantly impact an individual's overall happiness at work. Thus, while power may offer authority, it doesn't guarantee happiness.

Achievement and Employee Happiness:

The findings reveal a substantial correlation between Achievement and Employee Happiness, indicating a noteworthy relationship between these variables.

Feeling accomplished at work corresponds with higher happiness levels, indicating the importance of recognizing and rewarding employees' successes. This correlation suggests that individuals who feel a sense of accomplishment and success in their professional endeavors are more likely to experience greater overall satisfaction and happiness in their roles. The strong correlation underscores the importance of recognizing and rewarding employees' achievements as a means of fostering positive emotions and well-being in the workplace.

Affiliation and Employee Happiness:

The findings depict a substantial correlation between these variables, indicating a significant relationship. Employees who perceive a strong sense of affiliation, such as belongingness and camaraderie in their work environment, tend to report higher levels of happiness. This suggests that fostering a supportive and inclusive workplace culture can positively impact employees' overall satisfaction and happiness levels.

Gender and Employee Happiness*:*

Contrary to initial expectations, the results indicate that there is no significant difference in happiness levels between male and female employees. This suggests that factors influencing happiness in the workplace might be distributed evenly across genders, leading to similar levels of satisfaction and contentment among both male and female employees. While gender-based differences in workplace experiences have been widely discussed, this analysis suggests that, in terms of happiness, male and female employees may experience similar levels of satisfaction and contentment within the studied population.

Overall, these results underscore the importance of recognizing and addressing factors that contribute to overall workplace happiness, irrespective of gender. Organizations can use these insights to develop strategies aimed at fostering a positive work environment that caters to the diverse needs of all employees, ultimately enhancing overall employee well-being and productivity.

Generations and Employee Happiness:

The analysis shows a significant correlation between generation and employee happiness, indicating different levels of happiness among various age groups. ANOVA results reveal a statistically significant difference in happiness across generations (F-value = 5.512, p = 0.005), suggesting these variations are not due to chance. Younger employees often value career growth, work-life balance, and purpose, while older

employees prioritize job security, recognition, and leadership opportunities. Understanding these generational differences is crucial for organizations to create inclusive and supportive environments, enhancing overall employee happiness and well-being. Tailored strategies can help meet the diverse needs of each generation, benefiting both employees and the organization.

5. LIMITATIONS, RECOMMENDATIONS AND DIRECTION FOR FUTURE STUDY

5.1 LIMITATION

The study faces several limitations, including a small sample size of 127 participants, potentially hindering the detection of significant relationships between variables. Moreover, gender and age imbalances exist, with an unequal distribution among male and female participants and fewer individuals in the 30-40 age group, limiting the generalizability of findings. Additionally, the exclusion of key demographics such as educational background, occupation, and income restricts the comprehensiveness of the analysis. Furthermore, the assessment of organizational culture dimensions is narrow, overlooking crucial aspects like autonomy, innovation, leadership style, and organizational structure. The scope of discussions may also be constrained due to limited research experience and dissertation format, while the accuracy of responses may be compromised due to the length of the questionnaire or other factors, potentially introducing biases into the data.

5.2 RECOMMENDATIONS AND FUTURE SCOPE OF RESEARCH

While the study offers valuable insights into the link between organizational culture and employee happiness, there are notable areas for improvement. Future research should broaden its scope by incorporating additional culture dimensions such as autonomy, innovation, and leadership style, alongside comparative studies across industries and cultural contexts to tailor strategies effectively. Increasing the sample size and ensuring gender balance would bolster statistical power and provide clearer insights into demographic variations. Additionally, employing qualitative methods like interviews can deepen understanding, while developing and evaluating employee well-being initiatives, such as mindfulness programs or leadership development, could foster positive cultures and enhance happiness within organizations.

6. CONCLUSION

The dissertation delves into the complex interplay between organizational culture and employee happiness, employing a quantitative research approach. It reveals that while organizational power does not singularly dictate employee happiness, dimensions like achievement and affiliation do impact. The study challenges gender assumptions, finding no significant disparities in happiness levels, while generations do have different happiness levels, urging organizations to address diverse employee needs for sustained well-being.

Moreover, the dissertation underscores the pivotal role of organizational culture in shaping employee happiness, advocating for proactive measures to cultivate positive work environments. Recognizing factors like achievement and fostering inclusivity can enhance employee well-being, contributing to organizational success amidst the evolving landscape of modern workplaces. As literature suggests, employee happiness serves as a linchpin connecting job satisfaction, commitment, and engagement, reinforcing the critical importance of fostering a positive organizational culture.

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ANNEXURE A

Figure 1: Employee Happiness – Conceptual Framework

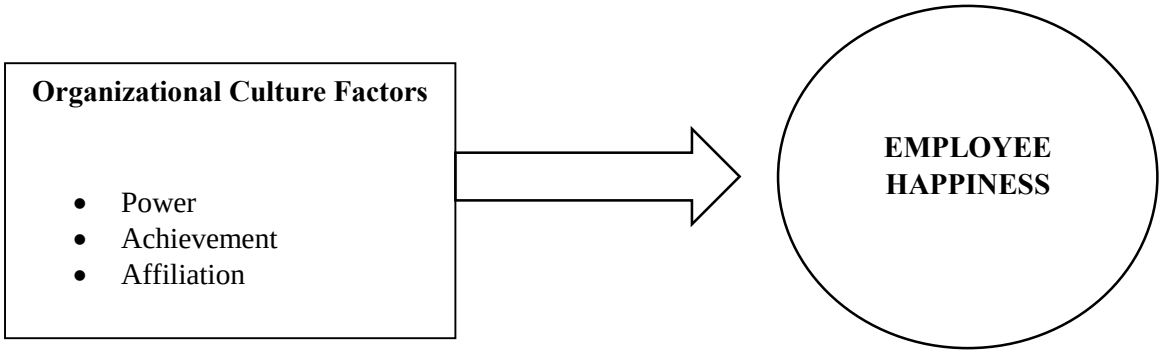

Table 1: Demographic Profile of Respondents

Sr. No	Demographic Factors					
1	Age	Below 30	30-40		Above 40	
		63	22		42	
2	Gender	Male			Female	
		53			74	
3	Work Experience	< 1 Year	1 - 3 Years	3 - 5 Years	5 - 7 Years	> 7 Years
		31	28	5	6	57

Table 2: Descriptive Statistics

Factors	N	Mean	Std. Deviation	Variance
Organizational Culture Factors				
Achievement	127	3.63	0.77	0.6
Affiliation	127	3.84	0.89	0.79
Power	127	3.05	0.9	0.82
Employee Happiness Factors				
Career Wellbeing	127	3.9	0.73	0.53
Subjective Wellbeing	127	3.84	0.74	0.55
Social Wellbeing	127	3.98	0.73	0.54
Emotional Wellbeing	127	3.85	0.76	0.58
Overall Happiness	127	3.89	0.64	0.42

Table 3: Reliability Statistics.

Cronbach's Alpha	N of Items
0.925	32

Table 4: Correlations

		Achievement	Affiliation	Power	Overall Happiness
Achievement	Pearson Correlation	1	.635**	0.16	.561**
	Sig. (2-tailed)		0	0.071	0
	N	127	127	127	127
Affiliation	Pearson Correlation	.635**	1	-0.103	.593**
	Sig. (2-tailed)	0		0.25	0
	N	127	127	127	127
Power	Pearson Correlation	0.16	-0.103	1	0.104
	Sig. (2-tailed)	0.071	0.25		0.242
	N	127	127	127	127
Overall Happiness	Pearson Correlation	.561**	.593**	0.104	1
	Sig. (2-tailed)	0	0	0.242	
	N	127	127	127	127

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5: Independent Samples Test

Group Statistics					
Gender code*		N	Mean	Std. Deviation	Std. Error Mean
Overall Happiness	0	53	3.877358	0.6395562	0.0878498
	1	74	3.904279	0.652605	0.0758638

*0 - Female, 1 - Male

Independent Samples Test								
		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Overall Happiness	Equal variances assumed	-0.231	125	0.818	-0.027	0.116	-0.257	0.204
	Equal variances not assumed	-0.232	113	0.817	-0.027	0.116	-0.257	0.203

Table 6: ANOVA

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Overall Happiness	**Between Groups**	4.276	2	2.138	5.512	0.005
	Within Groups	48.106	124	0.388		
	Total	52.382	126			

Table 7: POST-HOC

Dependent Variable		Mean Difference (I-J)			Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Overall Happiness	Tukey HSD	1	2	-.2693302	.1542466	.192	-.635232	.096572
			3	-.4014550*	.1240759	.004	-.695786	-.107124
		2	1	.2693302	.1542466	.192	-.096572	.635232
			3	-.1321248	.1639237	.700	-.520983	.256733
		3	1	.4014550*	.1240759	.004	.107124	.695786
			2	.1321248	.1639237	.700	-.256733	.520983

The Role of Blockchain Technology in Transforming International Trade Facilitation

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ABSTRACT

This literature review explores the transformative capacity of blockchain technology to enhance international trade facilitation. It consolidates current research on the application of blockchain across crucial aspects of global trade, such as supply chain management, trade finance, and customs and compliance procedures. The review highlights how blockchain's fundamental characteristics of decentralization, transparency, and immutability address persistent challenges in international trade. Key findings suggest that blockchain can significantly enhance supply chain traceability, streamline trade finance processes, and boost the efficiency of customs procedures. The technology shows promise in lowering trade costs, boosting trade volumes, and building trust among trade partners. However, the review also identifies several obstacles to widespread adoption, including the need for standardization, regulatory frameworks, and overcoming technical and implementation barriers. The paper concludes that while blockchain has significant potential to transform international trade facilitation, realizing its full benefits requires collaborative efforts from various stakeholders to tackle existing challenges. This review enriches the expanding body of knowledge on blockchain in international trade and provides valuable insights for policymakers, practitioners, and researchers in the field.

Keywords: *blockchain, international trade, trade facilitation, supply chain management, trade finance, customs procedures, digital transformation, smart contracts*

INTRODUCTION

International trade has historically been characterized by complex processes, multiple intermediaries, and substantial paperwork, resulting in inefficiencies, delays, and increased costs. However, the advent of blockchain technology offers a highly effective solution to enhance and revolutionize international trade facilitation. This literature review examines the potential of blockchain technology to revolutionize various aspects of international trade, such as supply chain management, trade finance, customs procedures, and overall trade facilitation.

Methodology:

This study employed ‘Elicit’, a research tool that assists in the retrieval, data extraction, and organization of pertinent academic publications. This tool was utilized to conduct a comprehensive search of available literature using an interrogative prompt containing the key terms 'Blockchain', 'International', and 'Trade Facilitation'. The query yielded a corpus of 288 relevant published articles. To enhance the comprehensiveness of the review, three additional publications from international organizations,

specifically, the United Nations (UN), World Trade Organization (WTO), and the World Customs Organization (WCO) were manually included. This approach resulted in a final set of 291 documents for analysis.

A structured database was subsequently developed, encompassing salient bibliometric information for each publication, including title, authorship, DOI, journal, citation frequency, year of publication, abstract, and blockchain-specific findings. This database was then subjected to a comprehensive screening process employing the following inclusion criteria, applied sequentially:

a) Relevance of title and abstract to the research focus (blockchain and international commerce)
b) Significance of blockchain-specific findings
c) Citation frequency (minimum threshold of 5 citations)

The application of these filtration criteria resulted in the identification of 46 articles of high relevance, which were subsequently subjected to full-text review. During this process, it was observed that certain findings were replicated across multiple publications. Consequently, a final selection of 22 publications was made, with due consideration given to citation frequency and the significance of the findings presented in each paper. This methodological approach ensured a comprehensive yet focused review of the most pertinent and impactful literature in the field, providing a solid foundation for further analysis and discussion.

Blockchain Technology: An Overview

Blockchain technology, initially conceptualized as the underlying architecture for Bitcoin by Nakamoto in 2008, has evolved into a decentralized digital ledger system with wide-ranging applications beyond cryptocurrencies (Chang, Chen & Wu, 2019; Bogucharskov et al., 2018). At its core, blockchain is a cryptographic protocol that enables separate parties to enhance the trustworthiness of transactions by creating an immutable and transparent record (De Villiers, Kuruppu & Dissanayake, 2021; UNCEFACT, 2020). The technology functions as a distributed database, generating time-stamped blocks via cryptography, which permanently maintains transaction records and improves the transparency and security of transactions (Chang, Luo & Chen, 2019; Sinha & Chowdhury, 2021).

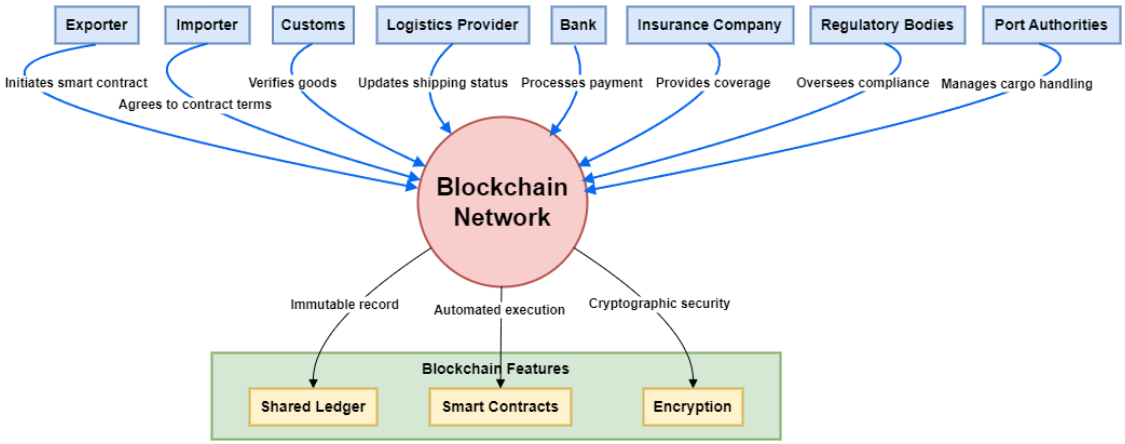

Fig 1: Blockchain Architecture in International Trade

Blockchain technology is characterized by its decentralized nature, transparency, unchangeable records, robust security, and the implementation of collaborative consensus protocols. (Chang, Iakovou & Shi, 2019; Sinha & Chowdhury, 2021; Belu, 2019). These characteristics make blockchain particularly suitable for applications requiring trust, transparency, and security across various industries, including international trade (Chang, Iakovou & Shi, 2019; Irannezhad, 2020).

Blockchain technology can be broadly classified into three primary types: public, private, and consortium or federated. (Sinha & Chowdhury, 2021; Balci & Surucu-Balci, 2021). Public blockchains are accessible to anyone, while private and consortium blockchains have restricted access and are often used in business applications (Ioannou & Demirel, 2022).

BLOCKCHAIN'S IMPACT ON CROSS-BORDER TRADE FACILITATION

One of the key areas where blockchain technology is set to have a profound impact is supply chain management (SCM). The complexity and opacity of global supply chains have long been challenges for international trade. Blockchain technology provides an effective, safe, and transparent means of monitoring and controlling the flow of goods across international borders. (Koh, Dolgui & Sarkis, 2020; Irannezhad, 2020).

Traceability and Transparency

Blockchain is especially useful for improving supply chain traceability because it can produce an unchangeable and transparent record of transactions. Blockchain, as mentioned by Hooper and Holtbrügge (2020) enables businesses to trace a product's history from the acquisition of raw materials through the supply chain to the point of sale. This level of transparency not only improves supply chain efficiency but also addresses growing consumer demands for ethical standards and product provenance (De Villiers, Kuruppu & Dissanayake, 2021).

Several major companies have already begun implementing blockchain solutions in their supply chains. For example, the TradeLens platform, created by IBM and Maersk, reduced the need for third-party validation during freight shipment by offering authenticity to all supply chain players (Hooper & Holtbrügge, 2020; Jensen, Hedman & Henningsson, 2019). In a similar vein, Walmart and IBM have collaborated to monitor the flow of food items through their supply chain; one of their initial significant initiatives involved tracking pork in the Chinese supply chain in order to improve food safety (Hooper & Holtbrügge, 2020).

Efficiency and Cost Reduction

Blockchain use in supply chain management (SCM) has the potential to significantly increase productivity and cut costs. Blockchain can save trade expenses and improve overall trade performance by doing away with middlemen and simplifying procedures (Chang, Chen & Wu, 2019; Siddik et al., 2020). According to projections from the World Economic Forum, blockchain-enabled IT solutions could raise global trade

volume by 10-15%, lower the cost of doing business internationally by 5-20%, and increase GDP globally by 3-5% (Jensen, Hedman & Henningsson, 2019).

Smart Contracts and Automation

Blockchain technology's self-executing contracts, or "smart contracts," are a crucial component that has the potential to completely transform supply chain management. According to Toorajipour et al. (2022) and Sinha & Chowdhury (2021), these contracts have the ability to automatically initiate actions or payments when predetermined conditions are met. This minimizes the need for manual intervention and reduces the possibility of errors or disagreements. Smart contracts can streamline the entire supply chain process in the context of international trade by automating a number of tasks like payments, document verification, and compliance checks (Segers et al., 2019; Bogucharskov et al., 2018).

Revolutionizing Trade Finance

Trade finance, a critical component of international trade, is another area where blockchain technology is making significant inroads. Traditional trade finance processes are often slow, paper-intensive, and prone to fraud. By giving trade finance transactions, a safe, transparent, and effective platform, blockchain provides an answer to these problems. (Ioannou & Demirel, 2022; Hofmann et al., 2017).

Letter of Credit Process Improvement

The letter of credit is among the most promising uses of blockchain in trade finance. (L/C) process. Chang, Chen & Wu (2019) propose a blockchain-based re-engineering of the L/C process, which could significantly improve the efficiency and security of this crucial trade finance instrument. By leveraging blockchain and smart contracts, the proposed system could automate document verification, reduce processing time, and minimize the risk of fraud (Chang, Luo & Chen 2019; Toorajipour et al., 2022).

Blockchain use in L/C payments would lower costs associated with this payment method, expedite document handling, and simplify the payment process (Belu, 2019; Bogucharskov et al., 2018). By cutting the time needed to complete a capital exchange from the usual week or ten days to less than one day, Barclays Bank, for example, has already shown the promising potential of blockchain in trade finance (Hooper & Holtbrügge, 2020).

Enhancing Access to Finance

Additionally, blockchain technology may make it easier for small and medium-sized businesses (SMEs) in developing nations to obtain trade finance. By providing a transparent and secure platform for transactions, blockchain can help reduce the perceived risk associated with lending to SMEs, potentially expanding the availability of trade finance (Dahdal, Truby & Botosh, 2020).

Moreover, blockchain-based platforms can enable new forms of trade finance, such as reverse factoring and dynamic discounting. These innovations can optimize working capital management for both buyers

and suppliers, further facilitating international trade (Ioannou & Demirel, 2022; Hofmann, Strewe & Bosia, 2017).

Streamlining Customs Procedures

Customs procedures are often a significant bottleneck in international trade, causing delays and increasing costs. Blockchain technology offers several opportunities to streamline these processes, enhancing efficiency and reducing the potential for fraud (Segers et al., 2019).

Digital Documentation and Verification

The capacity of blockchain technology to digitize and securely retain trade documents is one of its main advantages in customs processes. This can significantly reduce paperwork and streamline the verification process. Blockchain technology has the potential to enable shippers to digitize their supply chains and remove several middlemen that cause expensive delays and corruption, as highlighted by McDaniel and Norberg (2019)

Trade documents are more reliable due to the unalterable nature of blockchain records. Blockchain technology can guarantee data integrity by making it nearly impossible to change or delete once it has been recorded (Chang, Iakovou & Shi, 2019). This feature is particularly valuable for customs authorities, as it can help prevent fraud and improve the accuracy of declarations (UNCEFACT, 2020).

Cross-Border Data Exchange

Blockchain can facilitate secure and efficient cross-border data exchange between customs authorities and other relevant parties. By allowing traders to submit all import, export, and transit information through a single input point, this can aid in the realization of the idea of a "Single Window" system (Chang, Iakovou & Shi, 2019; UNCEFACT, 2020). Blockchain can dramatically cut processing times and enhance overall trade facilitation by enabling real-time information exchange and processing with all interested parties in a highly secure manner (Segers et al., 2019; Juma, Shaalan & Kamel, 2019).

Risk Management and Compliance

The transparent and traceable nature of blockchain can enhance risk management and compliance in customs procedures. By providing a complete and immutable record of transactions, blockchain can help customs authorities more effectively identify high-risk shipments and focus their resources on these areas. This risk-based approach can lead to more efficient customs clearance processes while maintaining or improving compliance levels (Juma, Shaalan & Kamel, 2019).

Enhancing Overall Trade Facilitation

Beyond specialized uses in trade finance, supply chain management, and customs processes, blockchain technology has the ability to improve overall trade facilitation in a number of ways:

1. Increased Transparency and Trust: Blockchain's immutable and transparent nature can foster trust among trade partners and regulatory bodies, reducing the need for intermediaries and facilitating smoother transactions (Siddik et al., 2020; Belu, 2019).
2. Improved Data Quality and Accessibility: By providing a single, shared source of truth, blockchain can improve the quality and accessibility of trade-related data, enabling better decision-making and risk management (UNCEFACT, 2020).
3. Enhanced Coordination and Collaboration: Blockchain platforms can facilitate better coordination and collaboration among various stakeholders in the trade ecosystem, including exporters, importers, logistics providers, and regulatory bodies (Jensen, Hedman & Henningsson, 2019).
4. Reduced Trade Costs: Through process automation, reduced paperwork, and improved efficiency, blockchain can significantly reduce overall trade costs (Siddik et al., 2020; Chang, Iakovou & Shi, 2019).
5. Facilitation of Cross-border E-commerce: Blockchain can support the growth of cross-border e-commerce by providing secure and efficient platforms for international transactions and logistics (Macedo, 2018).

CHALLENGES AND CONSIDERATIONS

Although blockchain has a lot to offer in terms of facilitating international trade, there are a number of issues and concerns that must be resolved before it can be widely used.

Standardization and Interoperability

One of the primary challenges in implementing blockchain solutions for international trade is the need for standardization and interoperability. As noted by Allen et al. (2019) and UNCEFACT (2020), the development of blockchain standards can take two broad paths: open or closed. Achieving consensus on standards and ensuring interoperability between different blockchain platforms is crucial for realizing the full potential of this technology in international trade (Balci & Surucu-Balci, 2021; Koh, Dolgui & Sarkis, 2020).

Regulatory and Legal Frameworks

Appropriate legislative and regulatory frameworks are also necessary for the deployment of blockchain in global commerce. To provide a solid basis for blockchain-based trade facilitation, concerns including the legal standing of smart contracts, data privacy laws, and cross-border jurisdiction must be resolved. It is frequently mentioned that one of the main obstacles to blockchain adoption in international trade is the absence of clear legislation and legal frameworks (Balci & Surucu-Balci, 2021).

Scalability and Technical Challenges

As blockchain technology is still evolving, there are concerns about its scalability and ability to handle the massive volume of transactions in international trade. Technical challenges such as transaction speed, energy consumption, and data storage need to be addressed to ensure the viability of blockchain solutions

at a global scale (Balci & Surucu-Balci, 2021). Concerns over the potential environmental effects of specific blockchain consensus algorithms, particularly in public blockchains, have also been voiced (De Villiers, Kuruppu & Dissanayake, 2021).

Adoption and Change Management

The effective use of blockchain technology in global trade requires widespread adoption by various stakeholders, including traders, banks, customs authorities, and logistics providers. Overcoming resistance to change and ensuring all parties have the necessary technical capabilities are significant challenges that need to be addressed (Balci & Surucu-Balci, 2021; Irannezhad, 2020). The lack of understanding and expertise in blockchain technology among trade professionals may also be a barrier to adoption.

Data Privacy and Security Concerns

While blockchain's cryptographic features provide increased security, concerns remain about data privacy and the potential for cyber-attacks. Ensuring the privacy of sensitive trade information while maintaining the transparency benefits of blockchain is a delicate balance that needs to be struck. Additionally, the immutability of blockchain records raises questions about the right to be forgotten and compliance with data protection regulations like GDPR (UNCEFACT, 2020).

Implementation Costs

The initial costs of implementing blockchain solutions in international trade can be significant, particularly for smaller businesses and developing countries. These costs include not only the technology infrastructure but also training and change management expenses.

FUTURE OUTLOOK

Despite the challenges, blockchain technology has enormous potential for transforming the facilitation of international trade. As this technology matures and more use cases are developed, we can expect to see increased adoption across various aspects of international trade.

Future Outlook

Blockchain's role in international trade will probably grow as it integrates more with other cutting-edge technologies like big data analytics, artificial intelligence (AI), and the Internet of Things (IoT). Even more advanced and effective trade facilitation solutions may result from this convergence of technologies. For example, real-time tracking of commodities and autonomous execution of smart contracts based on predetermined criteria could be made possible by the integration of blockchain with IoT.

As governments and international organizations recognize the potential of blockchain, we may see increased efforts to develop supportive regulatory frameworks and standards. The United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT), for instance, is already working on

developing standards and best practices for blockchain implementation in international trade. Similarly, initiatives like the World Trade Organization's blockchain for trade project are exploring how technology can be leveraged to enhance global trade.

The potential impact of blockchain on developing countries and small businesses is particularly noteworthy. By reducing trade costs and improving access to finance, blockchain could help level the playing field in international trade, enabling smaller players to compete more effectively in the global marketplace.

Further Research Propositions

Though several research gaps in the field of blockchain technology applications to facilitate international trade can be identified, there are some key areas that may warrant further comprehensive investigation. Some such key research propositions are provided below. These propositions could serve as starting points for future research projects, helping to address crucial questions in this field and contribute to a more thorough understanding of blockchain's potential and challenges in international trade facilitation.

- Investigation into the quantifiable impact of blockchain adoption on trade facilitation costs and efficiency.
- Studies investigating interoperability challenges between different blockchain platforms in international trade ecosystems.
- Research on the effectiveness of blockchain in reducing fraud and enhancing transparency in global supply chains.
- Examination of the evolution of legal and regulatory frameworks necessary to support blockchain adoption in cross-border trade.
- Analysis of blockchain's impact on trade participation for SMEs, and assessment of such trade participant’s inclusion and diversity.
- Studies on the integration of blockchain with IoT and AI for enhanced trade facilitation and cross-border supply chain management.
- Research on the role of blockchain in improving access to trade finance for businesses in developing countries.
- Analysis of the cybersecurity risks and data privacy challenges associated with implementation of blockchain-based trade platforms.

These propositions address critical areas where current knowledge seems to be limited or where there are significant opportunities for empirical investigation. They focus on quantifiable impacts, practical challenges in implementation, regulatory aspects, and inclusivity – all crucial aspects for the future of blockchain in international trade facilitation.

CONCLUSION

In summary, blockchain technology demonstrates significant potential to address many long-standing challenges in international trade facilitation. The transformative capacity of blockchain extends to various aspects of international trade, including supply chain traceability, streamlining of trade finance processes,

and boosting the efficiency of customs procedures. By enhancing transparency, security, and efficiency across supply chains, trade finance, and customs procedures, blockchain can contribute to reducing trade costs, increasing trade volumes, building trust among trade partners and ultimately fostering economic growth.

Limitations

Despite the promising outlook, this review has several limitations that should be acknowledged:

Limited Empirical Evidence: Much of the literature reviewed is theoretical, with limited real-world case studies or empirical data on blockchain's impact on international trade.

Interdisciplinary Gap: The review might not fully capture the interdisciplinary nature of the topic, potentially overlooking insights from fields such as international relations, global trade economics, socio-political landscape or mercantile law.

Inclusion Criteria: The scope of this literature review is primarily confined to peer-reviewed academic publications, which may have resulted in the exclusion of pertinent information from alternative sources. Given the rapidly evolving nature of this field, significant developments, including empirical evidence, are frequently disseminated through trade publications, industry-specific news releases, and proceedings from academic or professional conferences. The omission of these sources may limit the comprehensive nature of the review and potentially exclude recent, practical insights into the application of blockchain technology in international trade facilitation.

Implications

The findings of this review have several important implications:

Transformative Potential: Blockchain technology has significant potential to revolutionize various aspects of international trade, necessitating preparation and adaptation from all stakeholders.

Efficiency and Cost Reduction: The adoption of blockchain in international trade could lead to substantial improvements in efficiency and reductions in trade costs, potentially reshaping global trade dynamics.

Enhanced Transparency and Trust: Blockchain's inherent characteristics could foster greater transparency and trust among trade partners and regulatory bodies, potentially reducing fraud and disputes in international trade.

SME Empowerment: Blockchain could potentially level the playing field in international trade, enabling smaller businesses and developing countries to participate more effectively in global markets.

Regulatory Challenges: There is a clear need for supportive regulatory frameworks and standards to facilitate the widespread adoption of blockchain in international trade.

Technological Integration: Future developments in blockchain for international trade are likely to involve integration with other emerging technologies such as IoT, AI, and big data analytics, necessitating a multidisciplinary approach to research and implementation.

Environmental Considerations: The potential environmental impact of certain blockchain consensus mechanisms, particularly in public blockchains, needs to be carefully considered and addressed in future implementations.

Realizing the full potential of blockchain in international trade facilitation will require concerted efforts from all stakeholders to address technical, regulatory, and adoption challenges. As blockchain technology continues to develop and mature, it is expected to play an increasingly important role in shaping the future of international trade. Further research, particularly empirical studies and real-world case analyses is crucial to better understand the practical implications and challenges of implementing blockchain in international trade.

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Uncovering the Impact of Technology-driven Services on Boosting Farmer Producer Organizations (FPO) Growth: A Glimpse into the Promising Future of Indian Agriculture

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ABSTRACT

Farmer-producer organizations (FPOs) are vital for supporting agricultural communities by tackling challenges individual farmers face. Information and Communication Technology (ICT) not only improves FPO management but also has the potential to significantly enhance the performance and profitability of these organizations, driving the knowledge-based economy. This study aims to understand and harness this potential of ICT in FPO management, using a literature review as the research methodology. The study found that ICT applications such as precision farming, farm management software, and mobile technology are leading to unprecedented advancements in farming practices. The increasing importance of ICT in agriculture is improving the performance and profitability of FPOs, indicating a promising future for Indian agriculture. Effective integration programs could be designed to help farmers incorporate ICT more effectively and increase returns from their farming businesses. These programs may include capacity building, registration, business planning, MIS development, connection to the value chain, administrative expenses, and progress monitoring costs required for FPO development. Overall, the application of ICT in agriculture is increasingly important and has the potential to enhance the performance and profitability of Farmer Producer Organizations, demonstrating a promising future.

Key Words: *Farmers, Farm produce, ICT, Marketing, Challenges*

INTRODUCTION

The Indian agricultural sector, crucial for most of the population, faces significant challenges requiring innovative solutions. With the sector contributing about 14% of the country's GDP, it urgently needs a boost. Farmers struggle with low prices for their produce and lack information about prices in other markets. This research explores the impact of technology-driven services on boosting Farmer Producer Organizations (FPO) growth in Indian agriculture. FPOs play a crucial role in uniting individual farmers and improving their income. They offer better market access, reduce supply chain inefficiencies, and rely on external assistance for business management. It is crucial to equip FPOs with essential skills and knowledge for their sustainability and growth.

Farmers Producer Organizations (FPOs) support farmers by uniting small and marginal farmers, providing access to resources and market linkages. They reduce production costs and make farmers more competitive, ensuring a hopeful future for Indian agriculture. However, FPOs need help in governance, market linkage, and working capital management in rural areas. Modernizing agricultural marketing is crucial for the sector's development. This can be achieved by promoting alternative marketing systems, establishing effective farmer-purchaser linkages, and leveraging digital marketing. Farmer-producer organizations (FPOs) assist smallholder farmers in accessing inputs and selling produce collectively, thereby increasing their incomes. Maharashtra recently set up an e-trading platform for agricultural produce to streamline marketing and provide real-time prices based on market demand and supply.

The growth of ICT in developing countries offers new technology and opportunities for accessing information in poor countries. Various pilot programs in India, Bangladesh, and sub-Saharan countries are trying these new approaches. The essential elements for the journey towards Viksit Bharat@2047 include diversification into High-Value Commodities and improved market access through Farmers' Producers Organizations (FPOs), allowing farmers to receive better prices and higher profits. Nikam et al. (2019) have suggested that providing adequate policy and institutional support to FPOs is essential to make them productive and economically self-sustaining, ensuring sustainable livelihoods for farmers. The study by Kumar et al. (2020) revealed that most of the key performance indicators (KPIs) are related to the internal processes of the FPO. This indicates that an FPO should pay close attention to its internal operations and functions in order to succeed. The study also mentioned that the use of Information and Communication Technology (ICT) in farming and business practices serves as indicators of learning and growth for FPOs.
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This paper highlights the importance of Farmer Producer Organizations (FPOs) and the role of Information and Communication Technologies (ICTs) in enhancing their effectiveness. It emphasizes how ICTs help reduce transaction costs, improve market participation, and commercialize agrarian output to increase farmers' income. It also discusses how ICTs help overcome various challenges FPOs face, such as managing weather, technology, price, and other risks, and how they contribute to the country's socio-economic development.

Our study aims to investigate the impact of ICT on the development of farmer-producer organizations (FPO). It provides insights and solutions to their current challenges so that member farmers will be encouraged to use e-agricultural services.

OBJECTIVES OF THE PROPOSED STUDY

1. To identify information and communication technologies that are available for use in the management of FPOs.
2. To investigate the impact of ICT-enabled services on farmer-producer organization's (FPO) development.
3. To ascertain the challenges associated with using ICT tools to manage FPO from being a fully inimitable resource.

RESEARCH METHOD

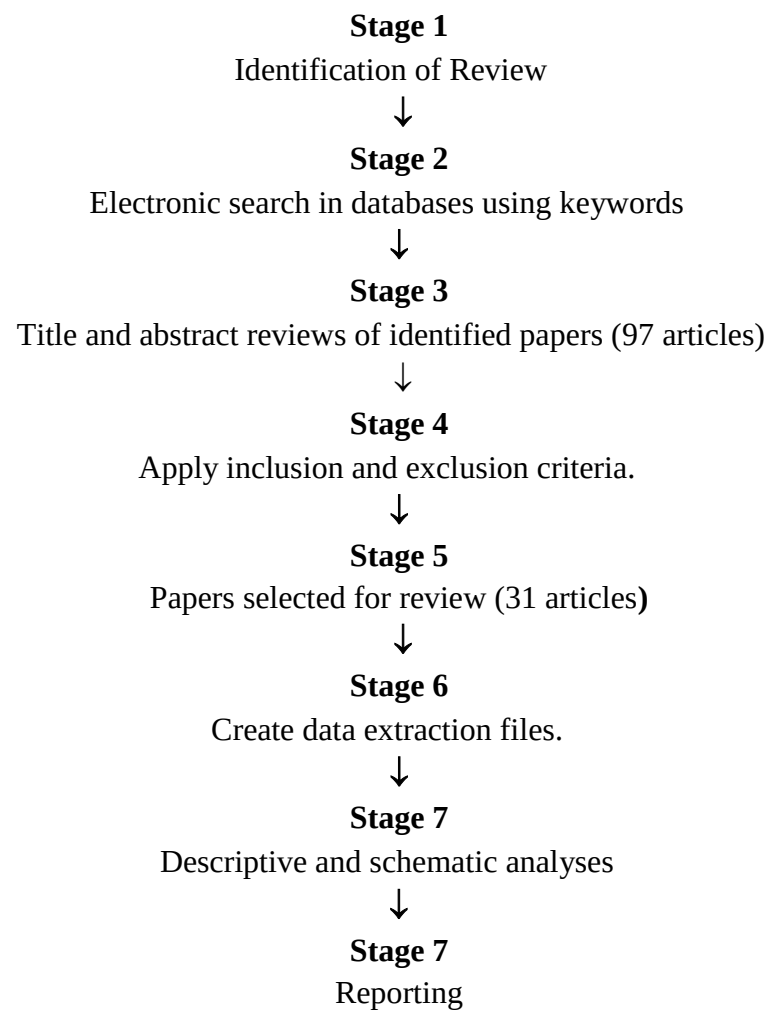
In this study, we focus on using literature reviews as a research methodology. A literature review aims to identify and assess all relevant literature on a topic to conclude. It forms the foundation of knowledge development, provides guidelines for policy and practice, and has the potential to produce new ideas. We have posed three key research questions in this study.

RQ1: What Information Communication technologies (ICT) are available to manage FPO?
RQ2: How will farmers and BOD benefit from ICT for FPO Management?
RQ3: What are the challenges associated with using ICT in managing FPO?

MATERIALS AND METHODS

The researcher used a literature review as a methodology for conducting the research. Used a literature review approach to answer RQ 1, RQ2 and RQ3 and attempted to evaluate the studies relevant to ICT use in FPO. Conducting a thorough review as a research method establishes a strong basis for advancing knowledge and promoting theory development (Webster & Watson, 2002). This literature review lays a foundation for theoretical developments in this research. A range of online databases from 2010 to August 2024 were searched, containing the words "ICT for Agriculture Development" and "ICT for FPO Development" in their title and phrases to provide a comprehensive listing of journal articles. Based on this, a total of 9 articles were found. Each of these articles was further reviewed and classified.

Figure 1.



Source: Adapted from Malviya and Kant (2015) and further refined per our study needs

RESEARCH GAP

A substantial amount of scholarly literature has been published on ICT in Agriculture. Most existing studies focus on the general benefits of ICT in agriculture without delving into how these technologies can be strategically integrated into FPO operations to create sustainable competitive advantages. However, there needs to be literature about using ICT for managing FPO and the

challenges associated with its use. Besides, studies have yet to assess the extent to which ICT is integrated into FPO operations and its impact on FPO performance. Additionally, there needs to be more research on FPOs' challenges in adopting and integrating ICT, such as the lack of digital literacy, infrastructure, and support systems, which could impede effective ICT integration in FPO operations.

RESULTS AND DISCUSSION

RQ1: What technologies are available for use in the management of FPO?

Existing Information and Communications Technologies identified.

ICT, short for Information and Communications Technology, supports storing, processing, disseminating, and communicating data and information. Mobile phones have bridged the gap between farmers and buyers, allowing direct communication and access to market prices, weather information, and global market data. ICTs improve agricultural performance, profitability, and risk management by providing crucial information and services for farmers and FPOs to connect to value chains. The journey of ICT in agriculture began with the digitization of information. Today, ICT applications encompass a wide range, including precision farming, farm management software, and mobile technology, revolutionizing farming practices. Precision farming is one of the most significant ICT applications in agriculture.

Using GPS, GIS, drones, and precision farming, farmers can optimize resource use and maximize yield. This tech provides data on soil health, humidity, temperature, and more for informed irrigation, fertilization, and crop management decisions. ICT simplifies FPO management, improving efficiency and productivity. Technological interventions provide farmers with accurate, timely information for more remunerative agriculture. Digitizing farmer profiles, transactions, and payments greatly benefits farmers and FPOs.

With the exploration of the initial literature review, the following technologies have the potential to impact FPO operations positively. The present study intends to assess how this technology is integrated into the sampled FPO’s operations. The IC technologies identified are as below-

Development of a mobile or web-based app for farmer onboarding and management.

Computer vision, spectral imaging, and AI are utilized for quality checking, grading, and sorting.

Establish a centralized digital platform for efficient resource management.

Create a digital procurement app for recording farmer-wise purchases on their smartphones.

Implement digital tracking and geofencing to aggregate and store farm produce, ensuring accurate inventory recording.

Enable e-auctions and e-marketplaces for FPOs to discover the best prices through transparent bidding.

Implement barcoding and scanning of lots to enable produce tracking from farmer to end buyer.

Install sensors to monitor conditions such as temperature and humidity and send alerts if any issues occur.

Use IoT sensors on machines to track operational data and enable predictive maintenance.

Provide digital platforms for real-time price information and enable price discovery through auctions and bids.

