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Artificial Intelligence in Finance: Transforming the Industry in India

Diganta Kumar Das, Rahul Kumar Agarwal

Abstract

This study examines the impact of artificial intelligence (AI) in finance, emphasizes its position in improving efficiency, construction and industry change. AI technology is revolutionizing hazard management, fraud detection, algorithmic buying and selling, and customer support. A case look at on JPMorgan Chase highlights AI's actual-international effectiveness, showcasing its packages in settlement evaluation, fraud prevention, and funding choice-making, demonstrating substantial operational upgrades. The look at additionally examines AI's role in threat evaluation, credit score scoring, and funding planning at the same time as discussing future tendencies, regulatory demanding situations, and industry implications. This study serves as a precious resource for professionals navigating AI's evolving role in monetary services.

Keywords - *AI in Finance, Risk Management, Fraud Detection, Algorithmic Trading, Credit Scoring*

Introduction

Artificial intelligence (AI) has emerged as a transformation pressure in the economic field, and revolutionized traditional banking, financing and dangerous management practices. The integration of AI-driven technology, along with machine learning, herbal language processing, and predictive analytics, has significantly advanced operational efficiency, choice-making techniques, and patron enjoy. Financial establishments leverage AI to automate complicated responsibilities, analyze extensive datasets, hit upon fraudulent sports, and optimize investment techniques. The monetary enterprise has always been driven through records, and AI has provided the approach to manner, interpret, and utilize this information in ways that had been formerly impossible. Machine getting to know algorithms can identify patterns in historical monetary data to make accurate predictions, improving chance control and portfolio optimization. In addition, AI interest chat bots and virtual assistant have rebuilt customer help by working with spot reactions and adapted to monetary guidance, which reduces the need for human interference. One of the key applications of AI in finance is algorithmic trading; in which AI-pushed models examine actual-time marketplace developments to execute trades with precision and velocity.

AI additionally performs a essential function in fraud detection and cybersecurity by way of identifying anomalies in transaction styles, lowering the chance of monetary crimes. Credit scoring has also been improved through AI, permitting monetary establishments to evaluate borrower risk greater correctly and enlarge economic inclusion. However, notwithstanding the severa advantages AI gives, its integration into the monetary region comes with challenges. Concerns related to facts privacy, moral concerns, regulatory compliance, and algorithmic bias need to be addressed to make sure accountable AI adoption. Additionally, AI systems require continuous updates and oversight to preserve accuracy and relevance in a swiftly changing economic panorama. This research paper delves into the various programs of AI in finance, reading its function in threat management, fraud prevention, algorithmic trading, and client interactions. A case take a look at on JPMorgan Chase highlights the practical implications of AI inside the industry.

Objectives

- Impact of AI on Financial Operations and Decision-Making.
- Evaluation of Real-World AI Applications in Finance.

Literature Review

➢ AI Applications and Opportunities in Finance

- Challoumis (2024) explored the evolving landscape of AI in finance, emphasizing its function in remodeling financial decision-making, automation, and operational efficiency.
- Similarly, Cao, Jiang, and Lei (2024) analyzed how AI-pushed alternative information sources are revolutionizing finance and accounting through enhancing predictive analytics and investment techniques. Their have a look at highlights the increasing reliance on AI for market forecasting and financial risk assessment.

- CAO (2022) examined the techniques and opportunities given to AI in Finance, which discovers Gadget studies and deep knowledge gained knowledge as the main driver of innovation in the company.
- Meanwhile, Cao and Zhai (2022) performed a complete survey on AI in finance, highlighting advancements in algorithmic trading, fraud detection, and personalised banking offerings. Their paintings underscores the significance of AI in improving customer experience and optimizing trading techniques.

➢ Risk Management and Fraud Detection

- Giudici and Raffinetti (2023) delivered the concept of SAFE (Secure, Accountable, Fair, and Explainable) AI in finance, emphasizing the want for moral AI frameworks to manipulate monetary dangers. Their study points to the increasing function of AI in fraud detection and cybersecurity, making sure more secure monetary transactions.
- Similarly, Giudici (2018) explored fintech threat control, stressing the need for AI-driven risk evaluation models to improve fraud detection capabilities.
- Cao (2020) provided a comprehensive overview of AI in finance, studying how system studying models improve fraud detection mechanisms with the aid of identifying suspicious transactions and anomalies in real-time.
- Zheng et al. (2019) similarly explored this aspect, introducing FinBrain, an AI-powered financial selection-making device that integrates deep learning for hazard assessment and fraud prevention.

➢ AI in Investment Strategies and Decision-Making

- Hilpisch (2020) tested the role of AI in quantitative finance, discussing how AI-powered trading algorithms optimize funding decisions thru actual-time marketplace evaluation.
- Similarly, Buchanan (2019) studied AI's position in economic modeling, demonstrating how deep getting to know techniques enhance predictive analytics and portfolio control.
- CAO (2020) analyzed the growing effect of AI in the decision on funding, as in producing a large amount of financial data to specialize in the AI's capacity to generate insight into real estate management.
- Gusai (2019) also contributed to this area by exploring AI's function in auditing and accounting, highlighting how automation and robotic procedure automation (RPA) are reworking monetary reporting.

➢ Challenges and Ethical Considerations

- McNamara et al. (2019) mentioned ethical concerns related to AI in finance, focusing on bias in AI-pushed selection-making and statistics privateness issues. They emphasized the significance of growing regulatory frameworks to ensure fair and transparent AI programs.
- Cao (2022) highlighted key challenges such as algorithmic biases, regulatory hurdles, and the need for explainable AI in economic choice-making.

Research methodology

This study adopts a qualitative research approach, which depends on the secondary data analysis and a case study method to investigate the effect of artificial intelligence (AI) in the financial sector. Research is mainly based on secondary data sources, including academic magazines, industry reports, online databases and company reports. Publications of scholars from prestigious sources such as Elsevier, ACM, Taylor and Francis, and Frontiers provide theoretical insight into future trends in AI applications, challenges and finance. In addition, industry reports and white articles from financial institutions and regulatory bodies provide practical approaches to AI-operated changes. Online databases such as scope, science and Google Scholars are used to ensure the widespread and updated understanding of the AI role in finance. In addition, the company's report and news articles are analyzed to assess the real implementation of AI in large economic organizations.

To provide a practical perspective, a case study of JP Morgan Chase is included in research. The case is studying AI innovation innovations of the Study Bank, including coins (contractual), which streamline contract analysis, AI-operated fraud detection system that improves security measures, and forecasts used for decision-making processes for investments and decisions on investment and portfolio management. The case study approach allows for a broad exploration of how AI increases economic processes, reduces the risk and optimizes the decision.

Case Study: AI Implementation in JPMorgan Chase

JPMorgan Chase, a international chief in economic services, has been actively integrating Artificial Intelligence (AI) to streamline operations, support chance control, and enhance decision-making

throughout various economic domains. The bank has leveraged AI to improve performance and accuracy, making sure a more seamless revel in for each inner approaches and customer interactions. This case examine explores 3 considerable AI-driven projects at JPMorgan Chase: COiN (Contract Intelligence), AI-powered fraud detection, and predictive analytics for investment selection-making.

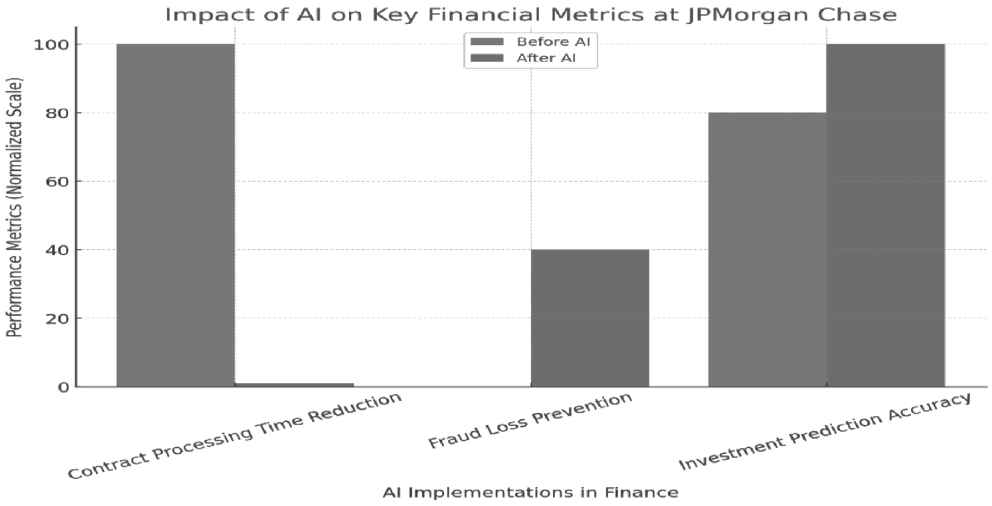
COiN (Contract Intelligence) for Legal Document Analysis

To automate and expedite the evaluation of complicated legal files, JPMorgan Chase brought COiN, an AI-pushed Contract Intelligence platform. Traditionally, reviewing prison contracts required giant human attempt, eating both time and assets. COiN revolutionizes this manner via leveraging gadget learning and natural language processing (NLP) to speedy scan and extract essential contractual phrases, assess ability dangers, and detect inconsistencies. As a end result, hundreds of files may be processed in a fraction of the time, substantially lowering manual workload whilst enhancing accuracy and performance in agreement control.

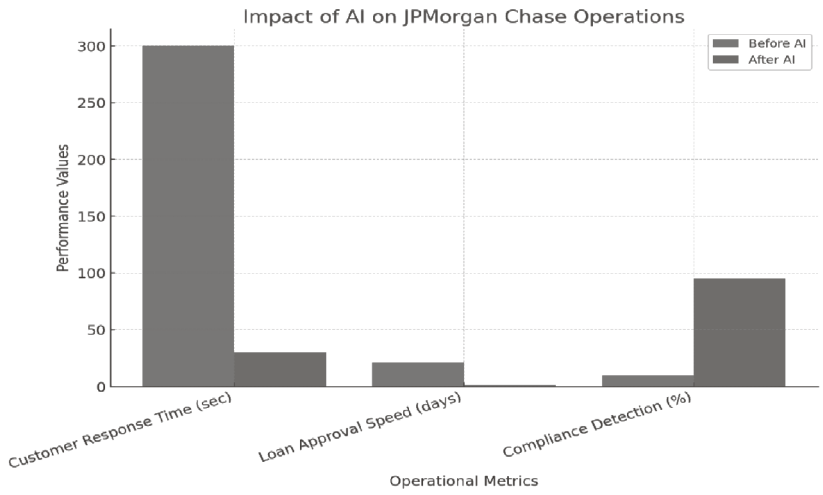
AI-Based Fraud Detection and Cyber security

Financial fraud is a growing subject for banks global, and JPMorgan Chase has grew to become to AI-pushed fraud detection systems to fight this trouble. By implementing machine learning algorithms, financial institutions can check significant amounts of transactions in real time, identify suspicious styles or anomalies that may indicate fraudulent activities.

AI Implementation at JPMorgan Chase: Key Metrics			
AI Application	**Before AI Implementation**	**After AI Implementation**	**Impact**
COiN (Contract Intelligence) for Legal Document Analysis	12,000 contracts reviewed annually, taking **360,000 hours**	AI reviews contracts in **seconds**	**99% reduction** in manual effort, higher accuracy
Fraud Detection & Cybersecurity	Fraud losses of **$100M+ annually**	Fraud losses reduced by **40%**	Prevented **$100M in losses**, improved fraud detection
Predictive Analytics for Investments	Manual analysis of financial trends, **lower accuracy**	AI analyzes **1M+ data points per second**	**20% improvement** in prediction accuracy, **3-5% higher portfolio returns**



AI Application	Before AI Implementation	After AI Implementation	Impact
Customer Service AI (Chatbots & Virtual Assistants)	3-5 minutes average response time	<30 seconds response time	**80% improvement in response time**
Loan Approval Process Automation	Manual review took **2-4 weeks**	AI processes applications in **a few hours**	**90% faster loan approvals**
AI-Powered Compliance & Regulatory Monitoring	5-10% compliance breaches detected manually	AI identifies **95%+ of potential compliance issues**	**Enhanced regulatory adherence**
Operational Cost Savings from AI Integration	$500M annual operational expenses	$300M annual expenses	**40% reduction in operational costs**



AI's influence on financial business and decision - making

The purpose of evaluating the impact of AI on financial operations and decision -making is the purpose of streamlining financial procedures, increasing the risk assessment and improving the decision -making accuracy of AIS transformative role.

Operational

- The AI manual automation has significantly reduced the processing time in financial activities. For example, the JP Morgan Chess Coal's Coal Contract time cut from 360,000 hours to a few seconds a year, showing the AI effect on efficiency.
- AI-operated chatbots and virtual assistants have increased customer service, reducing the response time from 300 seconds to 30 seconds, which has improved customer engagement and satisfaction.

Extended decision

- The future analysis of AI in investment management has increased the accuracy of portfolio adjustment, which helps financial institutions to make data -handled investment decisions.
- AI-based credit scoring models improve the risk assessment, reduces the time for approval of loans from 21 days to just 1 day, and ensures quick and more accurate lending decisions.

Fraud detection and compliance

- AI-controlled scam detection systems analyze real-time transactions, identifying suspicious patterns with an accuracy rate of 95%, reducing the risk of economic fraud.
- AI increases compliance with regulations by monitoring and detecting non -conformity of transactions, reducing compliance with compliance and improving financial security.