Create digital product catalogs with details on variety, quality, availability, pricing, and integrate digital platforms for processing and value addition.

Recording raw material inflow and outflow of processed goods digitally enables real-time inventory tracking.

Implement digital traceability systems to track the journey of produce from farm to finished goods, enabling food safety and quality control.

Use digital sales transactions to create transparency and traceability and allow banks and NBFCs to provide invoice financing and bill discounting to FPOs based on digital sales records.

Utilize digital marketing to enable FPOs to discover the best prices for their produce, reduce reliance on intermediaries, and build a brand identity.

Use technology platforms to connect FPOs to a network of vetted transporters and logistics providers.

Installation of IoT sensors on transport vehicles to track location, route adherence, and temperature, ensuring the quality and safety of perishable produce in transit.

Implement e-POD (proof of delivery) through digital signatures to increase the efficiency of FPOs' receivable collection.

Utilization of digital traceability systems to enable tracking of input batch numbers in case of quality issues.

Digitize payments and transfer them digitally to farmers' Aadhaar-linked bank accounts, and send farmers SMS notifications upon transfer.

Utilization of the Unified Payments Interface (UPI) to enable FPOs to make and receive payments seamlessly across different banks and platforms.

Developing a digital platform for input supply and distribution, enabling farmers to place input orders via a mobile app and book and pay for farm machinery digitally.

Implement digital record-keeping for FPOs to analyze input sales data, identify trends, better forecast demand, and optimize inventory.

Disseminate training and capacity-building content to farmers through digital channels.

Use digitization to offer value-added digital services to farmers, such as soil testing, pest management, and crop advisory.

Deliver personalized, real-time advisory to farmers through a digital platform.

Application of predictive analytics to agronomic data to provide planting date recommendations, yield forecasts, and harvest date alerts.

Using image recognition technology to diagnose pests and diseases.

ICTs improve agricultural performance and profitability, mitigate risks, and provide essential information and services for farmers and FPOs to connect to value chains. They facilitate knowledge management and help FPOs improve management, increase efficiency, and boost productivity to generate additional income through premium pricing for farm produce.

RQ2: How will farmers and BOD benefit from ICT for FPO Management?

Most farmers in the country are small and marginal, and their status can be improved by using new technologies for production and marketing. Using ICTs enhances the performance and profitability of agricultural activities for smallholder farmers. Digital innovators are developing solutions to help FPO farmer members improve their operations. More research is needed to enhance the implementation of ICT and develop FPO. Information and Communications Technology (ICT) aids in storing, processing, and communicating data and information. It's essential to build the capacity of FPOs' Boards of Directors and members, establish integrated information systems in rural areas, improve infrastructure and funding, and educate farmers about ICT tools. E-agriculture, or ICT in agriculture, focuses on using technology to enhance information and communication processes in farming. It is crucial in crop cultivation, water management, pest control, and post-harvest handling.

The findings of Rahman et al. (2021) suggest that educating and training farmers about ICT in Bangladesh can increase their usage of ICT-based media. Similarly, Agu et al. (2013) in Nigeria reported that providing information to rural areas is crucial for agricultural and rural development, particularly for empowering women. In rural Tanzania, Mng'ong'ose et al., 2018 found challenges with adopting ICT in agriculture due to a lack of knowledge, tools, expertise, and government support. Ahsan et al., 2022 noted inadequate training support for ICT in the Dhaka district. They emphasized the importance of mobile devices, internet connectivity, updated ICT applications, and farmer databases for modern agricultural practices. They suggested redesigning policies and allocating funding for infrastructure, capacity building, skill development, and ICT-based innovations in the sector.

Mujumdar and Singh 2019 found that farmers using ICT receive a higher net price than non-users. Education and land holding type also impact ICT use. Jayashree et al. (2023) noted that managing constraints in farming, marketing, and input delivery is critical for sustainable growth. Saxena (2021) reported that FPCs are hybrids with social and economic functions. Because the farmer members who constitute the FPC's board need more skill and expertise, support from the CEO and the promotion of an NGO become inevitable. Shah (2022) highlighted the potential of ICT in networking the agriculture sector locally and globally. He discussed key success factors of ICT services and outlined a framework for evaluating its impact on agricultural development, envisioning a technologically advanced agrarian landscape.

Gorai et al. (2022) emphasized the importance of members' attitudes towards their FPO and cooperation in maintaining group stability. Singh et al. (2021) highlighted the potential benefits of

introducing mobile phones and services in agriculture, improving decision-making for farmers, traders, and producers. Remember: Nandhini et al. (2023) found that adopting blockchain technology increased farm income. Jayashree et al. (2023) highlighted the benefits of mobilizing farmers for group action. ICT can provide vital information for farming, including weather, plant disease, and soil conditions (Lahan and Deka, 2019). When dealing with an ICT program, it is essential to prepare the appropriate ICT infrastructure and eliminate barriers to using ICT in FPO. This will create an environment that fosters creativity through practical planning and policy-making for extensive ICT use.

RQ3: What are the challenges associated with using ICT in managing FPO?

Challenges Faced while using specific ICT tools in FPO management.
The journey toward digital transformation in agriculture is challenging due to several implementation and adoption hurdles for digital solutions. Collaborating between FPOs and Digital Innovators (DIs) faces multiple challenges requiring thoughtful consideration and strategic planning." Tiwari and Upadhayay, 2021 indicated that operational and economic constraints were the major obstacles faced by the FPO members. Most FPOs rely on external technical assistance to manage business operations and make critical business decisions. Different factors affect the use of modern ICT, like age, education, farm size, traditional media, and mobile phones (Lahan & Deka, 2021).

Saidu et al. (2017) found that inadequate ICT facilities, lack of personnel, insufficient infrastructure, power supply, and farmers' perceptions obstruct the implementation of ICT in agricultural growth in developing countries. More research is needed to enhance the fruitful implementation of ICT in agriculture. Providing an extensive environment for forming FPOs and ensuring sustainable development of income-oriented farming is crucial, leading to overall socio-economic development and welfare for FPO members. Upgrading the FPO system, incorporating new technologies, and offering required services to retain members are essential for the viability and sustainability of FPOs.

Bala et al., 2022 highlighted that FPOs face infrastructure and information asymmetry challenges, affecting policy and credit coverage. Chauhan et al., 2021 emphasized the need for FPO leaders to enhance entrepreneurial and business management skills and acquire knowledge related to processing, value addition, and ICT in agricultural marketing. Mishra et al. (2020) and Nagaraji et al. (2023) highlighted constraints in using ICT tools for agricultural purposes, including lack of knowledge, poor equipment, and inadequate infrastructure. Patil et al. (2017) identified difficulties extension personnel face, such as poor internet connection and lack of training.

The 2020 study by Anand et al. found that most farmers need more power supply and better internet connection issues. They also need more knowledge, confidence, and access to training programs for using ICT tools. Access to ICT requires computer equipment, software, and the internet, with higher access predicted to increase IT use. Most farmers use popular ICT tools like the internet, email, mobile phones, Word, and PowerPoint, but tools related to data practices are rarely used. There is a need for farmers to be more competent and confident when using ICT tools. It is better to adopt digital technologies based on need, maturity, and familiarity (Nagaraji et al., 2023). Hasan et al. (2023) reported that despite Bahrain's high level of digital infrastructure

readiness, farmers still need to be ready to adopt sophisticated devices and complex applications such as crop sensing tools, the Internet of Things (IoT), and AI.

In their 2017 study, Patil et al. examined the difficulties faced by extension personnel when using ICT tools. They identified several issues: poor internet connection, lack of training, inadequate knowledge, power supply problems, and limited computer facilities. Physical problems included issues like eye, hand, and back pain. Social challenges encompassed less time spent with children and parents and reduced participation in social events. Economic hurdles involved low income and high costs. Additionally, technological problems included insufficient information and factors related to age. Rashtrapal et al. (2022) found that the farmer members contribute inadequately because of the poor economy and inadequate finance, lack of transport, distance to the market and storage facility, and lack of access to office buildings. However, using these technologies in rural areas could be faster (Shreshtha et al., 2021).

CONCLUSION

The use of Information and Communication Technology (ICT) can have a positive impact on the operations of Farmer Producer Organizations (FPOs). It can help accelerate FPO development, facilitate knowledge management, improve farmer skills, and enhance agricultural production, making FPOs economically viable and self-sustaining. Effective integration programs can be designed to help farmers incorporate ICT more effectively and gain greater returns from their farming business. Motivating farmers and the board of directors to support ICT-enabled environments is essential. Despite technological advancements in Maharashtra, FPOs and farmers have yet to benefit from ICT significantly. There is a need for awareness, training, and implementation of ICT integration in FPO management. FPOs should incorporate more ICT tools and guidance in their day-to-day work. Government officials and policymakers should develop policy-making FPOs that are responsible for spreading agricultural expertise among farmers. This research will assist the board of directors of FPOs in adequately selecting and implementing ICT tools.

A comprehensive study of the articles cited in this paper and related articles focused on using ICTs to improve agricultural performance and profitability, mitigate risks, provide essential information and services for farmers and FPOs, and help boost FPOs, which is critical to the viability and sustainability of FPOs.

UTILITY OF THE STUDY

The relevance of the study for policy making, society, and achievement of sustainability goals

i. Relevance of the study for policy-making:

Policy-making departments/institutions should develop clear operational guidelines for FPOs, converge resources at the State Government level, and coordinate systems across crucial state departments. FPOs should consider a localized, community-based food system perspective based on diversified cropping systems and free ecosystem services. It is essential to address the challenges FPOs face while using ICT tools to manage them and empower FPOs through suitable

policies and legal frameworks to improve farmer members' ability to manage the risks associated with farming.

ii. Relevance of the Study for Society:

"FPOs play a crucial role in improving the socio-economic status of farmers by enhancing productivity, reducing production costs, and increasing farmers' earnings. They also reduce poverty by accessing financial services, emerging technologies, and high-value markets. Additionally, FPOs undertake activities like seed production, beekeeping, and mushroom cultivation, ultimately contributing to society's overall development. Using ICT, FPOs can link with the market to obtain fair prices for farm produce, enhancing farmers' income and reducing poverty."

iii. Relevance of the Study for the Achievement of Sustainability Goals:

The key objective of FPOs is to enhance small farmers' forward and backward linkages. Through FPOs, farmers can obtain technology, inputs, and market access, fostering technology penetration, improving productivity, and increasing farmer incomes. ICTs play a crucial role in providing the latest information for sustainable farming. A favorable ecosystem is essential for developing FPOs, which deal with the vulnerable parts of the agricultural value chain.

IMPLICATION OF STUDY

The research aims to support farmer-producer organizations (FPOs) by establishing management and administration systems, governance standards, statutory compliance, and enhancing credibility. It will identify training needs for the Board of Directors and staff, focusing on vision and mission, value creation, marketing, and member welfare. Additionally, the research will determine the training needs of the FPOs' Board of Directors and how ICT will be used to emphasize knowledge sharing, capacity building, and sustainable farming practices. The training will also cover good governance and stakeholder networking for FPO success. The primary focus of the research was on how to build the capacity of the Board of Directors and farmer members through ICT to manage FPOs. Developing the skills of the Board of Directors and member farmers of FPOs will empower farmers, promote sustainable practices, and contribute to India's agricultural sector's overall growth and development through ICT.

LIMITATIONS

The primary constraint of FPOs is the need for more professional management. It is essential to equip the Board of Directors (BOD) members of FPOs with the necessary understanding and orientation to lead their FPOs effectively. Sensitizing FPO members about the workings of the FPO and linking FPOs to the market is challenging. Keeping records, meetings, and compliance with FPO members and BODs requires extra effort.

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Internet of Things in Company Operations: Upside and Downside

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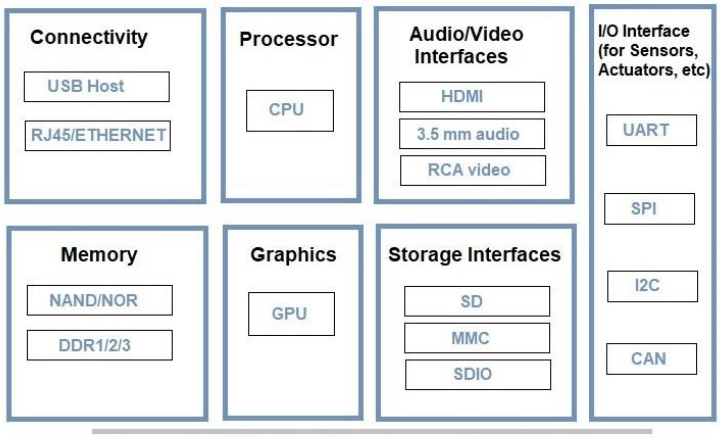
ABSTRACT

Internet of Things (IoT) is ubiquitous computing which refers to the practice of encapsulating information processing and network communication to be merged seamlessly into the environment with everyday objects. IoT endorses the idea of having large number of less powerful everyday objects rather than having small number of powerful devices. It integrates the internet, sensors, actuators, and processors along with software that continuously communicates with each other to provide real-time output. IoT confers intelligence to dumb things. Today IoT applications in business are found everywhere to enhance operations for improved efficiency and superior resource management. There are many ways in which IoT-enabled technology can significantly reduce costs and enhance operations efficiency, it can also lead to compromised data breaches, technical glitches, unemployment, and dependency. A Profound change in IoT-based technology and the rapid interchange of information will ultimately lead to increased manufacturing productivity, rapid growth in economics, and enhanced work culture, which will ultimately result in an exponential change in the way that companies operate.(Rüßmann et al., 2015). This article highlights the dynamics of IoT and its implications. An attempt will be made to analyze the upside and downside of IoT on company operations. It will uncover the advantages and disadvantages of IOT and also highlight the challenges in the implementation of IoT for company operations. It will give an insight into industry-based IoT solutions and its impact on companies' design, manufacturing, and operations. Towards the end, it will also suggest ways in which IoT can enhance company productivity. The findings of this paper will provide a reference basis for companies seeking to develop intelligent solutions.

Keywords: *IoT, operations, impact, technology, supply chain management*

INTRODUCTION

IoT has transformed how businesses function and manage. It has enabled the concept of connected devices to become more powerful and intelligent. When combined with AI and machine learning, it offers transformative solutions to industries that affect their entire business model and supply chain management. IoT is more about real-time data collection and automation so that the requirement for manual intervention is eradicated and the possibility of human error is diminished. Despite IoT's numerous benefits, several businesses have yet to implement this technology in their day-to-day work. This is mostly due to concerns regarding implementation expenses, integration complexities with existing systems, training of manpower, and its security framework.



Generic Block Diagram of IoT Devices

Source : Physical Design of IoT - IoTbyHVM

IoT block diagram shows the CPU which id the IoT Board and is the heart of the application where we can write the program and dump on it. The IoT Board may be either Arduino or Raspberry Pi depending upon the application. Arduino Suite can be used as a platform to dump the program (Phyton/C++) using I2C Communication Protocol or Serial Communication Protocol. The Sensor Module will measure the physical parameters and provide an output in terms of voltage which is given to an analog input of an Arduino/Raspberry board. For Transmitting/Receiving the radio signals a RF module will be used. During the IoT application, the configuration of a network is required. Virtual Private Server (VPS) is software-defined and can be easily configured. Most of the IoT Cloud servers like Amazon, Microsoft etc., they will use a web-based user interface in order to manage the server. The IoT Server can be used for monitoring and data-gathering the information

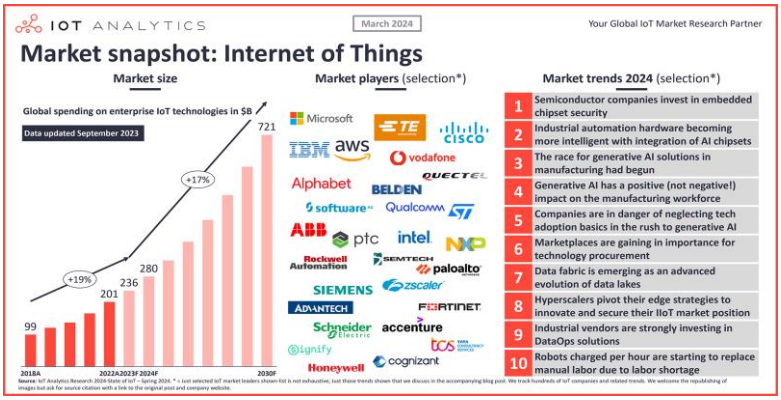
REVIEW OF LITERATURE

This review will assist industries in understanding the necessity and utilization of IoT technology for its growth, the establishment of new business models, and enhancing market competitiveness and productivity. According to the McKinsey report "Disruptive technologies: Advances that will transform life, business, and the global economy", the Internet of Things (IoT) is one of the top three technological advancements of the next decade (together with the mobile internet and the automation of knowledge work). The report goes on to say that "The Internet of Things is such a sweeping concept that it is a challenge to even imagine all the possible ways in which it will affect business, economies, and society."

A new McKinsey Global Institute report, *The Internet of Things: Mapping the value beyond the hype*, attempts to determine exactly how IoT technology can create real economic value. There central finding was that the hype may actually understate the full potential—but that capturing it will require an understanding of where real value can be created and a successful effort to address a set of systems issues, including interoperability.

To get a broader view of the IoT's potential benefits and challenges across the global economy, they analyzed more than 150 use cases, ranging from people whose devices monitor health and wellness to manufacturers that utilize sensors to optimize the maintenance of equipment and protect the safety of workers. The bottom-up analysis for these applications size was estimated that IoT has a total potential economic impact of $3.9 trillion to $11.1 trillion a year by 2025. At the top end, that level of value—including the consumer surplus—would be equivalent to about 11 percent of the world economy.

According to the latest 148-page State of IoT – Spring 2024 report, IoT remains a top-three corporate technology priority. While AI has surpassed IoT in corporate prioritization, combining IoT and AI is on the rise and seen as a tailwind for the $236-billion IoT market rather than a disrupter. It is important for vendors and end users alike to understand how to capitalize on the latest IoT technology trends and advancements. The graph below depicts the global spending on IoT technologies.



Source:https://iot-analytics.com/wp/wp-content/uploads/2024/03/Market-snapshot-Internet-of-Things-vf.png

IoT ADVANTAGES & DISADVANTAGES

Advantages

1. ***Control and automation***
   It offers anywhere access to devices and hence eliminates the need for human intervention. Machines also minimize human errors and replace it with precision. Industries can automate their entire production line along with other machinery to offer optimized solutions.

2. ***Real-Time Access to Information***
   Real-time data is incredibly helpful both for business and ordinary purposes. One of the primary benefits of the Internet of Things is the uninterrupted flow of information. Internet-connected devices can share data at the speed of light, which means fewer delays and a lower potential for miscommunication.

3. ***Emerging Businesses***
   IoT has penetrated as a smart means of business opportunity for enhanced productivity, safety, quick response and agility.

4. ***Advanced Data Collection***
   Deployed across a wide range of devices, the Internet of Things benefit of data collection can help business owners make decisions on a macro scale as well as a granular level. A simple example would be Amazon, an internet-based shopping experience on retail products, which could provide real-time data about purchasing decisions and trends on a daily or weekly basis.

5. ***Improved Efficiency***
   Internet of Things operates without human intervention. It is a system relying solely on machine-to-machine communication, with data logged and collected in real-time, at any time of day or night. One of the most significant impacts of such a system is the increased efficiency of a wide range of services. Staff members no longer need to spend valuable time collecting and processing information, as machines can effectively take over this job. This Internet of Things benefits leave human staff more time for creative endeavours, enabling them to focus on utilizing the collected information rather than the collection of data itself.

6. ***Cost Reduction***
   Internet of Things benefits industries with more effective inventory management, reductions in development cost, and even reduced expenses in production and transport of raw materials. As businesses become smarter, prices should theoretically go down across the board. Ambient temperature sensors could be connected to automate cooling and heating systems, offering highly efficient climate control with no human interaction whatsoever. Cost reduction is one of the strongest impacts of the Internet of Things on businesses and one that motivates business owners to invest in it.

7. ***Higher Productivity***
   The Internet of Things can also improve efficiency and productivity at work and in the industrial sector, similar to how voice-activated Amazon and Google products increase efficiency at home.

Disadvantages

1. ***Security Concerns***
   Security concerns remain a top challenge in the IoT landscape. As IoT devices continue to increase, they become increasingly attractive cyber-attack targets. Ensuring the security of both devices and data is paramount to prevent breaches.

2. ***Privacy Issues***
   IoT challenges encompass various concerns, with privacy issues taking centre stage in this digital landscape. Balancing data collection from IoT devices while respecting user privacy remains a significant challenge.

3. ***Interoperability***
   The diversity of IoT devices, originating from various manufacturers and utilizing different communication protocols, poses significant hurdles to creating a cohesive IoT ecosystem.

4. ***Scalability***
   As the number of IoT devices proliferates, managing and scaling IoT infrastructures becomes increasingly complex. Organizations encounter scalability challenges on multiple fronts, encompassing data storage, processing, and management.

5. ***Data management***
   Data management is pivotal to the Internet of Things (IoT). IoT systems generate vast volumes of data, posing significant challenges in real-time handling, processing, and analysing this information. Effective data management solutions are imperative to ensure the seamless operation of IoT ecosystems.

6. ***Cost Constraints***
   IoT challenges in 2024 are poised to shape the Internet of Things landscape. Cost constraints in IoT remain a pressing issue, hindering widespread adoption and implementation

7. ***Energy Efficiency***
   IoT challenges extend to energy efficiency as an integral concern. Many IoT devices rely on battery power, so enhancing energy efficiency for prolonged battery life and reduced environmental impact becomes paramount.

RESEARCH METHODOLOGY

OBJECTIVES OF THE STUDY

1. To highlight the fundamentals of IoT.
2. To evaluate the possible advantages and disadvantages of IoT in industry applications.
3. To give suggestions for IoT based industry.

DATA COLLECTION METHOD

• Secondary data was collected by referring research papers, case study and websites.

RESEARCH DESIGN

Descriptive in nature.

IMPORTANCE OF THE STUDY

IoT plays a very crucial role in enhancing the supply chain management in industries. It enables real time tracking which visibly improves the entire efficiency of the system. It leads to major contribution in the advancement of emerging technologies and has the potential to change the way industries work .

LIMITATIONS OF STUDY

- The study was restricted to only secondary data due to time and resource constraints.
- The study focused only on limited aspects in specific industrial areas

FINDINGS

According to Weber, The Internet of Things, is an emerging global Internet-based technical architecture facilitating the exchange of goods and services in global supply chain networks that has an impact on the security and privacy of the involved stakeholders. Measures ensuring the architecture's resilience to attacks, data authentication, access control and client privacy needs to be established.

Identifying IoT challenges and implementing solutions is crucial to the Internet of Things (IoT) landscape. It encompasses security concerns, interoperability issues, scalability, energy efficiency, data management, regulatory compliance, reliability, cost constraints, and environmental impact. As businesses and start-ups increasingly integrate IoT into their operations, addressing these challenges becomes crucial for success.

By recognizing and proactively tackling IoT problems, businesses can ensure their devices and data's security and privacy, enhance interoperability between devices, optimize energy consumption, efficiently manage vast amounts of data, adhere to regulatory requirements, and build reliable and cost-effective IoT solutions. Moreover, prioritizing sustainability can mitigate the environmental footprint of IoT deployments.

SUGGESTIONS

1. ***Enhanced Security Measures***
   One of the most critical challenges in the IoT landscape is security. The interconnected nature of IoT devices exposes them to various vulnerabilities, making them attractive targets for cyber attacks. To mitigate these risks, organizations must prioritize security. Implementing robust encryption protocols, authentication mechanisms, and regular security audits can help safeguard IoT networks and devices. Additionally, educating users about the importance of security practices can reduce the risk of IoT-related breaches.

2. ***Standardization and Interoperability***

To address this challenge, industry stakeholders must collaborate on developing and adopting common standards and protocols. Standardization enables devices from different vendors to communicate effectively, enhancing scalability and reducing compatibility issues, ultimately leading to a more cohesive IoT ecosystem.

3. ***Data Privacy and Consent Management***

As IoT devices collect and transmit vast amounts of data, concerns about data privacy and consent have grown. Organizations must prioritize data protection by implementing robust data encryption, anonymization techniques, and precise privacy policies. Additionally, providing users with transparent and easily understandable consent mechanisms empowers them to make informed data-sharing choices, fostering trust in IoT applications.

4. ***Edge Computing***

IoT generates massive data volumes, which can strain network bandwidth and centralized cloud resources. Edge computing offers a solution by processing data closer to the source, reducing latency and alleviating network congestion. Deploying edge computing infrastructure allows IoT devices to perform data processing tasks locally, enhancing real-time decision-making capabilities and reducing the burden on centralized servers.

5. ***Over-the-Air (OTA) Updates***

IoT devices often require frequent updates to address security vulnerabilities, improve functionality, and ensure compatibility with evolving standards. OTA updates enable manufacturers to deliver these updates remotely, reducing maintenance costs and enhancing the longevity of IoT devices. Implementing secure and efficient OTA update mechanisms is crucial to keep IoT ecosystems up-to-date and secure.

6. ***Energy-Efficient Designs***

Many IoT devices operate on battery power, and energy efficiency is a significant challenge. IoT manufacturers should prioritize energy-efficient designs to prolong battery life and reduce environmental impact. This includes optimizing hardware components, implementing low-power communication protocols, and leveraging power management techniques to ensure IoT devices can operate for extended periods without frequent recharging or battery replacement.

7. ***Robust Analytics and Machine Learning***

When harnessed effectively, IoT generates vast amounts of data that can provide valuable insights for businesses and organizations. Deploying robust analytics and machine learning algorithms can help extract actionable information from IoT data streams. These insights can drive informed decision-making, predictive maintenance, and enhanced operational efficiency.

CONCULSION

The advancements in Iot has drawn attention of the industries in the way they plan and function. However, increased efficiency is possible only if the current issues and shortcomings are taken into consideration and an improved technological structure is build based on the findings.

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The Power of Narrative: Analysing the Role of Storytelling in Boosting Brand Value and Enhancing Consumer Engagement

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ABSTRACT

This paper explores the strategic role of storytelling in business branding and marketing, examining its potential to forge emotional connections with audiences and enhance brand value in a competitive marketplace. The study investigates two primary approaches to storytelling: brands sharing their own narratives and those showcasing customer experiences. The former method demonstrates a brand's resilience and progression through challenges, serving as a testament to its quality and market strength. The latter approach fosters a sense of belonging among consumers, strengthening brand loyalty and authenticity. The research analyses how renowned global brands such as KFC, Maggi, Dove, Cadbury, Amazon, Apple, and Surf Excel among many others have leveraged storytelling techniques to elevate their market positions and reinforce their existing popularity. By examining these case studies, the paper aims to elucidate the effectiveness of narrative-driven marketing strategies in creating distinctive brand identities and fostering deep-rooted connections with consumers. This study contributes to the growing body of literature on experiential marketing and brand communication by highlighting the significance of authentic, relatable narratives in contemporary business practices. The findings suggest that strategic storytelling not only differentiates brands in a saturated market but also cultivates a loyal customer base by appealing to shared values and experiences. This research offers valuable insights for marketing professionals and brand strategists seeking to harness the power of storytelling in their communication efforts.

Keywords: *Narrative, Storytelling, Marketing, Brand-Value, Consumer-Engagement*

"Storytelling is a powerful tool that can help you close more sales, increase your revenues, and even recruit new agents or advisors" claims Richard T. Cleary in his comprehensive article 'The Power of Storytelling' (2022). Storytelling allows marketers to cut through the noise and create narratives that engage audiences on an emotional level. According to a significant survey conducted by Marketing Words, almost 68% of consumers admit that brand stories influence their purchasing decisions. In another experiment conducted by Stanford's Graduate School of Business, it was found that when people listened to audio clips containing either facts and figures or a story, then only a small number of people – merely 5% could recall statistics whereas a large number – around 63% remembered the stories, re-establishing the fact that storytelling is a very effective and impactful tool in affecting audiences (consumers) and the impact of powerful narratives leave a lasting effect on consumers in regard to strengthening consumer loyalty and engagement. As stated in psychology today, "a brand is nothing more than a mental representation of a product in the consumers' mind", so, unless there is no emotional link between the consumer and the product to influence them into buying that product, the chances of purchase are less despite that product's other information or attributes or features. Storytelling does that for a brand – getting an emotional response from the viewers/consumers and forming an emotional bond with them.

The power of narrative is often talked about and emphasised, but it is scientifically proven that this belief holds truth. Kudos to technical advancements in every field, the FMRI (Functional Magnetic Resonance Imaging) is a great way to know how our brain functions and acts and which area of brain (left or right side) is more active during thinking process or any cognitive activity, including decisions making. Through FMRI it was found that when consumers evaluate brands,

they prominently use emotions (as highlighted by right area of brain shining brighter on scan) in making decision as they get more influenced by the personal feelings and experiences which that product/brand provides them rather than the statistical or factual information available to them about that product or brand. Famous brands make the best use of these information and knowledge available to them by pitching it in into their marketing strategies and making the story telling as a prominent feature of their brand/product.

"Storytelling is a powerful way to engage an audience and influence their choices. It evokes passion and provides direction for "travelers" to map out where they'd like to go next" (Ron Sela, 2024) which shows that aggressive marketing doesn't work anymore in today's times as people do not want to be 'told' what to buy or what to consume. Consumers want to choose, and brands have this task in ahead of us to make their target audience 'choose; them over all other options available in the same category. Thy find solace in narrative centric marketing in which they tend to emotionally influence their target audience into buying their product, but not by brainwashing but by establishing a connection between the two by using narrative technique in their advertising, through storytelling. Storytelling is a great way to humanise a brand, because through the various narratives and stories consumers become sensitive towards the message these stories and narratives convey and they understand why they should care about something since they can resonate with the messaged and connect to the stories told. Furthermore, this also is evident that their emotional response to an ad plays a greater role in influencing them in buying that product rather than the actual content of the ad across all media platforms, be it TV commercial or digital or print.

There are famous and popular brands who have tapped in the potential of effective and impactful use of storytelling in marketing and advertising, and in return have basked in the increased popularity and significant consumer interaction and engagement in their journey. Dove, Cadbury, Surf Excel, Apple, KFC and Maggi have been some of the popular brands who need no introduction as they are a part of everyday life of majority of people in India. But, at the same time there are various ways and techniques of storytelling, and different brands choose different techniques or narrative styles as suited to their requirement and also based on advertisement type. Among various story-telling techniques, 'Before-After-Bridge' technique is the most prominent and popular one which also ensures the maximum chance of success. In this technique the narrative presents pictures of two conditions – 'the problem state' – the condition before, and 'the resolved state' – after the problem has been resolved, and the 'bridge' between the two conditions – the product/service itself which led the subject (consumer) from the previous condition, i.e. problem state to the later condition – the resolved situation, after the consumer used the said product/service.

Among various narrative techniques which have proved to be effective, AIDA is one popular technique to get the consumer to buy your product/service by presenting with such effective narratives that the consumer can't help but get so keenly interested in the narrative presented to them that the desire to get the hold of that product gets inevitable and chances of buying that product become relatively very high. AIDA, which stands for – grab 'Attention', generate 'Interest', cause 'Desire', and lead to 'Action', has been effectively used by brands like Apple, 'Privacy Matters' which immediately grabs the audience's attention and compels them to not

compromise with the security and protection of their privacy which may be at risk as various apps in android phones steal data and even sensitive information gets leaked. So, incorporating PPPP narrative technique in their ads which stands for Promise – Picture – Proof – Push, Apple makes its audience take the action. Without fail the consumer wants to switch to Apple which guarantees privacy protection.

In marketing world, the rule is simple, "rather than simply listing features or achievements, tell a story about how your product or service has positively impacted a person, a group of people, or society at large" (Ron Sela, 2024). This is what Dove has done. Dove is a well-known and well-established name and brand in the personal care industry which offers not only soaps but also shampoos and conditioners, and body-lotions etc. The American brand, owned by Unilever, is so popular in India that it has become synonymous with the term 'soft & gentle' in context of skin and hair. With its various famous and popular worldwide campaigns, Dove has successfully utilized the storytelling strategy to advertise their product as well as to enhance consumer involvement and consumer experience. Its 2004 campaign 'Real Beauty' garnered a tremendous response from people (especially women) and led to a significant boost in product trust and loyalty. And, various studies conducted over a period of time reflect that if a brand succeeds in having its consumers develop positive emotions towards it, then it increases the level of loyalty towards that particular brand, more than trust and judgment, hence, chances become higher that the consumers are likely to stay loyal and constant buyers of that particular brand. In this regard Dove has successfully been able to have a strong base of its loyal consumers over a period of time, and most of its credit goes to their successful use of connecting with its consumers through powerful narratives. Besides, Dove also demonstrates how Social Media has "evolved into important channels for marketing" (Niels et al. 2018) as its various campaigns – on social media platforms have garnered tremendous responses from public beyond their consumers, establishing it as "an agent of change to educate and inspire girls on a wider definition of beauty and to make them feel more confident about themselves" (Dove).

KFC is yet another famous brand to use powerful narratives in its marketing. Many KFC ads feature the story of Colonel Harland Sanders, emphasizing his journey from a small-town cook to a global fast-food icon. This narrative highlights the brand's authenticity and commitment to quality. Besides this, KFC gained more popularity by constructively using the first-hand narrative of its consumers in an incident in which an African man proposed his girlfriend in KFC and the video went viral. The guy is mocked for the same but KFC comes forward to their rescue by announcing to fund their wedding and the whole scenario changes! Other brands and sponsors pitched in and came forward to sponsor the wedding in their respective fields, thus, on KFC's intervention, the couple ended up having a dream-like wedding that made KFC more popular among its consumers and increased brand loyalty and consumer engagement. It reinforces the fact that "character-driven stories that sustain our attention through tension cause oxytocin synthesis in the brain: levels of this neurochemical, responsible for empathy and social connection, have been shown to influence the willingness of story viewers to help others" (Weinreich 2021). KFC has utilised this into its marketing strategy for optimum results.

The "Kuch Meetha Ho Jaaye" campaign by Cadbury Dairy Milk in India is a standout example of effective narrative advertising. What has made it popular is the fact that Cadbury freely features

scenes from daily Indian life in its ads where people are seen sharing moments of joy, celebration, and simple pleasures, giving a feeling of familiarity and connectedness to the viewers. The campaign reinforces that “strong stories with vivid imagery will allow your listeners to imagine themselves in a similar situation and they will be inspired to take action” (Ricard Cleary. White Paper. FSEdNet). Cadbury did the same. In one of the notable Diwali-themed ads, a middle-aged man is shown visiting a relative's home. After engaging in some light-hearted conversations and observing the festive preparations, he surprises everyone by sharing Cadbury Dairy Milk chocolates. This gesture brings a sense of warmth and joy to the gathering. The ad became instantly popular as it bakes on the idea of "Kuch Meetha Ho Jaaye" (Let’s have something sweet) which resonates with the cultural practice of celebrating special occasions with sweets. The ad underscores the concept that Cadbury Dairy Milk is not just a chocolate but a symbol of sweetness and happiness that enhances any moment of celebration. The fact that this narrative taps into emotional and cultural values, portraying the product as an integral part of cherished traditions and family gatherings has successfully worked in the favour of constantly increasing popularity of Cadbury. It creates a sense of connection and nostalgia, making Cadbury Dairy Milk feel like a natural choice for celebrating life’s special moments. In another Cadbury ad also themed ‘RAKHI’ in which a brother gifts chocolate to his sister bring out the similar sentiment of familial bonding in Indian culture. By aligning the ad with Indian festivals and customs, Cadbury effectively engages the local audience. The depiction of familiar festive scenes helps the brand connect with viewers on a personal level, reinforcing its relevance in Indian culture. The ad’s simple yet poignant message about sharing and celebrating with loved ones makes it memorable. It builds a positive association with the Cadbury brand, portraying it as a sweet addition to joyous occasions. By using these powerful narrative techniques Cadbury has successfully been able to evoke emotional responses, connect with cultural practices, and enhance its brand's presence in the Indian market.

Surf Excel detergent brand also has effectively utilized the power of narrative in its advertising campaigns to resonate with consumers on a deeper level. Its "Daag Acche Hain" (Stains Are Good) Campaign tells stories that revolve around children getting dirty while doing something good or kind. The narrative emphasizes that stains are not bad if they come from doing something positive. In one advertisement, a little boy gets his clothes dirty while helping a girl retrieve her ball from a muddy area. The narrative shows how getting dirty is a part of growing up and learning important life lessons, with the tagline "Daag Acche Hain." Another powerful and impactful campaign by the same brand has been "Rang Laaye Sang" (Colors Bring Us Together) Campaign which focused on the festival of Holi, using the idea that colors can bring people together, regardless of differences. As per the ad, a little boy decides to color an elderly man who is isolated from the festivities due to his religious beliefs. The boy's innocent act of including the man in the celebrations, despite the mess it creates, is portrayed as an act of unity and love. The message is reinforced by Surf Excel’s ability to remove the toughest stains, symbolizing that doesn’t matter how dirty things get, love and unity will always shine through. This ad resonated with audiences by highlighting social harmony and the innocence of children, making it more than just a detergent ad—it became a message of social cohesion. Yet in another of its attempts - "Neki Ek Ibadat" (Doing Good is a Form of Worship) Campaign, the series of ads focused on the idea of doing good deeds as a form of worship, tying the act of helping others with getting dirty in the process, but at the same time emphasizing that good deeds are worth the mess. The narrative uses the context of

religious and social values to connect with the audience, portraying Surf Excel as a brand that supports doing good deeds. So, by focusing on stories which highlight universal values like kindness, unity, and helping others, Surf Excel's narrative-centric marketing strategy successfully creates a strong emotional bond with the audience. The consistent use of narrative helps Surf Excel build a distinct brand identity cantered on positivity and moral values, making it stand out in a crowded market.

Maggi, a beloved instant noodle brand, has effectively used narrative advertising to connect emotionally with its consumers across generations. The brand's campaigns in India often revolve around themes of nostalgia, family bonding, and comfort, making Maggi more than just a food product—it's a part of everyday life, as the central narrative of this campaign focuses on the convenience and quick preparation of Maggi noodles, which makes it a perfect snack for any situation. In one iconic ad, a mother prepares Maggi for her hungry children after they come home from school. The children eagerly wait as the mother quickly prepares the noodles in just two minutes. The ad emphasizes the speed and ease of preparation, making it a go-to snack for busy families. This narrative resonated with consumers, particularly mothers, reinforcing Maggi's identity as a quick, reliable, and tasty solution for feeding hungry kids. In another ad, a child rushes home from school, exclaiming "Mummy, bhookh lagi hai!" The mother, with a smile, quickly prepares Maggi, satisfying her child's hunger while also making him happy. The narrative struck a chord with parents, particularly mothers, who see Maggi as a solution to their children's hunger, reinforcing the brand's image as a quick and delicious meal that mothers can trust. In another very popular campaign knowns as "Me & Meri Maggi", the focus was laid on nostalgia and personal memories associated with Maggi. The narrative invited consumers to share their own stories and experiences with Maggi, creating a collective memory and emotional connection with the brand. The ads under this campaign featured people from different walks of life—students, working professionals, grandparents—each sharing their unique Maggi moments. Whether it was a late-night study session, a quick meal at work, or a fun memory with friends, Maggi was portrayed as a constant companion in life's moments. By tapping into personal memories, the campaign created a strong emotional connection with consumers across different age groups, making Maggi a nostalgic and beloved brand.