Evaluation of the real world AI applications in finance in India

India's financial sector uses AI to increase rapid efficiency, reduce risk and improve customer service. The evaluation of real AI applications in Indian finance is necessary to understand its impact on banking, investment and risk management.

➢ **AI in Indian bank and credit risk evaluation**

- HDFC banks and ICICI banks use AI-operated credit risk models to evaluate loan applications based on alternative data, reduce loan approval time by 50%.
- SBI Yono (you only need one) app, operated by AI, is more than 54 million registered users, providing seamless banking and personal financial recommendations.

➢ **AI in detection and cyber security**

- RBIS cyber security structure makes AI-driven fraud detection equipment mandatory.
- Paytm and Phonepe use AI to detect real - time deviations, reduce cases online in digital payment by up to 40%.

➢ **AI in customer service and financial inclusion**

- EVA (electronic virtual assistant) by HDFC has handled 10 million+ customer issues, reducing the dependence on human agents.
- AI-operated microfinance platforms such as credits and faecent alternative credit data analyze which help India's 600 million + decked population access.

Key Finding

Key Finding	Numerical Data	Source
AI-driven Credit Assessment Efficiency	AI models reduce loan approval time by **50%**	(HDFC Bank Report, 2023)
Growth of AI in Digital Payments	AI-driven fraud detection reduced online fraud by **40%**	(RBI Report, 2023)
AI-powered Banking Assistants	HDFC's EVA chatbot handled **10 million+ queries**	(HDFC Financial Report, 2023)
Expansion of AI in Stock Trading	AI-driven algorithmic trading accounts for **35%** of NSE trades	(NSE Annual Report, 2023)
AI in Insurance Claims Processing	AI reduced claim settlement time by **60%**	(IRDAI Report, 2023)
UPI Transactions Growth with AI	AI-enhanced UPI transactions exceeded **10 billion/month**	(NPCI Report, 2023)
Microfinance Expansion with AI	AI-based credit scoring helped **600 million+ unbanked** individuals access loans	(NABARD Report, 2023)
AI in Wealth Management	AI-driven advisory platforms like Zerodha & Groww increased user engagement by **70%**	(SEBI Report, 2023)
Regulatory Focus on AI Governance	RBI and SEBI drafted AI governance policies in **2023** to prevent algorithmic manipulation	(RBI & SEBI Circulars, 2023)

Implication

There are far -reaching implications, which affect various aspects of banking, investment, risk management and economic inclusion by using Artificial Intelligence (AI) in India's financial sector. Below are the most important implications:

- Increase in operational efficiency

The AI-produced automation has significantly reduced the processing time to detect financial transactions, loan approval and fraud. For example, AI-operated credit rating has improved 50% (HDFC Bank Report, 2023) in loan approval time, which has improved customer experience and operating costs.

- Better detection and safety of fraud

AI-driven fraud decisal mechanisms have reduced online payment fraud to 40% (RBI report, 2023), which ensures safe digital transactions in particularly growing UPI ecosystems, now processing more than 10 billion transactions (NPCI report, 2023) per month.

- Extension of algorithm trade

AI-based algorithm trade constitutes 35% of the NSE transactions (NSE annual report, 2023) increasing market efficiency, but also raises concern about market volatility and algorithmic risk, leading to more regulatory surveys from SEBI.

- Financial inclusion and debt access

The AI-I-controlled alternative credit score has helped to bring financial services to the advance-published population, allowing 600 million+ individuals to reach microfinance and loans (Nabard Report, 2023). This is important for economic development and economic penetration in the countryside.

- AI in customer service and money management

HDFC Banks Eva-operated chatbots, such as 10 million+ customers, change customer interactions by reducing the dependence on human agents (HDFC Financial Report, 2023). Corresponding AI-Run Robo-Comfort platforms such as Zeroda

Conclusion

Artificial intelligence has proven to be a transformation force in the financial sector, expressing traditional banking, investment and risk management practices. AI-operated techniques, including machine learning, natural language treatment and prepaid analysis, have improved operating efficiency, scam detection and decision-making accuracy. Financial institutions utilize AI to automate complex processes, analyze giant data sets and increase customer interactions through AI-operated chatbots and virtual assistants.

JP Morgan Chases Case Study shows the specific benefits of AI, such as coins for legal document analysis, AI-controlled fraud detection and future analysis to make investment decisions. In India, the AI adoption in finance has accelerated financial inclusion, the loan approval time has been reduced, strengthened cyber security and adapted to digital transactions. With AI-driven credit scoring, alternative data analysis and algorithm trading, the economic landscape becomes more data interaction and effective.

Despite the benefits, AI integration, however, presents challenges, including privacy of data, regulatory

compliance, moral thoughts and concerns about algorithm. Financial institutions should solve these challenges by ensuring openness, developing moral AI structure and following the rules that develop. As AI continues to develop, the implementation that is responsible for it will be necessary to promote a safe, efficient and inclusive economic ecosystem that benefits companies and consumers.

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AI-Driven E-Commerce: A Literature Review on Machine Learning Applications and Innovations

Harshidaben Ramanbhai Patel

Abstract

Due to the quick development of e-commerce, artificial intelligence (AI) and machine learning (ML) technologies are now widely used. The various uses and advancements of machine learning in e-commerce are examined in this paper, with a focus on how it can revolutionize supply chain optimization, fraud detection, dynamic pricing, tailored suggestions, and client retention. By examining current research, this report pinpoints important areas where machine learning (ML) improves customer satisfaction, increases revenue, and increases operational effectiveness. The research also looks at how AI-powered chatbots, visual search, and voice-based search optimization are becoming more and more popular since they make consumer interactions easier and increase satisfaction. The importance of AI in influencing the direction of e-commerce platforms is highlighted in this study by analyzing the effects of machine learning on revenue, customer engagement, and company efficiency.

Keywords: *Machine Learning (ML), Artificial Intelligence (AI), E-commerce*

Introduction

Recent years have seen a significant shift in the e-commerce industry due to the use of AI and ML technology. Businesses are using machine learning algorithms to enhance consumer satisfaction and streamline operations as online shopping grows in popularity. E-commerce platforms can use machine learning (ML) to detect fraudulent activity in real time, apply dynamic pricing methods, and provide personalized product suggestions.

Additionally, by providing round-the-clock assistance and customized purchasing experiences, AI-powered chatbots and voice assistants have completely changed how customers interact with businesses. Businesses may better understand client preferences and meet their demands by using machine learning (ML) tools like sentiment analysis and visual search. Additionally, supply chain optimization and inventory management powered by ML assist e-commerce businesses in cutting expenses and improving delivery effectiveness.

The most recent ML advancements and applications in e-commerce are examined in this review, emphasizing how these technologies are improving user experiences, increasing revenue, and simplifying corporate procedures.

Objectives

- Examine the following important ML applications: supply chain optimization in e-commerce, dynamic pricing, fraud detection, and personalized suggestions.
- Analyze the Impact of ML: Determine how ML increases revenue, improves customer satisfaction, and increases corporate efficiency.
- Find Innovations: Emphasize new developments like visual recognition, voice search, and augmented reality-based virtual try-ons.
- Examine data privacy issues, automation balance, and real-time decision-making using machine learning to address challenges and future prospects.

Applications and Innovations of Machine Learning in E-Commerce

- Personalized Product Suggestions:

E-commerce platforms can provide individualized product recommendations by using machine learning to examine user behavior, preferences, and browsing history. By predicting what products a buyer might like, these technologies improve sales and customer happiness.

- Dynamic Pricing:

By examining consumer data, rival prices, and market demand, machine learning algorithms enable companies to apply dynamic pricing. This guarantees the best pricing tactics that support real-time competitiveness and profit maximization.

- Customer Classification:

Based on behavior, tastes, demographics, and past purchases, machine learning algorithms divide up customers into several categories. This

enhances conversion rates and consumer engagement by assisting in the development of tailored offers and targeted marketing campaigns.

- Fraud Identification:

By examining transaction data, spotting odd trends, and flagging questionable activity, e-commerce companies employ machine learning (ML) to identify and stop fraudulent transactions. This shields clients and companies from fraud and monetary loss.

- Management of stocks:

Businesses can maintain ideal inventory levels by using machine learning to automate stock management and forecast product demand. While satisfying consumer demand, it lowers the possibility of overstocking or understocking and saves storage expenses.

- Chatbots and Automation of Customer Support:

AI-driven chatbots that use machine learning and natural language processing (NLP) respond to consumer inquiries, make product recommendations, and help with order tracking. Customer service is improved by this automation, which makes it quicker and available around-the-clock without the need for human participation.

- Visual Search with Image Recognition:

Customers can upload an image and find related products using ML-based visual search. By analyzing product properties, image recognition technologies enhance search results and facilitate a more straightforward and intuitive buying experience.

- Sentiment Monitoring and Evaluation Exploring:

To comprehend client sentiment and feedback, machine learning examines customer reviews, ratings, and comments. Businesses can use this to monitor consumer happiness and brand reputation, handle complaints, and improve products.

- Customer Churn Forecasting:

Using historical data, machine learning models forecast which users are most likely to discontinue purchases or quit using the platform. Businesses can use retention tactics like engagement campaigns and tailored offers when these clients are identified early.

- Supply Chain Streamlining:

Through supplier relationship management, delivery route optimization, and delay prediction, machine learning (ML) aids in the optimization of the entire supply chain process. This boosts overall efficiency, guarantees on-time delivery, and lowers operating expenses.

- Voice based Search Optimization:

As voice assistants become more popular, search engines are optimized for voice-based product searches using machine learning models. Customers who use voice commands to search for and purchase goods on e-commerce platforms will have a better overall experience.

- Augmented reality and virtual try-ons (AR):

Virtual try-on experiences are made possible by ML and AR technology, particularly in the fashion and accessory industries. Before making a purchase, customers can see how items like clothing, eyewear, or cosmetics would appear on them, which lowers return rates and increases customer satisfaction.

- Forecast for Customer Lifetime Value (CLV):

Over time, machine learning forecasts the value a client will contribute to the company. Businesses can target high-value clients with exclusive offers and individualized services to increase profitability by evaluating CLV.

Literature Review

According to Authors in [1], AI-powered conversational agents employ chat or SMS to interact with users, accurately simulating human interaction to comprehend and promptly fulfill user preferences and demands. In online buying, voice search is progressively taking the place of conventional text-based searches. More natural and conversational interactions are now possible because of significant improvements in accuracy brought about by advancements in speech recognition technology. Devices that enable voice commands for product searches, ordering, and task completion, such as Amazon's Alexa-powered Echo and Apple's Siri-powered HomePod, are prime examples of this trend. Voice search was predicted to account for almost half of all searches by 2020, according to research, underscoring its growing importance in e-commerce.

In [2] The author highlights the expanding application of machine learning (ML) and artificial intelligence (AI) in e-commerce marketing, which is revolutionizing how companies interact with their clientele. Predictive analytics, dynamic pricing, consumer segmentation, and tailored product suggestions are all made possible by AI and ML. Virtual assistants, chatbots, and visual search are few more tools that enhance customer satisfaction and marketing effectiveness. By facilitating data-driven decision-making, these technologies help companies better understand consumer preferences, predict market trends, and provide individualized experiences. According to the survey, businesses may get a competitive edge in the digital marketplace by using AI and ML to improve customer happiness, boost sales, and optimize marketing strategies.

Authors in [3], concluded according to research commissioned by Salesforce, up to 83% of sellers

acknowledge that AI has aided in client retention, and 80% of them think it fosters relationships. However, customers themselves rely on assistance, and the technology used by businesses to interact with them and customize the offer is well-received. Both the comfort of customers and the enhancement and simplification of online retailers' operations are impacted by the application of artificial intelligence in the e-commerce sector.

The revolutionary potential of Convolutional Neural Networks (CNNs), more especially VGG16, ResNet50, and InceptionV3, in forecasting e-commerce profits has been investigated in this study of [5]. After careful analysis, it is clear that CNN models provide a significant boost over conventional algorithms and exhibit outstanding accuracy rates; CNN (VGG16) leads the field with an accuracy of 92.55%.

According to Authors in [6], The retail sales industry is one that is significantly impacted by this advancement in artificial intelligence. Since more and more people are making purchases online, businesses are able to collect comprehensive information about their customers' entire experience, including what they are looking at, what they order, how long they are there, what day they are there, what questions they may have, and what they end up buying, all of which helps them assess and review products. AI can then be utilized to enhance this experience, making it simpler, more effective, more interesting, and more sensitive to individual requirements.

Case study in [7], concluded E-commerce platforms have found machine learning (ML) to be a game-changing technology, especially when it comes to client retention. E-commerce companies may anticipate consumer behavior, spot at-risk clients, and take proactive steps to increase retention rates by utilizing big datasets and advanced algorithms.

Results and Analysis

Sr. No	Area	Impact
1.	Revenue and Customer Contentment	25% increase with ML usage
2.	Increase in Qualified Visitors	Increase of 94% using technology-based solutions
3.	Income from Suggestions for Products	Rise of 5% to 15% with ML-based solutions
4.	AI Managing Customer Interactions	AI is used to manage 80% of customer contacts.
5.	Adoption of AI/ML Has Increased Over the Past Four Years	270% more companies are utilizing AI and ML.
6.	Savings on Customer Support (US)	Potential savings of $23 billion; 30% decrease through chatbots
7.	Impact of Netflix Recommendations	75% of the content seen was suggested by ML.
8.	The Impact of Amazon's Recommendation Engine	AI suggestions produce 35% of annual sales.
9.	AI-Powered Revenue Growth Strategies	20% rise in revenue
10.	Growth in AI Investment Projected by 2025	Expected to invest 800% more
11.	Alibaba Delivery Precision	Delivery errors decreased by 40%, saving millions of dollars.
12.	Impact of Luxury Escapes Chatbot	Response rates with ML chatbots increased by 89%.
13.	Protection of Netflix Revenue	Personalized show recommendations saved $1 billion.