In the same light, in another likewise campaign - "Kuch Achha Pak Raha Hai" (Something Good is Cooking) Campaign new products and recipes were introduced, showing how Maggi could be more than just instant noodles. The narrative revolved around the idea of families coming together over a meal, with Maggi as the centrepiece. Such as, an ad depicted a family gathering where everyone contributes to preparing a unique Maggi recipe. The kitchen becomes a place of creativity and bonding, with the tagline "Kuch Achha Pak Raha Hai," suggesting that something good is cooking both in the pot and in the relationships being strengthened. This narrative expanded Maggi's brand image beyond just instant noodles, positioning it as a versatile product that can bring families together. Furthermore, in response to health concerns, Maggi started "Healthier Maggi" Campaign and introduced a healthier version with added nutrients. The narrative shifted to focus on health-conscious families who still wanted the comfort and taste of Maggi. In this campaign, a mother prepares the new, healthier Maggi for her family, reassuring them that it still tastes the same but is now better for them. The ad emphasizes that Maggi cares about the health of its consumers while still being the beloved product they trust.

The success of these campaigns and the power of narrative is evident in the fact that the brilliant use of powerful narratives helped Maggi retain consumer trust and loyalty during a period when the brand faced challenges related to health concerns as well as increased its popularity and enhanced consumer engagement and involvement in normal times. “Engagement is a babbling brook from which you will draw a thousand cups. More than nine out of ten people trust the recommendations of peers over traditional advertisements” (Pivotal Path, 2019). Maggi’s use of narrative in advertising has been instrumental in building a strong, emotional connection with its consumers, making it a staple in Indian households for decades.

In conclusion, the massive success of these popular brands speaks for the effective use of powerful techniques by these brands in their advertising and marketing which demonstrate the profound impact that storytelling can have on consumer interaction, consumer engagement, and brand loyalty. These brands have successfully harnessed emotional appeal, relatable characters, and life situations to establish the connection between their products and consumers, making their products a seamless part of the daily lives of the consumers. The strategic application of these narrative techniques highlights and confirms the importance of storytelling as a central element in brand communication in modern times as an inevitable part of marketing and advertising.

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A Study of Customer Perception and Attitude toward Protein Supplements

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ABSTRACT

This study explores customer perception and attitude towards protein supplements. This perception is influenced by various factors such as types of protein, Flavours, and health benefits. Protein products give health benefits, also protein powder helps to fulfill your daily requirements of protein. In today's time, people going to gymnasium are shifting to different types of protein powder to fulfill daily requirements. The objectives of this research were to identify the preferred pack of protein powder among respondents, to identify the preference of customers for different protein supplements, and to identify the relationship between the preference of protein powder with milk and the Flavours of protein powder. The research was done descriptively which was followed by exploratory research. The researcher did secondary data by incorporating a literature review of twenty-five journal articles, eighteen trade publications, four news, and three books a structured questionnaire was prepared by the researcher. 109 responses were collected from gymnasium trainers by visiting various gymnasiums. The data was analyzed by using SPSS. The study indicates that the preferred pack of protein powder is dependent on the age of respondents. There is no significant difference between people preferring whey protein supplements and them going to the neighborhood gymnasium. The preference for protein powder with milk is independent of the flavours of protein powder.

Keywords – *Protein supplements, Customer preferences, Flavours, Neighborhood gymnasium, Pack size.*

INTRODUCTION

In recent years, the global health and fitness industry has experienced a dramatic rise in the consumption of protein supplements, reflecting an increasing public awareness of health and wellness. Protein supplements, particularly in the form of protein powders, have become integral to the routines of athletes, fitness enthusiasts, and individuals aiming to meet their daily protein needs conveniently. This surge in popularity is fuelled by a growing emphasis on achieving optimal nutrition and performance, both in everyday life and within the realm of competitive sports.

The market for protein supplements is highly diverse, featuring a range of products that differ in terms of type, flavour, packaging, and formulation. These products are designed to cater to varying preferences and dietary requirements, which complicates the task for manufacturers and marketers striving to align their offerings with consumer desires. As such, understanding customer perceptions and attitudes toward these supplements becomes essential for tailoring products and marketing strategies effectively.

By addressing these research objectives and hypotheses, this study aims to provide valuable insights into customer preferences and behaviors regarding protein supplements. Such insights are critical for product development, marketing strategies, and improving customer satisfaction within the expanding health and fitness market.

LITERATURE REVIEW

(Deota, 2016) , (Johnson, 1997) A study was done by Deota and Johanson in Vadodara examined 59 protein supplements from 15 different brands, looking at their protein content, source, and price. It found that whey protein concentrate was the most popular, used in 58% of the supplements, while whey protein isolate was used in 50%. Other sources included milk protein concentrate (23.33%), milk protein isolate (21.66%), and casein (20%). The price for protein powder varied from INR 1.71 to 11.78 per gram.

(Carrillo, 2023) , (Ares, 2007) As per the Carrillo and Ares how eating habits change as people get older, focusing on protein intake. It was done in Spain with groups of people aged 60-75. The study found seven main changes in how they eat: they try to eat healthier, spend more time cooking, buy gourmet foods, eat less overall, shop online, frequently visit small stores, and prefer quick and easy dinners. The main reason for avoiding certain foods was to stay healthy. The study also explored how the types of products and their added benefits affect how healthy people think these foods are and their willingness to try new, health-focused foods. It found that the type of product had the biggest impact on how people perceive the healthiness of and their interest in trying these new foods.

(Keogh, 2019) , (Ashley, 2022) Keogh and Ashley highlighted that a study found that factors like gender and income don't really affect people's choice to use whey protein sports supplements. Instead, the type of exercise they do is important, especially if they want to build power and strength. Older people don't use whey protein as much, and it's not well-promoted based on where it's from. The study also showed that whey protein can help manage blood sugar levels in adults with type 2 diabetes, but we don't know much about what encourages people to start or stick with it. The key to getting more people to use whey protein for diabetes management is to highlight how it helps control appetite and blood sugar.

(Norton, 2020) , (Oberoi, 2020) Norton and Oberoi have mentioned that Protein products are suggested for older adults to help with nutrition and prevent muscle loss. However, these products can sometimes make the mouth feel dry. Two studies tested different whey protein drinks and found that these drinks increased the amount of protein in saliva. Older adults had less saliva flow and higher protein levels in their saliva compared to younger people. Heating the whey protein drinks made them because more mouth dryness, felt thicker, and reduced their sweetness. Another study showed that young men had reduced hunger and ate less after drinking whey protein, but older men didn't experience this same effect. Both young and older men ended up consuming more protein, and both felt fuller and less interested in eating more after having the protein drink compared to a control drink.

(Kuesten, 2020) , (Weir) Kuesten and Weir highlighted that more people are adding protein-rich functional foods and dietary supplements to their diets to stay healthy. Plant-based proteins are becoming more popular as people pay more attention to nutrition and health. When buying these products, people consider how they taste, the brand, how convenient they are, the price, and their environmental impact. It's important for consumers to be educated and aware to make good choices. Proteins, which are essential for good nutrition, have evolved from basic amino acids to the building blocks of life.

(Forestell, 2017) , (Phillips, 1997) Forestell and Phillips have mentioned that feeding children a balanced diet can be tough because they naturally prefer sweet foods and dislike bitter ones, a trait that may have helped our ancestors choose energy-rich foods and avoid toxins. However, this preference can lead to unhealthy eating habits today, as children are often exposed to junk food. Overweight children face higher risks of heart diseases, so it's important to find effective ways to encourage healthy eating. Infants start to develop a taste for healthy foods from birth, as the flavours from the mother's diet come through in amniotic fluid and breast milk. Those on formula might initially resist new flavours, but offering a variety of healthy foods during weaning and beyond can help.

RESEARCH OBJECTIVES

- To identify the preferred pack of protein powder among respondents.
- To identify the preference of customer for different protein supplements.
- To identify the relationship between the preference of protein powder with milk and the Flavours of protein powder.

HYPOTHESES

$H_0$1: The mean ratings given for the preferred pack of protein powder by respondents are the same.

$H_1$1:.The mean ratings given for the preferred pack of protein powder by respondents are different.

$H_0$2: There is no significant difference between protein supplements and people going to the neighborhood gymnasium.

$H_1$2: There is significance difference between protein supplements and people going to the neighborhood gymnasium.

$H_0$3: Preference of protein powder with milk is independent of taste of protein powder.

$H_1$3: Preference of protein powder with milk is dependent on the taste of protein powder.

RESEARCH METHODOLOGY

The research was done by descriptive in nature which was followed by exploratory research. Secondary data collection is done with 25 research paper which includes eighteen trade publications, four news, and three books from EBSCO database and Google scholar. Exploratory research was done through quantitative data analysis mentioned below. The sampling frame of the research was gymnasium and sampling unit was gym instructor. The sample size of this survey was 109.The area of study are Dahisar to Goregaon.

DATA ANALYSIS

Hypothesis 1

$H_0$1: The mean ratings given for the preferred pack of protein powder by respondents are the same.

$H_1$1:.The mean ratings given for the preferred pack of protein powder by respondents are different.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.541[a]	8	.035
Likelihood Ratio	18.562	8	.017
Linear-by-Linear Association	3.900	1	.048
N of Valid Cases	109		

The preferred pack of protein powder is independent of the age of respondents, the p-value is 0.035 hence we reject the null hypothesis.

Hypothesis 2

$H_0$2: There is no significant difference between protein supplements and people going to the neighborhood gymnasium.

$H_1$2: There is significant difference between protein supplements and people going to the neighborhood gymnasium.

ANOVA							
WHEY PROTEIN							
			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		.097	2	.048	.163	.850
	Linear Term	Unweight	.055	1	.055	.185	.668
		Weighted	.014	1	.014	.046	.831
		Deviation	.083	1	.083	.280	.598
Within Groups			31.591	106	.298		
Total			31.688	108			

There is no significance difference between preferring whey protein supplement and them going to going to neighbourhood gymnasium. The p value is 0.850 hence we do not reject the null hypothesis.

Hypothesis 3

$H_0$3: Preference of protein powder with milk is independent of taste of protein powder.

$H_1$3: Preference of protein powder with milk is dependent on the taste of protein powder.

ANOVA							
FLAVOURS							
			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		.041	1	.041	.120	.730
	Linear Term	Unweight	.041	1	.041	.120	.730
		Weighted	.041	1	.041	.120	.730
Within Groups			36.546	107	.342		
Total			36.587	108			

There is no relationship between the preference of protein powder with milk and the Flavours of protein powder. The p-value is 0.730 hence we do not reject the null hypothesis.

FINDINGS

- The data analysis shows that the preferred pack of protein powder is independent on the age of respondents.
- The preference of customer of consuming protein powder with milk has no relationship with the Flavours of protein powder.
- When different protein supplements are considered whey protein supplements has nothing to do with the gymnasium situated in any neighborhood.

CONCLUSIONS

- There is no preference for the preferred pack of protein supplements for gymnasium patrons which means in all packs like 500 gm., 1 kg, 2 kg and more than 2.5 kg are bought by gymnasium patrons.
- When it comes to preference of customer for different protein supplements specially whey protein supplements which is the most preferred protein supplements. It has nothing to do with the type of neighborhood where the customer goes for gymnasium.
- Protein products are usually consumed either with milk or water. Customer don't prefer any flavor when they consume protein powder with milk.

SUGGESTIONS

- The company should continue with the existing pack size of protein powder, there is no need to change or modify any pack size.
- The company should sell their protein products irrespective of the neighborhood of customers where the gymnasium are situated.
- The company should not go into any different Flavours as customers don't prefer Flavours when they consume protein powder with milk.

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ANNEXURE

Questionnaire

A Study of customers perception and attitude towards protein supplements

Below are a few statements related to protein supplements consumed by your gym members?
Kindly tick (√) below attributes by selecting from Unimportant (1) to Important (5)

Variables	Unimportant (1)	Some What Unimportant (2)	Neutral (3)	Some What Important (4)	Important (5)
Types of Protein					
Advertisement					
Price					
Availability					
Packaging					
Service provided by brands (Delivery)					
Discounts offered by brands					
Taste					
Flavours					
Health Benefits					
Digestive Enzymes					
Customers Feedback					

1. Your Gym is situated in which neighborhood. (Select any one)
   a) High-income neighborhood
   b) Middle-income neighborhood
   c) Low-income neighborhood

2. Do you prefer protein powder with milk?
   a) Yes
   b) No

3. Do you prefer protein powder with water?
   a) Yes
   b) No

4. What is your preferred pack of protein powder for a new gym joiner?
   a) 500 gm.
   b) 1 kg
   c) 2 kg
   d) 2.5 kg
   e) > 2.5 kg

5. How much percentage of customer eat protein supplements?

a) < 20 %
b) 21 % – 30 %
c) 31 % - 40 %
d) 41 % - 50 %
e) > 50 %

6. How much percentage of protein contents do you prefer in a scoop (approx. 36gms) ?
   a) > 20 %
   b) 23 %
   c) 26 %
   d) > 29 %

Kindly tick (√) below attributes by selecting from Unimportant (1) to Important (5)

	Unimportant (1)	**Some What Unimportant (2)**	**Neutral (3)**	**Some What Important (4)**	**Important (5)**
Whey Proteins					
Vegan Proteins					
Casein Proteins					
Sugar-Free Proteins					
Gluten-Free Proteins					
Soya Free Proteins					

7. I am,
   a) Male
   b) Female

8. My age is,
   a) < 25
   b) 26 – 40
   c) 41 – 55
   d) > 55

Value at Risk Performance and Backtesting of Cryptocurrencies

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ABSTRACT

Cryptocurrency has gained a lot of attention in recent times due to its high-risk high-return potential among the investor community. Therefore, cryptocurrency is being scrutinized heavily for its potential as a diversifying asset class. This study examines the performance of Value at Risk (VaR) measures in the context of the top twelve cryptocurrencies by market capitalization over the period from 2018 to 2023, by employing both historical and normal distribution-based approaches. By analyzing descriptive statistics such as means, variances, skewness, kurtosis, and correlation coefficients, we aim to understand the statistical properties of these cryptocurrencies. We compute Historical VaR (HVaR) and Normal VaR (NVaR) at various confidence levels to evaluate the tail risk associated with each cryptocurrency. Our findings reveal that Dogecoin, Cardano, and Chainlink exhibit the highest levels of risk, while stablecoins such as USDT and USDC show minimal risk exposure. The research highlights substantial limitations in the VaR models, with backtesting results from Kupiec's Proportion of Failures (POF) test, Christoffersen's Independence Test, and the Dynamic Quantile (DQ) test indicating significant inadequacies in capturing risk and predicting exceptions. Notably, both HVaR and NVaR models fail to account effectively for clustering of violations and extreme market conditions. We emphasize the importance of continuous monitoring of statistical indicators and correlations to navigate the volatile cryptocurrency market effectively. This study enhances the understanding of VaR performance and risk management in cryptocurrencies, offering valuable insights for both investors and researchers.

Keywords: *Value at Risk, Cryptocurrencies, Risk Management, Kupiec's POF-test, Christoffersen's Independence Test, Dynamic Quantile (DQ) test.*

1. INTRODUCTION

The evolving role of cryptocurrencies in global financial markets has renewed focus on their performance and risk assessment has become even more relevant due to their dynamic price fluctuations (Kapar & Olmo, 2021; Rajharia & Kaushik, 2023). Cryptocurrencies are known for their extreme volatility (Wang et al., 2016) and unique risk profiles, which necessitate a thorough understanding to develop effective risk management strategies. Additionally, the increasing adoption of cryptocurrencies (Kaul, 2021) and their potential for regulatory scrutiny, market manipulation, and technological risks underscore the need for robust research to navigate the uncertainties and safeguard investments. Since Value at Risk (VaR) is the most commonly used tool to assess market risk, our research provides valuable insights into potential losses and risk exposure profile for cryptocurrencies, enabling investors and portfolio managers to make informed decisions.

The literature identifies several variables that significantly affect the performance of cryptocurrencies. Key factors include price determinants such as futures prices (Rajharia & Kaushik, 2023; Kapar & Olmo, 2021), market inefficiencies, trading volumes (Wang et al., 2016; Kristoufek, 2013) and correlations with traditional assets (Corbet et al., 2018; Symitsi & Chalvatzis, 2019) and stock indices. Investor sentiment, as influenced by attention-driven trading and search volumes from platforms like Google Trends and Wikipedia (Aslanidis et al., 2022; Kristoufek, 2013), also plays a crucial role. Moreover, the interconnectedness and spillover effects among cryptocurrencies (Zhang et al., 2021; Yi et al., 2018), regulatory changes, and macroeconomic variables like oil prices further impact their performance. These

determinants collectively contribute to the volatility and risk associated with cryptocurrencies, necessitating comprehensive analysis to understand their VaR performance accurately.

The research on Value at Risk (VaR) performance of cryptocurrencies contributes significantly to the field by addressing several gaps in current literature. One primary contribution lies in its comprehensive analysis of VaR across twelve major cryptocurrencies—Bitcoin, Ethereum, Tether (USDT), Binance Coin (BNB), XRP, Solana, USD Coin (USDC), Cardano, Dogecoin, Avalanche, TRON and Chainlink, over the period from 2018 to 2023. Existing studies often focus on single cryptocurrencies or broader financial markets, neglecting the nuanced risk profiles of individual digital assets. This research fills this gap by providing detailed insights into the VaR characteristics of each cryptocurrency, considering their unique market behaviors, volatility patterns and interrelationships. By utilizing both Historical VaR (HVaR) and Normal VaR (NVaR) methodologies, the study not only quantifies potential downside risks at different confidence levels but also evaluates the impact of non-normal return distributions on risk assessment accuracy. This research thus offers a novel approach to understanding and managing risk in cryptocurrency markets, addressing a critical gap in the literature by providing actionable insights for investors, regulators, and financial institutions navigating the complexities of digital asset investments amidst evolving market dynamics and regulatory landscapes.

The primary stakeholders of this research include investors, portfolio managers, financial institutions, and regulators. For investors and portfolio managers, the study provides actionable insights into the risk profiles and VaR performance of various cryptocurrencies, aiding in more informed investment decisions, enabling them to assess and manage their risk exposure effectively. Financial institutions can leverage these findings to enhance their risk assessment frameworks and compliance with regulatory requirements related to digital assets. Regulators can benefit from the research by gaining a deeper understanding of the risk dynamics in cryptocurrency markets, which can inform the development of more robust regulatory guidelines to ensure market stability and investor protection. Ultimately, this research aims to enhance market transparency, investor protection, and overall market resilience in the rapidly evolving landscape of cryptocurrencies.

Apart from the introduction section, the paper is structured into four key sections: Section 2 reviews literature on cryptocurrency performance determinants and identifies gaps in VaR analysis. Section 3 details the study's data sources, VaR models and backtesting methods. Section 4 presents descriptive statistics, correlation plots, VaR calculations at various confidence levels and backtesting results to elucidate cryptocurrency risk profiles. Section 5 concludes with a discussion of the results' implications, proposes risk management strategies, and outlines limitations and future research directions.

2. LITERATURE REVIEW

Cryptocurrencies have emerged as a pivotal area of study within financial markets, driven by their dynamic price fluctuations and evolving role in global economies. The volatility and risk associated with cryptocurrencies have gained significant scholarly attention, particularly in understanding their VaR performance. Studies have analyzed price fluctuations across multiple cryptocurrencies, identifying cointegration among them, suggesting long-term statistical relationships and significant correlations, particularly with Bitcoin (Rajharia & Kaushik, 2023). Post-industrial economic development has seen cryptocurrencies play a disruptive role, noted by (Aslanidis et al., 2022), who identified a bilateral relationship between cryptocurrency returns and Google Trends data. Various determinants influencing price movements, beginning with (Kapar & Olmo, 2021) investigation into Bitcoin pricing mechanisms, emphasizing the impact of futures prices on spot market valuation. (Subramaniam & Chakraborty, 2020) explored attention-driven trading impacts on major cryptocurrencies like Bitcoin and Ethereum, suggesting market dynamics are influenced by investor sentiment. (Nadarajah & Chu, 2017) highlighted inefficiencies

in the Bitcoin market across different time periods. (Wang et al., 2016) studied Bitcoin price volatility in relation to stock indices and trading volumes, revealing transient associations with oil prices and significant impact from stock indices. (Kristoufek, 2013) explored the impact of Google Trends and Wikipedia on cryptocurrency returns, revealing an asymmetrical relationship between search volumes and Bitcoin prices.

The increasing adoption of cryptocurrencies in countries like India (Gkillas et al., 2022) showed less correlation between Bitcoin and crude oil compared to gold. (Zhang et al., 2021) found no convincing proof of Bitcoin causing spillover effects on other assets. (Kaul, 2021) underscores shifting investor preferences towards digital assets, contrasting traditional investments like gold. India's Supreme Court lifting the cryptocurrency ban led to a surge in investments, with over $1 billion invested by approximately 15 million Indians (Chauhan, 2022). In contrast, (Susilo et al., 2020) indicated that portfolios with multiple cryptocurrencies could effectively hedge equities and improve the Sharpe ratio. (Symitsi & Chalvatzis, 2019) examined Bitcoin's correlation with traditional assets, emphasizing its potential in portfolio diversification but noting bubble characteristics. Despite their growth, concerns persist regarding regulatory scrutiny, illicit use potential, and vulnerability to cybercrime (Feng et al., 2018). Cryptocurrency's emergence as an asset class has attracted attention, with studies like (Corbet et al., 2018) noting distinct advantages and risks compared to traditional assets. (Yi et al., 2018) explored volatility and spillover effects among cryptocurrencies, revealing interconnectedness and shock propagation across the network.

(Qadan et al., 2022) found asset pricing efficiency in cryptocurrencies, advocating for portfolio diversification. A study (Naeem et al., 2021) on asymmetric efficiency using MF-DFA suggested that COVID-19 negatively impacted the Bitcoin market's operation. Efficiency within the cryptocurrency realm was scrutinized by (Khuntia & Pattanayak, 2018), who applied the Adaptive Market Hypothesis to Bitcoin market returns, suggesting dynamic efficiency. Research in (Brauneis & Mestel, 2018) linked cryptocurrency predictability with liquidity, showing decreased predictability with higher liquidity. (Zumbach, 2007) introduces a new methodology for market risk evaluation by integrating advanced knowledge of financial time series, offering a conceptual comparison of performance measures across major risk methodologies. (Longerstaey & Zangari, 1996) document provides a comprehensive overview of RiskMetricTM framework, a standardized set of techniques and data designed to enhance market risk transparency and establish a benchmark for risk measurement across diverse financial instruments and derivatives.

Despite extensive research into cryptocurrency price fluctuations and their determinants (Rajharia & Kaushik, 2023; Kapar & Olmo, 2021), there remains a gap in understanding how these factors specifically impact Value at Risk (VaR) performance across different cryptocurrencies. While existing literature examines factors influencing price volatility and market efficiency, few studies directly address how these factors contribute to the accurate measurement and prediction of VaR in cryptocurrency markets. This research aims to address, understanding VaR performance is crucial for risk management strategies in cryptocurrency investments, necessitating further research to develop robust models that account for the unique characteristics and interconnectedness of cryptocurrencies in measuring and managing risk effectively.

3. DATA AND METHODOLOGY

This study comprehensively examines daily data of major cryptocurrencies i.e. Bitcoin, Ethereum, Tether USDT, Binance Coin, XRP, Solana, USD Coin, Cardano, Dogecoin, Avalanche, TRON, Chainlink from 2018 to 2023. It analyzes their risk using historical and normal VaR models, explores their statistical properties i.e. mean, variance, skewness, and kurtosis and evaluates correlations between them. Solana and Avalanche were excluded from the data analysis due to either data integrity issues or the timing of their issuance, which were pivotal factors in determining the cryptocurrencies to be included. We proceed with 10 cryptocurrencies for further analysis. The data is sourced from CoinMarketCap.

3.1 Historical Value at Risk (HVaR):

It is a non-parametric method used to estimate the potential loss in value of an asset or portfolio over a specified time period, based on historical price movements. It relies on the empirical distribution of past returns to determine the VaR at a given confidence level. HVaR does not assume a specific distribution for returns; instead, it uses actual historical data to model risk.

$$HVaR_{\propto} = -Quantile_{1-\propto}(R) \quad (1)$$

Where: α is the confidence level (e.g., 95%, 99%); $-Quantile_{1-\propto}(R)$is the (1-α)th percentile of the historical return distribution R.

3.2 Normal Value at Risk (NVaR):

It is a parametric approach that estimates the potential loss in value of an asset or portfolio over a specified time period, assuming that returns follow a normal distribution. It calculates VaR using the mean and standard deviation of returns.

$$NVaR_{\propto} = -(\mu + z_{\alpha}.\sigma) \quad (2)$$

Where: μ is the mean of the returns; σ is the standard deviation of the returns; $z_{\propto}$ is the z-score corresponding to the α confidence level from the standard normal distribution.

3.3 Performance Measurement of VaR:

We utilize backtesting techniques to evaluate the effectiveness of each VaR model in assessing the risk associated with cryptocurrencies. A straightforward approach to gauge the performance of these VaR models involves applying the methodologies established by (Kupiec, 1995) and (Christoffersen, 1998), which have been extensively utilized in prior research.

3.3.1 Kupiec's Proportion of Failures (POF) test:

It is a widely recognized method for backtesting VaR models (Kupiec, 1995). This test assesses the unconditional coverage property of the VaR model by examining the failure rate, i.e., the proportion of times the actual loss exceeds the VaR estimate. The test statistic, known as the Likelihood Ratio (LR) for the POF test, is calculated as follows

$$LR_{POF} = -2\,ln\left(\frac{(1-p)^{n-x}\,p^{x}}{\left(1-\frac{x}{n}\right)^{n-x}\left(\frac{x}{n}\right)^{x}}\right) \quad (3)$$

where x is the number of exceptions, n is the total number of observations, and p is the expected probability of failure. The test statistic follows a Chi-squared distribution with one degree of freedom. If the LR_{POF} value is below the critical value, the model passes the backtest. Higher values indicate an inaccurate model, leading to its rejection.

3.3.2 Christoffersen's Independence Test:

While Kupiec's POF test evaluates the overall failure rate, it does not consider the independence of exceptions. (Christoffersen, 1998) Christoffersen's Independence Test addresses this by examining whether VaR exceptions are clustered or independently distributed over time. This test, also known as the Markov

test, assesses the independence property by analyzing sequences of exceptions. The test statistic for the independence test is calculated as follows:

$$\mathrm{LR_{Ind}} = -2\ln\left(\frac{(1-\pi)^{n_{00}+n_{10}}\,\pi^{n_{01}+n_{11}}}{(1-\pi)^{n_{00}}\,\pi_0^{n_{01}}\,(1-\pi)^{n_{10}}\,\pi_1^{n_{11}}}\right) \qquad (4)$$

where n_{00} is the number of days with no exception followed by no exception, n_{01} is the number of days with no exception followed by an exception, n_{10} is the number of days with an exception followed by no exception, and n_{11} is the number of days with an exception followed by an exception. The probabilities π_0, π_1, and π are defined as:

$$\pi_0 = \frac{n_{01}}{n_{00}+n_{01}}, \qquad \pi_0 = \frac{n_{11}}{n_{10}+n_{11}}, \qquad \pi = \frac{n_{01}+n_{11}}{n_{00}+n_{01}+n_{10}+n_{11}}$$

Under the null hypothesis, the test statistic follows a Chi-squared distribution with one degree of freedom. A model passes the independence test if exceptions are independently distributed across days, indicated by equal probabilities ($\pi = \pi_0 = \pi_1$).

3.3.3 Dynamic Quantile:

Typical VaR tests often fail to account for the clustering of violations, meaning that while the overall average of violations may appear acceptable, these violations may still exhibit patterns or clustering over time. This can happen even if the average proportion of violations does not significantly deviate from the expected level of $(\text{where } \alpha = 1 - \text{VaR})$.

To address this issue, the Dynamic Conditional Quantile (DQ) test is used. This test evaluates whether the conditional expectation of violations is zero, which implies that the violations are uncorrelated with their past values and other lagged variables, such as past returns r_t, squared returns r_t^2, or one-step-ahead forecast VaR. The DQ test involves computing the statistic:

$$DQ = \frac{Hit^T X(X^T X)^{-1} X^T Hit}{\alpha(1-\alpha)} \qquad (5)$$

Where, X is the matrix of explanatory variables (e.g., past returns and their squares). $H_{it}$is the vector containing $H_{it}(\alpha)$, which represents the exceedances or violations. Under the null hypothesis, (Engle & Manganelli, 2004) demonstrate that this statistic DQ follows a chi-squared distribution with q degrees of freedom, where q is the rank of the matrix X.

4. DATA ANALYSIS

4.1 Cryptocurrency prices and returns charts (Annexure I):

The figure 1 shows the comparison between cryptocurrency prices. We observe that ETH, BNB, DOGE, and ADA show very low volumes / capitalization during the Covid period except that DOGE showcases a small spike whereas USDC volumes died in the later part of the analysis period. Figure 2 compares the cryptocurrency returns. We note that the all the cryptocurrency returns show spike during the Covid period. Also, the volatility levels are high for almost all the cryptocurrencies throughout the analysis period (and exceptionally high during the Covid period) except for USDC, DOGE, and later part of USDT.

4.2 Descriptive statistics (Annexure II):

The descriptive statistics in Annexure II reveals significant insights into the statistical properties and interrelationships among major cryptocurrencies. Across the analyzed assets in Table 1, the mean represents the average daily return for each cryptocurrency. Positive means for BTC, ETH, BNB, ADA, DOGE, and TRX indicate average gains, while near-zero means for USDT, XRP, and USDC suggest almost no average daily gains or losses. Variance, which measures the spread of returns around the mean, indicates greater volatility for XRP, ADA, and DOGE (0.024) compared to the minimal fluctuations in USDT and USDC (0.000). Skewness measures the asymmetry of returns, with negative skewness for BTC, ETH, BNB, USDC, ADA, and TRX indicating more frequent small gains but potential for large losses. Positive skewness for USDT (1.097), XRP (0.4695), and DOGE (0.533) suggests frequent small losses but potential for large gains. Excess kurtosis, indicating the likelihood of extreme returns, is very high for USDT (396.769) and DOGE (553.908), suggesting a higher probability of extreme values, while the rest show moderate kurtosis. JB test confirms the results of skewness and kurtosis that the data is not normally distributed. The Jarque-Bera test reveals significant JB statistics (p-value 0.000) for all cryptocurrencies, indicating non-normal return distributions.

Elliott, Rothenberg and Stock (ERS) unit root test is a modification of the augmented Dickey-Fuller (ADF) test and is also called as the ADF-GLS test. The ERS test dominates other unit root tests in terms of power. A unit root test determines whether a time series variable is non-stationary using an autoregressive model. The significant p-value results highlights that the return series for each cryptocurrencies is non-stationary. The Ljung-Box Q-test and Q^2-test checks for the null hypothesis whether the data is independently distributed collectively at the mentioned lag. The highly significant p-values for the Q-test and Q^2-test at 20 lags shows that the return distribution are heavily autocorrelated. Kendall's Tau reveals significant positive correlations among most cryptocurrencies, except for USDT and USDC, which show the least and negative correlations, indicating distinct movement patterns. These insights into statistical properties and interrelationships are crucial for understanding risk profiles and informing investment strategies in cryptocurrency markets.

4.3 Cryptocurrency correlation plot (Annexure III)

Most correlations presented are statistically significant, indicating non-random relationships. Major cryptocurrencies like BTC, ETH, BNB, XRP, ADA, TRX, and LINK exhibit strong positive correlations, suggesting they tend to move together, likely due to similar investor sentiment, market conditions, or usage patterns. In contrast, USDC and DOGE show weak correlations with most other cryptocurrencies, reflecting more independent price movements, especially for USDC as a stablecoin. USDT exhibits slight negative correlations, indicating a weak inverse relationship with other cryptocurrencies. This correlation analysis is vital for portfolio diversification, risk management, and trading strategies. Cryptocurrencies with low or negative correlations can help reduce overall portfolio risk, while high correlations suggest limited diversification benefits.

4.4 VAR calculations

4.4.1 Historical Value at Risk at different confidence levels for the cryptocurrencies (Annexure IV A):

The analysis of Historical Value at Risk (HVaR) across major cryptocurrencies reveals distinct risk profiles based on confidence levels in Table 2. DOGE consistently has the highest values, suggesting it is the most volatile and risky cryptocurrency followed by ADA and LINK. USDT and USDC have the lowest values across all confidence levels, indicating they are the least risky with minimal losses. BTC, ETH, BNB, XRP

and TRX have moderate to high values, indicating varying levels of risk, with ETH showing relatively higher risk compared to BTC and BNB.

4.4.2 Normal Value at Risk at different confidence levels for the cryptocurrencies (Annexure IV B):

The analysis of Normal Value at Risk (HVaR) across major cryptocurrencies reveals distinct risk profiles based on confidence levels in 3. XRP, ADA, DOGE and LINK consistently have the very highest values, suggesting it is a highly volatile and risky cryptocurrency. USDT and USDC have the lowest values across all confidence levels, indicating they are the least risky with minimal losses. BTC, ETH, BNB and TRX have moderate to high values, indicating varying levels of risk, with BNB and TRX showing relatively higher risk compared to BTC and ETH.

4.4.3 Historical value at risk at different confidence levels across time (Annexure V A):

The "Returns" column in Figure 4 depicts daily returns for each cryptocurrency, revealing significant variability and high volatility, especially during market shocks such as the 2020 pandemic. Notable spikes and dips indicate impactful market events. High volatility is particularly evident in all cryptocurrencies except DOGE show more stability. The HVaR values across all confidence levels reflect market volatility, with noticeable spikes during periods of high market stress, such as the COVID-19 pandemic. From 2020 to 2024, a general decline in HVaR values for some cryptocurrencies suggests reduced volatility and potentially more stable market conditions. While most cryptocurrencies exhibit relatively stable HVaR values over time, occasional spikes correspond to market turbulence. Few cryptocurrencies show persistently high HVaR values, indicating ongoing high risk.

4.4.4 Normal value at risk at different confidence levels across time (Annexure V B):

Figure 5 shows that NVaR follows same returns trend as HVaR. From 2020 to 2024, NVaR values for most cryptocurrencies exhibit a declining trend, suggesting reduced volatility and risk over time. During market stress periods, such as the COVID-19 pandemic in early 2020, there are noticeable spikes in NVaR values across all confidence levels, reflecting heightened risk. The general stability of NVaR values indicates effective risk management practices, with occasional spikes marking periods of market turbulence. NVaR, which assumes a normal distribution of returns, offers a distinct perspective on risk compared to Historical VaR, which is based on actual historical data.

4.5 Kupiec's POF-test (Annexure VI A):

Backtest Historical and Normal VaR Kupiec Test p-values (Table 4) results: For Historical and Normal VaR, the p-values of 0.00 indicate for all cryptocurrencies at all confidence levels. This means that both VaR models are not accurately predicting the number of exceptions, suggesting it is not performing well.

4.6 . Christoffersen Independence test (Annexure VI B):

Backtest Historical and Normal VaR Christoffersen Test p-values (Table 5) results: For Historical and Normal VaR Christoffersen, the p-values of 0.00 for all cryptocurrencies at all confidence levels. This indicates that the exceptions are not independently distributed for the normal VaR model either, making it unreliable for these cryptocurrencies at the tested confidence levels.

4.7 Dynamic Quantile (DQ) test (Annexure VI A):

Backtest Historical and Normal VaR Dynamic Quantile Test p-values (Table 6) results: The DQ test assesses whether the violations (or exceedances) of the VaR model are independent and uncorrelated with past values and other explanatory variables. The null hypothesis is that the violations are uncorrelated (i.e., the model is correctly specified).

For Historical and Normal VaR dynamic quantiles, the p-values of 0.00 indicate for all cryptocurrencies at all confidence levels. Both models show significant inadequacies in capturing the risk for most cryptocurrencies, as evidenced by the low p-values. These results suggest that for most cases, the models need improvement to better capture the risk and address the clustering of violations.

5. FINDINGS AND SUGGESTIONS

Our analysis of VaR performance for major cryptocurrencies from 2018 to 2023 highlights significant variations in risk profiles and volatility. Using Historical VaR (HVaR) and Normal VaR (NVaR) methods, we found that DOGE, ADA, and LINK exhibit the highest risk, while stablecoins like USDT and USDC show minimal risk. The decline in NVaR values from 2020 to 2024 suggests reduced volatility, possibly due to improved market stability.

During market stress periods, such as the COVID-19 pandemic, both HVaR and NVaR values spiked, indicating increased risk. Descriptive statistics reveal non-normal return distributions for most cryptocurrencies. Additionally, the correlation analysis shows strong positive correlations among major cryptocurrencies like BTC, ETH, and BNB, suggesting they tend to move together, influenced by similar market conditions and investor sentiment. Conversely, stablecoins like USDC and USDT exhibit weak or negative correlations with other cryptocurrencies, indicating more independent price movements. Backtesting results, including Kupiec's Proportion of Failures (POF) test, Christoffersen's Independence Test, and the Dynamic Quantile (DQ) test, indicate significant inadequacies in both HVaR and NVaR models. The tests revealed that neither model accurately predicts the number of exceptions or their independence, with low p-values across all tests suggesting a failure to capture the clustering of violations effectively. The failures indicate a lack of reliable risk assessment, as evidenced by the clustering of exceptions and the inability to account for extreme market conditions.

To mitigate potential losses, investors should diversify portfolios, use stop-loss orders, and monitor statistical indicators. Given the limitations of VaR models, caution is advised. Diversification strategies should consider the distinct risk profiles and correlation patterns, particularly the stability provided by stablecoins. Regulatory bodies can use these insights to develop guidelines for market stability. The study emphasizes the need for robust risk management practices and continuous market analysis to navigate the volatile cryptocurrency market effectively.

6. CONCLUSION

Firstly, this research is aimed to evaluate the performance of Value at Risk (VaR) measures for the top twelve cryptocurrencies by market capitalization, employing both Historical VaR (HVaR) and Normal VaR (NVaR) methodologies. Through comprehensive analysis, including descriptive statistics, correlation assessments, and backtesting using Kupiec's Proportion of Failures (POF) test, Christoffersen's Independence Test, and the Dynamic Quantile (DQ) test, the study sought to provide insights into the risk profiles of these cryptocurrencies and the accuracy of VaR models.

Secondly, our findings reveal substantial variations in risk profiles among the analyzed cryptocurrencies. Specifically, DOGE, ADA, and LINK exhibit the highest levels of risk, whereas stablecoins like USDT and USDC show minimal risk exposure. Both HVaR and NVaR models demonstrated significant limitations, with backtesting results indicating inadequate performance in predicting and capturing risk accurately. The clustering of exceptions and non-normal distribution of returns highlight the models' deficiencies in accounting for extreme market conditions and the dynamic nature of cryptocurrency volatility.

Lastly, to address these limitations, we suggest implementing robust risk management strategies such as portfolio diversification, stop-loss orders, and continuous monitoring of statistical indicators. Investors and financial institutions should exercise caution and consider the distinct risk profiles of cryptocurrencies when developing investment strategies. Future research should focus on refining VaR models to better capture the complexities and unique characteristics of cryptocurrency markets, exploring alternative risk measurement techniques such as Extreme Value Theory (EVT) and Copula-based VaR, and examining the impact of emerging market trends and regulatory changes on cryptocurrency risk dynamics.

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ANNEXURE

Annexure I A:

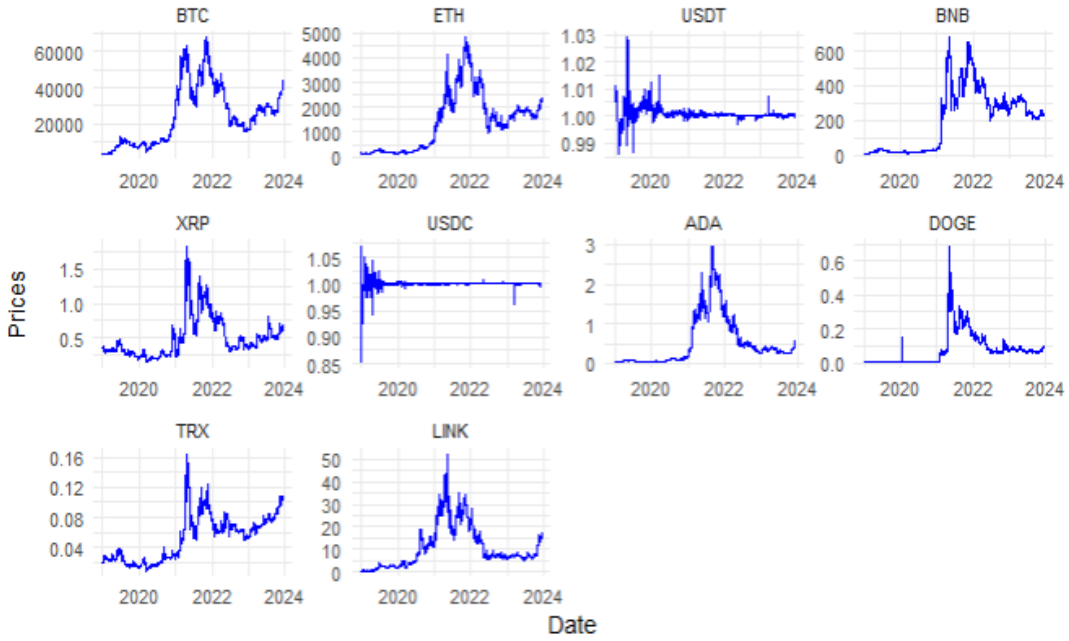

Figure 1: Cryptocurrency Price Charts

Annexure I B:

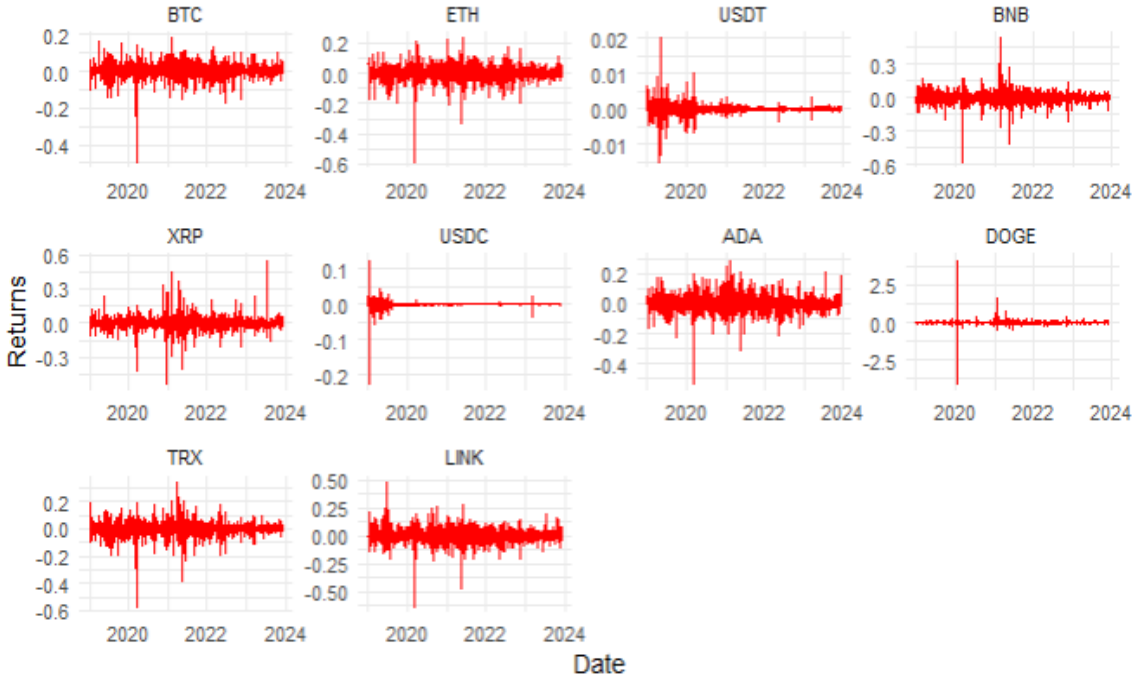

Figure 2: Cryptocurrency Returns Charts

Annexure II ***Table 1:*** ***Descriptive Statistics Table***

Statistics	BTC	ETH	USDT	BNB	XRP	USDC	ADA	DOGE	TRX	LINK
Mean	0	0	0	0.00*	0	0	0	0	0	0
	-0.11	-0.15	-0.99	-0.08	-0.79	-0.96	-0.24	-0.57	-0.4	-0.14
Variance	0	0	0	0	0	0	0	0.02	0	0
Skewness	-1.42***	-1.38***	1.10***	-0.42***	0.47***	-10.53***	-0.32***	0.53***	-0.98***	-0.43***
	0	0	0	0	0	0	0	0	0	0
Ex.Kurtosis	22.17***	17.89***	45.44***	23.38***	20.77***	396.77***	8.66***	553.91***	16.19***	10.98***
	0	0	0	0	0	0	0	0	0	0
JB	37572.40***	24639.32***	155673.10***	41149.48***	32503.78***	11873071.47***	5665.26***	23075070.29***	20003.81***	9131.28***
	0	0	0	0	0	0	0	0	0	0
ERS	-9.17	-5.95	-1.47	-12.46	-10.09	-5.46	-9.76	-22.49	-10.44	-18.72
	0	0	-0.14	0	0	0	0	0	0	0
Q.20.	20.99***	41.27***	293.06***	50.17***	15.43*	459.18***	32.18***	283.36***	45.83***	29.19***
	-0.01	0	0	0	-0.1	0	0	0	0	0
Q2.20.	27.21***	58.12***	1475.28***	169.06***	78.44***	208.70***	100.08***	441.73***	86.96***	77.89***
	0	0	0	0	0	0	0	0	0	0
kendall	BTC	ETH	USDT	BNB	XRP	USDC	ADA	DOGE	TRX	LINK
BTC	1.00***	0.64***	0.03**	0.51***	0.52***	-0.13***	0.52***	0.47***	0.47***	0.44***
ETH	0.64***	1.00***	0.04**	0.54***	0.56***	-0.10***	0.58***	0.47***	0.52***	0.51***
USDT	0.03**	0.04**	1.00***	0.01	0.01	-0.27***	0.03**	0.02	0.03	0.01
BNB	0.51***	0.54***	0.01	1.00***	0.46***	-0.08***	0.50***	0.41***	0.45***	0.43***
RP	0.52***	0.56***	0.01	0.46***	1.00***	-0.09***	0.55***	0.45***	0.51***	0.45***
USDC	-0.13***	-0.10***	-0.27***	-0.08***	-0.09***	1.00***	-0.11***	-0.08***	-0.10***	-0.10***
ADA	0.52***	0.58***	0.03**	0.50***	0.55***	-0.11***	1.00***	0.46***	0.51***	0.49***
DOGE	0.47***	0.47***	0.02	0.41***	0.45***	-0.08***	0.46***	1.00***	0.39***	0.40***
TRX	0.47***	0.52***	0.03	0.45***	0.51***	-0.10***	0.51***	0.39***	1.00***	0.41***
LINK	0.44***	0.51***	0.01	0.43***	0.45***	-0.10***	0.49***	0.40***	0.41***	1.00***

Annexure III:

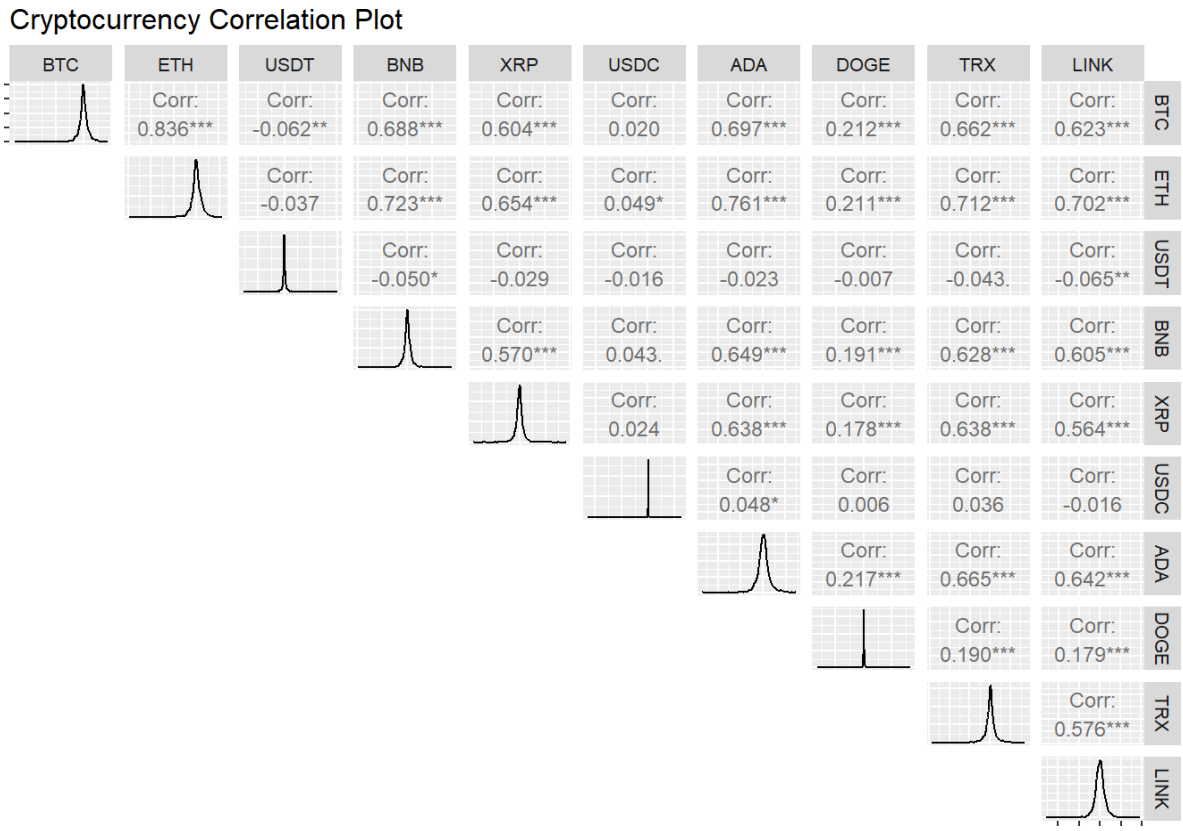

Figure 3: Cryptocurrency Correlation Plot

Significance Levels:
*** Correlation is significant at the ($p < 0.001$)
** Correlation is significant at the ($p < 0.01$)
* Correlation is significant at the ($p < 0.05$)
Correlation is significant at the ($p < 0.1$)

Annexure IV A:

Table 2: Historical Value at Risk (HVaR) at Different Confidence Levels

Crypto	HVaR_99	HVaR_95	HVaR_90
BTC	0.1020	0.0540	0.0343
ETH	0.1374	0.0708	0.0442
USDT	0.0044	0.0017	0.0009
BNB	0.1350	0.0688	0.0455
XRP	0.1356	0.0753	0.0491
USDC	0.0180	0.0022	0.0008
ADA	0.1301	0.0783	0.0558
DOGE	0.1598	0.0770	0.0516
TRX	0.1379	0.0729	0.0462
LINK	0.1510	0.0928	0.0636

Annexure IV B:

Table 3: Normal Value at Risk (NVaR) at different confidence levels

Crypto	NVaR_99	NVaR_95	NVaR_90
BTC	0.6770	0.4426	0.3177
ETH	0.8826	0.5821	0.4219
USDT	0.0328	0.0231	0.0180
BNB	0.9122	0.5914	0.4204
XRP	1.1895	0.8319	0.6413
USDC	0.1783	0.1263	0.0986
ADA	1.0386	0.6956	0.5127
DOGE	3.2634	2.2528	1.7140
TRX	0.9889	0.6736	0.5056
LINK	1.1758	0.7742	0.5601

Annexure V A:

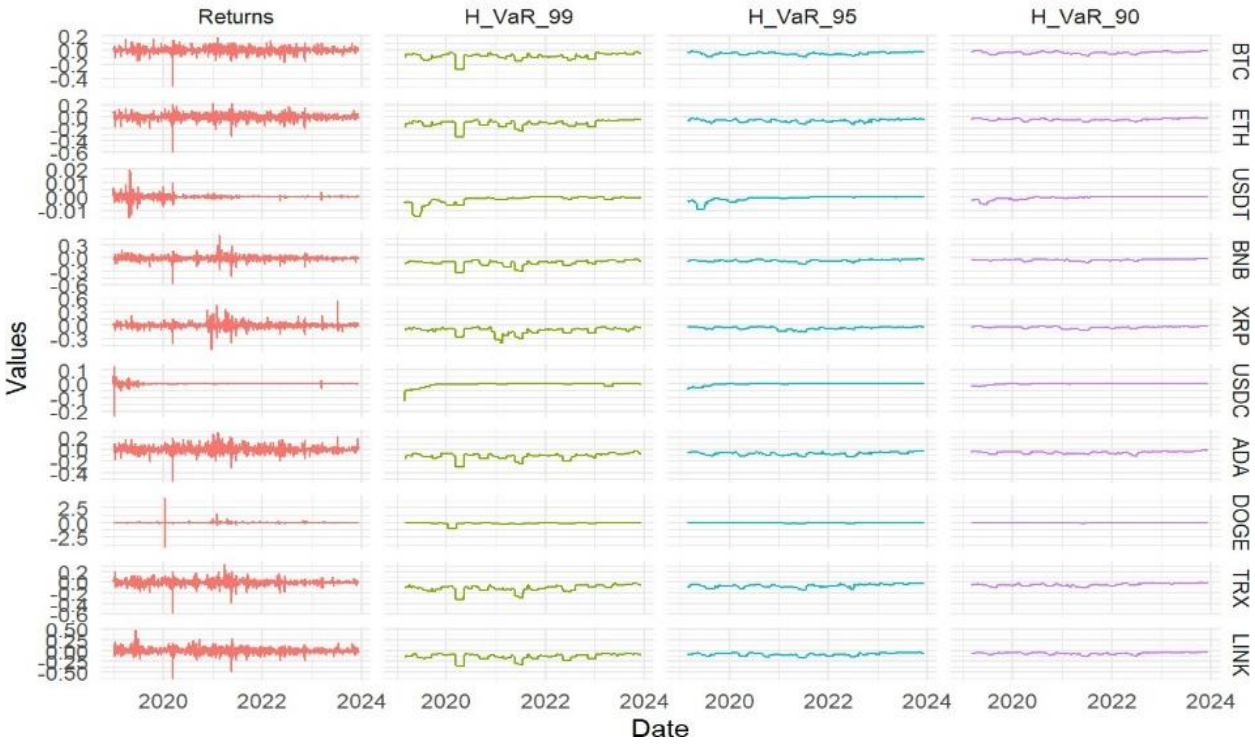

Figure 4: Historical value at risk at different confidence levels across time

Annexure V B:

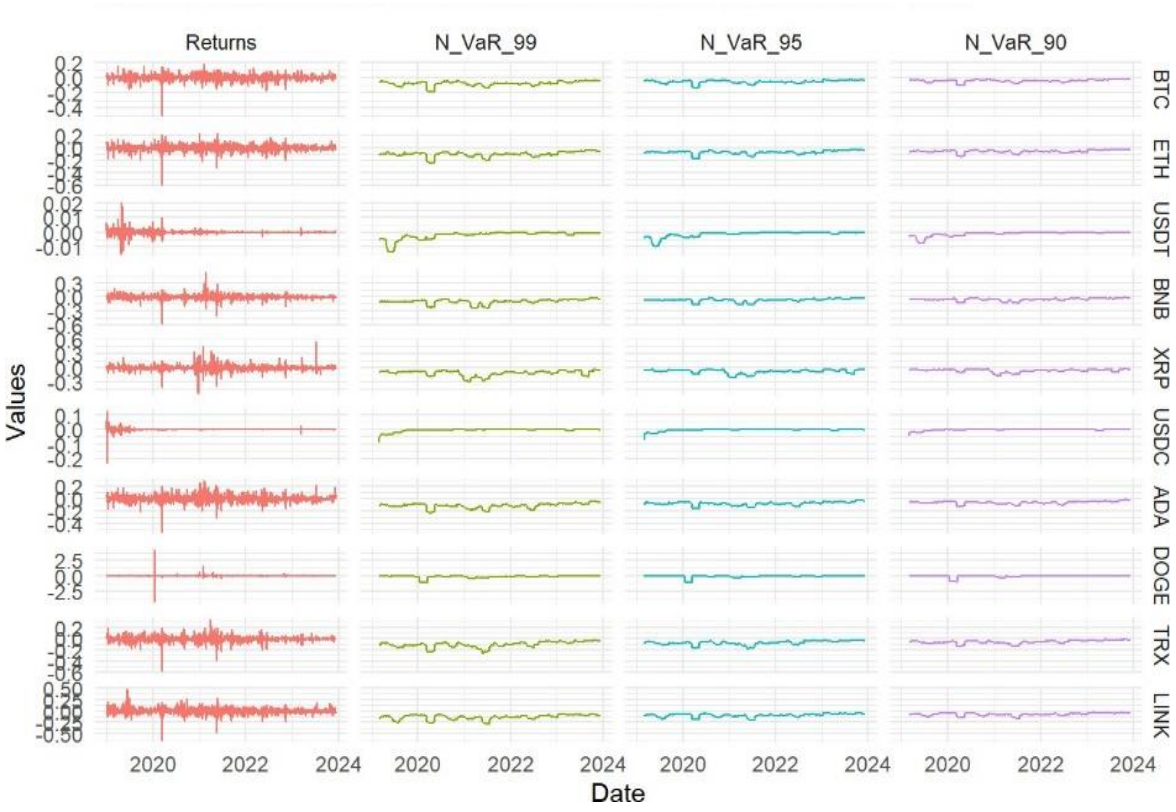

Figure 5: Normal value at risk at different confidence levels across time

Annexure VI A:

Table 4: Kupiec's PoF test for HVaR and NVaR at different confidence levels

Backtest Historical VaR Kupiec Test p-values			
Crypto	Kupiec_H99	Kupiec_H95	Kupiec_H90
BTC	0.00	0.00	0.00
ETH	0.00	0.00	0.00
USDT	0.00	0.00	0.00
BNB	0.00	0.00	0.00
XRP	0.00	0.00	0.00
USDC	0.00	0.00	0.00
ADA	0.00	0.00	0.00
DOGE	0.00	0.00	0.00
TRX	0.00	0.00	0.00
LINK	0.00	0.00	0.00

Backtest Normal VaR Kupiec Test p-values			
Crypto	Kupiec_N99	Kupiec_N95	Kupiec_N90
BTC	0.00	0.00	0.00
ETH	0.00	0.00	0.00
USDT	0.00	0.00	0.00
BNB	0.00	0.00	0.00
XRP	0.00	0.00	0.00
USDC	0.00	0.00	0.00
ADA	0.00	0.00	0.00
DOGE	0.00	0.00	0.00
TRX	0.00	0.00	0.00
LINK	0.00	0.00	0.00

Annexure VI B:

Table 5: Christoffersen Independence test for HVaR & NVaR at different confidence level

Backtest Historical VaR Christoffesen Test p-values			
Crypto	Christoffesen_H99	Christoffesen_H95	Christoffesen_H90
BTC	0.00	0.00	0.00
ETH	0.00	0.00	0.00
USDT	0.00	0.00	0.00
BNB	0.00	0.00	0.00
XRP	0.00	0.00	0.00
USDC	0.00	0.00	0.00
ADA	0.00	0.00	0.00
DOGE	0.00	0.00	0.00
TRX	0.00	0.00	0.00
LINK	0.00	0.00	0.00

Backtest Normal VaR Christoffesen Test p-values			
Crypto	Christoffesen_N99	Christoffesen_N95	Christoffesen_N90
BTC	0.00	0.00	0.00
ETH	0.00	0.00	0.00
USDT	0.00	0.00	0.00
BNB	0.00	0.00	0.00
XRP	0.00	0.00	0.00
USDC	0.00	0.00	0.00
ADA	0.00	0.00	0.00
DOGE	0.00	0.00	0.00
TRX	0.00	0.00	0.00
LINK	0.00	0.00	0.00

Annexure VI C:

Table 4: Dynamic Quantile test for HVaR and NVaR at different confidence levels

Backtest Historical VaR Dynamic Quantile Test p-values			
Crypto	Dyn_Quantile_H99	Dyn_Quantile_H95	Dyn_Quantile_H90
BTC	0.00	0.00	0.00
ETH	0.00	0.00	0.00
USDT	0.00	0.00	0.00
BNB	0.00	0.00	0.00
XRP	0.00	0.00	0.00
USDC	0.00	0.00	0.00
ADA	0.00	0.00	0.00
DOGE	0.00	0.00	0.00
TRX	0.00	0.00	0.00
LINK	0.00	0.00	0.00

Backtest Normal VaR Dynamic Quantile Test p-values			
Crypto	Dyn_Quantile_N99	Dyn_Quantile_N95	Dyn_Quantile_N90
BTC	0.00	0.00	0.00
ETH	0.00	0.00	0.00
USDT	0.00	0.00	0.00
BNB	0.00	0.00	0.00
XRP	0.00	0.00	0.00
USDC	0.00	0.00	0.00
ADA	0.00	0.00	0.00
DOGE	0.00	0.00	0.00
TRX	0.00	0.00	0.00
LINK	0.00	0.00	0.00

Environmental Degradation Due to the Rise of AI and Its Economic and Social Impacts

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ABSTRACT

The rapid development of artificial intelligence (AI) has the potential to increase global GDP, boost economic growth, and revolutionize many sectors. However, this economic boom has also brought environmental and economic pressures. Because AI systems require large amounts of computing power, they will contribute to environmental degradation, global warming, and increases in energy waste, while also contributing to increasingly consistent and disruptive business processes through automation. This article explores the inextricable connections between AI-driven economic growth, environmental degradation, and social inequality, and examines how these factors are generated, revealing how this affects ecological sustainability and economic balance. Based on recent empirical research, we analyse the burden of e-waste, increasing energy pressure, and resulting global warming. The article also identifies the risk of a dystopia in the future that will have a major impact on the economy and the environment, and highlights the urgent need for a policy that will convince the world that developing intellectual skills promotes well-being and not just the world.

Keywords: Environmental degradation, Artificial Intelligence (AI), Economic impacts, Social impacts, Resource consumption, Energy usage, Carbon footprints

INTRODUCTION

Artificial intelligence (AI) has become one of the biggest drivers of technological innovation in the 21st century. Its rapid adoption has transformed industries from healthcare and finance to transportation and manufacturing, delivering unprecedented performance and productivity gains. The impact of AI on global GDP is staggering; estimates suggest that AI could account for 14% of global GDP in the coming years. The growth of AI-powered businesses promises to change usage patterns, create new jobs, and drive further advancement. While AI's automation capabilities promise to replace routine tasks and increase efficiency, they are also disrupting the workforce, particularly in the middle-income sector, driving market changes and enabling better working relationships.

In addition, the environmental costs of AI should also be well evaluated. Training large intelligence structures and data centres requires a large amount of energy, increases carbon emissions and causes global warming. MIT research predicts that AI will soon become a significant part of the global energy system, raising concerns about the environmental sustainability of AI. The problem is that the rapid advancement of technology has caused equipment to change more frequently and interact regularly with electronic equipment. The development of AI and technology has increased the number of electronic devices and increased their load. As the environment deteriorates, global temperatures rise, disrupting the economy and society, especially those affected by climate change.

As wealthy groups benefit from AI-driven growth while lower-income groups face unemployment and environmental damage, the gap between rich and poor is likely to widen. This widening risks a future akin to a dystopian cyberpunk reality of increasing economic inequality and environmental destruction. These are interconnected issues. We analyze the feedback on AI development, environmental damage, and economic inequality, and highlight the need for policies that are important for sustainable and inclusive equality. We can only harness AI's transformative potential and support the global economy more effectively by addressing these issues.

4. LITERATURE REVIEW

AI and Economic Growth

Artificial Intelligence (AI) has been identified as a significant contributor to GDP growth through its influence on productivity across various economic sectors. The research indicates that AI's integration into economic activities enhances productivity, which in turn positively affects GDP. For instance, in the context of China, AI has been shown to have a "U-shaped" effect on green total factor productivity (GTFP), suggesting that AI can overcome the "resource curse" in resource-rich areas and enhance green economic growth ***(Zhao et al., 2022)***. Similarly, AI's role in driving innovation, influencing labour markets, and reshaping industries is highlighted as a catalyst for economic expansion, with a focus on sustainable and inclusive development ***(Chaudhary, 2024)***.

Contradictions arise when considering the regional and industry-specific impacts of AI. While Japan demonstrates effective utilization of AI in relation to GDP, China and India exhibit signs of technological unemployment and jobless growth, respectively ***(Bonsay et al., 2021).*** Moreover, the potential for AI to displace jobs in certain industries is acknowledged, although the overall impact is deemed to be positive due to the creation of new employment opportunities ***(Tiwari, 2023)***.

AI's contribution to GDP growth is multifaceted, with its ability to enhance productivity and efficiency across various sectors being a key factor. Examples include AI-driven technologies improving operations in healthcare, finance, automotive, and manufacturing sectors (Revolutionizing Industries: The Impact of Artificial Intelligence Applications, 2024). However, the economic impact of AI is complex and varies by region and industry, necessitating careful consideration of AI's ***(Jesus et al., 2022)*** role in economic policy and strategy ***(Gabisonia, 2024; Makarov, 2020; Zhou, 2023).*** The overall conclusion is that AI acts as a powerful economic factor with the potential to significantly influence GDP growth through its impact on productivity ***(Gabisonia, 2024; Makarov, 2020; Zhou, 2023).***

Environmental Impact of AI

Artificial intelligence (AI) can lead to environmental degradation primarily through its substantial computational resource requirements, which have direct environmental impacts associated with the energy consumption and electronic waste generated by AI systems and related equipment ***(Measuring the Environmental Impacts of Artificial Intelligence Compute and Applications, 2022).*** The indirect effects of AI on the environment can be both detrimental and beneficial, depending on the application. For instance, AI's role in industrial processes can increase the demand for environmental resources, potentially exacerbating environmental strain ***(Jesus et al., 2022)***. However, AI also can optimize these processes, such as in water treatment, thereby potentially reducing environmental impacts ***(Jesus et al., 2022).***

Contradictorily, AI applications in fields like biofuel technology can contribute positively to environmental sustainability by optimizing biofuel production processes and assessing the environmental impacts of biomass-to-biofuel technologies ***(Okolie, 2024)***. Moreover, AI's predictive capabilities, as demonstrated in life cycle assessment (LCA) models, can enhance decision-making to minimize environmental impacts ***(Jesus et al., 2022)***. It is also noteworthy that the environmental impacts of AI are not limited to degradation; AI can also be instrumental in environmental monitoring and protection efforts, as suggested by the establishment of measurement standards and the call for improved transparency and equity in AI's environmental impacts ***(Measuring the Environmental Impacts of Artificial Intelligence Compute and Applications, 2022)***

In summary, while AI can lead to environmental degradation through its resource-intensive nature and potential to increase demand for environmental resources, it also offers tools for mitigating these impacts

through optimization and predictive modelling ***(2022; Jesus et al., 2022; Okolie, 2024).*** The dual potential of AI necessitates a nuanced understanding of its environmental impacts, advocating for a balanced approach that harnesses AI's capabilities for environmental benefit while mitigating its negative effects.

Socio-Economic Implications

The advent of artificial intelligence (AI) has been identified as a significant disruptor in the labour market, with various studies examining its multifaceted impacts. AI's influence ranges from wealth creation to job displacement and the reshaping of employment patterns ***(Bian, 2024; Tzimas, 2023).*** The displacement effect, productivity effect, and reinstatement effect are key mechanisms through which AI alters the labour market, leading to fluctuations and a shift in demand towards AI-related skill sets (Bian, 2024). Moreover, the integration of AI into industries has been associated with the automation of routine tasks, resulting in job displacement, while simultaneously creating new roles that require advanced skills and collaboration with AI systems ***(Liang, 2024).***

Contradictions arise in the literature regarding the extent of AI's impact on jobs. While some studies suggest a significant portion of occupations could be fully or partially impacted by AI technologies like ChatGPT ***(Zarifhonarvar, 2023),*** others present a more optimistic view, emphasizing AI's potential to enhance human capabilities and create new opportunities ***(O Austine et al., 2024).*** The potential for wealth inequality increases as AI-related positions, which often offer higher salaries, become more prevalent, contributing to income disparity ***(Liang, 2024).*** Additionally, the role of AI in wealth accumulation and the gender wealth gap has been explored, with policy interventions suggested to mitigate these disparities ***(Sierminska et al., 2024).***

In summary, AI is a powerful force in the labour market, capable of both disrupting existing employment structures and generating new opportunities. The literature indicates that while AI can lead to job displacement, particularly in routine tasks, it also has the potential to create new roles and enhance the capabilities of the workforce ***(Austine et al., 2024; Rossomakha et al., 2024).*** However, the rise of AI also poses challenges related to wealth inequality and requires careful policy consideration to ensure equitable outcomes ***(Liang, 2024; Tzimas, 2023).*** The societal impacts of a cyberpunk-type future, characterized by advanced technology and stark social disparities, are not directly addressed in the provided papers, but the implications of AI on wealth inequality and labour market dynamics contribute to the broader discourse on the societal impacts of technological advancements.

5. METHODOLOGY

Research Design

This study utilizes a **qualitative research approach**, employing a comprehensive literature review to explore the intersections of Artificial Intelligence (AI) development, economic growth, and environmental impact. The qualitative approach allows for an in-depth analysis of existing research, synthesizing diverse perspectives to understand AI's broad influence on economic and environmental dimensions. By focusing on secondary sources, the research aims to interpret and integrate insights from empirical studies, AI growth projections, and environmental impact assessments to build a cohesive understanding of AI's multifaceted role in society.

Data Collection

Data for this research is primarily gathered from secondary sources, including peer-reviewed **scholarly articles**, **industry reports**, and **environmental databases**. Specific sources include studies on AI's

contributions to economic growth, assessments of AI's energy consumption, and evaluations of AI's broader social impacts. The selection of literature is based on relevance to the core themes of the study, publication date, and the credibility of the sources. This ensures the inclusion of up-to-date and accurate data on AI's economic and environmental effects. Key areas of focus include empirical studies on AI's economic contributions, reports on energy usage linked to AI, and socio-economic impact assessments.

Analysis

The research employs **thematic analysis** as its primary analytical technique, identifying and categorizing key themes across the selected literature. This method facilitates a detailed exploration of how AI development relates to economic growth and environmental impact. In evaluating the relationship between AI-driven growth and sustainability, the analysis also considers **frameworks** for assessing the trade-offs between AI advancement and environmental degradation. Critical evaluation of the sources aids in determining the broader implications of AI, specifically in balancing technological growth with long-term sustainability goals.

6. RESULTS

Outline Consumer Patterns and Economic Behavior

- **Income Elasticity of Demand**
  - The relationship between income changes due to AI-driven GDP growth and consumption patterns is multifaceted***. (Gries & Naudé, 2020)*** suggests that AI automation may decrease labor income share, potentially reducing aggregate demand and slowing GDP growth, which could lead to stagnating wages and productivity ***(Gries & Naudé, 2020).*** This implies that consumption patterns may shift towards more essential goods and services as disposable income becomes constrained. Conversely, ***(Nizam et al., 2024)*** indicates that disposable income has a significant positive relationship with consumer spending, suggesting that if AI-driven GDP growth leads to increased disposable income, consumer spending may rise accordingly ***(Nizam et al., 2024)***. Interestingly, while ***(Gries & Naudé, 2020)*** posits a potential negative impact of AI on labor income and aggregate demand, ***(Khan, 2022)*** and ***(Sharma et al., 2023)*** highlight the positive influence of AI on consumer buying behavior, with AI applications in commerce leading to more efficient marketing and enhanced customer experiences ***(Khan, 2022; Sharma et al., 2023)***. This could indicate that while AI may suppress income growth for some, it also creates new consumption opportunities through improved product recommendations and shopping experiences. Therefore, the impact of AI-driven GDP growth on consumption patterns appears to be dual: on one hand, it may lead to a decrease in labor income share and suppress consumption growth ***(Gries & Naudé, 2020),*** while on the other hand, it could enhance consumer buying behavior through technological advancements in commerce ***(Khan, 2022; Sharma et al., 2023)***. The net effect on consumption patterns would likely depend on the balance between these opposing forces, as well as on the distribution of AI-driven income gains across different demographic groups and the overall economic context.

  - The relationship between rising income levels, particularly within the upper echelons of society, and the increased demand for technology products, artificial intelligence (AI) services, and luxury items is multifaceted. ***(Morra et al., 2020)*** highlights the proliferation of AI in consumer electronics, with advancements in AI driving novel applications and functionalities in various sectors, including residential energy and robotics ***(Morra et al., 2020).*** Similarly, ***(Bindra et al., 2021)*** underscores the significant market revenue and growth potential of AI-powered products ***(Bindra et al., 2021)***. The demand for luxury goods, on the other hand, is influenced by factors

such as social-adjustive motivation, life satisfaction ***(Wang & Tong, 2017)***, and the perception of income inequality ***(Liu et al., 2024).*** The latter suggests that as perceptions of income inequality rise, so does the value placed on counterfeit luxury goods for their perceived ability to restore social equality ***(Liu et al., 2024)***. Interestingly, while rising income is generally associated with increased consumption of luxury goods, the demand for counterfeit luxury items also increases during economic crises, indicating a complex relationship between income levels and luxury consumption ***(Stravinskiene et al., 2014).*** Additionally, the demand for high-end luxury wines has been positively correlated with income inequality, suggesting that conspicuous consumption is a significant driver in the luxury market ***(Donzé & Katsumata, 2021)***. In the agricultural sector, AI is seen as a revolutionary force, with its adoption driven by the need to increase agricultural production and improve crop productivity ***(Bharti et al., 2018).*** The sum it up the rising income levels in the upper echelons of society contribute to the demand for technology products, AI services, and luxury items. This demand is shaped by the development of AI and its applications across various industries **(Bindra et al., 2021; Morra et al., 2020),** the motivations and perceptions surrounding luxury consumption ***(Liu et al., 2024; Wang & Tong, 2017)***, and the role of income inequality in influencing consumption patterns ***(Donzé & Katsumata, 2021; Liu et al., 2024).*** The demand for luxury goods, including their counterfeit counterparts, is complex and influenced by a variety of factors beyond mere income levels ***(Stravinskiene et al., 2014).***

- The studies collectively suggest that the integration of AI into labour markets has led to significant shifts in employment patterns, with potential implications for consumer behaviour among lower-income groups. As AI and automation disrupt traditional job roles, particularly in sectors with routine tasks, there is a displacement of workers, which may lead to a shift in spending towards essential goods due to reduced income or job insecurity ***(Liang, 2024; Melemuku, 2023; Pavashe et al., 2023)***. This is consistent with the findings that income redistribution towards lower-income households increases demand for basic necessities ***(Cheema & Malik, 1985).*** Interestingly, while AI-induced job displacement could exacerbate income inequality and influence spending patterns towards essentials, the literature also indicates that AI and automation can create new job opportunities and maintain overall employment levels if accompanied by appropriate policies and reskilling initiatives ***(Melemuku, 2023; Olaniyi et al., 2024).*** This suggests that the behavioural shift towards essential goods could be mitigated by such measures. Moreover, unique human capabilities like intuition and empathy are highlighted as irreplaceable by AI, implying that jobs requiring these skills may remain less affected, potentially stabilizing income and spending patterns in lower-income groups ***(Masriadi et al., 2023)***. In summary, the literature indicates that AI's disruption of labour markets may lead to a behavioural shift among lower-income groups towards essential goods, driven by job displacement and income insecurity. However, this trend could be counterbalanced by the creation of new job opportunities and the implementation of effective reskilling programs. The need for a nuanced understanding of these dynamics is critical for developing strategies that support equitable economic outcomes in the face of AI-driven labour market changes ***(Cheema & Malik, 1985; Liang, 2024; Melemuku, 2023; Olaniyi et al., 2024; Pavashe et al., 2023).*** markets.

- **Consumer Confidence and Spending**
  - Artificial Intelligence (AI) is influencing consumer spending in developed economies by enhancing marketing strategies and consumer engagement, particularly in sectors such as tourism and hospitality ***(Cunha et al., 2024).*** AI and Machine Learning (ML) applications are enabling businesses to better understand consumer behaviour through advanced data analysis, leading to more personalized and effective marketing efforts. This targeted approach can increase consumer spending by presenting individuals with options more aligned with their preferences and behaviours.

- However, there is a dichotomy in the impact of AI on consumer spending. While AI-driven marketing strategies can boost spending in certain sectors, job displacement and automation, predominantly in industries characterized by routine and repetitive tasks, may lead to economic uncertainty among affected workers ***(Faishal et al., 2023; Soueidan & Shoghari, 2024; Tiwari, 2023).*** This uncertainty can reduce disposable income and consumer spending in these sectors. Moreover, the jobs created by AI often require technical skills, potentially excluding those displaced from the job market without such qualifications ***(Nnamdi et al., 2023).***

2. AI Development and Environmental Degradation

- **Energy Consumption of AI**
  - The question of how much energy artificial intelligence (AI) will consume by 2050 is not directly addressed in the provided papers. However, the papers collectively highlight the dual role of AI in the energy sector: as a tool for optimizing energy consumption and as a consumer of energy itself. The papers discuss the application of AI in improving energy efficiency and management ***(Ahmad et al., 2019; Alwetaishi & Shamseldin, 2021; Dong et al., 2023; Fu et al., 2024; Iriakuma et al., 2024; Raihan, 2023; Sarduy et al., 2013)***, indicating that AI has the potential to reduce energy consumption in various industries. For instance, AI's role in forecasting, optimizing energy use, and enhancing the performance of energy systems is well documented ***(Ahmad et al., 2019; Dong et al., 2023; Fu et al., 2024; Iriakuma et al., 2024; Sarduy et al., 2013).*** However, the energy consumption of AI itself is a growing concern, particularly as models become more complex and require more computational power ***(Caspart et al., 2022).*** In summary, while the papers provide insights into the role of AI in energy management and its potential to reduce overall energy consumption, they do not offer specific projections for AI's energy consumption by 2050. The increasing demand for computational resources by AI models is acknowledged ***(Caspart et al., 2022),*** but without concrete data or projections, it is not possible to accurately predict AI's energy consumption by 2050 based on the provided context.