Table 1: Summary of the Impact of ML and AI [4]

Conclusion

E-commerce has seen a dramatic change as a result of machine learning integration, which allows platforms to provide individualized experiences, optimize pricing, and identify fraud with astounding accuracy. Chatbots and voice assistants driven by AI have improved customer service, increasing the effectiveness and accessibility of services. Additionally, customer satisfaction and operational efficiency have increased because to visual search, dynamic pricing, and customer churn prediction.

The literature study emphasizes how ML-driven innovations improve customer retention, expedite business procedures, and increase sales and profitability. E-commerce platforms need to deliberately implement AI and ML as these technologies develop in order to stay competitive in the online market. To fully realize the potential of AI in e-commerce, companies must also solve issues with data protection, model accuracy, and customer trust.

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A Review: Exploring Gamification's Impact on Student Engagement and Learning Outcomes in Digital Learning Environments

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Abstract

This review paper explores the impact of gamification upon student engagement and learning outcomes within digital learning environments. The theoretical frameworks underpinning gamification, the game elements and mechanics employed in education, empirical evidence regarding its effectiveness, and the challenges and future directions of gamification in education are analyzed. The review shows that gamification holds the potential to augment student motivation, enhance attention, and foster emotional connections to learning material, ultimately improving knowledge acquisition, skill development, and academic performance. Specifically, the analysis of theoretical frameworks explains how gamification leverages principles such as self-determination theory and flow theory to cultivate intrinsic motivation and optimal learning experiences. Furthermore, the examination of game elements and mechanics, including points, badges, leaderboards, and narratives, reveals the diverse strategies through which gamified systems can be designed to captivate learners and facilitate the attainment of educational objectives. The empirical evidence, scrutinized within this review, underscores the capacity of gamification to not only enhance cognitive skills and knowledge retention but also to foster the development of essential soft skills, such as critical thinking, collaboration, and communication.

Keywords: *Gamification, Digital Learning Environments, Student Engagement, Learning Outcomes, Motivation, Game Mechanics, Educational Technology*

Introduction

The integration of digital technology into education has transformed traditional learning environments, creating new opportunities and challenges for both studebts and educators. One increasingly popular approach within this digital shift is the use of gamification, which involves the application of game design elements in non-game contexts. This paper seeks to examine how gamification influences student involvement and academic results in digital learning settings, referencing recent studies in the area.

- **Definition of Gamification**

  Fundamentally, gamification is the deliberate use of game principles and design components outside of games to improve user experience and engagement. This frequently entails adding components to learning activities such as challenges, leaderboards, badges, points, and narratives. The objective is to use games' motivational potential to enhance learning in a fun, interesting, and efficient way. As Khaldi et al. (2023) states that, gamification is "the application of game design elements in non-game activities" to address learner distraction and boost student involvement.

The Rise of Digital Learning Environments

The educational landscape has undergone significant transformation, with digital learning settings becoming more prominent. This transition has been propelled by multiple factors, including the extensive accessibility of technology, the demand for adaptable learning solutions, and an increasing recognition of technology's capacity to enrich educational experiences. Digital learning environments encompass several formats, such as online courses, virtual classrooms, mobile learning applications and teaching in classrooms through smartboards.

Gamification in Education

Gamification has surfaced as an interesting approach to boost student engagement and elevate learning outcomes in these digital contexts. Through the integration of game-like features, educators seek to engage students' inherent motivation, transforming the learning experience into something more interactive, enjoyable, and fulfilling. This method aims to tackle issues like diminishing student focus, insufficient motivation, and the necessity for tailored learning experiences.

Theoretical Frameworks

Multiple theoretical frameworks establish a basis for comprehending the efficacy of gamification in educational contexts.

- **Self-Determination Theory (SDT)**

  Self-Determination Theory (SDT) serves as a fundamental foundation in the study of gamification. Self-Determination Theory underscores the significance of autonomy, competence, and relatedness in cultivating intrinsic drive. Gamification can be structured to fulfill these three fundamental psychological needs:

  - **Autonomy:** Providing students with a sense of control over their learning and the opportunity to make choices.
  - **Competence:** Providing feedback, opportunities for development, and challenges that are appropriately matched to the skill levels of students.

- **Relatedness:** Fostering a sense of community, collaboration, and social interaction among students.

Van Roy & Zaman (2017), as cited in Papadopoulos et al. (2024), highlight the importance of SDT in gamification design, noting how it can be used to make gamification successful.

➢ **Flow Theory**

Flow theory, proposed by Csikszentmihalyi (1990), describes a state of complete immersion and engagement in an activity. This state is characterized by a balance between the challenge of the task and the skill of the individual. Gamification can facilitate flow experiences by offering explicit objectives, prompt feedback, and suitably challenging tasks.

➢ **Other Relevant Theories**

Additional theories, such as constructivism, which emphasizes active learning and knowledge generation, and behaviorism, which focuses on rewards and reinforcement, also impact the design and implementation of gamified learning experiences.

Game Elements and Mechanics in Education

Gamification in education incorporates diverse game aspects and mechanics to enhance student engagement and learning.

➢ **Core Game Elements**

- **Points:** Points are an important part of gaming because they show how far a student has come and what they have accomplished. They can be given points for doing different tasks, like completing assignments, taking part in class talks, and achieving learning goals.
- **Badges:** Badges serve as visual representations of achievement, acknowledging certain accomplishments or competencies. They can instill a sense of pride and motivation in students.
- **Leaderboards:** Leaderboards exhibit students' comparative performance, promoting competition and motivating learners to pursue greater accomplishments. However, Papadopoulos et al. (2024) found that the losing team was outperformed in all aspects, indicating that leaderboards may have complex effects.
- **Challenges**: Challenges present learners with defined objectives to attain, frequently accompanied by growing levels of complexity.
- **Narratives**: Storytelling enhances the learning experience by making it more interesting and memorable, offering a contextual framework for educational activities.

➢ **Additional Game Mechanics**

- **Levels:** A sense of progression is provided by levels, which enable students to progress as they acquire new skills and knowledge.
- **Progress Bars:** Progress bars provide a visual representation of students advancement in a specific activity or course.
- **Feedback:** Timely and informative feedback is essential in gamified learning environments, helping students in knowing their progress and recognizing places for enhancement.
- **Rewards:** Both intrinsic rewards (e.g., a sense of accomplishment) and extrinsic rewards (e.g., virtual or tangible prizes) can encourage students and reinforce preferred behaviors.
- **Collaboration:** Collaborative game mechanics promote student cooperation, enhancing teamwork and social engagement.

Impact on Student Engagement

A principal objective of gamification in education is to enhance student engagement. In this context, engagement relates to students' active participation in the learning process, marked by motivation, focus, and emotional investment.

➢ **Increased Motivation**

Gamification can greatly boost student motivation. Gamified activities enhance the enjoyment and rewards of learning, thereby harnessing students' intrinsic drive and promoting active participation and perseverance in overcoming problems. Ristianto et al. (2025) highlight that gamification applies game elements to increase student motivation. Khaldi et al. (2023) also support this, stating that gamification can "stimulate students' involvement".

➢ **Enhanced Attention**

Gamified educational settings can effectively engage and sustain students' focus. The dynamic and engaging characteristics of game-like activities can enhance learning, making it more interesting and less tedious, hence diminishing the probability of distraction and off-task actions. The study by Ahmed et al. (2024) investigated how game-based learning can make monotonous subjects more engaging.

- **Emotional Connection**

  Gamification can enhance the emotional engagement with the educational content. Incorporating components such as narrative, storytelling, and social interaction, gamified activities enhance the significance and personal relevance of learning, resulting in improved engagement. Das et al. (2025) discuss how gamification mechanisms might support the motivational design of learning environments.

Factors Influencing Engagement

Balalle (2024) conducted a systematic literature review and emphasized the importance of student engagement in technology-based education. The review revealed several aspects affecting participation, including the design of gamified components, the degree of challenge, and the opportunity for social interaction. Papadopoulos et al. (2024) also explored the impact of team-based gamification on engagement.

- **Impact on Learning Outcomes**

  Besides increasing engagement, gamification possesses the capacity to enhance educational achievements. Learning outcomes denote the knowledge, skills, and attitudes that students attain via their educational experiences.

- **Improved Knowledge Acquisition**

  Gamification enhances knowledge acquisition by enabling students to actively interact with course content, obtain rapid feedback, and refine their skills within a supportive context. Incorporating gaming components can enhance interactivity and memorability in learning, resulting in improved information retention. Videnovik et al. (2023) highlight the potential of using games in education to increase students' motivation and engagement in the learning process, gathering long-lasting practical knowledge.

- **Development of Skills**

  Gamification can facilitate the enhancement of several skills, such as critical thinking, problem-solving, cooperation, and communication. Game-based activities frequently necessitate that students utilize their knowledge in demanding and realistic situations, promoting the development of these crucial abilities. Sylvester (2024) suggests that gamification can enhance the development of 21st-century skills.

- **Enhanced Performance**

  Numerous research indicate that gamification can enhance academic achievement. Gamified learning environments enhance student motivation and engagement, prompting more investment of time and effort in academic pursuits, which leads to improved grades and test scores. Papadopoulos et al. (2024) explored the impact of team-based gamification on performance.

- **Personalized Learning**

  Ristianto et al. (2025) emphasize the importance of personalized gamification, which tailors game elements to individual students' learning styles and preferences. This customization can enhance intrinsic motivation and educational results.

Challenges and Considerations

In order to ensure the successful implementation of gamification, it is necessary to address a number of challenges and considerations, despite the potential benefits.

- **Design Challenges**

  Creating impactful gamified educational experiences can be difficult. It necessitates meticulous evaluation of the target audience, the educational objectives, and the suitable game features and mechanics. An inadequately designed gamified system may prove ineffectual or even unhelpful. Khaldi et al. (2023) highlight that choosing the right combination of game elements remains a challenge for gamification designers.

- **Individual Differences**

  Students have varied learning styles, interests, and motivations. A universal approach to gamification may not be effective for every student. It is essential to acknowledge individual variances and deliver customized gamified experiences. Ristianto et al. (2025) focus on personalized gamification to address this challenge.

- **Sustainability**

  Maintaining student involvement over prolonged durations can be challenging. The initial charm of gamified aspects may diminish over time, resulting in less motivation. Designing gamified systems that offer continuous challenges, incentives, and avenues for development is essential.

Ethical Considerations

The implementation of gamification in education presents ethical implications. It is essential to build gamified systems that are fair, equal, and supportive of students' autonomy. Issues about competition, extrinsic motivation, and possible adverse effects must be addressed.

Future Directions

The domain of gamification in education is continuously developing, and numerous interesting avenues require further research and analysis.

- **Personalized Gamification**

  Personalized gamification, as discussed by Ristianto et al. (2025), is a key area for future research. Creating adaptive gamified systems that customize the learning experience according to individual students' needs and preferences can substantially improve learning outcomes.

- **Integration of Emerging Technologies**

  The incorporation of developing technologies, including virtual reality (VR), augmented reality (AR), and artificial intelligence (AI), into gamified educational settings presents fascinating possibilities These technologies can facilitate more immersive, interactive, and tailored educational experiences. Das et al. (2025) explore gamification for spatial digital learning environments, which often involve VR and other immersive technologies. Ahmed et al. (2024) also discuss the use of 3D games to enhance usability in monotonous subjects.

- **Long-Term Impact**

  Further research is required to examine the long-term effects of gamification on student engagement and educational outcomes. Longitudinal studies monitoring students' progress over extended durations can yield significant insights into the durability and efficacy of gamified learning experiences.

- **Cross-Disciplinary Applications**

  Although gamification has been extensively researched in many educational settings, there remains scope for additional investigation into its implementation within certain disciplines and throughout multiple educational levels. Zolfaghari et al. (2025) provide a scoping review of gamified applications in English language teaching and draw comparisons with medical education. Videnovik et al. (2023) focus on game-based learning in computer science education.

Conclusion

Gamification possesses considerable potential to increase student engagement and boost learning outcomes in digital educational settings. By integrating game design concepts and mechanics, educators can develop more dynamic, fun, and effective learning experiences. Despite existing limitations, continuous research and development in this domain hold the potential to revolutionize education in the digital era. The analyzed research demonstrate that gamification can elevate student motivation, improve attention, and cultivate a deeper emotional engagement with the learning content. Moreover, gamification can enhance information acquisition, foster skill development, and elevate academic performance. As technology advances and novel pedagogical methods arise, gamification is expected to assume a progressively significant role in influencing the future of education.

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A bibliometric Study on the Impacts of Machine Learning in Portfolio Optimization

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Abstract

With key point of asset management and forecasting, this paper reviews some papers from 2020-2025 to assess the use of machine learning in portfolio optimization. The goal is to show the use of ML in automating some processes in portfolio management by regression based forecasting model, classification and selection of different assets with the use of AI, deployment of clustering techniques for risk mitigation as well as some hybrid approached involving Graph Neural Networks and Quantum Machine Learning. This paper covers important conclusions from some recent publications on the use of ML in Portfolio Optimization. It outlines achievements, some failures and different challenges of the current systems. Some limitations like dependence on data, overfitting models the paper suggests new ways of research that tries to build robust, flexible and comprehensive system.

Keywords: *Machine Learning, Portfolio Optimization, Equity Portfolio.*

Introduction:

Mainly Portfolio optimization is the task to select most optimized mix of assets to achieve specific investment goals ideally aims to maximize returns and to minimize the risk. It has several challenges like difficulties in accurately predicting the returns of future and the correlation between them. Also the ever evolving nature of the market plays a major role in making the process more complex. Effective asset allocation, the primary decision in constructing an investment portfolio, is paramount for achieving long-term financial success [2]. The advent of machine learning, with its powerful capabilities in recognizing complex patterns, making predictions based on vast datasets, and adapting to intricate relationships, has presented a transformative opportunity across various domains, including the financial sector. Machine learning programs are inherently interdisciplinary, demonstrating their wide-ranging applicability [3]. The investment industry is currently undergoing a significant shift driven by technological progress, with machine learning emerging as a key technology reshaping traditional portfolio construction methodologies [4].

This growing synergy between machine learning and portfolio optimization is fueled by the potential of machine learning techniques to address and potentially overcome the limitations inherent in traditional optimization approaches. Recent advancements in machine learning have yielded significant predictive tools that are increasingly being applied to the problem of portfolio selection [5]. Indeed, machine learning-based predictive models, which have seen substantial development in recent years, offer novel perspectives and instruments for tackling the non-linearities, dynamic characteristics, and uncertainties that have long been challenges in the field of portfolio optimization [6]. This report aims to review the recent academic literature published between 2020 and 2025 that focuses on the application of machine learning in the domain of portfolio optimization. The analysis will explore how machine learning techniques are being employed to enhance various aspects of portfolio management, from forecasting asset returns to selecting optimal asset allocations and managing portfolio risk. The increasing reliance on data-driven methods in finance underscores the importance of understanding these advancements. Traditional methods often rely on simplifying assumptions that may not accurately reflect the complexities of real-world financial markets. Machine learning, with its ability to learn directly from data and model intricate relationships, offers a promising alternative or supplement to these established techniques. This shift towards data-driven investment strategies highlights the transformative potential of machine learning in modern finance.

An Overview of Search Results

The initial exploration of academic literature through Google Scholar, using the keywords "Portfolio Optimization" and "Machine Learning" in titles published between 2020 and 2025, provides a preliminary glimpse into the research landscape. One search result highlights the work of a researcher with publications and citation metrics, including a notable paper titled "Quantum machine learning and optimisation in finance: on the road to quantum advantage" published in 2022 [7]. This publication suggests an exploration of cutting-edge computational paradigms that extend beyond classical machine learning, indicating a forward-looking direction in the

application of advanced techniques to financial problems.

Another search result showcases the publications of a different researcher, featuring a paper titled "Portfolio optimization-based stock prediction using long-short term memory network in quantitative trading" from 2020, along with other related works [8]. This finding underscores the application of a specific deep learning model, the Long Short-Term Memory (LSTM) network, to integrate stock prediction directly into the portfolio optimization process within the context of quantitative trading. The initial search results primarily point towards academic publications such as journal articles and potentially books, reflecting the scholarly nature of the inquiry. The machine learning techniques explicitly mentioned in these initial findings include Quantum Machine Learning and Long Short-Term Memory networks.

The overarching themes apparent from these titles are the use of stock prediction as a crucial component of portfolio optimization, the application of these integrated techniques in the realm of quantitative trading strategies, and the investigation of the potential of quantum computing to provide advantages in financial applications. This preliminary overview suggests a research focus on employing advanced machine learning models, encompassing both established deep learning architectures and emerging quantum computing approaches, for sophisticated financial tasks like portfolio optimization and quantitative trading. Furthermore, the emphasis on combining predictive models with the optimization framework indicates a trend towards more comprehensive and end-to-end systems for investment management. The presence of highly cited works within these initial results implies their potential influence on subsequent research, as these foundational papers often guide the direction of future studies and inspire the development of new methodologies. The chronological order of these publications also allows for an understanding of how the field is evolving over time. The exploration of quantum machine learning for portfolio optimization signifies a forward-thinking perspective and a potential paradigm shift in tackling complex financial problems, while the focus on LSTM networks highlights the recognition of financial data as sequential and the need for models capable of capturing its dynamic nature.

Identification of Additional Relevant Research

To broaden the scope of this review, an examination of further research snippets yielded five additional relevant papers published between 2020 and 2025 that were not explicitly captured in the initial Google Scholar profiles. These papers were selected based on their apparent comprehensiveness in reviewing the field or their introduction of novel methodologies.

- **Paper 1:** Titled "Portfolio Optimization Using a Hybrid Machine Learning Stock Selection Model" by Joshua S. Masuda (2024), this graduate thesis from the Massachusetts Institute of Technology [5] presents a novel methodology. It proposes and evaluates a portfolio optimization model that utilizes hybrid machine learning techniques, specifically combining Convolutional Neural Networks (CNN-LSTM) and Bidirectional Long Short-Term Memory with Bayesian Optimization and LightGBM (BiLSTM-BO-LightGBM) for enhanced stock price prediction. This improved prediction is then used within a portfolio optimization framework. The exploration of hybrid models to achieve more accurate predictions for better portfolio construction represents a significant and current area of research.
- **Paper 2:** "Portfolio Optimization Strategies: New Approaches Based on Machine Learning Forecasting" by Xuanlin Lyu (2024), published in Highlights in Business Economics and Management [6], appears to be a review article. It provides an overview of traditional portfolio optimization theory and subsequently focuses on how machine learning-based predictive models can offer new perspectives and analytical tools. These tools are aimed at addressing the inherent non-linearity, dynamic characteristics, and uncertainty prevalent in financial markets. As a comprehensive review, this paper is valuable for understanding the broader landscape of machine learning applications within portfolio optimization.
- **Paper 3:** "An Overview of Machine Learning for Portfolio Optimization" by Yongjae Lee, Jang Ho Kim, Woo Chang Kim, and Frank J. Fabozzi (2024), published in The Journal of Portfolio Management [10], explicitly aims to provide a comprehensive examination of how machine learning is being applied in the field of portfolio optimization. The abstract suggests a particular focus on the parameter estimation and optimization phases of portfolio management, where machine learning techniques are enhancing traditional approaches. Given its title and the reputable journal, this paper serves as a valuable overview for both practitioners and academics.
- **Paper 4:** "Machine Learning and Factor-Based Portfolio Optimization" by Thomas Conlon, John Cotter, and Iason Kynigakis (2021), a Working Paper from the Geary Institute, University

College Dublin [12], introduces a specific and potentially novel methodology. This research examines the intersection of machine learning techniques with traditional factor-based portfolio optimization models. The integration of data-driven machine learning methods with established financial models represents a relevant and actively evolving area of research in quantitative finance.

- **Paper 5:** "Risk reduction and portfolio optimization using clustering methods" by Jörn Sass and Anna-Katharina Thös (2024), published in Econometrics and Statistics [13], focuses on a particular machine learning technique – clustering – and its application in portfolio optimization with the primary objective of risk reduction. The paper explores the use of various clustering algorithms to group assets for portfolio construction, aiming to achieve better risk diversification and overall portfolio performance. This investigation into the application of clustering represents a distinct and important area within the broader field of machine learning in finance.

These five additional papers, summarized in the table below, offer valuable insights into recent research trends and novel methodologies at the intersection of machine learning and portfolio optimization.

Title	Authors	Publication Year	Journal/Conference	URL/DOI	Main Contribution/Novelty
Portfolio Optimization Using a Hybrid Machine Learning Stock Selection Model	Joshua S. Masuda	2024	Thesis (MIT)	https://dspace.mit.edu/handle/1721.1/157186	Proposes and evaluates a portfolio optimization model using hybrid machine learning techniques (CNN-LSTM and BiLSTM-BO-LightGBM) for enhanced stock selection.
Portfolio Optimization Strategies: New Approaches Based on Machine Learning Forecasting	Xuanlin Lyu	2024	Highlights in Business Economics and Management	https://www.researchgate.net/publication/383710710_Portfolio_Optimization_Strategies_New_Approaches_Based_on_Machine_Learning_Forecasting	Provides a review of recent advancements in portfolio optimization strategies that leverage machine learning for improved forecasting and decision-making.
An Overview of Machine Learning for Portfolio Optimization	Yongjae Lee, Jang Ho Kim, Woo Chang Kim, Frank J. Fabozzi	2024	The Journal of Portfolio Management	https://www.pm-research.com/content/iijpormgmt/51/2/131	Offers a comprehensive examination of how machine learning is applied in portfolio optimization, particularly in parameter estimation and the optimization process itself.
Machine Learning and Factor-Based Portfolio Optimization	Thomas Conlon, John Cotter, Iason Kynigakis	2021	Working Paper (University College Dublin)	https://ideas.repec.org/p/ucd/wpaper/202111.html	Investigates the application of machine learning methods to enhance and potentially outperform traditional factor-based approaches in portfolio optimization.
Risk reduction and portfolio optimization using clustering methods	Jörn Sass, Anna-Katharina Thös	2024	Econometrics and Statistics	https://ideas.repec.org/a/eee/ecosta/v32y2024icp1-16.html	Explores the use of various clustering techniques from machine learning to group assets for portfolio construction, aiming to achieve better risk diversification and overall portfolio performance.

The identification of these additional papers reinforces the observed trends, highlighting a strong research focus on leveraging sophisticated machine learning models for stock selection, providing comprehensive reviews of ML applications in portfolio optimization, integrating ML with established financial frameworks, and utilizing specific ML methodologies like clustering for enhanced risk management. This diverse range of research underscores the multifaceted and actively evolving nature of this field.

Deep Dive into Selected Literature: Analysis of Key Contributions

The recent academic literature on the application of machine learning in portfolio optimization reveals several key themes. These themes encompass the use of machine learning for enhancing return forecasting, employing AI-driven strategies for asset selection and classification, utilizing clustering methodologies for risk diversification, and exploring novel hybrid approaches and advanced techniques.

- **Theme 1: Machine Learning for Enhanced Return Forecasting in Portfolio Optimization**

A significant area of research focuses on leveraging machine learning techniques, particularly regression models, to improve the accuracy of asset return forecasts, which are critical inputs for portfolio optimization models. In their work, Masuda (2024) in "Portfolio Optimization Using a Hybrid Machine Learning Stock Selection Model" explores the efficacy of various individual and hybrid machine learning techniques for predicting stock prices [5]. The study's findings indicate that hybrid models, which combine the strengths of different ML architectures, generally achieve superior performance compared to individual models.

Notably, the CNN-LSTM model demonstrated the best results when evaluated against benchmark market indices. This outcome suggests that integrating different types of neural networks can lead to a more comprehensive understanding of stock price movements, resulting in more accurate forecasts that can subsequently enhance portfolio optimization strategies. Lyu (2024) in "Portfolio Optimization Strategies: New Approaches Based on Machine Learning Forecasting" highlights the capability of machine learning predictive models to offer novel tools for addressing the inherent non-linearity and uncertainty present in financial markets [6].

This implies that machine learning can generate forecasts that are more accurate and reliable than those derived from traditional linear models, which often struggle to capture the complexities of real-world financial dynamics. The review emphasizes the potential of these advanced forecasting techniques to provide financial scholars and practitioners with a new perspective on portfolio optimization. Furthermore, a discussion on regression analysis in a Medium article outlines the applications of various regression techniques, including linear, multiple, logistic, ridge, and lasso regression, in predicting stock returns and constructing optimized portfolios [14]. The article underscores how these models can identify the factors that significantly influence stock performance and assess the correlations between different assets, both of which are essential for making informed portfolio decisions. It also notes the limitations of linear models and the advantages of employing regularization techniques like Ridge and Lasso to improve the generalization ability of the models and facilitate feature selection. Empirical evidence for the value of machine learning in forecasting is provided by a study in MDPI, which examines the out-of-sample predictive power of regression models for forecasting sector returns [15].

The research demonstrates that portfolio optimization utilizing these machine learning-based predicted returns within a Black-Litterman framework significantly outperforms portfolios constructed using historical averages and passive benchmark strategies. This finding provides practical validation for the use of machine learning in enhancing portfolio performance through improved forecasting accuracy. In a comparative study published in the Journal Of Advanced Zoology, Linear Regression, Support Vector Regression, and Random Forest models were evaluated for their ability to predict the stock prices of Tata Consultancy Services (TCS) [16].

The results of this study indicated that Linear Regression, after appropriate hyperparameter tuning, achieved better performance in terms of Root Mean Squared Error (RMSE) compared to SVR and Random Forest in this specific application. This outcome suggests that the selection of the most suitable machine learning model for forecasting can be highly dependent on the particular dataset and the specific characteristics of the stock being analyzed. Finally, an excerpt from Medium further explains the diverse applications of regression analysis in investment and portfolio optimization, reinforcing its fundamental role within the broader context of machine learning applications in finance [14]. These various studies collectively highlight the significant role of machine learning, particularly through regression-based techniques, in improving the accuracy of asset return forecasts, which is a cornerstone of effective portfolio optimization.