- **Carbon Emissions**
  - The rise of artificial intelligence (AI) could potentially lead to higher carbon emissions due to several factors. First, the significant energy consumption required for the operation of data centres and servers that store and process AI data is a primary concern ***(Wang et al., 2024).*** AI systems, particularly those that involve large-scale computations, necessitate substantial computational resources, which in turn consume considerable amounts of electricity, often generated from carbon-intensive sources. Interestingly, while AI has the potential to contribute to carbon emission reduction and energy transition, particularly in the context of trade openness, its impact is not uniform across different levels of trade openness and income groups. For instance, in countries with lower trade openness or lower AI levels, the impact of AI on carbon emissions is less significant ***(Wang et al., 2024)***. This suggests that the relationship between AI and carbon emissions is complex and influenced by economic and technological factors. In summary, the rise of AI could cause higher carbon emissions primarily due to the energy-intensive nature of AI systems and data centres. However, the impact of AI on carbon emissions is nuanced and can vary depending on trade openness and income levels. Policymakers must consider these factors when devising strategies to mitigate the carbon footprint associated with AI technologies ***(`Wang et al. (2024)`)***

- **Natural Resource Depletion**
  - The rise of artificial intelligence (AI) necessitates the development of advanced hardware

capable of supporting its computational demands. This hardware often relies on rare earth elements and heavy metals for components such as permanent magnets in hard drives, semiconductors, and batteries ***(Liu et al., 2020)***. As AI technologies proliferate, the demand for these materials is likely to increase, potentially leading to more intensive mining activities to extract the necessary resources. However, this increased demand for rare earth elements and heavy metals could exacerbate environmental issues. Mining activities are associated with soil degradation, vegetation loss, and pollution, which can have profound impacts on local ecosystems ***(Li et al., 2017; Li et al., 2017; Wu et al., 2021)***. The extraction and processing of these materials often result in the release of heavy metals into the environment, which can affect soil microbial communities and disrupt ecological functions ***(Chen et al., 2021; Liang et al., 2021; Liang et al., 2021; Luo et al., 2022).*** In summary, the expansion of AI technologies is likely to drive greater demand for rare earth elements and heavy metals, which are critical for the production of AI hardware. This increased demand could lead to more mining activities, with potential environmental consequences such as soil degradation, vegetation loss, and pollution. Addressing these challenges will require careful management of mining practices and consideration of ecological impacts ***(Li et al., 2017; Li et al., 2017; Liu et al., 2020; Wu et al., 2021; Zhang et al., 2023).***

3. Growth in E-Waste

- **E-Waste from AI and Technology Consumption**
    - The rise of artificial intelligence (AI) has the potential to generate more electronic waste (e-waste), which could accelerate environmental degradation and climate change. E-waste is a consequence of the rapid turnover of electronic devices, which are often integral to AI systems. As AI technologies advance and require more powerful hardware, the replacement of older equipment becomes more frequent, leading to an increase in e-waste ***(Kumari & Pandey, 2022)***. This e-waste, if not properly managed, can lead to the release of toxic substances into the environment, contributing to pollution and health hazards ***(Yang & Sun, 2012).***
    - Interestingly, while AI can contribute to e-waste, it also offers solutions for environmental sustainability. AI-driven systems can optimize energy use, reduce carbon emissions, and support recycling efforts ***(Kumar et al., 2024; Tseng & Lin, 2024)***. However, the production and operation of AI technologies themselves can be energy-intensive, potentially offsetting some of the environmental benefits ***(Gaur et al., 2023)***. The complexity of AI's impact on the environment is further highlighted by the need for large computational resources, which can have a significant carbon footprint ***(Kumari & Pandey, 2022).***
    - In summary, the rise of AI has a dual impact on the environment. On one hand, it can lead to an increase in e-waste and associated environmental degradation if not managed responsibly. On the other hand, AI has the potential to drive sustainability efforts and mitigate climate change. The challenge lies in balancing the benefits of AI with the environmental costs, emphasizing the development of sustainable AI practices and the responsible disposal and recycling of e-waste ***(Kumari & Pandey, 2022; Tseng & Lin, 2024)***. It is crucial to consider these factors as we continue to integrate AI into various sectors of society.

- **Circular Economy Failures**
    - The complexity of recycling AI-related hardware and the limited infrastructure for handling AI-generated waste are significant concerns. AI technologies, particularly those involving machine learning, require robust computational resources, which often include specialized hardware accelerators like GPUs, TPUs, and ASICs ***(Zou, 2024)***. These components have intricate designs and are made from a variety of materials, complicating the recycling process. Moreover, the rapid advancement in AI technologies leads to a faster turnover of hardware, contributing to the volume of waste. Interestingly, while AI is contributing to the waste problem, it also offers solutions for waste management through improved sorting and recycling processes ***(Olawade et al., 2024; Ozdemir et al., 2021)***. However, the recycling of AI hardware itself presents unique challenges due to the complexity of the materials and components involved. The infrastructure for recycling such specialized equipment is not as developed as for more common electronic waste, which exacerbates the issue ***(Zou, 2024).*** In summary, the difficulty in recycling AI-related hardware is twofold: the complex structure of the hardware itself and the lack of adequate infrastructure to process this type of waste. Addressing these challenges requires advancements in recycling technologies, possibly aided by AI itself, and the development of more comprehensive waste management systems specifically tailored to handle the intricacies of AI-generated waste ***(Olawade et al., 2024; Zou, 2024).***

4. Rising Global Temperatures and Environmental Impact

- Rising global temperatures fueled by AI-driven energy consumption have significant environmental and economic implications. As AI systems, especially large language models and deep learning algorithms, demand vast computational resources, their energy consumption contributes directly to global warming. MIT studies predict that AI could account for nearly 20% of global electricity consumption by 2027, intensifying carbon emissions and pushing global temperatures toward dangerous thresholds, with estimates ranging between a 2.5°C to 3°C rise by 2050. These temperature increases are linked to more frequent extreme weather events, causing widespread economic disruptions, from agricultural losses to infrastructure damage. Climate change will impose a steep economic cost, with nations needing to allocate substantial resources toward disaster recovery, population displacement, and climate mitigation strategies, diverting funds that could otherwise fuel economic growth. Consequently, AI's contribution to global warming poses risks not only to the environment but also to the stability of global economies.

5. Impact of AI on Global GDP

- **AI-Driven Economic Growth**
    - Artificial Intelligence significantly contributes to global GDP growth by enhancing productivity, optimizing supply chains, and opening new market opportunities. According to PwC, AI is expected to contribute up to $15.7 trillion, or 14%, to the global economy by 2030. This growth is driven primarily by increased automation, efficiency gains across industries, and the creation of new products and services. AI enables faster decision-making, predictive analytics, and process optimization, fueling growth in sectors like finance, healthcare, retail, and logistics. China and North America are expected to benefit the most from AI advancements, contributing nearly 70% of the global economic impact.

- **Job Displacement and Income Disparities**
    - While AI drives economic expansion, it also results in significant job displacement. Automation threatens millions of jobs, particularly in manufacturing, retail, and transportation. A report by McKinsey predicts that up to 375 million workers globally may

need to switch occupational categories due to AI and automation by 2030. In emerging economies, where labour-intensive jobs dominate, the rapid adoption of AI could lead to widespread economic dislocation, exacerbating existing income inequalities. AI's impact is also extending into skilled industries such as finance, law, and medicine, where algorithms are increasingly replacing routine cognitive tasks.

- **Rising Inequality**
    - The development of AI tends to concentrate wealth within advanced economies and high-skilled sectors. As a result, income inequality is rising, with the benefits of AI-driven GDP growth disproportionately accruing to tech-savvy, upper-income groups, while low-skilled labour sectors face job losses. In the U.S., for example, wage disparities have increased as AI and automation have created high-paying jobs for those with the right skills while eliminating many mid-level and lower-skilled positions. Globally, this wealth concentration is further pronounced, as developed countries with advanced technological infrastructure capitalize on AI growth, leaving developing economies struggling to catch up. This creates imbalanced global economic structures, where wealth and technological advancements are heavily skewed towards a few nations and corporations, exacerbating global inequality.

6. Influence on Consumption Patterns

- **Economic Polarization and Consumption**
    - The widening wealth gap driven by AI adoption and technological advances leads to sharply divided consumption patterns. Among the wealthy, there is a noticeable shift toward luxury consumption, including premium AI-driven products and services such as personalized smart homes, AI-assisted healthcare, and automated luxury vehicles. This contrasts starkly with the spending habits of lower-income populations, who are increasingly focused on survival-oriented consumption—primarily allocating their limited resources toward basic necessities like food, water, and shelter. A study by Liang (2024) highlights this bifurcation, showing how AI's contributions to economic growth often disproportionately benefit the affluent, further entrenching economic divides.

- **Shifts in Resource Allocation**
    - Environmental degradation exacerbated by AI-fueled industrial growth has led to a reallocation of resources. Lower-income demographics, disproportionately affected by climate change, are forced to spend more on essential needs like water, food, and shelter, with environmental stressors such as droughts and floods driving prices higher. In contrast, the wealthier population channels increasing portions of their income toward luxury consumption, including emerging sectors like space travel, cutting-edge AI technologies, and AI-driven innovations in leisure and comfort. According to Olaniyi et al. (2024), this shift in resource allocation not only strains global resources but also further deepens environmental degradation, as wealthier individuals consume high-energy, resource-intensive products and services.

- **Climate-Related Consumption Adjustments**
    - Climate change has catalyzed shifts in consumption patterns across all income levels. Rising temperatures and environmental awareness have led to growing demand for eco-friendly products, green technologies, and sustainable goods, particularly among environmentally-conscious consumers. Wealthier segments of the population, with greater access to AI-driven solutions, are increasingly adopting sustainable practices, such as optimizing energy use in homes through AI-powered systems and investing in green

transportation solutions. However, these technologies remain largely out of reach for lower-income populations, further reinforcing economic divides. Melemuku (2023) found that while AI holds significant potential as a tool for optimizing sustainable consumption, its benefits are often exclusive to affluent groups, limiting its broader societal impact and contributing to unequal access to sustainability initiatives.

7. Feedback Loop of AI, Environmental Degradation, and Economic Growth

- **Reinforcing Cycles of Growth and Degradation**
    - AI-driven GDP growth accelerates consumption patterns, which in turn drives higher levels of resource extraction, energy consumption, and environmental degradation. As industries and economies grow through the integration of AI technologies, the demand for raw materials and energy surges, further straining natural ecosystems and contributing to pollution and habitat destruction. This environmental degradation, in turn, necessitates greater economic spending on climate mitigation and adaptation efforts, diverting resources that could be invested in sustainable development. Simultaneously, the economic growth propelled by AI often exacerbates wealth inequality, with the benefits concentrated among a small, affluent segment of society. This widening inequality fuels the further development of advanced technologies, creating a cycle of increased consumption and carbon emissions that deepens the environmental damage, threatening long-term sustainability.
- **Policy Interventions and Sustainable AI**
    - There is an urgent need for policies that regulate AI development to ensure that its economic benefits are distributed equitably across all sectors of society while minimizing environmental harm. These policies should focus on fostering sustainable growth by encouraging investment in renewable energy sources to power AI technologies, reducing their reliance on fossil fuels and lowering carbon emissions. In addition, building a robust recycling infrastructure will help mitigate the environmental costs of AI hardware, such as servers and devices, by promoting responsible disposal and reuse of materials. Furthermore, the promotion of ethical AI practices—such as designing AI systems that prioritize efficiency and sustainability—will be crucial in reducing AI's ecological footprint. By aligning AI development with environmental and social responsibility, these policies can help ensure that technological advancement supports both human prosperity and the preservation of the planet.
- **Future Socio-Economic Scenarios**
    - The unchecked growth of AI risks creating a cyberpunk-like dystopia with vast wealth disparities, environmental collapse, and societal instability, where the rich benefit from advanced technologies while the majority face economic and environmental degradation. To prevent this future, global cooperation is essential to regulate AI and ensure it serves sustainable development and environmental preservation. By directing AI towards solving climate challenges and promoting equitable growth, we can harness its power for the greater good, avoiding a world where technological progress deepens inequality and undermines the planet's health.

LIMITATIONS

- While this research provides valuable insights into the environmental and social impact of AI technologies, it is important to acknowledge certain limitations. First, the study is primarily based on secondary data sources, such as existing literature, reports, and case studies. As a result, some of the data may lack real-time accuracy, particularly in the rapidly evolving field of artificial

intelligence. Future research could benefit from primary data collection, such as interviews with industry experts or direct observations in AI-centric industries, to further validate the findings

- Second, the focus of this research is limited to specific AI applications, particularly large language models, which may not represent the full spectrum of AI technologies. AI's impact on the environment and society is multifaceted, and generalizations made in this study may not fully apply to other AI domains, such as robotics or autonomous systems. Future research should consider these broader applications to provide a more comprehensive understanding of AI's influence on global environmental and social dynamics.
- Additionally, this study predominantly addresses the environmental consequences related to energy consumption and carbon emissions, while other ecological factors such as electronic waste from AI hardware development, resource depletion, and water usage are only briefly mentioned. These aspects warrant more in-depth exploration in subsequent studies to give a more holistic view of AI's environmental footprint.

IMPLICATIONS

- Despite its limitations, this research holds significant implications for policymakers, corporate stakeholders, and AI developers. The findings underscore the urgent need for the integration of sustainability principles into AI development processes. Companies involved in the development and deployment of AI technologies should consider adopting greener energy sources, improving energy efficiency, and investing in carbon offset programs to mitigate the adverse environmental impacts outlined in the study.
- For policymakers, the research highlights the critical necessity of introducing regulations that address the environmental costs of AI technologies. Establishing mandatory guidelines for energy usage, carbon emissions, and the responsible disposal of AI hardware can help manage and reduce the industry's ecological footprint. Furthermore, a greater emphasis on corporate accountability in line with the United Nations' Sustainable Development Goals (SDGs) should be encouraged to foster an equitable and sustainable AI landscape.
- Lastly, the social implications of AI-driven environmental degradation cannot be overlooked. This study suggests that vulnerable populations disproportionately bear the negative consequences of AI's environmental impacts. Policymakers and corporate entities must prioritize inclusive strategies that address these inequities and ensure that the benefits of AI innovation are equitably distributed across all socioeconomic strata. This could involve the creation of socio-environmental programs that focus on climate justice, community resilience, and equitable access to AI-driven advancements.

CONCLUSION

The development of AI stands at the crossroads of unprecedented economic growth and equally significant challenges in terms of environmental sustainability and social equity. As AI continues to drive GDP growth and technological innovation, it also risks deepening wealth disparities and accelerating environmental degradation. The dual-edged nature of AI makes it clear that without deliberate and strategic interventions, the future could witness an exacerbation of wealth inequality, pushing a greater divide between the affluent, who will increasingly benefit from AI, and the marginalized, who may face heightened economic and environmental vulnerabilities. Moreover, AI-driven industrial growth could further strain natural resources, increase carbon emissions, and worsen climate change impacts. This analysis highlights the critical importance of establishing sustainable and inclusive AI policies that address not only the technological and economic aspects of AI advancement but also the environmental costs and social consequences. To safeguard the future, AI development must be carefully guided to ensure it supports equitable economic benefits, promotes green innovation, and contributes to a more sustainable world for all.

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A Study on the Impact of Core Self-Evaluation on Work Engagement in Indian Railways

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ABSTRACT

This study explores the relationship between employees' Core Self-Evaluation (CSE) and Work Engagement (WE) levels in Indian Railways in Maharashtra and Punjab. Indian Railways, one of the largest employers in the world, faces challenges related to work engagement. Understanding the factors influencing work engagement, such as CSE, is essential for organizational success and employee well-being. "Core Self-Evaluation" is a psychological concept that refers to an individual's fundamental perception of themselves, including their self-esteem, self-efficacy, locus of control, and emotional stability. Work Engagement is the psychological state characterized by vigor, dedication, and absorption in one's work tasks. It involves feeling energized, committed, and deeply immersed in work activities, leading to enhanced performance, satisfaction, and overall well-being in the workplace. A quantitative research approach was adopted, utilizing survey questionnaires to collect data from a sample of Indian Railways employees across various job roles. Core Self-Evaluation Scale - CSES and Utrecht Work Engagement Scale - UWES were used to capture the responses. The study finds a strong relationship between CSE and WE, using regression analysis. This study highlights the importance of CSE as a significant predictor of WE among Indian Railways employees. By recognizing and nurturing employees' self-perceptions and beliefs, organizations can foster a positive work environment conducive to higher levels of work engagement, productivity, and satisfaction.

Keywords: *Work Engagement, Core Self Evaluation, Employee Well-Being, Positive Work Environment*

1. INTRODUCTION

1.1 Industry Analysis

Indian Railways, a statutory body under the Ministry of Railways, operates India's national railway system and is the world's fourth-largest by size. Established on 16 April 1853, it manages 104,647 km of track, with 60,451 km electrified. As of 2023, Indian Railways employs over 1.2 million people, making it the world's ninth-largest employer and India's second-largest. The organization is divided into 18 zones (17 operational), further subdivided into 71 divisions, each managed by Divisional Railway Managers (DRMs). Indian Railways also oversees several manufacturing units, training establishments, and public sector undertakings.

1.2 Situational analysis

Work engagement in the Indian Railways is shaped by a mix of deep-rooted commitment and significant challenges. While the Railways offer stable employment and a strong ethos of national service, issues like overburdened infrastructure and bureaucratic hurdles can undermine motivation. Modernization efforts, including digital initiatives and employee welfare programs, seek to enhance efficiency and morale. However, sustaining engagement requires continuous efforts to address systemic inefficiencies, improve working conditions, and promote a culture of innovation and recognition.

1.3 Topic Summary

In the modern era, as the cost of human capital rises, organizations increasingly value employee engagement as a key asset. HR plays a vital role in fostering this engagement, which is crucial for enhancing organizational effectiveness. Recent studies highlight that engaged employees boost productivity, making it essential for organizations to identify effective strategies. Tools to measure employee engagement are emerging, with human psychology playing a key role, particularly the concept of core self-evaluation, which significantly influences work engagement.

1.3.1 Concept of Core Self-Evaluation

Core self-evaluation (CSE) is a stable personality trait that reflects an individual's self-perceptions, talents, and confidence. Four personality factors are involved in core self-evaluations, which were initially studied by (Judge T. A., 1998). These dimensions are locus of control, neuroticism, generalized self-efficacy, and self-esteem. Those with high CSE possess positive self-assurance, while those with low CSE lack confidence and have poor self-view. CSE emerged from the study of job satisfaction, which has historically been analyzed through three models: the situational/job characteristics approach (focused on external job factors), the dispositional approach (focused on stable personality traits), and the interactionist approach (a mix of both). CSE was developed to further explore the dispositional approach to job satisfaction.

Locus of control refers to an individual's belief about the extent to which they have control over events affecting them. Those with an "internal" locus of control believe they can influence outcomes through their actions, while those with an "external" locus of control perceive outcomes as being determined by external forces. (Rotter, 1966). Neuroticism is a fundamental personality trait associated with the tendency to experience negative emotional states, such as anxiety, anger, or depression. It reflects emotional instability and a higher likelihood of perceiving ordinary situations as threatening (Eysenck, 1967). Generalized self-efficacy refers to an individual’s belief in their ability to successfully execute the behaviors required to produce desired outcomes across various situations. It reflects a broad and stable sense of personal competence (Jerusalem, 1995). Self-esteem is the overall affective evaluation an individual has of themselves, encompassing feelings of self-worth, value, and competence. It is a fundamental aspect of an individual's self-concept and personal identity (Rosenberg, 1965).

1.3.2 Concept of Work Engagement

Work engagement is a positive work behavior characterized by enthusiasm, commitment, and full involvement in one's job. The Utrecht Work Engagement Scale (UWES) measures this through three dimensions: vigor, dedication, and absorption. Available in 20 languages, UWES is widely validated and reliable, with versions for students and a short form. Another tool, the Oldenburg Burnout Inventory (OLBI), assesses engagement through cynicism-dedication and exhaustion-vigor. "Drive," a newer construct measuring passion, effort, and ideation, has shown promise in predicting future motivation and work engagement.

Vigor is characterized by high levels of energy, mental resilience, and a willingness to invest effort in one's work, along with the persistence to overcome difficulties. It reflects a sense of vitality and robustness in work activities. Dedication refers to a strong sense of involvement, enthusiasm, inspiration, pride, and challenge in one's work. It represents a deep emotional commitment and connection to one's tasks. Absorption is characterized by being fully concentrated and happily engrossed in one's work, where time passes quickly, and one finds it difficult to detach from work. It involves being deeply involved in activities, often to the point of losing track of time. (Wilmar B. Schaufeli, 2006).

Two main groups of variables that influence work engagements have been found through research:

Job resources, such as learning opportunities, job control, performance feedback, coaching, and social support, are positively linked to work engagement. These resources help achieve work goals, reduce workplace stress, and promote personal growth. Their importance increases when job demands are high. For example, a longitudinal study of 2,555 Finnish dentists found that job resources boost work engagement, which then enhances personal initiative and work-unit innovation.

Personal resources: Resilience, optimism, and self-efficacy are examples of personal resources that can be successfully used to influence and manage the environment. Moreover, several individual traits set highly engaged workers apart from less so. The dispositional source of job engagement can be examined with the use of the five-factor model. Work engagement was correlated with the big five factors as a higher-order factor. Extraversion, scrupulousness, and emotional stability are a few examples (Arnold B. Bakker, 2013). Work involvement appears to be correlated with psychological capital as well. As an illustration, (D Xanthopoulou, 2007) investigated the job engagement of Dutch technicians in connection to three personal resources (optimism, organizationally based self-esteem, and self-efficacy). The outcomes showed a connection between these resources and involvement at work.

Importance of work engagement

- Higher productivity
- Improved learning and development
- Stronger relationships with colleagues
- Reduced turnover
- Improved customer service
- Improve brand loyalty

2. LITERATURE REVIEW

Core Self-Evaluation (CSE) is a broad personality trait encompassing self-esteem, generalized self-efficacy, locus of control, and emotional stability. It reflects an individual's self-perception and overall evaluation of their capabilities and worth. Work engagement, on the other hand, refers to the degree of enthusiasm, dedication, and absorption an employee exhibits toward their work. This literature review explores the relationship between CSE and work engagement, summarizing key findings from various studies.

CSE integrates four components: Self-Esteem: The overall sense of personal worth; Generalized Self-Efficacy: Belief in one's ability to perform across various situations; Locus of Control: The extent to which individuals believe they can control events affecting them and Emotional Stability: The ability to remain calm and collected under stress. (Judge T. A., 1998). Work Engagement is defined by three key dimensions of Vigor: High levels of energy and mental resilience; Dedication: A sense of significance, enthusiasm, and pride in one's work and Absorption: Being fully immersed in one's tasks.

The concept of Core Self-Evaluations (CSE) has been extensively examined, showcasing its significant impact on life satisfaction, work success, and career adaptability. (Smedema, 2002) focused on CSE among college students with disabilities, emphasizing the need for further development to improve their self-evaluations. This idea extends to various professional settings, where (Ghuan, 2014) established a positive association between CSE and burnout among Chinese nurses, proposing CSE as an effective coping strategy. Building on this, (Judge T. A., 2009) demonstrated that higher levels of CSE correlate with greater work success.

In educational contexts, (Cao, 2024) linked CSE to reduced academic stress through physical activities. (Du1, 2022) discovered that CSE positively predicts career adaptability, with protean career attitudes acting as a mediator. (M´erida-L´opez, 2017) further revealed that CSE mediates the relationship between burnout, work engagement, and life satisfaction. The exploration of CSE's role in work engagement and turnover intentions by (Barbosa, 2018) and K (Khusanova, 2021) highlighted its importance. (Schaufeli W. , 2008): and (Arnold B. Bakker, 2013) validated the positive correlation between work engagement, job satisfaction, and personal resources like self-efficacy.

(Yoo, 2019) and (R. Monica, 2018) delved into how CSE relates to work engagement, with their studies moderated by job insecurity and proactive personality. (Dasgupta, 2020)) and (Huang1, 2021) emphasized the role of leadership and organizational factors in reinforcing CSE's impact on work engagement, thereby showcasing CSE's crucial role in various professional and academic contexts.
Additional research highlights a positive correlation between CSE and work engagement. (Judge T. A., 2001) found that core self-evaluations are positively related to job satisfaction and performance, both closely linked to work engagement. (Luthans, 2007) demonstrated that individuals with high CSE show greater work engagement due to their resilience and positive outlook, enhancing their energy and enthusiasm at work.

Self-efficacy, a component of CSE, is crucial in mediating the relationship between CSE and work engagement. (Eisenberger, 2004) identified self-efficacy as a significant predictor of work engagement, while (Xanthopoulou, 2009) found that self-efficacy mediates this relationship, suggesting that individuals with strong self-efficacy engage more deeply with their work. Emotional stability, another CSE component, is positively associated with work engagement. (Baron, 2007) proposed that emotionally stable employees experience less stress and maintain high engagement levels. (Kulik, 2008) supported this by indicating that emotional stability contributes to resilience and positive work attitudes, enhancing engagement.

The impact of locus of control on work engagement is also noteworthy. (Judge T. A., 2001) found that individuals with an internal locus of control, who believe they can influence events, exhibit higher work engagement due to their proactive approach. Furthermore, job resources, such as support and autonomy, can moderate the relationship between CSE and work engagement. (Schaufeli W. B., 2004) emphasized that adequate job resources enhance the positive effects of high CSE on engagement. A supportive organizational culture further amplifies this impact, as noted by (Salanova, 2010), who found that a positive organizational climate enhances the relationship between CSE and work engagement.

3. SCOPE AND OBJECTIVES

3.1 Problem Statement

To study the impact of core self-evaluation on work engagement

3.2 Scope

- A questionnaire-based survey in Indian Railways was conducted.
- The survey was conducted in two regions Maharashtra and Punjab in India.

3.3 Objectives

- To study the level of work engagement in Indian Railways.
- To study the impact of core self-evaluation on work engagement in Indian Railways.

4. RESEARCH METHODOLOGY

4.1 Research Design:

This study employs a quantitative research design to examine the relationship between core self-evaluation (CSE) and work engagement among employees of Indian Railways. Quantitative methods allow for the systematic collection and analysis of numerical data to test hypotheses and establish relationships between variables.

4.2 Research Instrument: Core self-evaluations scale and Utretch work engagement scale.

4.3 Hypothesis

Null Hypothesis (H0): There is no significant relationship between Core self-evaluation and Work Engagement.
Alternate Hypothesis (H1): there is a significant relationship between Core self-evaluation and Work Engagement.

4.4 Population and Sample:

The population of interest comprises employees across various job roles and departments within Indian Railways. A convenient random sampling technique was utilized to ensure representation from different employees.

4.5 Sample Size: 100 employees of Indian Railways in Maharashtra and Punjab.

Justification of sample size:

- With a sample size of 100, we achieved sufficient statistical power (typically 80% or higher) to detect medium-sized effects or differences between groups, assuming a standard significance level (e.g., 0.05). This sample size is large enough to detect meaningful differences for Hypothesis testing.
- A sample size of 100 provides a reasonable balance between achieving a desirable confidence level (typically 95%) and maintaining a manageable margin of error (often around ±10%). This margin of error is acceptable in many practical contexts, such as employee surveys or customer feedback studies.
- Based on the Central Limit Theorem, a sample size of 30 or more is generally sufficient for the sample mean to approximate a normal distribution, regardless of the underlying population distribution. A sample size of 100 exceeds this threshold, which allows for the reliable application of parametric statistical tests (like t-tests or ANOVA).

4.6 Data Collection:

Data was collected through self-administered surveys distributed among the selected sample of Indian Railways employees. The survey instrument consisted of validated scales to measure core self-evaluation (e.g., Core Self-Evaluations Scale) and work engagement (Utrecht Work Engagement Scale). The survey also included demographic questions to capture relevant participant characteristics.

4.7 Variables and Measures:

The independent variable of interest is core self-evaluation, operationalized as individuals' perceptions of their self-esteem, self-efficacy, locus of control, and emotional stability. The dependent variable is work engagement, comprising dimensions such as vigor, dedication, and absorption in work tasks. Both variables were assessed using Likert-type scales ranging from 1 (strongly disagree) to 5 (strongly agree) for CSE and from 0 **(never)** to 6 **(Always) for WE.**

5. DATA ANALYSIS AND INTERPRETATION

5.1 Analysis of the Responses for Core Self-Evaluations Scale

Table 1

Construct	Average Scores (5-point Scale)	Overall Average Score for CSE
Emotional Stability	3.36	**3.68**
Generalized Self-Efficacy	4.06	
Locus of Control	3.49	
Self-Esteem	3.84	

Source: Author's interpretation based on responses received

Interpretation: The overall average of 3.68 suggests that employees generally have a moderately positive view of themselves. This indicates they are fairly confident, feel competent in their roles, and are likely to be reasonably satisfied at work.

- The highest score among the components is for generalized self-efficacy (4.06), suggesting that employees have a strong belief in their ability to handle tasks, overcome challenges, and achieve goals. They are confident in their competencies and likely approach their work with determination and a "can-do" attitude.
- The score for self-esteem (3.84) indicates that employees generally have a good level of self-worth and feel valued, but there may be room for improvement in how they perceive their overall value and capability in the workplace.
- The score for locus of control (3.49) suggests that employees moderately believe they can influence outcomes in their work and personal lives. However, there is a tendency for some employees to feel that external factors (like luck or circumstances) also play a significant role in their success or failure.
- The lower score for emotional stability (3.36) suggests that employees may experience more stress, anxiety, or emotional volatility compared to other aspects of core self-evaluation. This could mean they are somewhat less resilient when faced with pressure or uncertainty, potentially affecting their ability to stay calm under stress.

5.2 Analysis of the Responses to the Utrecht Work Engagement Scale

Table 2

Construct	Average Scores (7-point Scale)	Overall Average Score for WE
Vigor	5.18	**5.29**
Dedication	5.57	
Absorption	5.13	

Source: Author's interpretation based on responses received

Interpretation: An average score of 5.29 on a 7-point scale suggests that employees are highly engaged in their work. They likely exhibit a strong commitment to their roles, are enthusiastic about their tasks, and are actively involved in their work.

- Dedication (5.29) is the highest component score, reflecting that employees feel a strong sense of purpose and pride in their work. They likely find their work meaningful and are motivated by their tasks, which can drive high performance and job satisfaction.
- Vigor (5.18) indicates that employees have a high level of energy and resilience at work. They are enthusiastic and motivated, and they tend to approach their work with a high level of energy and endurance.
- Absorption (5.13) reflects that employees are fully immersed and focused on their work. They likely experience a state of flow, where they are deeply engaged and concentrated on their tasks.

5.3 Data Analysis Tools

Data analysis for this study was done by using statistical tools like regression, ANOVA and corn barn alpha. Data was collected by survey method from 100 samples from all over India. The population was employees of Indian Railways from junior level to senior level including males and females.

The software used for analyzing the data is SPSS. The outputs are as follows:

Table 3

Reliability Statistics	
Cronbach's Alpha	N of Items
.830	12

Output 1: Reliability statistics of Core self-evaluations scale.
Interpretation: The reliability statistics index shows a value of .830 which signifies that the questionnaire is reliable for the study.

Table 4

Reliability Statistics	
Cronbach's Alpha	N of Items
.794	17

Output 2: Reliability statistics of Utrech work engagement scale.
Interpretation: The reliability statistics index shows value .749 which signifies that the questionnaire is reliable for the study.

Table 5

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2582.616	1	2582.616	22.79	.000[b]
	Residual	9634.441	85	113.346		
	Total	12217.057	86			
a. Dependent Variable: WE						
b. Predictors: (Constant), CSE						

Output 3: ANOVA

Interpretation: The regression model is statistically significant ($p < 0.05$), as indicated by the p-value (Sig.) being less than the chosen alpha level (usually 0.05). This suggests that there is a relationship between the predictor variable (CSE) and the dependent variable (WE) the F-value of 22.785 is also significant, further supporting the idea that the regression model fits the data well.
Since the P value is < 00o5 it fails to reject the null hypothesis which means there is a significant relationship between core self-evaluation and work engagement. In Indian Railway employees.

There is an impact of core self–evaluation on work engagement.
Overall, it seems like the predictor variable (CSE) is a significant factor in explaining the variance in the dependent variable (WE).

6. FINDINGS OF STUDY

This research investigates the relationship between core self-evaluation (CSE) and work engagement within the context of Indian Railways. Utilizing a quantitative approach, data was collected from employees across various departments through surveys. The study employed regression analysis to analyze the data, examining the extent to which CSE predicts work engagement. Findings reveal a significant positive correlation between CSE and work engagement, indicating that individuals with higher levels of CSE are more likely to exhibit greater work engagement. This suggests that personal evaluations of one's capabilities, worth, and effectiveness play a crucial role in fostering engagement among employees in the Indian Railways sector. These findings have implications for human resource management practices within the organization, emphasizing the importance of nurturing employees' core self-evaluations to enhance their engagement and productivity.

Preliminary analysis indicates a positive correlation between CSE and work engagement among employees in Indian Railways. Regression analysis further confirms this relationship, revealing that CSE significantly predicts work engagement even after controlling for demographic variables such as age, gender, and job tenure. Specifically, individuals with higher levels of CSE demonstrate greater vigor, dedication, and absorption in their work, contributing to higher levels of overall work engagement. These findings highlight the importance of individual differences in shaping employees' engagement levels within the organizational context of Indian Railways.

Core Self-Evaluation Implications for the Organization

- Employees feel confident in their abilities (high self-efficacy) and generally have a reasonable level of self-esteem, which can drive motivation, engagement, and performance.
- The moderately positive self-evaluation suggests that while the workforce is fairly confident and capable, there are opportunities for the organization to strengthen areas like emotional resilience and a sense of personal control to further improve employee satisfaction, performance, and retention.

Work Engagement Implications for the Organization

- The high engagement scores suggest a positive and supportive work environment where employees feel energized, committed, and deeply involved in their work. This environment likely fosters high levels of motivation and productivity.

- High engagement levels typically correlate with increased job satisfaction, better performance, and lower turnover. Engaged employees are more likely to contribute positively to organizational goals and be productive.

7. RECOMMENDATIONS AND CONCLUSION

7.1 RECOMMENDATIONS

- **Training Programs:** Implement training sessions focused on enhancing core self-evaluation skills among employees, fostering self-awareness and confidence.
- **Feedback Mechanisms:** Establish regular feedback mechanisms to help employees assess their own performance and strengths, aligning with the core self-evaluation concept.
- **Recognition Programs:** Develop recognition programs that acknowledge and reward employees who demonstrate high levels of core self-evaluation and actively engage in their work.
- **Leadership Development:** Incorporate core self-evaluation assessments in leadership development programs to empower managers with self-awareness and the ability to engage their teams effectively.
- **Performance Appraisals:** Revise performance appraisal systems to include evaluation criteria that reflect the impact of core self-evaluation on work engagement, promoting a culture of self-assessment and improvement.
- **Employee Support Services:** Provide resources such as counseling or mentoring to support employees in developing their core self-evaluation skills, addressing any barriers to engagement they may face.
- **Employee Wellbeing:** Programs aimed at improving self-efficacy and emotional stability can enhance work engagement levels.
- **Organizational Practices:** Creating a supportive work environment that fosters high CSE can lead to increased engagement and improved job performance.
- **Empower Employees:** Enhancing the sense of control (locus of control) might involve empowering employees through decision-making opportunities, feedback, and involvement in organizational changes.
- **Maintain and Enhance Engagement:** The organization should continue to support and nurture these high engagement levels by providing meaningful work, recognizing achievements, and ensuring that employees have the resources and support they need.
- **Monitor Trends:** While current scores are high, it's important to regularly assess engagement to ensure that it remains strong and address any emerging concerns that might affect it.

7.2 CONCLUSION

The findings of this study have several implications for human resource management practices within Indian Railways. By recognizing the influence of CSE on work engagement, organizations can tailor interventions to enhance employees' core self-evaluations and, subsequently, their work engagement levels. Strategies such as leadership development programs, employee empowerment initiatives, and performance feedback mechanisms can be designed to promote a positive sense of self-efficacy and confidence among employees. Ultimately, fostering a work environment that supports employees' core self-evaluations can lead to improved job satisfaction, organizational commitment, and overall performance within Indian Railways. Further research exploring additional factors influencing work engagement and the effectiveness of intervention strategies is warranted to develop a comprehensive understanding of work engagement dynamics in this sector. There is further scope for a multivariate analysis of the two constructs.

To conclude this study we can say that Indian railway employees' work engagement is impacted by core self–evaluation.

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8. APPENDICES

8.1 Core self –evaluations scale questionnaire

1. ____ I am confident I get the success I deserve in life.
2. ____ sometimes I feel depressed. (r)
3. ____ when I try, I generally succeed.
4. ____ sometimes when I fail I feel worthless. (r)
5. ____ I complete tasks successfully.
6. ____ Sometimes, I do not feel in control of my work. (r)
7. ____ Overall, I am satisfied with myself.
8. ____ I am filled with doubts about my competence. (r)
9. ____ I determine what will happen in my life.
10. ____ I do not feel in control of my success in my career. (r)
11. ____ I am capable of coping with most of my problems.
12. ____ there are times when things look pretty bleak and hopeless to me. (r)

8.2 Utrech work engagement scale questionnaire

1. _____ At my work, I feel bursting with energy* (VI1)
2. _____ I find the work that I do full of meaning and purpose (DE1)
3. _____ Time flies when I'm working (AB1)
4. _____ At my job, I feel strong and vigorous (VI2)*
5. _____ I am enthusiastic about my job (DE2)*
6. _____ When I am working, I forget everything else around me (AB2)
7. _____ My job inspires me (DE3)*
8. _____ When I get up in the morning, I feel like going to work (VI3)*
9. _____ I feel happy when I am working intensely (AB3)*
10. _____ I am proud on the work that I do (DE4)*
11. _____ I am immersed in my work (AB4)*
12. _____ I can continue working for very long periods at a time (VI4)
13. _____ To me, my job is challenging (DE5)
14. _____ I get carried away when I’m working (AB5)*
15. _____ At my job, I am very resilient, mentally (VI5)
16. _____ It is difficult to detach myself from my job (AB6)
17. _____ At my work I always persevere, even when things do not go well (VI6)

Customer Experience in Volatile Economic Conditions: A Study in Mangaluru

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ABSTRACT

The purpose of this research is to analyze the relationship between customer's perceptions and recommendations of reliance retail during current economic uncertainty. Methodology: 152 respondents were selected for the study based on simple random sampling. For the analysis of the results, inferential analysis such as correlation and chi-square analysis were used to test the research hypotheses. Findings: outcome highlights the complexity of customer behaviour and suggests that other factors may be more influential in driving customer recommendations. Originality/Value: The longevity and revenue maximization of companies hinges on delivering exceptional customer experiences, which are pivotal for maintaining competitiveness in the marketplace. Conversely, inadequate customer experiences can lead to adverse outcomes for organizations.

Keywords: *Brand image, customer loyalty,* customer satisfaction, economic uncertainty, *perception.*

INTRODUCTION

The contemporary business landscape is characterized by increasing economic volatility, presenting significant challenges for companies of all sizes. Amidst these uncertain times, delivering exceptional customer experiences has become paramount for organizations seeking to maintain competitiveness and long-term sustainability. Understanding how customer perceptions and behaviors evolve during economic downturns is crucial for businesses to adapt their strategies and ensure continued success. We live in a connected, fast-paced world where economic swings are inevitable. The shifting economic landscape presents enormous difficulties to all industries worldwide. The likely causes of the economic oscillations are shifts in consumer spending, variations in the exchange rate, and changes in government policies. Customers and industries need to understand the effects of variations in order to successfully navigate through periods of turbulent economic conditions.

Customer Experience (CX) is the overall impression a customer forms of a brand or company through their interactions. It encompasses every touchpoint, from initial marketing to post-purchase support. A positive CX fosters customer loyalty, advocacy, and ultimately, business growth. Conversely, negative experiences can lead to customer churn and damage brand reputation.Prioritizing CX becomes especially crucial in volatile markets. Economic downturns, supply chain disruptions, and unforeseen events can significantly impact customer behavior and expectations. Businesses must adapt their strategies to not only survive but thrive in these

challenging conditions.The COVID-19 pandemic serves as a prime example of market volatility. Consumers faced unprecedented uncertainty, and their purchasing habits shifted dramatically. To navigate these challenges, companies had to quickly pivot their approaches to CX. For instance, the surge in online shopping necessitated robust e-commerce platforms and efficient delivery services. Additionally, providing exceptional customer support became paramount as customers sought assistance with order cancellations, refunds, and product inquiries.Effective CX in volatile markets requires a multifaceted approach. Building trust and empathy is essential. Brands must demonstrate genuine care for their customers' well-being and address their concerns promptly. Open and transparent communication is crucial to managing expectations and maintaining customer confidence. Moreover, leveraging technology to enhance customer interactions can streamline processes and improve overall satisfaction.

LITERATURE REVIEW

Tong et al (2023)[2] made an effort to comprehend how the economy reacts to uncertainty. The study focuses on stock return volatility, new metrics for measuring economic uncertainty, and econometric recommendations for framing measurements and determining the link between volatility and uncertainty.