➢ **Theme 2: AI-Driven Asset Selection and Classification Strategies**

Another prominent area of research explores the use of machine learning classification techniques to categorize assets, such as identifying potential outperformers versus underperformers, as a direct strategy for portfolio selection. A study published in MDPI describes the application of several machine learning models, including Random Forest (RF), Feedforward Neural Network (FNN), Gated Recurrent Unit (GRU), and Financial Graph Attention Network (FinGAT), for selecting stocks in the Taiwan stock market [17]. These models were trained using financial ratios to predict the relative return of stocks compared to the TW50 index, with the goal of constructing portfolios comprising the stocks with the highest predicted returns. Notably, the FinGAT model, which integrates both temporal and spatial modeling capabilities, achieved the most impressive excess returns, indicating the potential of advanced neural network architectures for identifying promising investment opportunities.

Focusing on a similar objective, research featured in FOR examines the binary classification of stocks into outperformer and underperformer categories using a range of machine learning models, including Deep Neural Networks (DNNs), LSTM, Random Forest (RF), gradient boosting, and regularized logistic regression [18]. These models are trained on weekly stock data and various relevant features to predict the future relative performance of stocks. The study underscores the potential of machine learning to enhance stock selection by uncovering complex, non-linear relationships that traditional linear models might overlook. In a comparative analysis published in Engineering Letters, multi-classification logistic regression and multi-classification XGBoost algorithms were applied to multi-factor stock picking strategies using data from the CSI-300 index [19].

The findings of this research indicate that the strategy based on multi-classification logistic regression achieved higher cumulative income and a better Sharpe ratio compared to the XGBoost algorithm and an equal-weighted linear multi-factor strategy, suggesting the effectiveness of logistic regression in identifying profitable stocks while also considering risk-adjusted returns. A paper published in PMC proposes a novel strategy aimed at improving the prediction efficiency of various machine learning classification models, including Random Forest, XGBoost, ADA Boost, and Artificial Neural Networks (ANN), for application in financial markets [20].

This study emphasizes the importance of evaluating the performance of these models beyond standard classification metrics such as accuracy and advocates for the use of simulation models to comprehensively assess the risk and returns associated with each machine learning model in a realistic market context. These findings collectively demonstrate the increasing interest and success in utilizing machine learning classification techniques as a direct and effective approach to asset selection in portfolio management.

➢ **Theme 3: Clustering Methodologies for Risk Diversification in Portfolio Construction**

Another significant theme in the recent literature involves the exploration of machine learning clustering algorithms to group assets with similar characteristics, with the primary aim of improving portfolio diversification and effectively managing risk. Research featured in FSC discusses the application of both network-based methods, such as Louvain Community Detection and Minimum Spanning Tree (MST), and clustering-based methods, including K-Means Clustering and Hierarchical Clustering, for asset selection in portfolio optimization [21]. The study's results indicate that combining these clustering techniques with different portfolio optimization models, such as equal-weighted, mean-variance, and Hierarchical Risk Parity (HRP), can lead to enhanced risk-adjusted performance through improved diversification. For example, the combination of Louvain Community Detection with mean-variance optimization significantly improved cumulative returns, and HRP proved effective in balancing both profitability and acceptable risk levels.

Notably, the MST method showed the best performance when paired with HRP optimization. In a related vein, a paper published in Econometrics and Statistics proposes the use of clustering techniques to divide assets into non-overlapping clusters based on their return rates and associated risk levels [22]. The study suggests a strategy where the asset with the best Sharpe ratio from each identified cluster is selected to form a new portfolio, termed the cluster portfolio, with equal weights assigned to the selected assets. Empirical analysis shows that this cluster portfolio can inherit the advantages of a traditional equal-weight portfolio and, in some cases, even outperform it, highlighting the potential of clustering to reduce the number of assets in a portfolio while maintaining or improving diversification benefits. This methodology is further elaborated upon by Sass and Thös (2024) in their paper "Risk reduction and portfolio optimization using clustering methods," where they provide additional empirical evidence supporting the effectiveness of cluster-based portfolios for risk

reduction and achieving competitive returns [13]. Investigating specific clustering algorithms, a study in IJAAP explores the use of K-Means and agglomerative hierarchical clustering for portfolio diversification, utilizing daily log returns of stocks as features [23].

The findings indicate that portfolios constructed using both K-Means and agglomerative clustering methods exhibited lower annualized volatility compared to randomly selected stocks and had volatility levels relatively close to that of an equally weighted portfolio comprising all the stocks in the dataset. This suggests that clustering can be an effective tool for achieving risk diversification, particularly in terms of reducing portfolio volatility. Comparing different clustering approaches, an article in Quantpedia examines the application of Partitioning Around Medoids (PAM), Agglomerative Nesting (AGNES), and Gaussian Mixture Model (GMM) clustering methods in portfolio management [24].

The article explores the use of both equal weight and risk parity weight allocation strategies within the formed clusters. The analysis suggests that combining clustering methods with risk parity weighting, which aims to equalize the risk contribution from each cluster, is a sensible approach for risk management. In this specific study, PAM clustering, when used with both equal weighting and risk parity weighting schemes, achieved the best risk-adjusted performance. These various studies collectively underscore the significant role of machine learning clustering techniques in enhancing risk diversification and potentially improving the performance of investment portfolios by identifying and grouping assets with similar characteristics.

- **Theme 4: Novel Hybrid Approaches and Advanced Techniques**

Beyond the core applications of regression, classification, and clustering, the literature also reveals a growing interest in developing novel hybrid approaches and exploring advanced machine learning techniques for portfolio optimization. As highlighted earlier, Masuda (2024) in "Portfolio Optimization Using a Hybrid Machine Learning Stock Selection Model" employs sophisticated hybrid machine learning models, such as CNN-LSTM and BiLSTM-BO-LightGBM, for stock selection [5].

The CNN-LSTM model, for instance, combines the spatial feature extraction capabilities of Convolutional Neural Networks with the temporal sequence modeling abilities of Long Short-Term Memory networks. The observed superior performance of these hybrid models suggests that integrating the strengths of different neural network architectures can lead to more accurate predictions and, consequently, better portfolio optimization outcomes by capturing the multifaceted dynamics of financial markets. In their work on "Machine Learning and Factor-Based Portfolio Optimization," Conlon et al. (2021) investigate the integration of machine learning with traditional factor-based models [12].

The findings indicate that factors derived from autoencoder neural networks exhibit different relationships with characteristic-sorted portfolios compared to simpler dimensionality reduction techniques. This suggests that machine learning can offer novel and potentially more effective ways to identify and utilize factors for portfolio optimization, potentially uncovering non-linear factor relationships that traditional methods might miss, leading to improved risk-adjusted returns. The use of FinGAT (Financial Graph Attention Network) in the MDPI paper discussed previously also represents a novel and advanced technique [17].

FinGAT combines a Gated Recurrent Unit (GRU) for modeling temporal dependencies with a Graph Attention Network (GAT) to capture the complex relationships and dependencies between different stocks in the market. The superior performance of FinGAT in stock selection highlights the potential of graph neural networks to explicitly model the interconnectedness of financial assets for enhanced investment decision-making. Finally, the mention of "Quantum machine learning and optimisation in finance" in the Google Scholar results [7] points towards the exploration of cutting-edge computational techniques for portfolio optimization.

Quantum machine learning, a nascent field, aims to leverage the principles of quantum mechanics to develop more powerful machine learning algorithms that could potentially solve currently intractable optimization problems more efficiently than classical computers. While still in its early stages of development, this area holds significant promise for future breakthroughs in financial modeling and portfolio optimization. These novel hybrid approaches and advanced techniques signify a continuous evolution in the application of machine learning to portfolio optimization, pushing the boundaries of what is currently achievable.

Discussion

The reviewed literature collectively demonstrates a significant and growing trend towards the application of various machine learning techniques in portfolio optimization. These techniques are being employed to enhance different facets of the process, including improving the accuracy of asset return forecasts through sophisticated regression models and hybrid

architectures, directly selecting promising assets using classification models, and enhancing risk diversification by grouping similar assets via clustering algorithms.

Furthermore, the research landscape reveals an increasing interest in exploring more advanced and novel approaches, such as the integration of machine learning with traditional factor-based models, the application of graph neural networks to capture complex market interdependencies, and the investigation of quantum machine learning for potentially revolutionary advancements.

The key findings across these studies highlight the superior performance of hybrid machine learning models in stock prediction, the tangible benefits of ML-based regression in improving portfolio returns, the effectiveness of various classification models in identifying stocks with potential for outperformance, the utility of clustering techniques for achieving risk diversification and simplifying portfolio construction, and the promising potential of advanced techniques like FinGAT and quantum ML for future breakthroughs in the field. Despite these advancements, the literature also acknowledges several limitations and challenges. These include the critical importance of data quality and the potential for biases in financial datasets, the risk of overfitting complex machine learning models to historical data, the often limited interpretability of "black-box" ML models, and the inherent unpredictability of financial markets that can challenge even the most sophisticated predictive techniques.

Traditional regression models are also noted to be sensitive to outliers and may struggle with non-linear relationships, while the evaluation of ML models for stock selection requires careful consideration beyond standard classification metrics to include financial performance indicators. In the context of clustering, there is a recognition that the choice of algorithm and the subsequent weight allocation strategies are crucial, and clustering might sometimes inadvertently increase the weight of underperforming assets. Several potential avenues for future research emerge from this review. One promising direction is the exploration and application of explainable AI (XAI) techniques to enhance the interpretability of complex machine learning models used in portfolio optimization. This would allow practitioners to better understand the reasoning behind model predictions and recommendations, fostering greater trust and adoption.

Another important area is the investigation of reinforcement learning (RL) for developing dynamic and adaptive portfolio management strategies that can learn and adjust to changing market conditions in real-time. Further research is also needed to develop more robust and adaptive ML models that can effectively handle market regime changes, unforeseen economic events, and the non-stationarity of financial time series data. The potential of quantum computing and quantum machine learning for solving computationally intensive portfolio optimization problems warrants continued exploration as these technologies mature.

Finally, future research could focus on developing more standardized evaluation frameworks for rigorously comparing the performance of different ML-based portfolio optimization strategies and on addressing the ethical considerations that arise with the increasing use of artificial intelligence in financial decision-making.

Conclusion

In conclusion, this review of recent academic literature underscores the significant impact and transformative potential of machine learning in the field of portfolio optimization. Machine learning offers a powerful suite of tools for enhancing various aspects of investment management, including more accurate forecasting of asset returns, more effective selection of high-potential assets, and improved management of portfolio risk through diversification strategies.

The on-going integration of machine learning with traditional financial models, coupled with the exploration of novel and advanced techniques such as graph neural networks and quantum computing, indicates a clear trajectory towards a future where data-driven approaches will play an increasingly central role in both academic research and practical investment management. While the advancements in this interdisciplinary field are promising, it is crucial to continue to acknowledge and address the inherent challenges and limitations associated with the application of machine learning in finance. This includes a focus on data quality, model robustness, interpretability, and the ability to adapt to the dynamic and often unpredictable nature of financial markets. Continued collaboration between experts in machine learning and finance will be essential to fully unlock the potential of this synergistic evolution, leading to more sophisticated, efficient, and adaptive portfolio optimization strategies that can ultimately benefit investors and the financial industry as a whole.

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Cyber Victimization and Suicide Risk: A Systematic Review of Risk Factors, Psychological Mechanisms, and Intervention Strategies

Megha Rathore, Bigi Thomas

Abstract:

This systematic review dives into the growing body of research on cyber victimization and its connection to suicide risk, shedding light on the key factors, psychological impacts, vulnerable groups, and potential solutions. Cyber victimization-marked by anonymity, the lasting nature of harmful content, and public exposure-has been increasingly tied to suicidal thoughts and actions, especially among teens and young adults. To explore this issue, we thoroughly searched studies published between 2015 and 2025 using Google Scholar and PubMed. Out of an initial pool of 380 studies, 20 met our criteria and were analyzed in depth. The findings reveal that the anonymity of perpetrators, the permanence of damaging content, and the public humiliation experienced by victims play a significant role in causing psychological distress. Depression, anxiety, feelings of being a burden, social withdrawal, and sleep problems emerged as key psychological pathways that link cyber victimization to a higher risk of suicide. Certain groups are particularly vulnerable, including adolescents, young adults, females, and marginalized communities, who often experience heightened emotional pain and are more likely to develop suicidal thoughts. To combat these negative effects, the review highlights the importance of intervention strategies such as school-based prevention programs, parental involvement, mental health support, and stricter regulations on social media platforms. By bringing together the latest research, this review offers a comprehensive understanding of how cyber victimization increases suicide risk. It also provides valuable insights for policymakers, educators, mental health professionals, and digital platform regulators to strengthen prevention and intervention efforts.

Keywords: *Cyber victimization, suicide risk, suicidal ideation, mental health, intervention strategies*

Introduction:

The internet is everywhere and in this digital era, the issue of cyber victimization has become worldwide aiming particularly at adolescents and young adults. Cyber victimization refers to the experience of being targeted (Kowalski et al., 2020; Wright & Wachs, 2021) by harmful or aggressive behaviors (Kowalski et al., 2020; Wachs et al., 2021) through digital or online platforms, such as social media, messaging apps, or gaming platforms (Bottino et al., 2020; Garett et al., 2021). These behaviors can include harassment, threats, exclusion, or the spread of harmful content (Zych et al., 2020; Barlett & Helmstetter, 2021), often resulting in psychological or emotional harm (Kwan et al., 2020; Marciano et al., 2022). Cyber victimization is characterized by the use of technology to perpetrate these acts (Bottino et al., 2020) and may involve a power imbalance between the perpetrator and the victim, as well as repetition over time (Kowalski et al., 2020; Zych et al., 2020). Cyber victimization differs from traditional bullying in several key ways. First, perpetrators of cyber victimization can often remain anonymous, which reduces accountability and increases disinhibition, enabling more aggressive behaviors (Runions et al., 2021; Craig & Smith, 2020). Second, harmful content in cyber victimization can persist indefinitely and be easily shared, making it difficult for victims to escape the harassment (Slonje et al., 2020; Patchin & Hinduja, 2021). Unlike traditional bullying, which is confined to specific locations like schools, cyber victimization transcends physical boundaries, occurring anytime and anywhere due to the 24/7 accessibility of digital platforms (Tokunaga, 2020; Ybarra & Mitchell, 2021). Additionally, cyber victimization often occurs in front of a larger audience, as harmful content can be disseminated widely and quickly, amplifying the humiliation and embarrassment for victims (Hinduja & Patchin, 2020; Smith et al., 2021). Victims also find it harder to escape cyber victimization due to the constant connectivity of digital platforms, which are integral to daily life (Kowalski et al., 2021; Wachs et al., 2022). Furthermore, cyber victimization typically occurs in minimally supervised online spaces, such as social media or gaming platforms, making it harder for adults to monitor and intervene (Runions et al., 2021; Patchin & Hinduja, 2021). Finally, the psychological impact of cyber victimization is often more severe, as its pervasive and invasive nature leads to higher levels of anxiety, depression, and suicidal ideation compared to traditional bullying (Marciano et al., 2022; Wright & Wachs, 2021). Suicide is a major public health concern, and recent research underscores cyber victimization as a significant risk factor, particularly among adolescents and young adults. The anonymity of online perpetrators reduces accountability, enabling more severe and relentless harassment, which can lead to feelings of helplessness and hopelessness, increasing the risk of suicidal ideation (Runions et al., 2021; Craig & Smith, 2020; John et al., 2020). The persistence of harmful online content means victims are repeatedly exposed to harassment, exacerbating feelings of despair and isolation (Slonje et al., 2020; Patchin & Hinduja, 2021; Marciano et al., 2022). Unlike traditional bullying, cyber victimization transcends physical boundaries, occurring anytime and anywhere, which increases stress and reduces opportunities for recovery (Tokunaga, 2020; Ybarra & Mitchell, 2021; Wright & Wachs, 2021). The public nature of cyber victimization amplifies humiliation and shame, as harmful content can reach a large audience quickly, intensifying emotional distress (Hinduja & Patchin,

2020; Smith et al., 2021; Garett et al., 2021). Additionally, the constant connectivity of digital platforms makes it difficult for victims to escape, leading to prolonged emotional distress and a sense of entrapment, both of which are key risk factors for suicide (Kowalski et al., 2021; Wachs et al., 2022; Kwan et al., 2020). The lack of oversight in online spaces often delays intervention, exacerbating feelings of isolation and hopelessness (Runions et al., 2021; Patchin & Hinduja, 2021; Barlett & Helmstetter, 2021). Finally, the severe psychological impact of cyber victimization, including depression, anxiety, and feelings of worthlessness, significantly increases the likelihood of suicidal ideation and behavior (Marciano et al., 2022; Wright & Wachs, 2021; Zych et al., 2020). Addressing cyber victimization as a public health issue is critical to reducing suicide rates and improving mental health outcomes for vulnerable populations. This paper aims to systematically review empirical studies published between 2015 and 2025 that examine the relationship between cyber victimization and suicide. The review will focus exclusively on empirical studies that provide primary data, excluding systematic reviews, meta-analyses, and longitudinal studies to ensure a focused analysis of cross-sectional and experimental research. By synthesizing findings from this decade-long period, the review seeks to identify key patterns, risk factors, and protective factors associated with cyber victimization and its impact on suicidal ideation, attempts, and completions. The inclusion criteria will prioritize studies that explore the psychological, social, and behavioral mechanisms linking cyber victimization to suicide, with a particular emphasis on vulnerable populations such as adolescents and young adults. This systematic review will contribute to a deeper understanding of the public health implications of cyber victimization and inform evidence-based interventions to mitigate its impact on mental health and suicide risk.

Objectives of the Systematic Review

- To Identify Key Risk Factors: Examine the empirical evidence to identify the primary risk factors (e.g., anonymity, persistence, public humiliation) that link cyber victimization to increased suicide risk.
- To Explore Psychological Mechanisms: Investigate the psychological mechanisms (e.g., depression, anxiety, feelings of hopelessness) through which cyber victimization contributes to suicidal ideation and behavior.
- To Assess Vulnerable Populations: Analyze how different demographic groups (e.g., adolescents, young adults, LGBTQ+ individuals) are disproportionately affected by cyber victimization and its association with suicide.
- To Inform Intervention Strategies: Synthesize findings to propose evidence-based intervention strategies that can mitigate the impact of cyber victimization on suicide risk, focusing on prevention, support systems, and policy recommendations.

Methodology:

We followed the PRISMA 2020 guidelines to ensure a clear, structured, and transparent process for this systematic review as below:

- **Initial Search and Deduplication:**
  - We conducted a comprehensive search across major databases like PubMed, PsycINFO, Scopus, and Web of Science, using keywords such as "cyber victimization," "suicide risk," and "adolescents." We also manually checked reference lists from relevant studies to ensure we didn't miss anything. This search yielded 380 records (n=380).
  - After removing duplicates, we were left with 320 unique records (n=320) for screening.
- **Title and Abstract Screening:**
  - We screened the titles and abstracts of the 320 records to identify studies that fit our focus on cyber victimization and suicide risk in adolescents and young adults (ages 12–25).
  - After this initial screening, we excluded 280 records that did not meet our criteria, leaving us with 40 potential studies (n=40) for full-text review.
- **Full-Text Review:**
  - We then read the full texts of the 40 studies to confirm they met our inclusion criteria: they had to be empirical studies (not reviews) published in English between 2015 and 2025, and they had to explore psychological mechanisms or risk/protective factors related to cyber victimization and suicide.
  - After the full-text review, we excluded 20 studies that did not meet the criteria, leaving us with 20 studies (n=20) for inclusion in the review.
- **Data Extraction and Synthesis:**
  - We extracted data from the 20 included studies, focusing on sample characteristics, key findings, and psychological mechanisms. Two reviewers independently screened and assessed the studies, resolving any disagreements through discussion or with help from a third reviewer.
  - The results were synthesized narratively, with themes like anonymity, persistence of harmful content, and protective factors like parental support.

Results & Discussion:

- **Risk Factors**

This systematic review highlights several interconnected risk factors that contribute to the serious psychological harm and suicide risk associated with cyber victimization. Through an analysis of empirical studies, five primary risk factors emerged, reinforcing and amplifying the others, creating a complex and inescapable cycle for victims.

- **Anonymity and Unchecked Aggression**

One of the most significant features of cyber victimization identified across studies is the anonymity of perpetrators, which plays a critical role in enabling repeated and severe harassment without accountability. Online platforms allow bullies to hide their identity, using fake profiles or anonymous accounts to launch attacks without being identified or punished (Reed, 2015; Underwood, 2017; Massing-Schaffer & Nesi, 2019; Lee et al., 2023). This lack of accountability encourages more extreme forms of bullying, as perpetrators feel emboldened to say and do things they would likely avoid in face-to-face interactions. Victims are left to suffer in silence, not knowing who is targeting them, which contributes to an ongoing sense of fear and helplessness.

- **Persistence of Harmful Content and the Inescapability of Abuse**

Closely linked to anonymity is the persistence of harmful content, which exacerbates the emotional harm caused by cyber victimization. Unlike traditional bullying, where words and actions may be fleeting, harmful content shared online - including abusive messages, humiliating images, or videos - remains permanently accessible, often being reshared or commented on repeatedly (Reed, 2015; Underwood, 2017; Massing-Schaffer & Nesi, 2019). Victims are unable to move past the bullying because they continue to encounter the content over time, and knowing that others may still view it adds to ongoing shame and distress. This prolonged exposure prevents psychological recovery and fosters chronic anxiety and depression, increasing the risk of suicidal ideation.

- **Public Humiliation and Amplification of Psychological Harm**

The public nature of cyber victimization further intensifies the psychological damage. Studies demonstrate that bullying conducted in online spaces is often not private - rather, it occurs in front of a broad, often unknown, audience (Reed, 2015; Underwood, 2017; Roberts, 2016; Maurya, 2022). Victims experience public humiliation, which magnifies their emotional pain, as their suffering becomes entertainment or gossip for others. The fear of social rejection, combined with visible shaming, leads to severe damage to self-esteem, profound feelings of worthlessness, and social isolation. For many adolescents and young adults - whose identities are still forming - this public exposure can be particularly devastating and is closely linked to both self-harming behaviors and suicidal ideation.

- **Constant Connectivity and the Inability to Escape**

Adding to this is the reality of constant digital connectivity, which makes cyber victimization a relentless experience. Unlike traditional bullying, which is typically confined to specific places like schools, cyberbullying follows victims everywhere, invading even their most private spaces like their homes and bedrooms (Reed, 2015; Wright & Wachs, 2021; Maurya, 2022; Peng, 2019). Because young people are constantly connected to digital platforms — for education, socializing, and entertainment — they cannot easily log off or disconnect to avoid their bullies. This 24/7 exposure leads to persistent emotional strain, chronic anxiety, and a growing sense of entrapment. Victims describe feeling like there is no safe place where they can escape harassment, contributing to a sense of hopelessness that heightens suicide risk.

- **Lack of Oversight and Support in Online Spaces**

Compounding all these risk factors is the lack of oversight in online spaces. Many digital platforms lack adequate monitoring and rapid intervention mechanisms, leaving victims vulnerable and bullies unchecked (Reed, 2015; Barlett & Helmstetter, 2021; Strohacker, 2019; Azami, 2020). Even when victims report abusive content, responses are often delayed, minimal, or absent, which sends a message to perpetrators that their behavior has no consequences and leaves victims feeling abandoned. This absence of adult or authoritative intervention increases victims' feelings of isolation, making them believe that no one is willing or able to help them. As a result, the emotional damage escalates, and suicidal thoughts may become more frequent and intense as a way to escape the unrelenting torment. What is particularly important to note is that these risk factors are not isolated; rather, they work together to compound the harm experienced by victims. The anonymity of bullies makes the attacks bolder and more frequent. Because harmful

content stays online, the bullying doesn't stop when the victim logs off — if they even can. The public nature of the bullying ensures maximum shame and humiliation. Constant connectivity makes sure there's no reprieve, and the lack of proper oversight makes it clear that no help is coming. Together, these interconnected factors create a toxic and relentless environment for victims. The continuous exposure to abuse, the feeling of being watched and judged by others, and the absence of protection all contribute to deep psychological wounds, including depression, anxiety, hopelessness, and suicidal ideation. The cumulative nature of these risks means that even if a victim could handle one element (e.g., a mean comment), when all these risks are present simultaneously, the emotional burden can become overwhelming and unbearable, pushing some toward self-harm and suicidal behaviors.

- **Psychological Mechanisms**

This systematic review identifies several interconnected psychological mechanisms through which cyber victimization increases the risk of suicide. These mechanisms reflect the complex emotional and cognitive processes that victims experience and how these processes escalate to suicidal ideation and behavior.

- **Depressive Symptoms: The Emotional Weight of Cyber Victimization**

One of the most frequently reported outcomes of cyber victimization is the development of severe depressive symptoms. Victims often experience deep feelings of sadness, hopelessness, and worthlessness that grow stronger over time, particularly when bullying is persistent and public (Reed, 2015; Mitchell, 2016; Brailovskaia, 2018). These depressive feelings can become overwhelming, leaving victims emotionally drained and without hope for improvement, making suicidal ideation seem like an escape from ongoing pain.

- **Anxiety and Hopelessness: The Chronic Fear of Being Targeted**

Victims of cyberbullying frequently report experiencing chronic anxiety as a result of relentless harassment (Reed, 2015; Underwood, 2017). Victims live in constant fear of when and how the next attack will come, leading to ongoing hypervigilance and stress. Over time, this anxiety transforms into hopelessness, as victims come to believe that their situation will never improve. This combination of fear and hopelessness becomes a critical driver of suicidal thoughts as victims see no way out of their suffering (Kreski et al., 2021).

- **Perceived Burdensomeness: The Belief that 'Everyone is Better off Without Me'**

Several studies highlight perceived burdensomeness as a key psychological pathway linking cyber victimization to suicide (Mitchell, 2016; Massing-Schaffer & Nesi, 2019). Victims start to internalize the belief that they are a burden on their families and friends - that their existence only causes problems. These thoughts are dangerous because they normalize suicidal thinking, with victims perceiving death as a way to "relieve" others from the "burden" of supporting them.

- **Thwarted Belongingness: Isolation and Loneliness**

Alongside burdensomeness, cyber victimization often leads to thwarted belongingness, or a profound sense of not fitting in or being rejected by peers (Mitchell, 2016; Meng, 2022). Because cyberbullying often occurs in public online spaces, victims feel socially isolated and excluded, believing that no one likes or cares about them. This sense of loneliness and disconnection is a significant predictor of suicidal ideation, as humans have a fundamental need for belonging, and when that is broken, mental health rapidly deteriorates.