Lim et al (2022)[8] observe in their study that key themes in consumer behaviour include the processing of consumer information, consumption communities' values, sustainable consumption, intergenerational behaviour, brand relationships, ethics, and conditional relationships. **Yurievna (2022)[15]** examines in study that, the shifting dynamics of the economy have led to a variety of behavioural shifts in consumers. Consumers tend to reduce their purchases during recessions, and increase their purchases during prosperous times. **Guleria et al (2022)[7]** in their study examined the exchange and spatial arrangement between markets that produce and consume tomatoes. In the current study, monthly series data on arrivals and prices for a given time period were employed. **David De Cremer and Garry Kasparov (2021)**[4] AI highlight the increasing challenges for humans to keep pace with rapidly changing technology and the necessity of continuously building up competencies with upgraded technologies to remain relevant in the market. J**uana et al, (2019)[12]** in their research has shown that a circular economy always has a beneficial impact on the economy and has a significant influence on sustainability. Companies and economies that tend to increase their own involvement in the economy should prioritise consumption and consumers. **Ayuso (2019)[5]** studies hypothesis that emerges organically from the transmission mechanism's financial perspective. According to the study, depending on the state of the financial markets, an exogenous rise in economic uncertainty can have drastically different macroeconomic effects. **Gafar et al, (2017)[6]** in their study investigated the factors that affect the development of customer experiences in Malaysia's retail sector. The study's findings indicate that three factors have a good and significant association with customer experience: assortment, retail atmosphere, and service interface. **Umashankar et al (2016)[13]** believes that because devoted clients are less price-sensitive, service businesses perform well. According to research, one of the main factors attenuating the positive relationship between price sensitivity and behavioural loyalty is improved service experiences and attitudes towards loyalty. **Mukhopadhyay (2016)[10]** opines that the primary indicator for business is the volatility of the micro economy. The study attempts to determine why sales of two-wheelers are lower in Tamilnadu than in other states. It was found that the primary cause of the decline in two-wheelers was a change in consumption behaviour. **Caldara et al (2016)[3]** considers shocks related to money and uncertainty are significant causes of changes in the economy. Research looks into the major impact financial shocks have on economic results. Shocks

of uncertainty have a detrimental effect on the economy by tightening financial conditions. **Kumar et al., (2014)[14]** opine in their study that, service-oriented businesses work hard to satisfy their customers. The study's goal was to investigate how shifting economic conditions affect consumer experiences and disposable income, which in turn affects how customers choose which services to buy. According to a study, consumers with lower incomes are more perceptive to shifts in the economy than those with higher incomes. **Jabłoński, M. (2019)[9]** In practice, many business models are volatile—unstable and highly susceptible to various factors—which makes them incapable of guaranteeing success **Frank and Enkawa (2009)[1]** in their study eamine the impact of seven countries' economies on consumer satisfaction. According to research, economic growth fosters optimism for consumer satisfaction whereas economic expectations have the opposite effect. According to the study, businesses should enhance their approach when evaluating the findings of firm-level customer satisfaction surveys. **Ogikubo and Enkawa (2007)[11]** in their study disclose intriguing research results. For their cross-country comparison, two countries in their consumer behaviour rating survey did not take purchasing parties into account. Rather than making direct comparisons between the countries, data on the economic impact of customer happiness was gathered, which is more trustworthy inside the nation. The methodological and cultural influences on customer satisfaction are eliminated by this process. **Kent and Anna (2000)[4]** – opine that the relationships created during interactions with the parties have a major impact on client retention. A conceptual model is developed and evaluated using a representative sample of professional services business partnerships. Customer retention is increased when they make purchases. Research demonstrates how specific types of relationship content affect client retention. **John and Argia (1995)[9]** opines that a consumers' gloomy views about the economy will eventually cause output to decline. The study makes a compelling case for the necessity of building a link between changes in the economy and consumer confidence. **Amjed, Sohail. (2019)** The impact of volatile economic conditions on corporate capital structure adjustment towards dynamic target in Pakistan. In a volatile economic environment, a common characteristic of developing economies, a firm's ability to leverage resilience against random economic shocks positively impacts its financial performance, thereby increasing the firm's value

AIMS AND OBJECTIVE

The study is intended to assess the relationship between customer's perception and recommendation of the company during current economic condition in Mangalore City. The study also analyses the impact of customer satisfaction with the value for money of the company's products/services on their continued usage during economic uncertainty

HYPOTHESES OF THE STUDY

It is formulated as follows;
H1: Customers who perceive that the company has adapted well to the current economic conditions are more likely to recommend the company to others.
H2: Customers who are satisfied with the value for money of the company's products/services during economic uncertainty are more likely to continue using the company's products/services.

RESEARCH METHODOLOGY

This study is focused on determining customer perception, satisfaction and recommendation. Descriptive research design has been followed in this study. Both primary as well as secondary

data is utilized. The primary information is gathered using a structured questionnaire. 152 respondents are selected for the study based on simple random sampling. The study is covered in Mangalore City. There was limited time and resources to review a larger number, hence only a manageable number of high quality respondents are considered. The measurement instruments were constructed and extracted a more comprehensive questionnaire based on the items of interest for this study cronbach's alpha value is 0.947 which is higher than the minimum value (0.7) which shows that test results are acceptable and study is considered to be reliable.

DATA ANALYSIS AND INTERPRETATION

Data collected was tabulated and analysis was carried out by using Simple percentage analysis, Descriptive analysis using mean and standard deviation and inferential analysis such as correlation and chisquare analysis. Data was analyzed as follows;
Respondents profile:

The present study considered respondents from Mangalore city as participants. Respondents above the age group of 30 are considered as they have more established careers, financial responsibilities when compared to younger demographics, also older respondents may have experienced previous economic downturns, providing valuable insight into how they perceive and respond to current economic condition.
Company profile:

Reliance Industries Limited, amidst the current economic uncertainty, remains a pivotal player in India's corporate landscape, known for its diversified business interests spanning petrochemicals, refining, telecommunications, and retail. The company's resilience is underscored by its strategic investments in digital services through Jio Platforms, which have bolstered its revenue streams despite economic fluctuations. Reliance's commitment to innovation and sustainability continues to drive its growth trajectory, evidenced by its initiatives in renewable energy and green technologies. Despite challenges posed by global economic volatility, Reliance's robust financial health and market leadership position it favorably for navigating uncertain times and capitalizing on emerging opportunities. As a cornerstone of India's industrial sector, Reliance's adaptability and forward-thinking strategies position it as a resilient force in the face of economic uncertainty.

Net Promoter Score (NPS) was presented by Reichheld in the Harvard Business Review, in an article entitled 'The Only Number You Need to Grow'. The respondents are given a response option of a rating scale from 0 to 10. Customers answering 0 to 6 are to be considered 'detractors', 7 and 8 'passive', and 9 and 10 'promoters'. The NPS index, expressed in a percentage, is calculated by subtracting the detractors' scores from the promoters' scores and dividing the total by the number of questionnaires. Passive customers are not considered.

How likely would you be to recommend the product or service?

Detractors	Passives	Promoter
0 1 2 3 4 5 6	7 8	9 10
Not likely at all		Extremely likely

Table 1: Recommendation of the product/service

Promoters	42.1
Passives	22.4
Detractors	35.5

Company tries to meet customer expectation at very interaction. With this data it can be analysed that the promoters are the one who spread positive word of mouth and stay loyal. The company need to formulate strategy to increase the count of promoters. The negative emotion of the customers i.e through detractors the brand image of the company will be destroyed.
H1: Customers who perceive that the company has adapted well to the current economic conditions are more likely to recommend the company to others.

Table 2: Karl Pearson's correlation coefficient between Customers who perceive that the company has adapted well to the current economic conditions are more likely to recommend the company to others.

VARIABLES	Recommendation	
Customer perseverance	Pearson Correlation	0.773
	P	1

The above table shows Karl Pearson's correlation coefficient between Customers who perceive that the company has adapted well to the current economic conditions are more likely to recommend the company to others. The results demonstrate that there is a correlation between overall shopping experience contentment and the likelihood of recommending the store ($r = 0.773$, $p>0.01$). The study reveals that there is a no correlation between Customers who perceive that the company has adapted well to the current economic conditions are more likely to recommend the company to others. Therefore, HI is rejected. This outcome highlights the complexity of customer behaviour and suggest that other factors may be more influential in driving customer recommendations.

H2: Customers who are satisfied with the value for money of the company's products/services during economic uncertainty are more likely to continue using the company's products/services.
The test result of chisquare shows that there is strong evidence to suggest that there is a significant association between customer satisfaction with the value for money of the company's products and services and their likelihood to continue using the company's products and services during economic uncertainty as $p<0.01$. hence H2 is accepted. This result supports hypothesis that satisfied customers are more likely to continue using the company's products and services. It implies that improving customer satisfaction with value for money could positively influence customer retention during uncertain economic times.

IMPLICATIONS OF THE STUDY

The study implies that companies might need to focus on other aspects of their customer experience, such as product quality, service excellence, or emotional connections, to encourage recommendations. The strong association between customer satisfaction with value for money and

their likelihood to continue using the company's products/services highlights the importance of pricing strategies during economic uncertainty. By prioritizing customer satisfaction and building strong relationships, companies can improve their resilience and long-term sustainability.

CONCLUSION

A significant portion of Reliance Retail's customer base consists of promoters, who are highly satisfied and likely to recommend the company's products and services to others. This indicates a strong level of customer satisfaction and loyalty among a substantial segment of customers. A considerable proportion of customers are detractors, who are dissatisfied and likely to speak negatively about the company. This high percentage highlights significant issues that need to be addressed to improve customer satisfaction and reduce negative word-of-mouth. However, the substantial number of detractors calls for immediate attention to identify and rectify the underlying issues causing dissatisfaction. Efforts should be made to engage the passive customers more effectively, as they represent a group that could potentially be converted into promoters with the right strategies and improvements in service. It is recommended to establish robust feedback mechanisms to gather insights from detractors and passives, enabling the company to make informed improvements. Continue to engage and reward promoters to maintain their loyalty and encourage positive word-of-mouth. While adaptation to economic conditions does not significantly impact recommendations, other factors such as product quality, customer service, and brand reputation might play a more critical role. Understanding and enhancing these factors could be crucial for increasing customer recommendations. Improving customer satisfaction, particularly in terms of perceived value for money, is essential. This can positively influence customer retention, as satisfied customers are more resilient to economic uncertainties and are likely to maintain their loyalty to the brand. Ensuring that products and services are perceived as offering good value for money is critical. Strategies to enhance this perception can include competitive pricing, high-quality offerings, and exceptional customer service. further research could be conducted to identify the key factors that drive customer recommendations. These conclusions provide a clear and actionable summary of the findings, highlighting the importance of focusing on customer satisfaction and identifying key drivers of customer recommendations for strategic improvement.

LIMITATION OF THE STUDY

Sample Size: The study is limited by a relatively small sample size, which could affect the generalizability of the findings to the larger population.
Geographic Scope: The study was conducted in Mangalore City, and the results may not be representative of other regions or countries with different economic conditions or cultural contexts.
Self-reported Data: The study relied on self-reported data, which may be subject to biases such as social desirability bias or recall bias

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A Study on Consumer Perception of Benefits of Milk and Milk-Based Products

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ABSTRACT

India is ranked first in milk production contributing 24.64 per cent of global milk production as per the year-end review report 2023 by (the Ministry of Fisheries, Animal Husbandry and Dairying). There are 27 state/UT-level marketing federations. Also, there are 228 dairy cooperative milk unions in India. A total of 2,28,374 village-level co-operative societies are under milk unions. ((NDDB, 2021-2022).This culminates to competitiveness in the market place which necessitates companies to know about the behaviour of customers which originates from their perception. For this reason, the present study aims to interpret consumers' perceptions of the benefits of milk and milk-based products. As primary data questionnaire is collected from a sample size of 101 respondents from different localities of Thane, Mumbai and Palghar based on consumers' demographics, preferences, and factors of influence to select organized (packed) or unorganized (unpacked) milk. The study consists of milk, buttermilk, curd and Ghee which are consumed by people for different purposes Research design was made after the review of the literature. The study could provide some important insights to producers and marketers of dairy products based on consumers' perceptions.

Keywords: *National Dairy Development Board (NDB), Demographics- Age, income, location, Milk co-operatives – Procurement of milk and provide service.*

INTRODUCTION

“Change is the law of nature”, complying with the quote markets are also subject to it. As market consists of buyers and sellers the transition of both can be seen as , the buyers evolved since buying product or services to fulfil physiological needs to buying for fulfilling of psychological needs and in case of sellers, the sellers went from following the production concept to following the marketing concept. This explicitly signifies that to sustain in the market, change must be embraced. In past we have seen many giants of the market, at time holding majority of market share ending up losing the hold of market to the competitors and new players who were catering their services or selling products which were making consumers delighted by helping consumers converging their changing desires with the offerings. This new or existing competition did nothing but centralized their offerings according to customers i.e customer orientation, by merely emphasizing and embracing the change in behaviour and perception of the buyers.

This is important for businesses to satisfy consumers' needs and serve them what consumers expect from them. To crack the code of the changing needs and wants of the consumers it is very important to study or recognize the perception of consumers and their behaviour. This evolution of customers is lucrative to many players in markets and set a level field for new entrants. So to outstand the competition, businesses need to interpret the consumers and orient the offering according to the customers. This can pave the way for businesses to sustain and ultimately grow.

LITERATURE REVIEW

(Keller, 2016)The production concept is one of the ancient concepts of business. It proposes to make products available at arm's length and with lower prices. So, sellers followed this technique and produced more at a low cost.

(Keller, 2016) The product concept proposes that consumers value product or services which has quality, performance. So it is unlike earlier that producers manufacture any product and the consumers will buy. This is very important for start-ups to understand that it is very important to price, distribute, advertised and sold properly.

(Keller, 2016) The selling concept puts that businesses do hard selling to sell which results in the opposite. If consumers is not a good option rather they must be coaxed so they not only return back but also don't bad mouth.

(Keller, 2016) The marketing concept proposes that businesses should sense and respond to the market. Its unlike the above concept that focuses on sellers or the products rather it is more customer-oriented and produces the product which the customer demands. It says do not find the right customers for products rather find the right product for customers.

(al, 2010) The research emphasises the connection between the purchase preference, behaviour and motives of the buyer while selecting dairy products reflecting that there are factors (gender and educational level) affecting the buying and consumption pattern. In the study, women are on higher demand for beverages of milk which contains less fat and conversely, men are more brand loyal. While the population that was high on education preferred to buy drinks contains whey(protein) it. Also, the taste was found out to be the determining factor, followed by the health benefits, brand, weight control and price.

(al., 2009) The study tested 11 product-related aspects such as packaging, price, brand, appearance, flavour, and others, along with 8 consumer-related characteristics like age, income, health issues, and more, to investigate their impact on Sri Lankan consumer's intake of fresh milk. The research findings revealed there was a positive association between consumer-related characteristics and fresh milk consumption, particularly in relation to income, age, education, and household makeup. Conversely, there was negative association observed for ethnicity and health, indicating a decline in fresh milk consumption as the numerical value of the investigated factor increased.

(Veblenian Socio-Psychological Model)The theories discussed focus on the impact of social and cultural norms on individual consumer behaviour. Thorsten Veblen emphasized the influence of social groups on shaping desires and behaviours. Reference groups, such as family, friends, and celebrities, play a significant role in influencing consumer behaviour by serving as sources of information and points of comparison. Marketers often use popular figures in advertising to appeal to these reference groups. Culture, consisting of learned beliefs and behaviours shared by a society, greatly influences consumer behaviour patterns. Cultural behaviour is dynamic, making it challenging for marketers to target specific consumer segments. Subcultures, which exist within larger cultures, have distinct beliefs and values that impact buying behaviour. Social class also plays a significant role in influencing consumer behaviour, as individuals are classified based on their societal values.

(Kotler) Customers often rate brands based on their pricing approach, considering intrinsic product meaning and perceived quality. Value-based pricing tactics are used by marketers to sell goods at the ideal price, understand customer perceptions of prices, identify quality and value implications, and influence consumer choice.

(Hanna/Wozniak', , 2013)Customers are influenced by their environment and mental and physical states, leading to purchases and actions reflecting their situational self-image. Contextual variables, including physical surroundings, social environment, task definition, timing, and previous conditions, are external conditions that influence product consumption, purchases, and conversations.

OBJECTIVES OF THE STUDY

To understand the relation between the belief and knowledge of consumers on the benefits of milk and milk-based products.

- To identify factors influencing the buying behaviour of milk.
- To study preference of attributes during milk purchase.
- To assess the use of milk products for additional benefits.

RESEARCH METHODOLOGY

Research methodology is a systematic and logical way of addressing and resolving a research problem. It is a way through which the intent and ways of research can be reflected. .

Research Design

Research on this topic can be classified in to two namely **exploratory** and **descriptive** which intend to study the perceptions of consumers of benefits provided by the milk and by its derivatives of the consumers , their perceptions , awareness and understanding of milk and other influencing factors. Also, carried out a review of previous studies done by researchers in the field of dairy. For instance, studies take into consideration such as (Kotler) for the study on consumer perceptions. To study the consumer's behaviours studies reviewed such as (al, 2010) and (al., 2009). The study takes into consideration only five products (milk, buttermilk, ghee, lassi, and curd). Thus these five products are taken for the study of consumer perception in three districts.

Research Hypotheses

There are three hypotheses framed after interpretation of objectives and review of the literature. The first hypothesis is to examine the relationship between beliefs concerning the knowledge of customers.. The second hypothesis is to study the correlation between preference of attributes during purchase with educational qualification. The third hypothesis is to interpret the correlation between various uses of milk for additional benefits in the respondent's mother tongue, of the respondents. The framed hypotheses are as follows:

H_0: There is a relation between the belief and knowledge of respondents on milk nutritive components.
H_{01}: There is no correlation between preference of attributes during milk purchase with educational qualification,
H_{02}; There is a correlation between the use of milk products for additional benefits with respondents' mother tongue

Methodology of sampling

The sample is a part of the population, it represents the essence of the whole population. This research includes a sample of 101 respondents. This response is randomly collected and the data is analyzed by the SPSS software

- Sampling technique: Simple random sampling
- Sample size: 101 respondents
- Data analysis method: chi-square analysis, correlation analysis.

METHOD OF DATA COLLECTION

There are two types of sources for data "to study the consumer's perception on benefits of milk and milk-based products."

1. **Primary data:** In this research process 101 samples are collected from three districts (Mumbai, Thane and Palghar) in the western region of Mumbai.

2. **Secondary data:** Secondary data is collected from various sources such as Books, research articles, websites and government websites.

TOOLS OF DATA COLLECTION

All the responses are collected first by the structured questionnaire then it has been collected into Excel and then finally for the analysis of the data SPSS software was utilized. The designed hypotheses are tested by the tools such as chi-square and Pearson correlation to understand the study better as shown in the table below.

Table 1

Hypothesis	Dependent variable	Independent variable	Statistical test
Ho	Consumer	Belief knowledge	Chi-square
Ho1	Attributes during purchasing	Educational Qualification	Pearson correlation
Ho2	additional benefits.	Mother tongue	Pearson correlation

LIMITATIONS OF THE STUDY

- The sample collected during the survey covers only three districts in Maharashtra (Mumbai, Thane and Palghar)
- The survey consists of a simple random sample
- Evaluation is based on primary data and findings depend on the response of respondents.
- Data collected through questionnaires is not immune from biased information.

Qualitative data interpretation and analysis

Hypothesis

(H_0)**:** There is a relation between belief and knowledge of respondents on milk nutritive components.

Table 2

Chi-Square Tests			
	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	1.970[a]	3	0.579
Likelihood Ratio	2.075	3	0.557
Linear-by-Linear Association	0.032	1	0.858
N of Valid Cases	101		

Data interpretation

All the p-values for the Chi-Square tests are above 0.05, there is no statistically significant associations between the variables. So we reject the null hypothesis that belief and knowledge are independent of each other with exceptions.

Hypothesis

(H_{01}): There is a no correlation between preference of attributes during milk purchase with educational qualification

Table 3

Correlations			
		what are your preferences for attributes of milk	what is your educational qualification
what are your preferences for attributes of milk	Pearson Correlation	1	-.211*
	Sig. (2-tailed)		0.034
	N	101	101
what is your educational qualification	Pearson Correlation	-.211*	1
	Sig. (2-tailed)	0.034	
	N	101	101

Data interpretation

The negative correlation of -0.211 suggests a statistically negative correlation relationship between preferences for attributes of milk and educational qualification. Hence, we fail to reject the null hypothesis.

Hypothesis

(H_{02})**:** There is no correlation between the use of milk products for additional benefits with respondents' mother tongue

Table 4

Correlations			
		what is your mother tongue	what would you select for additional benefits
what is your mother tongue	Pearson Correlation	1	0.160
	Sig. (2-tailed)		0.110
	N	101	101
what would you select for additional benefits	Pearson Correlation	0.160	1
	Sig. (2-tailed)	0.110	
	N	101	101

Data interpretation

The positive correlation of 0.160 is greater than the significant difference between the mother tongue and the selection of additional benefits. Hence, we reject the null hypothesis.

CONCLUSION

- The lack of statistically significant relationships between the variables under investigation may be caused by a sizable percentage of cells having lower than predicted counts, which would undermine the validity of the Chi-Square test findings.

- A statistically significant, weak negative correlation of -0.211 exists between educational qualification and preferences for attributes of milk, suggesting a slight tendency for differences in milk preferences as educational qualification increases

- The selection of additional benefits and mother tongue has a small positive association value of 0.160, suggesting that people with various linguistic origins may have somewhat different preferences when selecting additional advantages. Further analysis of additional variables is recommended for a more comprehensive understanding.

RECOMMENDATIONS

- As there is no significant relationship between belief and knowledge, the companies can focus more on being transparent and spreading more awareness of the benefits of milk.
- Companies should spread the awareness to check and know of different attributes (such as price, packaging, taste, ingredients details) before buying the product irrespective of educational qualifications.
- Milk is used in different ways in different cultures, so companies should emphasise adding product lines that cater to the different purposes of milk in getting additional benefits to consumers.

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The Impact of Female Leadership on Organisational Success

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ABSTRACT

This study explores the influence of female leadership on organizational success, focusing on the hospitality sector. Drawing on extensive psychological research, it suggests that female leadersenhance productivity, collaboration, and equity. However, a quantitative analysis involving 250 professionals found no significant impact of female leadership on organizational success. While a weakpositive correlation exists between perceptions of success and female leadership, no strong connectionwas evident. The research underscores the importance of evidence-based strategies like early leadership identification, allyship training for male leaders, and formal mentoring programs to foster inclusive workplaces. It advocates for comprehensive diversity efforts beyond gender, recognizing diverse leadership perspectives as crucial for long-term organizational success.

Keywords: *Female leadership, Organizational success, Hospitality sector, Diversity, Equity, Inclusive*

INTRODUCTION

Hospitality Sector

The hospitality sector is vast, encompassing various commercial and economic activities that support travel and tourism. It includes businesses like hotelsand travel companies that directly contribute to the industry. The sector is divided into four main categories:

Travel and Tourism (T&T)

This subset includes airlines, travel agencies, and servicesthat facilitate tourism.

Accommodation - Ranging from hotels to event spaces, this is one of the largest and mostdiverse sectors.

Food and Beverages (F&B) - This includes restaurants and other food services, integralto hospitality.

Entertainment & Recreation - Encompassing activities and attractions like bars,nightclubs, and parks, this sector aims to provide pleasurable experiences.

Hospitality has ancient roots, with early forms of hospitality found in ancient Greece and prehistoric times. Its goal remains to ensure a positive experience for customers, whether through a meal, accommodation, or recreational activity. (Campbell, 2023)

Hospitality Sector in India (2024-2029) India's hospitality sector is growing due to its rich culture, diversity, and government initiatives. The market is projected to grow from USD 24.61 billionin 2024 to USD 31.01 billion by 2029. Factors driving this growth include:

Rise in Domestic Travel: Increased disposable income and interest among millennials.
Accommodation Innovations: Companies like Airbnb and Oyo offer affordable lodging.
Government Initiatives: Efforts to promote tourism, including developing ports as cruise hubs.
Impact of COVID-19: The pandemic hit the sector hard, but it is gradually recovering with newhotel projects and government support.

Women in Leadership Roles Empowering women in leadership benefits everyone by increasing productivity, collaboration, and fairness. Despite these benefits, women hold only 10% of Fortune 500CEO positions. Psychological research shows that women in leadership roles can have transformativeeffects, such as improved team collaboration and organizational trust.

However, progress is slow, with women still facing significant challenges, including biases based on gender, race, and other factors. To close the gender gap in leadership, organizations can:

Identify potential leaders early.
Establish mentorship and sponsorship programs.
Encourage participation in women-led professional organizations.
Promote allyship, where men and others in power advocate for women's advancement.

Ongoing efforts are helping to empower women in leadership, showing promise for future progress. (Novotney, 2023)

LITERATURE REVIEW

The study investigated how gender and experience with female leaders affect perceptions of female leadership effectiveness in Saudi Arabian higher education. It compared male and female leaders' views and examined how these are influenced by their gender and experience. Data from 554 leaders at five universities in Riyadh were analyzed. The mediation model best fit the data, revealing a significant gender-related perception of female leadership effectiveness, though this was less clear in the mediation-moderation model. The study included a discussion on key findings, limitations, and future research suggestions. (Al-shakha, 2019) . The study aimed to assess the validity and reliability of a questionnaire designed to evaluate the use of accounting information systems (AIS), knowledge management capabilities (KMC), and innovation in Iraqi SMEs. Given the high risk of low performance and failure in these SMEs, this research sought to address the lack of comprehensive studies on these factors. A pilot study with 32 participants was conducted to test the questionnaire's reliability. The process included expert validation to refine the questionnaire, followed by a pilot test.Analysis using exploratory factor analysis (EFA) and Cronbach's alpha showed that the instrument was both valid and reliable, with Cronbach's alpha exceeding 0.7 and satisfactory Kaiser–Meyer– Olkin (KMO) values. (Kareem, 2019) This study examines the persistent gender disparities in the hospitality labor market, specifically focusing on horizontal and vertical segregation and the wage gapaffecting female executives. Utilizing Barbara Risman's "Gender as a Social Structure" model,enhanced with an intersectional perspective, the researchers conducted 30 in-depth interviews with female executives in Spain's hospitality sector. The findings highlight several barriers hindering genderequality, including self-imposed limitations, traditional gender roles, challenges in work-life balance,and organizational structures that perpetuate gender biases. The study underscores the need for systemic changes to address discrimination and promote equal opportunities for women in hospitality leadership roles. (Segovia-Pérez, 2019) This research explores the impact of gender stereotypes, particularly femininity and masculinity, on perceived emotional leadership (PEL) within the hospitality industry. Through two Implicit Association Tests and a survey involving a total of 590 participants, the study investigates how different gender role ideals influence employees' perceptions of leadership.Results indicate that employees who perceive leadership through an androgynous lens—combining both masculine and feminine traits—report higher levels of PEL. The study suggests that adopting androgynous leadership styles can be beneficial in hospitality settings, promoting more effective and emotionally intelligent management practices. (Xiong, 2022) This paper conducts an extensive reviewof literature to identify factors affecting women's career progression in the global hotel sector. Analyzing 50 articles across various regions, the study finds common obstacles such as limited networking opportunities, gender discrimination,

occupational segregation, demanding work hours, and challenges balancing work and family life. Some region-specific issues include cultural barriers and the significance of mentorship and sponsorship. The pervasive presence of the 'glass ceiling' effect is confirmed across different socioeconomic contexts, indicating systemic impediments to women's advancement in hotel management despite existing equal opportunity legislations. (Kumara, 2018) Thestudy investigates barriers hindering women in Aqaba, Jordan, from attaining upper-level positions inthe tourism sector. Utilizing a survey of 200 female employees across tourism and hospitality industries, the research examines internal business structures, societal norms, government policies, situational factors, and personal challenges. Findings reveal that while these barriers exist, they affectwomen to moderate and low degrees, with mean scores ranging between 2.16 and 3.35 out of 4. The study provides valuable insights for policymakers to develop strategies that further empower women and facilitate their career advancement within Aqaba's tourism and hospitality sectors. (Bazazo, 2017)

This research aims to understand how moods and emotions influence leadership styles among femaleleaders in the hospitality sector. By collecting questionnaire responses from 100 female leaders, the study examines positive and negative moods, as well as emotions like happiness, power, and powerlessness. Using multiple regression and Chi-Square analysis, results indicate that both moods and emotions have a positive, albeit not statistically significant, impact on leadership style. Notably, the emotion of happiness has the most substantial influence. The study suggests that fostering positiveemotional states may enhance effective leadership among women in hospitality. (Munawaroh, 2021) This thesis explores gender-related challenges women face in advancing their careers to uppermanagement positions within the hospitality industry. Through desk research and semi-structured interviews, the study identifies barriers such as occupational segregation, discrimination, work-life balance difficulties, and the pervasive glass ceiling effect. Interview findings reveal that while direct gender inequality is not always overtly experienced, it is perceived to exist, and organizations often lack policies to address it. Opinions on the existence and impact of the glass ceiling vary among respondents. The research concludes that gender inequality persists in the hospitality sector, often influenced by differing leadership styles and societal expectations of men and women. (Bijsterveldt, 2020)This thesis investigates the qualities that constitute successful leadership in the hospitality sectorand examines how gender influences leadership success. Conducting interviews with ten hospitality professionals, the study finds a shift towards people-centered and transformational leadership styles, traits commonly associated with female leaders. Effective leadership in hospitality is linked to open communication and employee-focused approaches. The research also notes a gradual reduction in the gender gap, with increasing support and motivation for female leaders within the industry. These findings suggest a positive trend towards gender equality and recognition of diverse leadership styles in hospitality management. (Hill, 2022) The study assesses how transformational leadership styles (TLS) of hotel general managers impact departmental performance in upscale Australian hotels, considering the mediating role of department managers' organizational commitment (OC). Surveyingdepartment managers from four and five-star hotels, the research utilizes factor analysis and bootstrapped regression methods. Results demonstrate that TLS positively influences non-financial, social, and environmental performance both directly and indirectly through enhanced OC. However, OC does not mediate the relationship between TLS and financial performance. The study contributes to leadership literature by advocating for comprehensive performance assessments and recommendingthat hotels prioritize TLS qualities in leadership development and performance evaluations. (Patiar)

This quantitative study examines the factors limiting women's career progression and the prevalent leadership styles among female hotel managers in Sunyani Municipality, Ghana. The findings identify family responsibilities and unfavorable corporate practices and policies as primary obstacles hindering women's advancement. Additionally, the study reveals that the autocratic leadership style is most commonly practiced by women in hotel management within the region. The research highlights the need for organizational and societal reforms to support women's career development and suggests avenues for

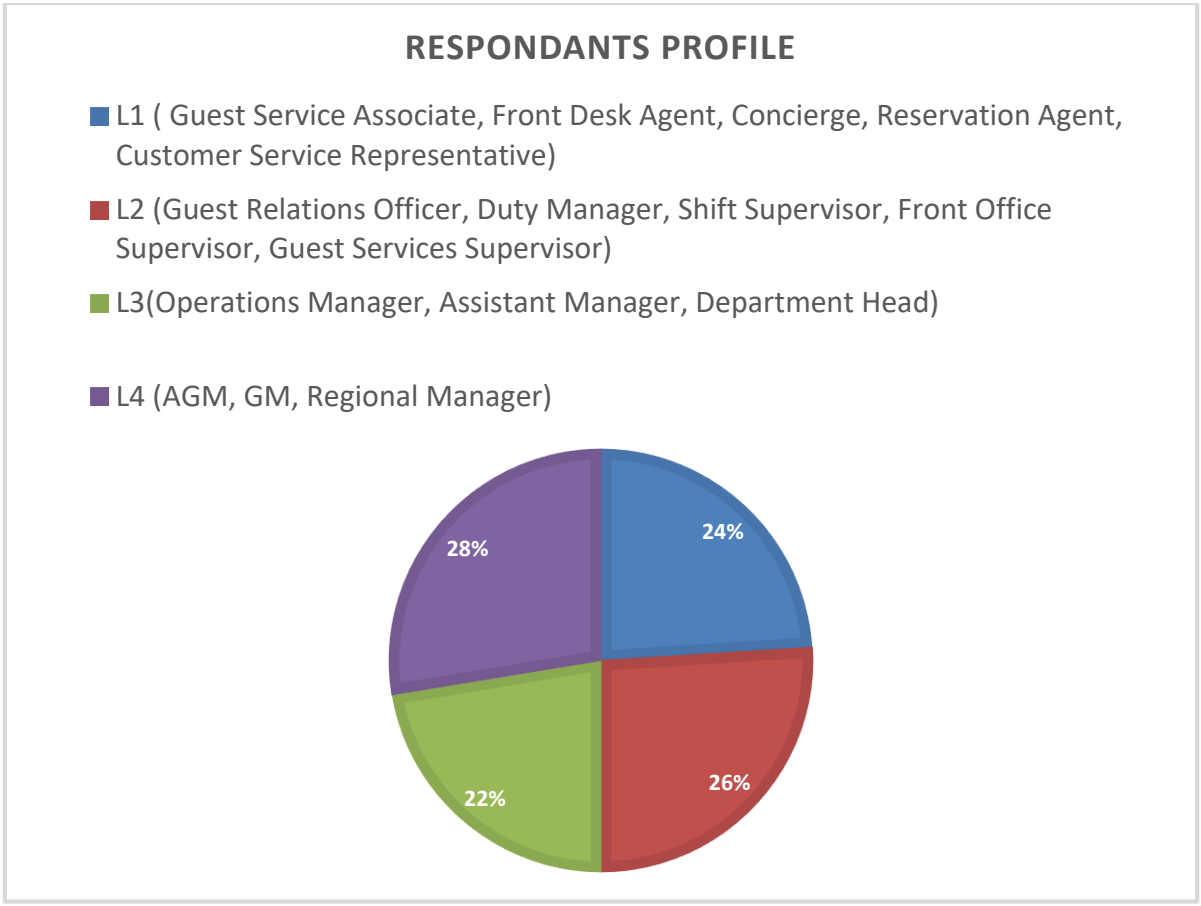
future research to deepen understanding of gender dynamics in hospitality leadership. (Zaazie, 2022) This study conducts a content analysis of hospitality magazine articles to understand therepresentation and challenges of women managers in the Maldivian hospitality sector. Combining qualitative and quantitative methods, the analysis of narratives from "Hotelier Maldives" magazine reveals that although women managers are still underrepresented, their participation in the sector is increasing. The study challenges the notion that gender is a limiting factor for attaining senior positions, attributing the increased presence of women managers to evolving social and cultural contexts. This research is pioneering in examining media representation of female leaders in hospitalityand underscores the importance of visibility and narrative in promoting gender equality. (Nagar, 2021)

DATA AND METHODOLOGY

Primary Data: - The primary data was collected using a questionnaire sent to employees of different organizations coming under the hospitality sector.

Secondary Data: - The questionnaires were referred from a research paper titled: The Perceptionof Female Leadership: Impact of Gender and Leader's Qualification on Leader's Qualification on Leader's Effectiveness. (Al-shakha, 2019) In the International journal the University of Florida and Organizational Performance in Iraqi SMEs Validity and Reliability Questionnaire. (Kareem, 2019) respectively.
The primary data was collected using a questionnaire sent to employees of different organizations coming under the hospitality sector.
Sample Size: -

250 working professionals from the hospitality sector have been taken as samples for this project.



Sampling method

Snowball sampling method which is a non-random sampling technique was used wherein the initial informants are approached who through their social network nominate or refer the participants that meet the eligibility criteria of the research under study.

Measures: -
To study the impact of the objective, 5-point Likert scale questionnaires were used. 30 questions apartfrom the demographic questions are present in each of the questionnaires. The scales are standardized and tested in the Western context. In the questionnaire, demographic variables were Gender, and Yearsof experience of working with a female leader.

Methods used: -

Reliability
The scales are standardized and tested in Western context however the reliability of these scales has been tested again using Cronbach Alpha reliability test. (Al-shakha, 2019) (Kareem, 2019). The reliability of the measure indicates the extent to which it is without bias or error free and hence ensures consistent measurement across time and across various items in the instrument. In other words, the reliability of a measure is an indication of stability and the consistency with which the instruments measure the concept and helps to assess the 'goodness' of a measure. Here in this research paper Reliability has been done to see whether the questionnaires are reliable or not.

Correlation
Correlation is a statistical measure that indicates the extent to which two or more variables fluctuate together. A positive correlation indicates the extent to which those variables increase or decrease in parallel; a negative correlation indicates the extent to which one variable increases as the other decreases.
Regression

To understand the Impact of Independent variables on the dependent variables Regression analysis wasused. For attaining the objective of the study Regression analysis was used. Regression analysis is a technique for determining the statistical relationship between two or more variables where a change ina dependent variable is associated with and depends on a change in one or more variables. In this studythe dependent variable is Organisational Success in the Hospitality Sector and the independent variable is Female Leadership.

DATA ANALYSIS

Hypothesis:

H0 : There is no significant impact of Female Leadership on Organisational Success in theHospitality Sector.
H1 : There is a significant impact of Female Leadership on Organisational Success in theHospitality Sector.

Correlation

	Female Leadership	***Organisational Success***
Female Leadership	1	0.203298559
Organisational Success	**0.203298559**	1

The above table shows two variables regarding perceptions of organizational success and the role of women within those organizations.

The first set of data presents an average of responses, indicating that, on average, respondents rate the importance of women's roles in their organization's success at approximately 0.203. This showsthat there might be a tendency for respondents to perceive women's contributions to organizational success as relatively low or insignificant.

The second set of data shows a correlation coefficient of approximately 0.203 between the variables "**Organisational Success**" and "**Female Leadership**". This correlation value suggests a weak positive correlation between perceptions of organizational success and acknowledgment of women's roles in achieving that success. However, the low correlation coefficient indicates that this relationship may not be particularly strong.

Taken together, these findings show that, on average, respondents may not strongly believe in the significance of women's contributions to organizational success. While there appears to be a weak positive correlation between perceptions of organizational success and the acknowledgment ofwomen's roles, the relationship between these variables is not robust. However, it's important to consider that these interpretations are based solely on the numerical data provided and may be influenced by various factors not accounted for in the analysis, such as the demographics of the respondents or the specific context of the survey.

Regression

Regression Statistics	
Multiple R	0.200
R Square	0.040
Adjusted R Square	0.036
Standard Error	0.150
Observations	250

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.232	0.232	1.545	0.214
Residual	248	5.577	0.022		
Total	249	5.809			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Uppe r 95.0 %*
Intercept	1.500	0.200	7.500	0.000	1.104	1.896	1.265	2.135
Female Leadership	0.120	0.096	1.250	**0.214**	-0.068	0.308	- 0.086	0.246

The above table shows that the p value is 0.214. This indicates that there is no statistically significant relationship between female leadership and organizational success at the chosen significance level, typically 0.05

When interpreting the p-value in hypothesis testing, a common approach is to compare it to the chosen significance level. Since the p-value (0.214) is greater than the significance level (0.05), onewould fail to reject the null hypothesis.

The null hypothesis in this scenario would typically be that there is no significant impact of female leadership on organizational success. Thus, failing to reject the null hypothesis implies that there is insufficient evidence to conclude that female leadership has a statistically significant impact on organizational success based on the data analyzed in the regression.

FINDINGS AND SUGGESTIONS

The investigation into the "Impact of Female Leadership on Organisational Success" reveals a nuanced understanding of this relationship. While there is a weak positive correlation between the perception of organizational success and the recognition of women's roles, statistical analyses, including regression and correlation, do not provide strong evidence to support a significant link between female leadership and organizational success.

This finding highlights the complexities of assessing the influence of female leadership. The lack of statistical significance could be attributed to various factors such as data limitations, specific organizational contexts, or unaccounted confounding variables. It's essential to recognize thatstatistical significance does not always equate to real-world impact.

Further research that incorporates different methodologies and considers broader contextual factorsmay offer a more comprehensive understanding of female leadership's role in organizational performance. Despite the current findings, it is important for organizations and policymakers to continue promoting diversity and inclusion in leadership roles, recognizing the potential benefits ofdiverse perspectives.