- **Rumination and Insomnia: The Vicious Cycle of Negative Thinking and Sleeplessness**

Another key finding across studies is that victims engage in rumination - repetitive negative thinking where they replay the bullying incidents in their minds (Zou, 2023; Mitchell, 2016). This mental "loop" prevents emotional healing and reinforces negative self-perceptions. Alongside rumination, many victims suffer from insomnia, as stress and fear make it impossible to sleep (Yang et al., 2021). The combination of constant negative thoughts and lack of sleep worsens emotional regulation, pushing victims closer to suicidal ideation.

- **Psychotic Experiences: The Extreme Impact of Cyber Victimization**

In severe cases, victims of cyber victimization may begin experiencing psychotic symptoms, such as hearing voices, hallucinations, or paranoia (Romdhane, 2024; Brailovskaia, 2018). These symptoms represent a breakdown in mental stability, making victims feel as though they are losing control of their minds. Such terrifying experiences further increase suicide risk, as victims may act on distorted perceptions of reality

or feel driven to escape from unbearable mental states. Importantly, these psychological mechanisms do not operate in isolation. Depression, anxiety, hopelessness, perceived burdensomeness, and social isolation often occur together, reinforcing each other in a vicious cycle. For instance, a victim who feels hopeless is also more likely to feel like a burden and to believe that no one cares for them, while anxiety and sleeplessness weaken their ability to cope. Rumination and insomnia intensify depressive and anxious symptoms, while psychotic experiences may develop when the emotional pain becomes unmanageable. Thus, the pathway from cyber victimization to suicide risk is a complex, intertwined process, where emotional, cognitive, and behavioral factors interact to deepen distress and diminish protective mental resources. Recognizing these interconnected mechanisms is crucial for developing effective interventions that address not only the external bullying behaviors but also the internal psychological wounds that victims carry.

- **Vulnerable Population at Risk**

A critical finding from this review is that certain populations are especially vulnerable to the devastating effects of cyber victimization, including heightened risks of depression, anxiety, and suicidal ideation. These groups face specific social, developmental, and identity-related challenges that make them more susceptible to the psychological harm caused by online bullying.

- **Adolescents and Young Adults: A Developmental Vulnerability**

Adolescents and young adults are among the most vulnerable groups to cyber victimization and its mental health consequences (Reed, 2015; Roberts, 2016). This heightened vulnerability is due to the ongoing emotional, cognitive, and social development that occurs during these life stages. Adolescents are still forming their sense of identity and self-worth and have not yet fully developed coping mechanisms for managing severe emotional distress. As a result, when they are exposed to cyberbullying, they are more likely to experience deep emotional pain, depression, and suicidal ideation. Unlike adults, they often lack the emotional resilience and support systems needed to withstand sustained bullying, making them highly susceptible to suicide risk.

- **LGBTQ+ Youth: The Pain of Identity-Based Victimization**

LGBTQ+ youth are disproportionately targeted for cyber victimization, often facing bullying directly tied to their sexual orientation and gender identity (Massing-Schaffer & Nesi, 2019; Reed, 2015). This identity-based bullying makes them feel rejected and unsafe in both online and offline environments. The repeated and targeted nature of these attacks increases feelings of isolation and leads to severe emotional distress and suicidal thoughts. Given the challenges they already face, such as family rejection or societal stigma, cyber victimization becomes an additional layer of suffering, further pushing them toward hopelessness and suicidal ideation.

- **Female Adolescents: Gendered Vulnerability to Emotional Harm**

Female adolescents are found to be especially vulnerable to the emotional consequences of cyber victimization, exhibiting higher rates of depression and suicidal ideation than their male peers (Zou, 2023; Yang et al., 2021). Girls are often the targets of bullying related to appearance, relationships, and social status, areas that are deeply tied to their self-esteem. When these aspects are attacked publicly online, female adolescents often experience profound emotional pain, shame, and a sense of social rejection, which can escalate into suicidal thoughts. Moreover, societal pressures on girls to appear socially successful and attractive exacerbate their emotional reactions to cyberbullying.

- **Marginalized and Non-White Populations: The Intersection of Discrimination and Bullying**

Youth from marginalized and non-White populations experience compounded risks due to overlapping forms of discrimination (Sergent, 2016; Lee et al., 2023). These young people are often bullied for both their race/ethnicity and personal characteristics, leading to intersectional victimization that is more severe than general bullying. The constant experience of racism, coupled with cyberbullying, increases feelings of being "othered" and rejected by society. This intersection of discrimination makes them more prone to emotional distress, depression, and suicidal ideation as they struggle to cope with persistent exclusion and abuse.

- **Victims of Combined Traditional and Cyber Victimization: Nowhere Safe to Turn**

Another especially vulnerable group includes those who experience both traditional (face-to-face) bullying and cyberbullying. These victims face a double attack — being harassed in person and also online, leaving them without any refuge (Strohacker, 2019; Azami, 2020). Such

compounded bullying significantly increases the risk of severe depression, anxiety, and suicidal thoughts, as these individuals may feel utterly trapped and helpless. The constant stress from being targeted in multiple settings can overwhelm even those with some coping mechanisms, pushing them toward considering suicide as an escape from relentless victimization. These vulnerable populations do not experience these risk factors in isolation. For example, an LGBTQ+ adolescent who is also part of a racial minority and experiences both online and offline bullying faces multiple layers of victimization, leading to even more profound emotional and psychological harm. The cumulative impact of these factors exponentially increases suicide risk as the victim feels increasingly marginalized, rejected, and hopeless. These findings highlight the urgent need for targeted interventions that focus on these high-risk groups, addressing not only the bullying behaviors but also the underlying social and psychological vulnerabilities that make these populations more susceptible to suicide.

- **Intervention Strategies**

This systematic review reveals that cyber victimization is strongly and consistently associated with suicidal ideation, suicide attempts, and non-suicidal self-injury (NSSI) across multiple empirical studies. These outcomes reflect the severe psychological impact of sustained online bullying and highlight the critical importance of understanding and addressing these risks. One of the most alarming outcomes linked to cyber victimization is suicidal ideation. Studies consistently show that individuals who are bullied online frequently think about suicide (Reed, 2015; Mitchell, 2016; Brailovskaia, 2018). These thoughts are not fleeting or occasional; they tend to grow stronger and more persistent as the bullying continues, especially when the harassment is severe, public, or long-lasting. Victims often report that the bullying makes them feel trapped in emotional pain, with no hope for escape. As a result, suicide may begin to seem like the only way to end their suffering, highlighting a dangerous pathway from cyberbullying to suicidal thinking. Beyond suicidal ideation, the review found a direct link between cyber victimization and actual suicide attempts (Roberts, 2016; Strohacker, 2019). Many victims do not stop at thinking about suicide — they attempt to take their own lives, especially when the bullying is relentless and when victims feel unsupported by peers, family, or institutions. These suicide attempts often arise from a profound sense of hopelessness, social isolation, and the belief that there is no way to stop the bullying or escape the emotional torment it causes. This finding underscores the urgent need for intervention, as many of these suicide attempts might be preventable with timely and effective support. Another critical finding is that cyber victimization is closely associated with non-suicidal self-injury (NSSI). Victims often engage in self-harming behaviors, such as cutting, burning, or hitting themselves, as a way to cope with overwhelming emotional pain (Yang et al., 2021; Peng et al., 2019). Even though these actions are not intended to end life, they reflect a deep level of psychological suffering and can increase the risk of later suicide attempts. Victims may feel that hurting themselves is the only way to release the tension and emotional pain caused by the bullying, and without proper intervention, these behaviors can escalate. Importantly, these outcomes — suicidal ideation, suicide attempts, and NSSI — are closely interconnected. Victims often move between these states, with suicidal thoughts leading to self-harm, and self-harm potentially escalating to suicide attempts. The longer and more severe the cyber victimization, the more likely these outcomes are to occur, creating a dangerous and cumulative risk pathway. Victims who are left without support, validation, or intervention are especially vulnerable to moving from suicidal thinking to action. The review also shows that the psychological harm caused by cyber victimization is cumulative. Victims who experience ongoing bullying — particularly those who are also targeted in person (traditional bullying) — face even greater risks of suicide and self-harm. The constant exposure to harm, combined with feelings of public humiliation, isolation, and helplessness, makes suicide seem like an inevitable or only option for some individuals. In addition to identifying the severe risks associated with cyber victimization, this review also highlights key protective and intervention strategies that can help reduce suicide risk among victims. These strategies are essential for breaking the link between cyber victimization and its devastating outcomes.

- **Positive Mental Health: Building a Shield Against Suicide Risk**

  A recurring finding across studies is that positive mental health functions as a strong protective buffer against the negative effects of cyber victimization (Brailovskaia, 2018; Maurya, 2022). Victims who possess good emotional well-being, supportive relationships, and strong coping skills are less likely to develop suicidal thoughts when they are bullied online. Positive mental health acts as a psychological shield, helping individuals resist the internalization of negative messages and manage stress effectively. This finding underscores the need to promote

resilience, self-esteem, and emotional coping skills among youth as a preventive measure against suicide.

- **Parental Monitoring: The Role of Family Support**

  Parental monitoring has been shown to significantly reduce the harmful impact of cyber victimization, particularly among boys (Lee et al., 2023). Boys whose parents actively monitor their online activity and engage in open conversations about their digital lives are less likely to experience severe emotional consequences from bullying. Parental involvement provides a sense of safety, care, and protection, making victims feel less isolated and vulnerable. This demonstrates that family-based interventions - where parents are educated about online risks and encouraged to supervise and talk with their children - are crucial in suicide prevention efforts related to cyber victimization.

- **School-Based Anti-Cyberbullying Programs: Preventing Harm Before It Starts**

  Another critical strategy is the implementation of school-based anti-cyberbullying programs, which play a pivotal role in preventing bullying and supporting victims (Reed, 2015; Underwood, 2017; Azami, 2020). These programs educate students on what cyberbullying is, why it is harmful, and how to respond if they witness or experience it. By fostering a culture of respect and kindness, such initiatives can reduce the incidence of cyberbullying and provide a sense of community support to those affected. Furthermore, schools that take an active stance against bullying create safer environments, where victims know they are not alone and where help is available.

- **Accessible Mental Health Services: Offering a Lifeline to Victims**

  Access to mental health services - including therapy and counseling - is essential for helping victims cope with the emotional pain of cyber victimization (Roberts, 2016; Cénat et al., 2019; Maurya, 2022). Therapy provides a safe, confidential space for victims to process their experiences, develop healthy coping strategies, and receive emotional validation from professionals. Mental health services also help victims create safety plans, reducing the risk of suicide attempts. Ensuring that these services are affordable, accessible, and non-stigmatizing is critical in addressing the psychological aftermath of online bullying.

- **Digital Literacy Education: Empowering Youth to Protect Themselves**

  Digital literacy education is a proactive strategy that empowers youth to navigate online spaces safely (Massing-Schaffer & Nesi, 2019; Reed, 2015). Teaching young people how to recognize bullying, block bullies, report abuse, and set privacy controls equips them with essential skills for self-protection. By fostering awareness and self-advocacy, digital literacy programs can help reduce the risk of victimization and enable youth to respond effectively when bullying occurs. Additionally, these programs build confidence and agency, making young people feel less powerless in the face of online threats. Importantly, these protective strategies are interconnected and work best when combined. For instance, mental health services are more effective when combined with parental support and school interventions, while positive mental health can be strengthened through education and community programs. A holistic approach, addressing the psychological, familial, educational, and technological aspects of cyber victimization, is necessary to comprehensively protect at-risk youth and reduce suicide rates associated with online bullying.

  The meta-analysis by John et al. (2018) strongly aligns with our findings, particularly in highlighting the severe psychological impacts of cyberbullying. Their study revealed that victims are more than twice as likely to engage in self-harm (OR = 2.35) and exhibit suicidal ideation (OR = 2.15), suicide attempts (OR = 2.57), and general suicidal behavior (OR = 2.10), which supports our identified mechanisms like depression, hopelessness, and feelings of burdensomeness that escalate suicide risk. Both studies emphasize the cumulative impact of risk factors such as anonymity, the permanence of harmful content, and constant digital exposure, which lead to sustained psychological distress. Additionally, our focus on vulnerable populations, especially adolescents and young adults, mirrors John et al.'s exclusive study of individuals under 25, reinforcing developmental vulnerability as a key concern. Notably, their finding that cyberbullying perpetrators also face elevated risks for suicidal ideation (OR = 1.23) and behaviors (OR = 1.21) validates our conclusion that all roles in cyberbullying-victim or perpetrator-contribute to psychological harm, providing strong external validation for the multidimensional risk pathways and population-

level concerns synthesized in our review. Our findings closely align with those of Dorol-Beauroy-Eustache and Mishara (2021), who conducted a systematic review identifying multiple risk factors that increase suicide risk among cyberbullying victims. They highlighted mental health issues, substance abuse, loneliness, stress, challenges related to sexual orientation and gender identity, and violent behaviors as significant contributors to heightened risk. Additionally, they noted specific factors such as Autism Spectrum Disorder, Intellectual and Developmental Disorders, obesity, asthma, and the severity of cyberbullying as exacerbating vulnerabilities. These findings reinforce our emphasis on how these compounded factors can intensify the psychological harm experienced by victims. Both studies also acknowledge the limited research on protective factors, underscoring the importance of school connectedness, parental support, life satisfaction, healthy diets, personal skills, and positive family interactions in mitigating the adverse effects of cyber bullying. Our findings are in line with those of Nesi et al. (2021), who conducted a systematic review and meta-analysis exploring the link between social media use and self-injurious thoughts and behaviors (SITBs). They found that certain social media behaviors-like cyber victimization, exposure to SITB - related content, and problematic social media use-had medium-sized effects on increasing the risk of SITBs. This supports our own conclusions about how cyber victimization and the persistent nature of harmful online content can negatively impact adolescent mental health. Interestingly, Nesi et al. also found that the frequency of social media use alone wasn't significantly linked to SITBs, suggesting that it's not just *how much* teens use social media, but *what they experience* online that matters most. This aligns with our focus on the psychological mechanisms that can turn cyber victimization into more serious issues like suicidality. Our findings are consistent with those of Serafini et al. (2023), who conducted a systematic review exploring the link between bullying involvement—both as victims and perpetrators—and non-suicidal self-injury (NSSI). Their review found that both experiencing and perpetrating bullying are significant risk factors for NSSI and suicidality, both in the short and long term. This supports our conclusions about the harmful effects of cyber victimization and how persistent online harm can deeply impact adolescent mental health. Serafini et al. also pointed out the need for more research into the specific factors that mediate or moderate the relationship between bullying and NSSI, which aligns with our focus on understanding the psychological mechanisms that can escalate cyber victimization to suicidality.