While statistical analysis may not always capture significant links, the qualitative aspects and broadersocietal impacts of diverse leadership should not be overlooked. Diverse leadership teams can lead to more innovative problem-solving, creativity, and improved decision-making. Inclusive work environments can boost employee morale, productivity, and, ultimately, organizational performance.

Thus, while statistical findings are valuable, they should be complemented with qualitative researchand ongoing discussions within organizations. Embracing gender diversity in leadership can position organizations for long-term success in a diverse and competitive global market.

CONCLUSION

The study on the "Impact of Female Leadership on Organisational Success" provides a nuanced perspective on this relationship. While there is a slight positive correlation between organizational success and the recognition of women's roles, the statistical analyses, including regression and correlation, do not offer compelling evidence of a significant link between female leadership and organizational success.

This outcome underscores the complexities involved in evaluating the impact of female leadership. The absence of strong statistical significance may be influenced by factors such as data limitations, specific organizational contexts, or unaccounted-for confounding variables. It is crucial to acknowledge that statistical significance does not always translate to practical, real-world effects.

To gain a more complete understanding of female leadership’s impact on organizational performance, further

research employing diverse methodologies and accounting for broader contextual factors is recommended. Despite these findings, it remains essential for organizations and policymakers to continue advancing diversity and inclusion in leadership roles, given the potential advantages that diverse perspectives can bring.

Even though statistical analysis may not consistently demonstrate significant correlations, thequalitative and broader societal impacts of diverse leadership are significant and should not be disregarded. Leadership teams that embrace diversity are likely to experience enhanced problem- solving, creativity, and decision-making. Additionally, fostering inclusive work environments can lead to increased employee morale, productivity, and, ultimately, improved organizational performance.

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ANNEXURE

Annexure: 1

Demographics

What is your gender?
Male / Female

Have you ever worked with afemale leader?
Yes / No

How long have you been working with afemale leader?
Less than 1 year / 1- 4 years / 5- 10 years / 11- 15 years / More than 15 year

1. Female leaders set a personal example of what is expected.
2. Female leaders talk about future trends that will influence how work gets done.
3. Female leaders seek out challenging opportunities that test the skills and abilities.
4. Female leaders develop cooperative relationships among the people they work with
5. Female leaders praise people for a job well done.
6. Female leaders spend time and energy making certain that people they work with adhere tothe principles and standards they have to agree on
7. Female leaders describe a compelling image of what their future could be like.
8. Female leaders challenge people to try out new and innovative ways to do their work.
9. Female leaders actively listen to diverse points of view
10. Female leaders make it a point to let people know about their confidence in others abilities.
11. Female leaders follow through on the promises and commitments that they make.
12. Female leaders appeal to others to share an exciting dream of the future.
13. Female leaders search outside the formal boundaries of their organization for innovativeways to improve what they do
14. Female leaders treat others with dignity and respect.
15. Female leaders make sure that people are creatively rewarded for their contributions to thesuccess of their projects.
16. Female leaders ask for feedback on how their actions affect other people's performance.
17. Female leaders show others how their longterm interests can be realized by enlisting in acommon vision.
18. Female leaders ask "what can we learn?" when things don't go as expected
19. Female leaders support the decisions that people make on their own.
20. Female leaders publicly recognize people who exemplify commitment to shared values
21. Female leaders build consensus around a common set of values for running outorganizations.
22. Female leaders paint the "big picture" of what they aspire to accomplish.
23. Female leaders make certain that they set achievable goals, make concrete plans, andestablish measurable milestones for the projects and programs they work on.
24. Female leaders give people a great deal of freedom and choice in deciding how to do theirwork
25. Female leaders find ways to celebrate accomplishments.
26. Female leaders are clear about their philosophy of leadership.
27. Female leaders speak with genuine conviction about the higher meaning and purpose oftheir work.
28. Female leaders experiment and take risks, even when there are chances of failure.
29. Female leaders ensure that people grow in their jobs by learning new skills and developingthemselves.
30. leaders give the members of the team lots of appreciation and support for theirContributions. (Al-shakha, 2019)

5 point rating scale (Strongly Agree, Agree, Maybe, Disagree, Strongly Disagree

Annexure: 2

Demographics

What is your gender?
Male / Female

Have you ever worked with a female leader?
Yes / No

How long have you been working with a female leader?Less than 1 year
4 years / 5- 10 years / 11- 15 years / More than 15 years

Rate your organisation basis of comprisal of these factorsDecision-Making

Rational decision-making

1- Speed of decision-making
2- Formalization in decision-making
3- Participation in decision-making
4- Influence in decision-making
5- Type of decision-making

Operational Efficiency

1. Improve workflow
2. Increase output
3. Increase efficiency
4. Increase reliability
5. Increase repeatability
6. Increase quality
7. Increase flexibility

Financial Reporting

1- Provide bank balance at any point in time
2- Provide information about debtors at any time
3- Provide information about creditors at any point in time
4- Provide a good level of periodic reporting
5- Provide a good level of annual budgeting
6- Provide a good level of performance reporting

Provide good level of overall accounting system

1. Knowledge Sharing
2. Exchange information with its customers
3. Exchange information with its external partners
4. Share information effectively throughout the organization
5. Share information between all parties involved in new service development

Organizational Performance

1. Is more competitive
2. Has more customers
3. Is growing faster
4. Is more profitable
5. Is more innovative
6. Has more employees (Kareem, 2019)

5 point rating scale (Strongly Agree, Agree, Maybe, Disagree, Strongly Disagree)

Annexure 3:

Cronbach alpha values for each questions: (Al-shakha, 2019)

PFLE1	Female leaders set a personal example of what is expected	71
PELE2	Female leaders talk about future trends that will influence how work gets done	72
PELE3	Female leaders seek out challenging opportunities that test the ls and abilities	62
PELE4	Female leaders develop cooperative relationships among the people they work with	61
PELE5	Female leaders praise people for a job well done	72
PELE6	Female leaders spend time and energy making certain that people they work with adhere to the principles and standards they have to agree on	74
PELE7	Female leaders describe a compelling image of what their future could be like	76
PELE8	Female leaders challenge people to try out new and innovative ways to do their work	76
PELE9	Female leaders actively listen to diverse points of view	79
PELE10	Female leaders make it a point to let people know about their confidence in others abilities	78
PELE11	Female leaders follow through on the promises and commitments that they make	73
PELE12	Female leaders appeal to others to share an exciting dream of the future	61
PELE13	Female leaders search outside the formal boundaries of their organization for innovative ways to improve what they do	73
PELE14	Female leaders treat others with dignity and respect	71
PELE15	Female leaders make sure that people are creatively rewarded for their contributions to the success of their projects	74
PELE16	Female leaders ask for feedback on how their actions affect other people's performance	72
PELE17	Female leaders show others how their long-term interests can be realized by enlisting in a common vision	76
PELE18	Female leaders ask "what can we learn?" when things don't go as expected	75
PELE19	Female leaders support the decisions that people make on their own	67
PELE20	Female leaders publicly recognize people who exemplify commitment to shared values	68
PELE21	Female leaders build consensus around a common set of values for running out organizations	76
PELE22	Female leaders paint the "big picture" of what they aspire to accomplish	74
PELE23	Female leaders make certain that they set achievable goals, make concrete plans, and establish measurable milestones for the projects and programs they work on	75
PELE24	Female leaders give people a great deal of freedom & choice in deciding how to do their work	73
PELE25	Female leaders find ways to celebrate accomplishments	55
PELE26	Female leaders are clear about their philosophy of leadership	69
PELE27	Female leaders speak with genuine conviction about higher meaning & purpose of their work	76
PELE28	Female leaders experiment and take risks, even when there are chances of failure	53
PELE29	Female leaders ensure that people grow in their jobs by learning new skills and developing themselves	84
PELE30	Female leaders give the members of the team lots of appreciation and support for their contributions	8

Annexure 4:

Cronbach alpha values for each set of questions: (Kareem, 2019)

Factor	Cronbach's Alpha coefficient	No. of items
Decision-Making	892	6
Operational Efficiency	889	7
Financial Reporting	882	7
Knowledge Sharing	88	4
Organizational Performance	944	6

Financial Image Classification for Enhanced Operational Efficiency

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ABSTRACT

Efficient document processing is crucial for financial institutions aiming to optimize operational workflows and ensure compliance in today's digital era. This research investigates the development and deployment of a sophisticated deep learning-based financial image classification system tailored for Financial Institutions. The study focuses on enhancing the accuracy and efficiency of categorizing various financial documents, including invoices, receipts, and identification papers, using the MobileNetV2 architecture. Methodologically, the project integrates comprehensive data collection from Private Bank's document repository, meticulous preprocessing of images, and strategic augmentation techniques to bolster model resilience. Results demonstrate significant advancements in accuracy metrics, with the model achieving an impressive validation accuracy of 95.7% across diverse document types. This research not only pushes the frontier of automated document processing within financial institutions but also envisions practical applications in customer onboarding, loan processing, KYC verification, and fraud detection. By leveraging deep learning capabilities, the study underscores the transformative potential to fortify operational efficiencies, reduce manual intervention, and augment the overall operational landscape of financial entities. The findings contribute to the growing body of literature on deep learning applications in financial document processing, offering insights into methodological advancements and practical implications for industry stakeholders. Beyond enhancing efficiency, the system's implementation promises to mitigate compliance risks, accelerate decision-making processes, and improve customer experience through streamlined operations. This research sets a precedent for leveraging cutting-edge technologies to address complex challenges in financial document management, paving the way for future innovations in automated financial services.

Keywords*: Financial Image Classification, Deep Learning, MobileNetV2, KYC, Compliance.*

INTRODUCTION

In the rapidly evolving financial sector, Financial Institutions face an unprecedented surge in the volume and complexity of documentation they manage. Like merchant onboarding forms, the sheer quantity of financial documents processed daily has grown exponentially. Managing these documents manually is not only a labour-intensive process but also fraught with challenges that can lead to significant operational inefficiencies. Human error, variability in document formats, and the need for rapid processing are just a few of the issues that can compromise the accuracy and efficiency of traditional document management systems.

To address these challenges, financial institutions are increasingly turning to advanced technologies to streamline operations and enhance service delivery. Among these technologies, artificial intelligence (AI) and machine learning (ML) have emerged as transformative tools with the potential to revolutionize document processing workflows. By leveraging these technologies, institutions can automate repetitive tasks, improve accuracy, and ultimately enhance operational efficiency.

This research paper explores the development and implementation of a cutting-edge deep learning-based financial image classification system, designed specifically to automate the categorization of diverse financial documents. The core of this system is MobileNetV2, a state-of-the-art convolutional neural

network (CNN) architecture renowned for its efficiency and accuracy in image classification tasks. MobileNetV2's advanced features make it particularly well-suited for handling the complex and varied nature of financial documents.

Significance of Deep Learning in Financial Document Processing

Deep learning, a subset of machine learning, has significantly advanced the field of document processing. Traditional methods often rely on manual feature extraction and rule-based algorithms, which can be both labour-intensive and error-prone. In contrast, deep learning models can automatically learn and extract relevant features from raw data, leading to more accurate and scalable solutions. Convolutional Neural Networks (CNNs), a prominent deep learning technique, have proven to be highly effective in processing and analyzing image data, making them ideal for tasks involving visual documents.

The application of deep learning in financial document processing offers several advantages:

1. Automated Classification: Deep learning models can categorize different types of financial documents with high accuracy, reducing the need for manual sorting and classification.
2. Enhanced Accuracy: By learning from large datasets, these models can identify subtle patterns and features that might be missed by traditional methods, leading to more precise document classification.
3. Scalability: Deep learning models can handle large volumes of data efficiently, making them suitable for high-throughput environments like financial institutions.

MobileNetV2: An Overview

MobileNetV2 represents a significant advancement in CNN architecture, designed to deliver high performance while maintaining computational efficiency. This architecture builds upon the success of MobileNetV1, incorporating several innovations that enhance its suitability for real-world applications.

1. Inverted Residuals and Linear Bottlenecks: MobileNetV2 introduces the concept of inverted residuals, which use lightweight depthwise separable convolutions followed by linear layers. This design reduces computational complexity while preserving the model’s ability to extract meaningful features. Linear bottlenecks further optimize the model by minimizing dimensionality and computational overhead.
2. Depthwise Separable Convolutions: This technique decomposes standard convolutions into depthwise and pointwise operations, significantly reducing the number of parameters and computational requirements. This makes MobileNetV2 particularly well-suited for deployment on mobile and edge devices.
3. Residual Connections: The use of residual connections in MobileNetV2 addresses the challenges of training deep networks by allowing gradients to flow more effectively through the network. This facilitates better training performance and model accuracy.

Methodology and Implementation

The methodology of this research project involves several critical stages:

1. Data Collection and Preprocessing: Financial documents were collected from Private Bank's digital repositories and augmented with publicly available datasets. Preprocessing included standardizing document formats, removing sensitive information, and ensuring high-quality input for the model.
2. Data Augmentation: To enhance the model’s robustness and generalization ability, data augmentation techniques such as rotation, scaling, and flipping were employed. This increased the

diversity of the training dataset and improved the model's ability to handle variations in document appearance.

3. Model Training and Evaluation: MobileNetV2 was fine-tuned with custom layers to adapt it to the specific task of financial document classification. The model was trained and validated over multiple epochs, with continuous monitoring and tuning of hyperparameters to optimize performance.

Practical Implications and Future Directions

The integration of this classification system into Institution's operations has the potential to transform document processing workflows. Automated classification can significantly reduce processing time, minimize human errors, and allow employees to focus on more strategic tasks. This improvement in efficiency and accuracy directly enhances the customer experience by accelerating document processing and reducing wait times.

Looking ahead, there are opportunities for further refinement and expansion of the classification system. Future enhancements may include expanding the dataset to cover a broader range of document types, incorporating real-world testing to validate the model's performance in diverse scenarios, and exploring ensemble learning techniques to improve classification accuracy.

In conclusion, this research paper highlights the successful development and implementation of a deep learning-based financial image classification system. The project demonstrates the transformative potential of AI and ML technologies in the financial sector, offering a pathway to more efficient, accurate, and scalable solutions that address the industry's growing demands.

LITERATURE REVIEW

Image Classification using Advanced CNN Based on TensorFlow

Garchar and Chudhary (2019) [1] present a study on image classification leveraging Advanced Convolutional Neural Networks (CNN) with TensorFlow. Their research focuses on plant classification by analyzing leaf images, demonstrating that advanced CNN models offer superior accuracy compared to traditional methods. They highlight the following key aspects:

- **Methodology**: The study utilizes TensorFlow, a powerful Python library, to implement CNNs for plant classification. The CNN architecture employed includes multiple convolutional and pooling layers followed by dense layers and a softmax classifier.
- **Results**: The advanced CNN achieved classification accuracy exceeding 95%, significantly outperforming other methods that recorded accuracies below 90%. The study underscores that advanced CNNs are effective for image identification tasks, providing high accuracy and efficiency.
- **Comparative Analysis**: The paper compares various image classification models, including Deep Neural Networks (DNNs), Convolutional Neural Networks (CNNs), and Transfer Learning approaches. It finds that while DNNs show lower performance, CNNs and Transfer Learning offer better accuracy and reduced processing time.
- **Contributions**: The study provides insights into the effectiveness of CNNs for plant identification, noting the importance of model architecture and the use of GPUs for enhanced performance. It also discusses the challenges and potential improvements in CNN-based image classification.

Image Classification Methods and Techniques

Lu and Weng (2007) provide a comprehensive overview of image classification methods and techniques aimed at enhancing classification performance. Their review underscores the complexity of image classification, influenced by factors such as the type of remotely sensed data, classification systems, and training sample selection. The authors highlight the growing importance of non-parametric classifiers, including neural networks and decision trees, especially in multi-source data classification. They also discuss the integration of remote sensing, GIS, and expert systems as a new research frontier. The paper emphasizes that effective image classification requires careful consideration of data preprocessing, feature extraction, and the choice of classification methods. The authors call for further research to address uncertainties and improve classification accuracy.

This research is relevant to our study as it offers a detailed comparison of image classification techniques and highlights the advantages of using advanced CNN models for high-accuracy results. The findings align with our focus on leveraging deep learning techniques for classification tasks, especially in domains requiring high precision.

METHODOLOGY

1. Data Collection

Source Identification: We started by identifying the sources of our financial documents. The primary source was Private Bank's digital repositories, which contained scanned copies of customer-submitted documents and internal records. Additionally, we used publicly available financial document datasets to ensure our training data was diverse and comprehensive.

Data Labeling: Each document was manually labeled to ensure accuracy, categorizing them into different document types such as application forms, bank statements, and tax documents. Domain experts verified these labels to maintain high accuracy and relevance.

Data Augmentation: To address the relatively small dataset size, data augmentation techniques were employed. This involved synthetically generating new documents by altering existing ones and adding random distortions and noise, simulating various real-world scenarios.

Dataset Splitting: The final dataset was split into training, validation, and test sets in a ratio of 70:15:15. Stratified sampling was used to ensure each subset had a representative distribution of document types.

2. Model Development

Base Model: We used MobileNetV2, a pre-trained convolutional neural network, known for its efficiency and performance in image classification tasks. We excluded the top layers of the base model to add custom layers tailored to our specific classification task.

Custom Layers:

- GlobalAveragePooling2D: This layer reduces the spatial dimensions of the output from the base model, making it suitable for classification.
- Dense Layer (256 units, ReLU activation): A fully connected layer with ReLU activation introduces non-linearity.
- Dense Layer (5 units, Softmax activation): The final layer with softmax activation outputs probabilities for each of the five document classes.

3. Training and Evaluation

Data Augmentation Parameters:

- Rescale: Scaling pixel values to the range [0, 1].
- Rotation Range: 20 degrees.
- Width Shift Range: 0.2.
- Height Shift Range: 0.2.
- Shear Range: 0.2.
- Zoom Range: 0.2.
- Horizontal Flip: True.
- Validation Split: 15%.

Training Parameters:

- Epochs: 30
- Batch Size: 32
- Optimizer: Adam, chosen for its efficiency and ability to handle sparse gradients.
- Learning Rate: Initially set at 0.0001 and gradually reduced based on performance.

Training Process: The model was trained for 30 epochs. Training accuracy improved from approximately 68% to 98%, and validation accuracy from 74% to 100%. Training loss decreased significantly from around 0.87 to 0.02, while validation loss varied, indicating areas for potential tuning.

Test Set Evaluation: The model achieved a test loss of approximately 0.14 and a test accuracy of around 96%, demonstrating its robustness and effectiveness in classifying financial documents.

4. Hyperparameter Tuning

Hyperparameters were tuned through several iterations to optimize model performance. Key hyperparameters included:

- Learning Rate: Gradually reduced to fine-tune the model.
- Batch Size: Set to 32 to balance training speed and memory usage.
- Number of Epochs: Determined based on the convergence of training and validation loss.

5. Model Validation

Confusion Matrix: The confusion matrix for the test set provided detailed insights into the model's performance. It highlighted the number of true positives, false positives, true negatives, and false negatives for each document class, allowing a thorough evaluation of the model's classification capabilities.

Evaluation Metrics:

- Accuracy: Measures the proportion of correctly classified instances out of the total instances.
- Loss: Represents the model's prediction error, with categorical cross-entropy loss used for the multi-class classification problem.

RESULTS/ANALYSIS

Training and Validation

Epoch Performance: The model was trained over 30 epochs, with the following observations:

- Training Accuracy: Initially, accuracy was around 68%, increasing to approximately 98% by the end of training. This significant improvement demonstrates effective learning and adaptation to the training data.
- Validation Accuracy: Validation accuracy varied from 74% to 100%, indicating the model's ability to generalize across different subsets of the data. The high accuracy in some epochs suggests strong performance, while variability points to potential overfitting or underfitting in certain cases.
- Training Loss: Training loss decreased from around 0.87 to 0.02, indicating that the model progressively improved its predictions and reduced errors on the training data.
- Validation Loss: While validation loss generally decreased, it exhibited variability, suggesting areas where the model's performance could be fine-tuned further.

Test Set Evaluation

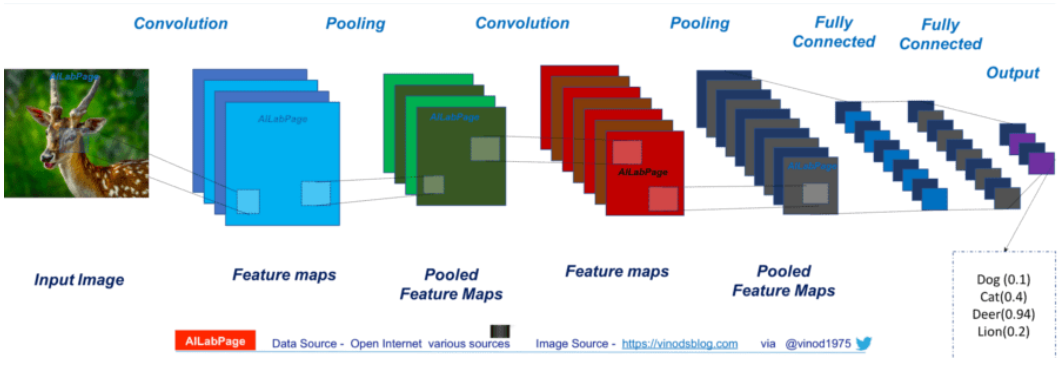
Test Set Metrics:

- Test Loss: Approximately 0.14, reflecting the model's low error rate on the unseen test data.
- Test Accuracy: Approximately 96%, demonstrating the model's effectiveness in classifying financial documents accurately.

Detailed Training Logs

Epoch-wise Metrics:

- Early Epochs: Showed rapid improvement in both training and validation accuracy. The model quickly learned to distinguish between different document types.
- Middle Epochs: Displayed some fluctuations in validation loss, indicating occasional overfitting. These fluctuations prompted the need for additional regularization or tuning.
- Final Epochs: Accuracy stabilized at high levels, reflecting successful convergence and robustness of the model.



CONCLUSION

This research has demonstrated the efficacy of deep learning, particularly the MobileNetV2 architecture, in automating the classification of financial documents. By addressing the challenges associated with manual document processing, our system significantly enhances operational efficiency within financial institutions. The model's high accuracy and robust performance across various document types underscore its potential to transform traditional document handling workflows. The adoption of this technology can

lead to substantial improvements in compliance, accuracy, and scalability, thereby supporting the growth and modernization of financial services.

The study's findings suggest that integrating advanced deep learning models into financial document processing systems can mitigate human error, expedite processing times, and ensure regulatory compliance. Furthermore, the practical implications extend beyond operational efficiency, offering financial institutions a competitive edge in the increasingly digital and automated financial landscape. This research sets a foundation for future advancements in automated document classification, paving the way for more sophisticated and comprehensive AI-driven solutions in the financial sector.

LIMITATIONS

Despite the promising results, this research encountered several limitations that highlight areas for further investigation and improvement:

1. Data Imbalance: The dataset used for training and evaluation exhibited an imbalance in the distribution of document types. Although data augmentation techniques were employed to mitigate this issue, an imbalanced dataset could still affect the model's performance, particularly in underrepresented categories. Future work should focus on collecting a more balanced dataset to ensure equitable model training.
2. Model Generalization: While the model performed well on the test set, its generalization to entirely new and unseen financial document types remains uncertain. Real-world financial documents can vary significantly in format and content, and the model's ability to handle such variability needs further validation through extensive field testing.
3. Computational Resources: Training deep learning models like MobileNetV2 requires substantial computational resources, which can be a limitation for smaller financial institutions with limited access to high-performance computing infrastructure. Future research should explore optimizing the model to reduce computational requirements without compromising performance.
4. Integration with Existing Systems: Integrating the developed classification system with existing document management and processing systems in financial institutions poses practical challenges. Compatibility issues, data privacy concerns, and the need for extensive system integration can hinder the seamless adoption of this technology. Addressing these integration challenges is essential for real-world implementation.
5. Text Extraction: This research primarily focused on image-based classification. However, many financial documents contain both textual and visual information. The integration of Optical Character Recognition (OCR) technology to extract and process text from documents was not covered in this study. Future work should investigate combining image classification with OCR to enhance the system's overall functionality and accuracy.

SCOPE FOR FURTHER STUDY

1. Expansion of Dataset and Diversity
    - Increase Dataset Size: Collaborate with financial institutions to gather diverse financial documents to improve generalization and avoid overfitting.
    - Incorporate Real-World Data: Source documents from external institutions and open datasets to expose the model to varied layouts and quality levels.

2. Model Enhancements
    - Explore Advanced Architectures: Evaluate architectures like EfficientNet and ResNet to improve classification accuracy and efficiency.
    - Implement Ensemble Methods: Use techniques like bagging, boosting, and stacking to combine models and reduce biases.
3. Real-Time Implementation and Integration
    - Develop an End-to-End Pipeline: Design a pipeline for seamless document processing from acquisition to classification, reducing manual intervention.
    - Integrate with Existing Systems: Ensure compatibility with financial institutions' current infrastructure for smooth deployment.
4. Advanced Data Augmentation
    - Utilize Sophisticated Techniques: Implement techniques like CutMix, MixUp, and AutoAugment to introduce variability and improve model robustness.
5. Error Analysis and Model Refinement
    - Conduct Detailed Error Analysis: Identify and analyze misclassifications to refine the model.
    - Enhance Feature Extraction: Experiment with advanced techniques and additional features to improve classification accuracy.
6. Broader Applicability
    - Cross-Industry Use: This model can be adapted for use in other financial institutions and industries, enhancing document classification and operational efficiency across various sectors.

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Image Source- https://vinodsblog.com/2018/10/15/everything-you-need-to-know-about-convolutional-neural-networks/

A Literature Study on Mortality Models with Special Reference to the Renshaw-Haberman Model (RH) and Its Practical Relevance

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ABSTRACT

The mortality analysis is a complicated subject. There are complex mathematical mortality models like the Renshaw-Haberman model (RH) which takes into account cohort effects. The RH model is an extension of the Lee-Carter model. The current literature work will highlight dimensions of studies in mortality modeling and simultaneously focus on specific elements of the RH model. It is expected that such studies will help in improving the knowledge of core models implemented in age-cohort based (including geographic-based idiosyncratic effects). The methodologies surrounding the context of least square (distribution-free) restrict over-parametrization which is the empirical problem with the RH model and possesses serious limitations. This is the reason some improvements in the construction of the RM model are desirable as a scope of this study.

Keywords: *Least square, Over-parametrization, MLE, Newton-Raphson method (optimization).*

RESEARCH OBJECTIVES

1. To discuss the concept behind mortality related empirical work in terms of life insurance policies.
2. To describe in detail the 'Lee-Carter model' and 'Renshaw Haberman Model' and its various constituents.

OVERVIEW OF INDUSTRY

Insurance

Insurance is a contract in which the risk of loss is transferred to the insurance company. Insurance companies offer coverage for unexpected costs in exchange for a premium.
To carry out an insurance event, the insurer and the insured make a legal contract, which is called an insurance contract. The policy provides financial security against future uncertainty.

History Of Insurance

In India, the history of insurance is rooted in the writings of Manu (Manusmrithi), Kautilya (Arthasastra) and Yagnavalkya (Dharmasastra). The writings refer to the pooling of resources that could be redistributed during disasters such as epidemics, floods, fires, famines, etc. Ancient Indian history preserves the earliest evidence of insurance such as marine trade loans and carrier contracts. The insurance sector in India was largely influenced by foreign nations, particularly England. "*History of Insurance – Overview (28th June 2024)."*

Life Insurance

Life insurance helps reduce your loved one's financial burden when the inevitable happens. Life insurance is an agreement between an insurance company and a policyholder in which the insurer guarantees compensation for the loss of life in exchange for the payment of a set premium. In the event of a death, the

beneficiary whose name appears on the contract receives the specified payment from the insurer. *"Life Insurance (28th June 2024)."*

METHODOLOGY

This research is on the basis of structured literature review. Sources: academic journals, and scholarly articles. The study involves analyzing a mortality table obtained from the Institute of Actuaries of India. The mortality data, divided into age cohorts with a 10-year gap, was examined using statistical methods such as standard deviation and median. The results were then visualized using a line graph to highlight trends. Each reviewed paper is systematically tabulated, detailing the title, problem, category, variables, methods/tools, findings, and solutions. Further, the Lee-Carter and Renshaw Haberman models are explained in detail.

MORTALITY

"Mortality" refers to the number of deaths caused by a specific illness or condition. The mortality rate is a common way of describing mortality. This is the ratio of illness-related deaths to the total population at that time. A person's death is directly caused by their condition or illness. The mortality rate represents the number of deaths within a particular population over a given time period. "*About Morbidity and Mortality, (29th June 2024).*"

Importance of studying mortality modeling:

"Biffis (2005), Cairns, Blake and Dowd (2006), Lee and Tuljapurkar (1994), Gavrilov and Gavrilova (2001), Lee and Carter (1992)." Mortality models are important for many reasons, particularly in the disciplines of actuarial science, insurance, public health, and demography research. Here are the major points that highlight the importance of these models:

- Risk Assessment and Pricing: Mortality models assist insurers in calculating the chance of death for individuals or groups, which is crucial for appropriately pricing life insurance policies.
- Product Development: Mortality model insights help to create new insurance products like annuities and pension plans, ensuring that they match the market needs while being financially sustainable for the insurer.
- Health Interventions and Policies: Mortality models can identify trends and causes of death, allowing public health officials to develop targeted interventions to lower mortality rates
- Pension Systems: Mortality models are used by governments and private pension funds to ensure that pension systems remain sustainable. Accurate life expectancy projections are critical for financial planning and management.
- Population Projections: Mortality models are critical for predicting population changes over time, such as aging, fertility, and migration patterns. These estimates influence policy decisions concerning social services, infrastructure, and economic planning.
- Understanding Longevity: Mortality research helps demographers understand the factors that contribute to increasing life expectancy and find differences in longevity between populations.
- Resource Allocation: By identifying which groups are at higher risk, governments and health organizations can more effectively allocate resources, ensuring that areas in greatest need receive adequate attention and financing.

MORTALITY TABLE ANALYSIS

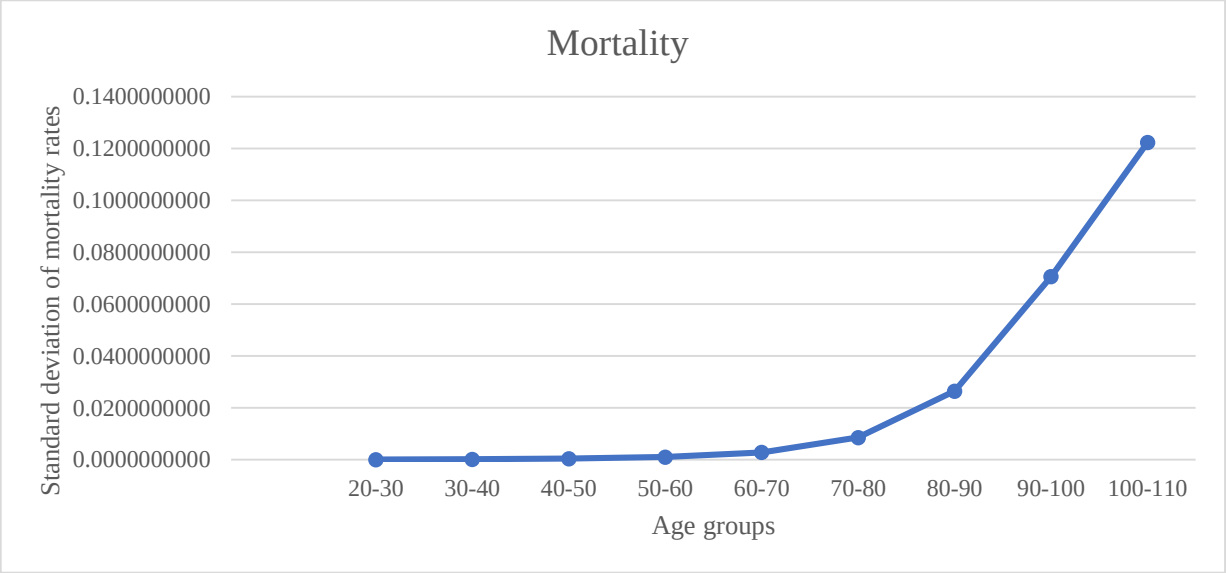
The researcher has analyzed the table by dividing the age cohorts with 10 years gap and this way the following outcomes have emerged. *"For the Mortality Table please refer to Table 1 in Appendix 1."*

Table 1. Age Groups concerning Standard Deviation of Graduated Mortality Rates

Age groups	The standard deviation of graduated mortality rates
20-30	0.0000877459
30-40	0.000187392
40-50	0.000423406
50-60	0.001041133
60-70	0.002849624
70-80	0.008574065
80-90	0.026453557
90-100	0.070605105
100-110	0.122351244

Source: "*Indian Individual Annuitant's Mortality Table (2012-15), accessed from Institute of Actuaries of India". Author's Compilation.*

Figure 1. Standard Deviation of Graduated Mortality Rates



Source: "*Indian Individual Annuitant's Mortality Table (2012-15), accessed from Institute of Actuaries of India". Author's Compilation.*

The line graph plots the standard deviation of graduated mortality rates against age groups. The x-axis represents age groups, while the y-axis shows the standard deviation of graduated mortality rates. Standard deviation helps to measure the amount of variation or dispersion in set of values. Here, it indicates how spread out the mortality rates are within each age group.

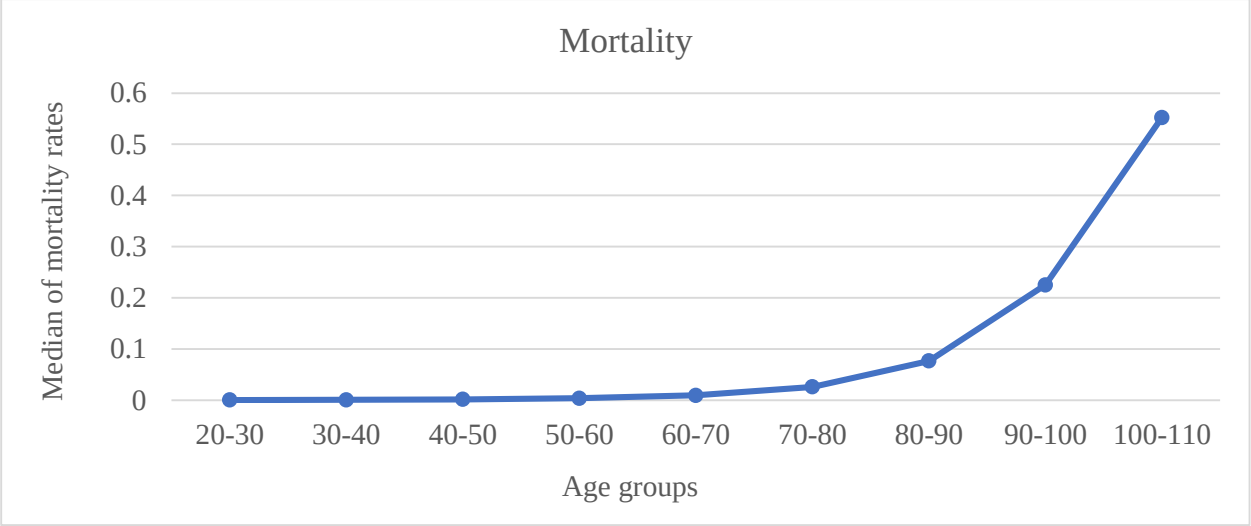
For younger age groups, the standard deviation is relatively low, but as age increases, the standard deviation gradually rises, indicating an increase in variability in mortality rates. The highest standard deviations are observed in older age groups.

Table 2. Age Groups with Respect to Median of Graduated Mortality Rates

Age groups	Median of Graduated mortality rates
20-30	0.000393
30-40	0.000817
40-50	0.001747
50-60	0.0039345
60-70	0.0096165
70-80	0.0260205
80-90	0.076625
90-100	0.225196
100-110	0.5523995

Source: "Indian Individual Annuitant's Mortality Table (2012-15), accessed from Institute of Actuaries of India". Author's Compilation.

Figure 2. Median of Graduated Mortality Rates



Source: "Indian Individual Annuitant's Mortality Table (2012-15), accessed from Institute of Actuaries of India". Author's Compilation.

The line graph plots the median of graduated mortality rates against age groups. The x-axis depicts age groups, and the y-axis represents the median mortality rate.

Median provides a clear picture of mortality rates within each age group and it does not get affected by the outliers and helps to identify the typical mortality rate of an age group.

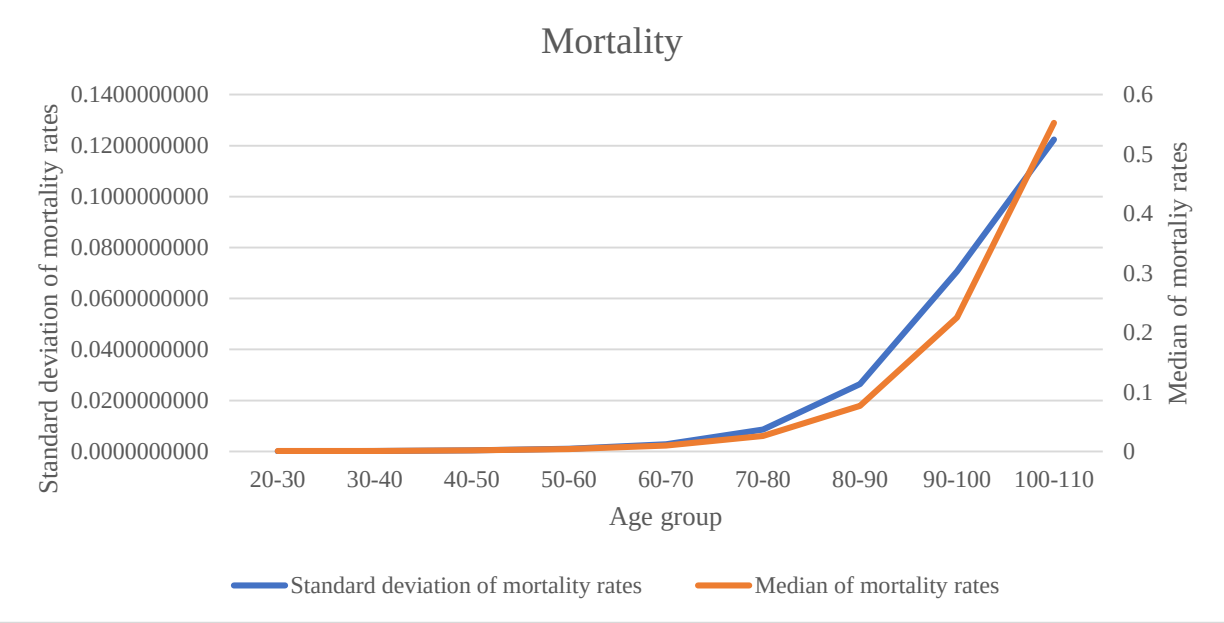
The general rule says that the mortality rate starts increasing after the age of 35. In both graphs we can see that mortality rate increases gradually after the age group of 60-70 and there is a rapid rise after the age group of 80-90, reflecting high mortality risks in the older age group.

Table 3. Age group with respect to standard deviation and median of graduated mortality rates

Age groups	The standard deviation of graduated mortality rates	Median of graduated mortality rates
20-30	0.0000877459	0.000393
30-40	0.000187392	0.000817
40-50	0.000423406	0.00175
50-60	0.001041133	0.003935
60-70	0.002849624	0.009617
70-80	0.008574065	0.026021
80-90	0.026453557	0.076625
90-100	0.070605105	0.225196
100-110	0.122351244	0.5524

Source: "Indian Individual Annuitant's Mortality Table (2012-15), accessed from Institute of Actuaries of India". Author's Compilation.

Figure 3. Combination of both standard deviation and median of graduated mortality rates



Source: "*Indian Individual Annuitant's Mortality Table (2012-15), accessed from Institute of Actuaries of India". Author's Compilation*

The standard deviation and median of mortality rates are very low and almost constant until the age group of 60-70, which indicates low variability and consistent mortality rates within these age groups. The increase in both the standard deviation and median of mortality rates after the age of 70 is gradual at first and then it becomes steeper after the 80-90 age group. The mortality rates in the older age groups exhibit greater variability.

While the median provides a central value, the standard deviation demonstrates how much the data varies around that central point. Together, they aid in understanding not only the average mortality rate, but also its reliability.

TABLE FOR ANALYSIS

Table 4. Tabulation of the research papers studied

Title	Problem	Category	Variables	Methods/ Tools	Findings	Solutions
"Baliunas, Patra, Rehm, Popova, Kaiserman, and Taylor, B. (2007)." Smoking-attributable mortality and expected years of life lost in Canada 2002: Conclusion for prevention and policy.	Impact of smoking on mortality and premature deaths.	Canada, Age Group, Sex, Diseases	Smoking-Attributable Mortality, Passive-Smoking-Attributable Mortality, Age, Sex.	Meta-Analysis	In 2002, smoking-related deaths totaled 37,209 and accounted for 16.6% of all deaths in Canada. As people age, the prevalence of smoking decreases. Cancer remains the leading cause of smoking-related fatalities.	Public health policies can be improved and could include smoking cessation programs, public awareness campaigns, and regulations to limit exposure to second hand smoke.
"Ja, J. (1995)." Drug-Related Morbidity and Mortality: A Cost-of-Illness Model	Drug-related morbidity and mortality are major medical concerns, and misuse of prescribed drugs results in enormous hospitalization expenses.	USA	Drug related problems, Pharmacist, Morbidity, Mortality	Probability Pathway Model, Survey of Pharmacist Practitioners	The majority of the total expenditure is attributed to drug-related hospitalizations	Emphasis on creating policies and services to reduce and prevent drug-related morbidity and mortality.
"Arokiasamy and Yadav, (2014)." Changing Age Patterns of Morbidity Vis-A` -Vis Mortality in India	What is the changing pattern of morbidity and mortality and is morbidity expanding or compressing in India?	India, Epidemiological Research and Public Health	Age, Gender, Morbidity and Mortality Rates, Health Ratio	Life tables, data from Sample Registration System (SRS), Examination of patterns of Morbidity Prevalence	Increased life expectancy in India; increased prevalence of NCDs, particularly among the elderly.	Improved healthcare policies, focus on preventing NCDs to reduce morbidity.

Table 5. Tabulation of the research papers studied

Title	Problem	Category	Variables	Methods/ Tools	Findings	Solutions
"Rehm, Gmel, Sempos, and Trevisan, (2003)." Alcohol-related morbidity and mortality	Relationship between alcohol and diseases	USA, epidemiological research	Morbidity and mortality from diseases, drinking patterns, alcohol consumption,	Meta-Analysis, Cohort studies, Observational Data	Alcohol consumption is more strongly correlated with morbidity and disability than with death; there are both positive and negative associations, and binge drinking raises the risk of several serious illnesses.	To implement policies and strategies that will help reduce heavy and binge drinking.
"Wang, Yue, and Tsai (2016)." Marital Status as a Risk Factor in Life Insurance: An Empirical Study in Taiwan	Whether mortality rates differ by marital status or not.	Taiwan, Actuarial Science, Demographic Research	Mortality Rates, Marital Status, Age	Graduation Methods: Whittaker Ratio and Partial Standard Mortality Ratio (SMR), Relational mortality model (RM), Lee-Carter model (LC), Renshaw-Haberman model (RH), and Cairns-Blake-Dowd model (CBD), Statistical methods, Stochastic Mortality Models	Marriage considerably lowers mortality rates compared to single status. The relational mortality model (RM) demonstrated the fewest prediction errors, indicating that it is a useful tool for predicting mortality rates by marital status.	Use the Whittaker ratio method for smoothing mortality rates, which showed the smallest Mean Squared Errors (MSEs) in the study and suggestions to include marital status in pricing of life Insurance products which are based on observed mortality differences.
"Williams, Grant, Stinson, Zobeck, Aitken, and Noble, (1988)." Trends in Alcohol related Morbidity and Mortality	What is the trend in alcohol related morbidity and mortality	Public health	Per capita alcohol consumption, alcohol related hospital discharges and traffic fatalities, age, sex etc,	Trend Analysis, Proportionate Analysis	Decline in per capita alcohol consumption since 1981 Increase in proportionate mortality from alcohol-related traffic fatalities in 1986.	Public awareness and health promotion activities aimed at reducing drinking and the hazards linked with excessive drinking, as well as tougher law enforcement.

Table 6. Tabulation of the research papers studied

Title	Problem	Category	Variables	Methods/ Tools	Findings	Solutions
Jang, Noh, Kim, Kim, "Kim, and Kim, (2021)." Mortality and morbidity in children with asthma: A nationwide study in Korea.	Asthma can lead to severe morbidity and even mortality in children, despite advances in treatment and management, this study aims to valuate trends in asthma prevalence mortality, and morbidity among children in Korea	Korea, epidemiological research	Age, Asthma Prevalence, Mortality rates, Hospitalization and ICU admission rates	Statistical Software: SPSS version 22 and R version 3.5.1 for data analysis, National Health Insurance (NHI) database, Korean Statistical Information Service (KOSIS), Cochrane–Armitage Test for Trend, student t-test or Mann-Whitney U test	The prevalence of asthma declined between 2002 and 2015, reaching a peak in 2006. Children with asthma had a significantly higher death rate from respiratory disorders than children without asthma, especially those who were older than five.	There is a need for better asthma management and adherence to treatment guidelines in order to reduce mortality and morbidity, there is a need to focus on high high-risk groups, such as young children and adolescents, for interventions to prevent severe asthma exacerbations.
"Dhingra, Jha, Sharma, Cohen, Jotkar, Rodriguez, and Peto, R. (2010)." Adult And Child Malaria Mortality in India.	Underestimation of malaria mortality rates in India by existing sources, particularly the World Health Organization	India, Epidemiological Research and Public Health	Age Groups, Season, Symptoms, Geographic location, Malaria-attributed mortality rate, Healthcare facility.	Retrospective study, Interviews, Comparison, Statistical Analysis, Geographic Correlation	90% of malaria deaths occur in rural areas, with 86% outside health-care facilities. Malaria accounts for 3.6% of deaths in people aged 1 month to 70 years, causing about 205,000 deaths annually in India, far exceeding WHO's estimate of 15,000. Mortality rates increase with local transmission and during the wet season.	The low WHO estimate should be reconsidered, suggesting the need for better estimation methods and data collection. There is a need for changes in disease control strategies especially in rural areas. Emphasis should be made on more rapid access to malaria diagnosis and effective antimalarial drugs, especially in rural communities.

Table 7. Tabulation of the research papers studied

Title	Problem	Category	Variables	Methods/ Tools	Findings	Solutions
"Gupta, Pal, Tiwari, Garg, Shrivastava, Sarawagi, and Lahariya, (2012)." Impact of Janani Suraksha Yojana on Institutional Delivery Rate and Maternal Morbidity and Mortality: An Observational Study in India	What is the impact of the Janani Suraksha Yojana (JSY) cash incentive scheme on institutional deliveries, MMR, and maternal morbidity factors.	Madhya Pradesh, India, Health Policy Evaluation	Implementation of JSY (pre and post periods: 2003-2005 vs. 2005-2007), High Risk Pregnancy Indicators, Sociodemographic Factors, Maternal mortality Ratio	Observational study design, Retrospective data collection from hospital records, Pearson chi-square test, t- test, Data comparison between pre- and post-JSY periods	Institutional deliveries were increased by 42.6% after JSY implementation, especially among rural, illiterate, and lower socio-economic strata women. Major causes of mortality remained consistent i.e. eclampsia, pre-eclampsia, severe anaemia. Anaemia was the most common mortality factor before and after the implementation of the scheme.	Promotion of institutional deliveries is must and also the education about benefits of the same. Provide better training and resources to community-level health workers, address logistical issues like poor road connectivity and transportation to reduce delays in referral and care.
"Shadiq and Hanggraeni, (2022)." The Impact of Mortality Risk to Life Insurance 's Financial Performance in Indonesia During Covid-19	How covid-19 pandemic has affected morbidity and mortality risks faced by insurance companies.	Secondary Data, Indonesia, Risk Management	Covid-19 Impact, Financial Health Indicators, Insurance Company Types	Regression Analysis, Paired t-test, Secondary Data Analysis	Claim payments were expected to rise after pandemic but instead it was observed to be stable or decreasing, there is relatively low insurance penetration rate in Indonesia compared to neighbouring countries	Suggests exploring the impact of excess mortality on solvency requirements, analysing investment yields and GDP impacts, and updating mortality tables to reflect pandemic-induced changes in life expectancy.

Table 8. Tabulation of the research papers studied

Title	Problem	Category	Variables	Methods/ Tools	Findings	Solutions
"Claeson, Bos, Mawji, and Pathmanathan, (2000)." Reducing child mortality in India in the new millennium	Slowing in decline of childhood mortality rates.	Public Health, India	Infant Mortality Rate, Socioeconomic factors, Maternal Factors, Gender Disparities	National Family Health Survey, Indian Sample Registration System, Demographic and Health Surveys, World Bank Reports, Comparative analysis of mortality rates over different periods (1981-1997)	The decline in child mortality rates has slowed down, particularly in last 5 years (1993-1997), Access to maternal and child health services is crucial but inconsistent across states, Higher mortality rates and less healthcare access for girls, Malnutrition and micronutrient deficiencies are major contributors to high mortality rates.	Increase access to essential maternal and child health services, promote female education and empowerment to improve health outcomes, focus on improving all the aspects of Health.
"Guo and Bauer (2021)." Different Shades of Risk: Mortality Trends Implied by Term Insurance Prices	Estimating life insurance premiums by considering various factors and how these factors influence the pricing of term life insurance.	Actuarial Science, Life Insurance, Financial Economics	Annual term insurance premiums, interest rates, mortality rates, etc.	Generalized Method of Moments (GMM) Estimator, constrained optimization by linear approximation (COBYLA) algorithm.	Mortality rates significantly vary among companies, which is not explained by company size or financial ratings, the model with company effects is strongly favoured over others, emphasizing the importance of company-specific factors.	The study points to the relevance of understanding detailed mortality trends rather than relying on aggregate trends, the paper highlights the importance of including company-specific mortality effects in the estimation models.

Table 9. Tabulation of the research papers studied

Title	Problem	Category	Variables	Methods/ Tools	Findings	Solutions
"Sijbrands, Tornij, and Homsma (2009)." Mortality Risk Prediction by an Insurance Company and Long-Term Follow-Up of 62,000 Men	Whether the current underwriting practices used by insurance companies have significant discriminative ability to predict mortality risk accurately over the long term. Additionally, the study seeks to evaluate if more advanced methods, such as genetic testing or other molecular diagnostics, can improve mortality predictions compared to traditional methods.	Dutch population, Insurance Risk Assessment, Mortality Prediction, Underwriting Practices	Age, History of Diseases, Body mass index (BMI), Presence of risk factors, Mortality	Cox's regression, Standardized Mortality Ratio & Tables, Statistical Analyses	Obesity was not associated with excess mortality but correlated with higher hypertension and more frequent type 2 diabetes, The study concluded that current medical evaluations by insurance companies can accurately predict the mortality risk of large groups of men.	The study concluded that current medical evaluations by insurance companies can accurately predict the mortality risk of large groups of men. Simple Risk Assessment**:** Insurance companies can continue using simple medical evaluations to set premiums as they are cost-effective and reasonably accurate. **:** Additional tests (e.g., genetic testing) might not provide significant benefits relative to their costs due to the low absolute risk in the majority of applicants.

ANALYSIS AND FINDINGS

The models that were used in literature are as follows:

- *"Ja, J. (1995)"* Probability Pathway Model
- "*Wang, Yue, and Tsai (2016)"* Relational mortality model (RM)
- "*Wang, Yue, and Tsai (2016)"* Lee-Carter model (LC)
- "*Wang, Yue, and Tsai (2016)"* Renshaw-Haberman model (RH)
- "*Wang, Yue, and Tsai (2016)"* Cairns-Blake-Dowd model (CBD).

The detailed explanation of Lee-Carter Model (LC) and Renshaw-Haberman Model (RH) are as follows:

- **"*Wang, Yue, and Tsai (2016)"* Lee-Carter Model (LC)**

Ronald Lee and Lawrence Carter developed the Lee-Carter model in 1992, which is now a popular method for predicting death rates and life expectancy. The model's simplicity and efficacy have made it an essential

instrument in demography and actuarial science. The model helps life insurers forecast future mortality patterns and set premiums and reserves for their policies.

Key concepts of the model are:

1. **Age-specific component (αx):** This term refers to the average death rate at each age during the entire period i.e. this component shows how death rates fluctuate with age but remain constant throughout time periods. It provides a baseline mortality rate for each age group.
2. **Time-varying component/ Period Effect (kt):** This term represents the overall pattern in mortality over time. It measures temporal changes in mortality that affects all ages equally. Improvements in healthcare and environmental circumstances would be reflected in $k\,t$. A decrease in kt often suggests improved mortality rates (i.e., lower death rates).
3. **Sensitivity parameter (βx):** This term describes how mortality at each age responds to changes in the overall mortality trend kt. Different age groups may have varying sensitivity to changes in overall mortality.
4. **Error Term (ϵx,t):** The error term, which is assumed to be normally distributed with a mean of zero and a constant variance, represents random fluctuations in mortality data.

Model Specifications

The Lee-Carter model computes the logarithm of the central death rate at age x and time t , as follows:
Log mx,t = αx + βxkt + ϵx,t

where:

- mx, t: Represents central death rate at age x in a year t
- αx: The age-specific component represents the overall shape of the mortality curve as it varies with age.
- βx: Age-based sensitivity to the time-varying component.
- kt: The time-varying component shows the total level of mortality over time.
- ϵx,t: Represents the error term.

Fitting the Model

1. **Data Preparation:** Collect historical mortality data including central mortality rates for various ages and years.
2. **Decomposition:** Decompose mortality rates by age, time, and sensitivity.
3. **Parameter Estimation:** Estimate the parameters using a statistical approach like ordinary least square method.
4. **Forecasting:** Project mortality rates by extending the period effect kt into subsequent years. Forecasting future mortality rates requires forecasting the time-specific index kt along with estimated αx and βx values.

The Lee-Carter model is an important tool in mortality forecasting, providing a systematic approach to understanding and projecting changes in mortality rates over time. By breaking down mortality rates into age-specific components, period effects, and sensitivities, the model can help actuaries, demographers, and policymakers anticipate future mortality patterns and make educated judgments in areas such as insurance and pension planning.

- **"*Wang, Yue, and Tsai (2016)*" Renshaw-Haberman Model (RH):**

This model is an extension of the Lee-Carter model that incorporates cohort effects. Arthur Renshaw and Steven Haberman developed it in 2006 to measure the impact of birth cohorts on mortality. They used their extended model with mortality data from England and Wales. This model is especially effective for understanding and predicting mortality when taking into account not only age and era, but also the influence of being born within a specific period.

Key concepts of the model are:

1. **Age Effect (αx):** It represents the mortality rate pattern associated with different ages, the general shape of the mortality curve across ages.
2. **Period Effect (κt):** It captures the impact of specific time periods on mortality rates. It depicts mortality trends that effect all ages equally in a given year. Medical advances, public health efforts, and socioeconomic factors, all such factors have an impact on the period effect.
3. **Cohort Effect (γt−x):** It represents the influence of birth cohorts (individuals born in the same period) on mortality rates.

Model Specifications

Log (mx, t) = αx + βxκt + yt − x + ϵx, t
where:

- mx, t: This represents the central mortality rate at age x and time t.
- αx: It refers to the age-specific mortality trend.
- βx: It is the age-specific sensitivity to the period effect.
- κt: It is the time-specific index of the period effect.
- γt−x: The cohort effect measures the impact of a person's year of birth (t-x) on mortality, or the overall level of mortality in year t.
- ϵx, t: The error term is assumed to follow a normal distribution with a mean of zero.

Fitting the Model

1. **Data Preparation:** Collect historical mortality data which will include central mortality rates (mx, t) for various ages and years t.
2. **Initial Parameter Estimation:** Estimate the initial parameters αx, βx, and kt derived from the Lee-Carter model.
3. **Incorporating cohort effects:** Introduce the cohort effect of yt-x.
4. **Iterative Optimization:** To estimate the parameters, use iterative techniques like the Newton-Raphson or Maximum Likelihood Estimation (MLE). The objective is to reduce the sum of squared errors or maximize the likelihood function. These methods iteratively update parameter estimates to reduce the discrepancy between observed and anticipated log mortality rates.
5. **Convergence**: Continue the iterative procedure until the parameter estimations converge, which means that the differences between iterations become negligible.

For example, Individuals born during a war or economic depression may exhibit different mortality patterns compared to those born in more prosperous times. The RH model's cohort term (γt−x) allows the insurer to incorporate this information into their projections, leading to more accurate and reliable mortality forecasts.

This model is especially useful in the insurance industry for accurately forecasting future mortality rates, pricing life insurance products, allocating reserves, and managing longevity risk. By taking into account

both seasonal and cohort effects, the RH model provides a more comprehensive understanding of mortality trends and their impact on insurance and pension plans. It is more complex than Lee-Carter Model due to the inclusion of cohort effects, which requires more sophisticated fitting techniques and computational resources. *"Guo, and Li, (2023)" and "Kimondo, W. (2018)."*

LIMITATIONS

Lee carter model

1. Linear Trend Assumption: The Lee-Carter model is based on the assumption that mortality changes over time follow a linear trend. This assumption can be restrictive because real-world mortality improvements do not always follow a linear pattern. Significant deviations from linearity can lead to inaccurate long-term forecasts.
2. Lack of Cohort Effects: The Lee-Carter model does not account for cohort effects, which are crucial when comparing mortality improvements across generations. In populations with significant cohort effects, ignoring them can result in inaccurate forecasts.
3. Age-Invariant Mortality Improvements: The model assumes that the impact of time on mortality rates is consistent across all ages, but this may not always be the case. This assumption may result in inaccurate forecasts for specific age groups if mortality improvements vary significantly by age.

Renshaw-Haberman Model

1. Increased Complexity: The Renshaw-Haberman model builds on the Lee-Carter model by incorporating cohort effects, making it more complex. The added complexity necessitates more sophisticated estimation techniques and raises the computational burden, making the model less accessible to practitioners who lack advanced statistical knowledge.
2. Risk of overfitting: Adding a cohort parameter increases the number of parameters to estimate, potentially leading to overfitting in datasets with limited observations. Overfitting can produce poor out-of-sample forecasts.
3. Data requirements: The model needs detailed data to accurately estimate cohort effects. Insufficient or noisy data can result in unreliable estimates of the cohort parameter, lowering the model's predictive accuracy.
4. Model Identifiability: The model may suffer from identifiability issues, which occur when different parameter combinations produce similar fits to the data. Interpreting individual components can be difficult, resulting in uncertainty in estimates.

IMPLICATIONS

Lee Carter Model

1. Potential for Bias: Long-term forecasts may be biased due to linear trend assumptions, especially if mortality improvements slow or accelerate. Users should exercise caution when making long-term predictions with the model.
2. Long-Term Projections: Because of its simplicity and computational efficiency, the Lee-Carter model is appropriate for long-term mortality projections, particularly when detailed age-cohort interactions are not required.
3. Pension and Insurance Applications: Life insurance companies and pension funds use the Lee-Carter model to forecast future mortality rates, which has a direct impact on pricing, reserving, and risk management. The model's simplicity makes it easy for actuaries to implement, making it a standard tool in the industry for setting mortality predictions.

Renshaw-Haberman Model

1. Enhanced accuracy in cohort-driven populations: In populations with significant cohort effects, the Renshaw-Haberman model can provide more accurate forecasts. This makes the model suitable for in-depth mortality analysis in such situations.
2. Higher Data Demands: The model works better for populations with robust and complete mortality datasets because it depends on detailed data for accurate cohort effect estimation. Incomplete data can have a significant impact on how well the model performs.
3. Use in Longevity Risk Management and Pension Planning: The Renshaw-Haberman model's improved accuracy benefits pension funds and insurance companies that deal with large cohorts (such as the baby boomer generation). The model enables these institutions to better forecast future liabilities and develop more precise funding strategies.

CONCLUSION

Upon comparing the two models, it becomes evident that each model has certain benefits and drawbacks. Lee carter model (LC) is relatively simple and easy to implement and is one of the most widely used models for mortality predictions. It captures the overall trend in mortality rates and it can be estimated using ordinary least squares method whereas Renshaw Haberman Model is more intricate and takes more computational effort to estimate it. There is an additional parameter i.e. $\gamma t-x$ which captures the influence of cohort effects, which is not taken into consideration by the lee carter model. The (Rh) model can account for differences in mortality rates among birth cohorts. It gives more accurate fit to historical mortality data by capturing more detailed mortality dynamics but the risk of overfitting the historical data is a possible consequence of the additional parameter. Hence, (Lc) model is suitable for quick and broad mortality projections whereas (Rh) model is suitable for more detailed analysis where cohort effects are significant and the choice of the model is based on the particular needs of the mortality study. *"Guo, Y., & Li, J. S. H. (2023)."*

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APPENDIX

MORTALITY TABLE

This mortality table was effective from 1st April 2021. "*Indian Individual Annuitant's Mortality Table (2012-15), (28th July 2024).*"

Table 1. Mortality Table (2012-2015)

Age	Graduated Mortality Rates	Age	Graduated Mortality Rates	Age	Graduated Mortality Rates
20	0.000284	52	0.003188	84	0.072410
21	0.000305	53	0.003464	85	0.080840
22	0.000328	54	0.003768	86	0.090252
23	0.000353	55	0.004101	87	0.100746
24	0.000379	56	0.004468	88	0.112428
25	0.000407	57	0.004871	89	0.125408
26	0.000438	58	0.005316	90	0.139798
27	0.000471	59	0.005807	91	0.155712
28	0.000507	60	0.006349	92	0.173260
29	0.000545	61	0.006948	93	0.192548
30	0.000586	62	0.007612	94	0.213673
31	0.000631	63	0.008347	95	0.236719
32	0.000679	64	0.009163	96	0.261749
33	0.000731	65	0.010070	97	0.288807
34	0.000787	66	0.011077	98	0.317906
35	0.000847	67	0.012198	99	0.349031
36	0.000913	68	0.013447	100	0.382129
37	0.000984	69	0.014840	101	0.417111
38	0.001061	70	0.016393	102	0.453851
39	0.001144	71	0.018128	103	0.492190
40	0.001234	72	0.020067	104	0.531933
41	0.001332	73	0.022236	105	0.572866
42	0.001438	74	0.024662	106	0.614755
43	0.001553	75	0.027379	107	0.657357
44	0.001679	76	0.030422	108	0.700435
45	0.001815	77	0.033830	109	0.743762
46	0.001964	78	0.037651	110	0.787136
47	0.002125	79	0.041932		
48	0.002302	80	0.046730		
49	0.002495	81	0.052106		
50	0.002705	82	0.058127		
51	0.002936	83	0.064868		

Enhancing Sales and Customer Experience at Jewellery Showroom through Visual Merchandising

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ABSTRACT

This study explores the impact of Visual Merchandising on customer experience and purchasing decisions, with a focus on retail jewellery showrooms. It examines various merchandising techniques, including window displays, themes, signage, ambiance, and colour coordination. The objectives of this research are to analyze whether elements of Visual Merchandising influence buying process for jewellery, to identify the ease of jewellery displayed in showrooms has any effect on customer purchasing decision, and to analyze whether elements of Visual Merchandising influence buying process for jewellery. The research was descriptive in nature which was followed by exploratory research. The researcher did secondary research by incorporating literature review in seventeen journal articles, six book and two trade publications. A structured questionnaire was prepared by the researcher. 47 responses were collected from respondents who came to the jewellery store. The respondents were from Mumbai Metropolitan Region (MMR). The data was analyzed using SPSS. The study indicates elements of Visual Merchandising does not influence the buying process for jewellery. There is no significant difference in the mean ratings given by customer segments on jewellery showrooms using displays. There is no relationship between jewelery showrooms using displays to target customer segment. Age has no effect on mean ratings of colour coordination.

Keywords: *Visual Merchandising, Customer behaviour, Attractive displays, Buying process, Customer segments, Jewellery*

INTRODUCTION

Visual merchandising plays a crucial role in retail strategy by combining art, psychology, and business principles to shape customer behavior and increase sales. The aim is to enhance the appeal of the products and lead customers through the store in a manner that optimizes their engagement with the merchandise. This overview delves into the key elements and significance of visual merchandising, emphasizing how it shapes customer behavior and enhances the shopping experience.

This research investigates how visual merchandising can be utilized to enhance both sales performance and the overall customer experience within jewellery showrooms. The study is guided by three primary objectives. First, it seeks to analyze how specific elements of visual merchandising—such as colour coordination, window display, themes, and ambience—affect the jewellery buying process. Second, the research aims to identify whether the organization and presentation of jewellery within showrooms influence the ease with which customers make their purchasing decision. Finally, the study explores how jewellery showrooms use visual displays to target different customer segments, examining the effectiveness of these strategies in catering to varied customer preferences.

By addressing these objectives, the research aims to provide jewellery retailers with valuable insights into optimizing their visual merchandising practices. This will help them create more compelling shopping environments, improve customer engagement, and ultimately drive sales growth.

LITERATURE REVIEW

(Tesfaye, Feb 2022) In this study Tesfaye's findings were to evaluate the impact of visual merchandising on impulsive buying behavior. As the retail sector faces intensified competition and challenges in today's fast-paced environment, retailers strive to enhance profitability through increased sales. To achieve this,

visual merchandising is employed as a strategy to capture customer attention and boost sales. This technique involves visually enhancing the brand and emphasizing the store's unique attributes.

The research focuses on six key elements of visual merchandising: store layout, window displays, mannequins, promotional signage, pricing, and lighting. It examines how these factors affect impulsive buying behavior. Data for this study were gathered through a questionnaire administered to customers in the mall located in Bole Sub City. A simple random sampling method was used to ensure representative responses, and a structured questionnaire was developed for this purpose. A total of 116 responses were collected, providing authentic feedback.
The study includes an analysis of demographic profiles, descriptive statistics, and inferential statistics, such as correlation and regression analysis. The findings indicate that the visual merchandising elements significantly influence impulsive buying behavior. Based on these results, it is recommended that retail managers invest in enhancing the store environment to stimulate higher levels of impulse purchases.

(Arshdeep Kaur, 2016) (Awais, 2022) In this article, Arshdeep Kaur and Awais discusses visual merchandising as a strategy to communicate a store's design and image to customers. This approach enhances the store's reputation, boosts customer loyalty, and influences buying behaviors by showcasing clothing and accessories. Visual merchandising encompasses various display types, including window and interior displays, signage, and branding elements. The article defines customer behavior as the study of how individuals or groups select, purchase, use, or dispose of products to meet their needs and desires. Impulse buying occurs when customers make spontaneous and emotional purchases without careful consideration of necessity or cost. Recent research highlights that impulsive buying behavior is influenced by both internal states and external cues, with visual merchandising playing a significant role. Awais's study further underscores the importance of strategic store layout and design in shaping customer preferences and suggests that successful businesses attract and retain customers by investing in effective marketing and store aesthetics.

(Quantzig, 2019) (McKinley, 2003) Quantzig and McKinley have highlighted the significance of store design, window displays, and educational product setups in boosting product appeal, sales, and customer engagement. With over 120 clients, including 45 Fortune 500 companies, Quantzig underscores visual merchandising's crucial role in financial services retail. They recommend a six-stage approach, focusing on research, accommodating busy customers, designing for customer needs, and creating inviting shopping environments. The article notes the increasing importance of visual merchandising in the financial services sector.

(Tom Page, 2012) (Batra, 2016) Tom Page and Batra S. have stated in their paper that how colour theories affect product success and customer preferences, especially in interior design. It reveals how age and gender shape colour tastes and explores the link between colours, emotions, and product types. The study of 100 Indian participants identifies sincerity, enthusiasm, sophistication, and ruggedness as key brand personality traits associated with colours, underscoring the need for colour psychology in marketing.

(Alireza Karbasivar, 2011) The layout of the in-store shopping environment and window display have a major role in influencing customers' buying choices. Customers' selection of a store is influenced by its physical appeal, which is usually produced at the façade level. In order to draw in customers and draw passersby, retailers are putting more and more emphasis on their window displays, making them attractive to customers. Impulsive buying is also significantly influenced by the in-store environment, which is defined by elements such as background music, displays, scents, promotions, prices, cleanliness, density, and staff.

(Widyastuti, 1945) (Ahmad, 2004) The study of Widyastuti and Ahmad investigates the elements driving impulse purchases in Indonesian retail settings, with a focus on visual merchandising, store atmosphere, and private label products. Findings indicate that affordable prices, unique packaging, an attractive store environment, and effective visual merchandising are key factors in encouraging impulsive buying. The research seeks to understand customer-influencing tactics and the role of visual merchandising in increasing sales and improving brand reputation.

OBJECTIVES OF THE STUDY

- To identify the ease of jewellery displayed in showrooms has any effect on customer purchasing decision.
- To analyze whether elements of Visual Merchandising influence buying process for jewellery

HYPOTHESES

H_01: There is no significant difference in the mean ratings given by customer segments on jewellery showrooms using displays

H_11: There is significant difference in the mean ratings given by customer segments on jewellery showrooms using displays

H_02: Age has no effect on mean ratings of elements (colour coordination, window displays, themes, signage and ambience) of Visual Merchandising.

H_02: Age has effect on mean ratings of elements (colour coordination, window displays, themes, signage and ambience) of Visual Merchandising.

RESEARCH METHODOLOGY

The research project "Enhancing Sales and Customer Experience at a Jewelry Showroom through Visual Merchandising" employs descriptive research followed by exploratory research, combining literature review with customer surveys. It examines effective visual merchandising practices in retail jewelry businesses by analyzing academic journals, industry publications, and books. Secondary data collection was done with 25 research papers (seventeen journal articles, six books and two trade publications) from EBSCO as well as Google Scholar. Exploratory research was done through quantitative data analysis mentioned below. The sampling frame used was jewellery showrooms and the sampling unit were customers who bought jewellery from the showroom.

The sample size was of 47 respondents who had just purchased jewellery from the showroom and the area of study was Mumbai Metropolitan Region (MMR). Data collection instrument used was structured questionnaire prepared by the researcher. Simple random sampling technique was used. Data analysis is done through SPSS software and ANOVA, Chi-square tests have been conducted.

DATA ANALYSIS

Data collection includes in-person surveys. Data analysis involves quantitative statistical analysis using SPSS software.

Hypothesis 1

H_0: There is no significant difference in the mean ratings given by customer segments on jewellery showrooms using displays

H_1: There is significant difference in the mean ratings given by customer segments on jewellery showrooms using displays

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.814	2	1.407	1.155	.325
Within Groups	53.612	44	1.218		
Total	56.426	46			

If the P-value is lesser than 0.05, we reject the null hypothesis. But here P-value is 0.325, which is greater than 0.05.
Therefore we reject the null hypothesis.
There is no significant difference in the mean ratings given by customer segments on jewellery showrooms using displays.

Hypothesis 2

H_02: Age has no effect on mean ratings of elements (colour coordination, window displays, themes, signage and ambience) of Visual Merchandising.

H_02: Age has effect on mean ratings of elements (colour coordination, window displays, themes, signage and ambience) of Visual Merchandising.

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Kindly rate the element of colour coordination which you find most appealing/important in your decision-making process when browsing for jewelry.	Between Groups	4.305	3	1.435	1.820	.158
	Within Groups	33.908	43	.789		
	Total	38.213	46			
Kindly rate the element of window displays which you find most appealing/important in your decision-making process when browsing for jewelry.	Between Groups	2.503	3	.834	.690	.563
	Within Groups	51.966	43	1.209		
	Total	54.468	46			
Kindly rate the element of themes which you find most appealing/important in your decision-making process when browsing for jewelry.	Between Groups	4.695	3	1.565	1.672	.187
	Within Groups	40.241	43	.936		
	Total	44.936	46			
Kindly rate the element of signage which you find most appealing/important in your decision-making process when browsing for jewelry.	Between Groups	1.929	3	.643	.561	.644
	Within Groups	49.305	43	1.147		
	Total	51.234	46			
Kindly rate the element of ambiance which you find most appealing/important in your decision-making process when browsing for jewelry.	Between Groups	2.150	3	.717	.456	.714
	Within Groups	67.552	43	1.571		
	Total	69.702	46			

If the P-value is lesser than 0.05, we reject the null hypothesis.
But here P-value is greater than 0.05.
Therefore we do not reject the null hypothesis.
Age has no effect on mean ratings of elements (colour coordination, window displays, themes, signage and ambience) of Visual Merchandising.

RESULTS

According to the research, aspects of visual merchandising, such as window displays, colour coordination, themes, and signage, do not strongly affect how customers decide to buy jewellery. This suggests that customers might prioritize other factors, like pricing, brand reputation, or product quality, rather than the visual appeal of the showroom.

The findings reveal that various customer segments (such as those defined by income, gender, or lifestyle) do not significantly differ in their opinions of the visual displays in jewellery showrooms. The average ratings from these segments are relatively similar, indicating that visual merchandising does not have a differentiated appeal across these groups.

The research also found that age does not significantly influence customers' ratings of the colour coordination, window displays, themes, signage and ambience in jewellery displays. This means that preferences for colour schemes are consistent across different age groups, and no particular age group has a notably different perception of the colour coordination, window displays, themes, signage and ambience.

The study suggests that visual displays in jewellery showrooms do not effectively target or attract specific customer segments. This implies that despite investments in visual merchandising aimed at appealing to certain demographics, the strategy may not be achieving its intended goals.

CONCLUSIONS

- Attractive displays of jewellerys as a part of Visual Merchandising is independent of customer segments. Therefore, there should be no age group which jewellers should target for attractive displays in jewellery showrooms.

- Since there is no effect of mean ratings for all elements of Visual Merchandising (colour coordination, window displays, themes, signage and ambience) we can conclude that there is no specific element of Visual Merchandising which we can segregate and we need to concentrate on all elements of Visual Merchandising.

RECOMMENDATIONS

- Jewellery showrooms should display attractive jewellery's related to all customer segments (age groups).

- All six elements (colour coordination, window displays, themes, signage and ambience) needs to be done effectively to influence buying process for jewellery

LIMITATIONS OF THE RESEARCH

The limitations of Research were:

1. The research was conducted in the Mumbai Metropolitan region (MMR). Further research can be conducted across Metros or all India.
2. Time constraint was a major limitation as this research was done for a timespan of two months.
3. The research was self-funded by the researchers.
4. Sample size is a constraint because of time constraint for study.

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ANNEXURE

1. Gender *

2. Age*
(a) 15- 25 (b) 26-35 (c) 36-45 (d) 46-55 (e) Above 55

3. In your opinion, how does the overall aesthetic and design of a showroom contribute to creating a positive shopping experience? *

(a) Creates a luxurious and inviting atmosphere
(b) Makes it easier to find what I'm looking for
(c) Doesn't affect my shopping experience

4. Kindly rate each of the below elements that you find most appealing/important in your decision- making process when browsing for jewelry, the elements of visual merchandising (e.g., color psychology, window displays, themes, signage) do

(a) Color coordination
(b) Window displays
(c) Themes
(d) Signage
(e) Ambiance

Unimportant	Marginal	Considerable	Crucial	Indispensable
1	2	3	4	5

5. Please rate the statement on a scale of 1 to 5
The overall layout of the jewelry store influences shopping experience.

Unimportant	Marginal	Considerable	Crucial	Indispensable
1	2	3	4	5

6. In your past experiences, how easy was it to see individual pieces of jewelry in most showrooms? *

(a) Very easy - all pieces were clearly displayed
(b) Somewhat easy - some pieces were difficult to see
(c) Difficult - many pieces were obscured or poorly lit

7. In your past experiences, how often did the staff in jewelry showrooms seem knowledgeable and able to answer questions about the jewelry based on the displays? *

(a) Frequently - the staff readily offered information based on the displays
(b) Occasionally - the staff wasn't always proactive in using the displays to assist customers
(c) Rarely - the staff didn't seem to use the displays to guide customers

8. Based on your past visits, did jewelry showroom displays ever inspire you to consider new styles or pieces you might not have noticed otherwise? *

(a) Often - the displays sparked my interest in new designs
(b) Sometimes - the displays mainly showcased familiar styles
(c) Rarely - the displays didn't offer anything particularly new

9. How likely are you to make an unplanned purchase when you see an attractive display?

Unimportant	Marginal	Considerable	Crucial	Indispensable
1	2	3	4	5

10. How often did jewelry showroom displays create a sense of occasion or tell a story about the jewelry (e.g., wedding sets, every day wear)? *

(a) Frequently - the displays helped me understand the jewellery's purpose

(b) Occasionally - the purpose of the jewellery wasn't always clear from the displays

(c) Rarely - the displays seemed random and lacked clear themes

11. In your past experiences, which type of jewelry display typically appealed to you the most? (Select all that apply) *

(a) Clean and minimalist displays with a focus on individual pieces

(b) Themed displays that create a specific mood or story

(c) Technological elements like digital screens showcasing product details

12. How often did you find jewelry showrooms using displays to specifically target different customer segments (e.g., age groups, budgets)? *

(a) Frequently - the displays catered to various tastes and budgets

(b) Occasionally - the displays seemed aimed at a general audience

(c) Rarely - the displays didn't seem targeted to any specific customer group

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Address by Session Chair

Prof. Dr. Pankaj Trivedi

Dean, KJ Somaiya Institute of Management Studies & Research (KJSIMSR)

Session Chair Dr. Pankaj Trivedi delivered a compelling address, offering expert opinions and constructive feedback to each of the authors. He expressed his sincere appreciation and congratulations to the faculty members of DSIMS and DSGS for their exceptional guidance in mentoring students through their research manuscripts and paper presentations. Dr. Trivedi also explored future research directions in the field of business and management. He advised researchers to thoroughly study relevant theories and literature, refine their focus to deeply understand their objectives, and consider framing their research within new contexts, locations, and cultures. He emphasized the importance of reassessing and expanding upon the theories, frameworks, or models addressed in their work.

Best Paper Presentation Awards

Following a rigorous evaluation by a panel of session chairs and blind reviewers, four of the eighteen presenters have been selected for the Best Paper Awards.

First Best Paper Award: Ms. Glancy Albuquerque and Mr. Rajeev Kamble were honored with the first-place award and **a cash prize of ₹10,000** for their research paper titled "**The Role of Financial Literacy in Promoting Gender Equality in the Workplace, Mumbai."**

Second Best Paper Award: Dr. Ravindra Dey received the second-place award and **a cash prize of ₹7,000** for his paper titled "**Influence of Organizational Culture and its Impact on Employees' Happiness."**

Best Paper in Student Track: Mr. Vaibhav Sonawane and CA Dr. Rajul Murudkar were recognized with the Best Paper Award **in the student track**, along with **a cash prize of ₹5,000**, for their research paper "**Financial Image Classification for Enhanced Operational Efficiency."**

Second Best Paper in Student Track: Ms. Jyotishree Mallela and Mr. Maneesh Gupta received the second-place award and **a cash prize of ₹2,000** for their paper titled **"Value at Risk Performance and Backtesting of Cryptocurrencies."**

Certificates were awarded to all the presenters by the jury members. The winning papers will be published in **Volume Six, Issue Two of The Management Quest**, a Bi-Annual Research Journal of DSIMS, under the auspices of the Remsons Centre for Management Research **(Online ISSN: 2581-6632).**

Concluding Note

The unique endeavor in the part of the Institute was to host a Conference on the essence of fostering a culture of collaboration, leveraging technology and data insights, prioritizing continuous learning and exhibiting resilience and responsiveness: Empowering Transformational Change in the Business Landscape. The Conference was indeed a grand success.

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ONE STOP EDU-SHOP

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health centre
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Kirandevi Saraf
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