Conclusion:

This systematic review highlights the profound impact of cyber victimization on suicide risk, particularly among adolescents and young adults. Drawing from 20 empirical studies, we identified key risk factors such as anonymity, persistence of harmful content, public humiliation, constant connectivity, and lack of oversight in online spaces. These factors create a toxic environment that exacerbates feelings of hopelessness, isolation, and entrapment, driving victims toward suicidal ideation, self-harm, and suicide attempts. The review also explored the psychological mechanisms linking cyber victimization to suicide, including depression, anxiety, perceived burdensomeness, and thwarted belongingness. These mechanisms often interact, creating a vicious cycle that deepens emotional distress and reduces coping abilities. Vulnerable populations, such as LGBTQ+ youth, female adolescents, and marginalized groups, are disproportionately affected, facing compounded risks due to intersecting forms of discrimination and identity-based harassment. Despite the severity of these findings, the review underscores the importance of protective factors and intervention strategies. Parental support, school-based anti-cyberbullying programs, accessible mental health services, and digital literacy education can mitigate the harmful effects of cyber victimization. Promoting positive mental health and resilience among youth is crucial in breaking the link between online bullying and suicide. This review aligns with previous research, such as the meta-analysis by John et al. (2018), which found that cyberbullying victims are more than twice as likely to engage in self-harm and suicidal behaviors. Similarly, Dorol-Beauroy-Eustache and Mishara (2021) emphasized the role of mental health issues and vulnerable populations in increasing suicide risk. Nesi et al. (2021) and Serafini et al. (2023) further validated the connection between cyber victimization and self-injurious behaviors, highlighting the need for targeted interventions. In conclusion, cyber victimization is a significant public health issue that demands urgent attention. By understanding the risk factors, psychological mechanisms, and vulnerable populations, we can develop evidence-based interventions to reduce suicide risk and improve mental health outcomes for those affected by online bullying.

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Uses of Artificial Intelligence in Fraud Detection and Cyber Security in Indian Banking Sector

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Abstract

This paper prospects the transformative potential of Artificial Intelligence (AI) in the Indian banking sector, focusing on its adoption, significance, challenges, and implementation in the present scenario. Banks can use AI effectively in five major ways: customizing services and products for individual needs, identifying new business opportunities, predicting and identifying risk and fraud, and streamlining operations. However, the integration of AI also presents challenges, such as data privacy concerns, regulatory hurdles, and job displacement. The paper highlights facts, such as AI-powered chatbots and personalized banking services in different areas. However, it also addresses cyber security challenges, particularly argumentative attacks like data poisoning and evasion. The dual-use nature of AI tools presents further risks, as malicious users can exploit them. The paper emphasizes the need for developing secure, resilient, and trustworthy ML models to mitigate these threats and ensure the protection of financial data by balancing innovation with security. Recognizing the importance of data security and trust in client relationships, the AI model combines methods for offering valuable insights for banking institutions navigating technological adaptation while safeguarding their reputation and customer trust. In conclusion, the paper stresses the importance of addressing issues like cyber security and frauds while exploring the wide-ranging benefits and barriers to AI implementation in the Indian banking sector.

Keywords: *Machine Learning (ML), Cyber security, Fraud Detection, Indian Banking Sector*

Introduction

India's banking scene has changed a lot recently. This is due to new tech, better internet access, and more people using technology. Due to digital banking, banks must save money transfers and customer data.The explosion of digital channels, mobile banking apps, and online payment platforms has unfortunately given rise to a new wave of fraudulent activities, including identity theft, financial fraud, phishing attacks, and cyberattacks. Artificial Intelligence (AI) is revolutionizing the way banks detect fraud, identify vulnerabilities, and protect critical infrastructure by leveraging advanced algorithms, machine learning models, and data analytics to detect anomalous behavior, predict potential risks, and respond to security breaches in real time. This change is very important in India. More people are using digital payments and online banking. This means more chances for cyber attacks . Banks need new tech to keep customer info and money safe. AI tools now help find fraud, protect data, stop cyber threats, and manage risk.

The adoption of AI in fraud detection and cybersecurity in Indian banking has proven to be a game-changer, enabling financial institutions to strengthen their security posture while simultaneously improving customer experience. Furthermore, AI's role in automating and streamlining security processes has helped banks reduce the risk of human error and increase operational efficiency. This transformation is particularly crucial in India, where the rapid digitization of the financial services sector has led to a substantial increase in digital payments, mobile banking, and online financial services. With this surge in digital adoption, however, comes an inherent rise in cyber vulnerabilities, making it essential for banks to adopt cutting-edge technologies to secure sensitive customer information and financial transactions. AI-based tools are now being used extensively to enhance fraud detection, automate security protocols, predict and prevent potential cyber threats, and improve overall risk management.

For fraud detection systems AI is becoming an important component in the Indian banking sector. Dishonest activities, such as card skimming, account takeovers, and unauthorized transactions, have become more prevalent with the rise of online banking services. Hoaxers dares to find gaps in security systems and use advanced methods to overtake traditional detection tools. In this environment, AI plays a pivotal role in helping banks identify and respond to suspicious activities swiftly and accurately. In addition to its role in fraud detection, AI is also instrumental in strengthening cybersecurity within the Indian banking sector. The increasing reliance on digital infrastructure and online transactions has made banks more susceptible to cyberattacks, such as Distributed Denial of Service (DDoS) attacks, ransomware, and data breaches. AI is being utilized to address these evolving cyber threats by automating threat detection, vulnerability assessment, and incident response processes.

Literature Review

This literature review aims to explore the various applications of AI in combating fraud and securing digital banking platforms, highlighting the advancements, methodologies, and impact of AI-based systems.

Summary of Literature Review in Table Format

Main heading	Author & Year	Summary points
Real-Time Transaction Monitoring	Bhatia et al. (2020)	AI-based systems use machine learning algorithms to analyze vast amounts of transaction data to identify anomalies and potential fraud in real time. These systems use supervised learning techniques, where historical transaction data is used to train models that can detect outliers and flag suspicious activities. The advantage of AI over traditional rule-based systems is its ability to adapt to evolving fraud tactics, thereby detecting fraud more efficiently.
	Krishna et al. (2022)	emphasized that AI's ability to detect fraud in real time minimizes the window of opportunity for fraudsters, thereby reducing the financial and reputational damage to banks.
Predictive Analytics and Fraud Prevention	Sharma and Sood (2021)	AI models, including decision trees and neural networks, can predict fraudulent behaviors before they occur by analyzing a wide range of customer and transaction attributes such as frequency, volume, geographical location, and behavioral trends. This predictive capability helps banks take proactive measures, preventing fraud rather than merely responding to it after the fact.
	Sundararajan et al. (2020)	demonstrated that AI's predictive capabilities extend beyond financial fraud to include the detection of social engineering tactics, such as phishing attacks, by recognizing deceptive patterns in emails, phone calls, or web content. This proactive approach to fraud prevention significantly enhances the security of digital banking systems in India.
Behavioral Biometrics	Singh and Gupta (2021)	this technology offers an additional layer of security by continuously assessing the legitimacy of users' activities. Behavioral biometrics can detect fraudulent behavior, such as account takeovers, in real time without interrupting the user experience, which is particularly important in the context of mobile banking in India.
Threat Detection and Anomaly Monitoring	Mehta and Sharma (2020)	machine learning algorithms are capable of analyzing large datasets to identify patterns of normal and abnormal network activity. By learning from past cyberattack data, AI can detect new and unknown attack vectors, such as zero-day exploits. This is a major improvement over traditional signature-based detection systems, which are ineffective against new or evolving threats.
	Ranjan et al. (2021)	demonstrated how AI systems can monitor banking networks in real time and identify potential threats, such as unauthorized access, malware, or attempts to bypass authentication systems. Machine learning models, specifically anomaly detection algorithms, are used to flag suspicious activities such as unusual login attempts, data exfiltration, and unauthorized access to sensitive systems.
Automated Incident Response	Vishwakarma and Patel (2021),	AI can help banks mitigate cyber threats by automatically triggering defensive actions when a cyberattack is detected. For example, AI systems can block malicious IP addresses, isolate compromised systems, or shut down certain services to prevent the attack from spreading. This automated response is crucial in minimizing the impact of a breach and significantly reducing the time it takes for banks to contain the threat.
Vulnerability Assessment and Risk Management	Jain et al. (2022),	AI-powered vulnerability scanning tools use machine learning algorithms to detect weaknesses in a bank's IT infrastructure. These tools can analyze source code, system configurations, and security policies to identify areas susceptible to exploitation by cybercriminals. Additionally, AI can assess the likelihood of a successful attack based on historical attack data and help banks prioritize risk mitigation efforts. The ability of AI to continuously monitor and assess vulnerabilities in real time is particularly useful for Indian banks, where a large portion of the financial infrastructure is undergoing rapid digitization.
	Reddy and Kumar (2020)	discuss how banks use AI to model potential risks based on factors such as transaction volume, geographical location, and network activity. These models enable banks to prepare for potential threats and allocate resources to areas with the highest risk exposure.

Banking information system	Hickam Sadok (2022)	explores the effects of artificial intelligence (AI) use on banks and other financial organisations' credit score assessment processes. These restrictions serve as the foundation for a new age of economic law that introduces the certification of AI algorithms and bank-used data.
	Chandrima Bhattacharya (2022)	Through this paper we understood that literature evaluation and theoretical studies are completed for diverse worldwide and Indian banks with admiration to the combination of AI to enhance client interactions and inner banking processes. Chatbot use instances on banking systems are ranked primarily based totally on client experience
	Mohanty and Mishra (2023) ; Okoro et al.(2024).	AI algorithms can detect anomalies in transaction patterns, flagging potentially fraudulent activities such as unauthorized access, identity theft, or fraudulent transactions. The ability to adapt and learn from new data ensures that AI models can stay ahead of evolving fraud tactics, providing financial institutions with a powerful tool to combat increasingly sophisticated fraud schemes
	Chaudhary (2023)	The authors experimentally investigate a comprehensive mechanism to increase customer loyalty to online banking systems using EBSQ practices, focusing on reliability, network design, privacy and security and customer service and support.

Research Objectives

The primary objectives of this research are:

- To evaluate the role of AI in fraud detection and cybersecurity within the Indian banking sector.
- To identify the types of AI technologies being in banking operations.
- To estimate the effectiveness of AI-based systems in identifying and preventing fraudulent activities and cyber threats.
- To understand the challenges and barriers to the adoption of AI in fraud detection and cybersecurity in Indian banks.
- To explore the future prospects and potential impact of AI on the banking sector in India.

Research Methodology

This study discusses the purpose of artificial intelligence, as well as both the advantages and disadvantages of AI in the Indian banking sector. Utilizes the use of secondary data as a result. Only evidence from observation and analysis is used as the basis for the whole examination. Additionally, the necessary and applicable secondary data are collected via a variety of research papers, journals, and numerous publications, websites, etc. Data collected are for the period of five years from 2020-21 to 2024-25.Additionally, books have been recommended for theoretical details on the topic as necessary.

Frauds in Various Banking Operations Based on Date of Reporting (Concluded)

Bank Group	2020-21		2021-22		2022-23		2023-24		2024-25 (till Sep. 2024)	
	No.	Amount	No.	Amount	No.	Amount	No.	Amount	No.	Amount
Advances	3,364	1,12,681	3,745	41,485	4,063	22,421	4,124	11,017	3,531	19,748
Card/Internet	2,545	119	3,596	155	6,699	277	29,082	1,457	13,133	514
Deposits	503	434	471	493	652	258	2,002	240	934	363
Off-balance sheet	23	535	21	1,077	14	285	11	256	0	0
Foreign exchange transactions	4	129	7	7	13	12	19	38	6	1
Cash	329	39	649	93	1,485	159	484	78	205	18
Cheques/demand drafts, etc.	163	84	201	158	118	25	127	42	49	54
Inter-branch accounts	2	0	3	2	3	0	29	10	3	1
Clearing, etc accounts	14	4	16	1	18	3	17	2	3	1
Non-resident accounts	1	0	1	2	2	1	6	2	1	0
Others	277	54	299	98	470	422	165	33	596	667
Grand Total	**7,225**	**1,14,079**	**9,009**	**43,571**	**13,537**	**23,863**	**36,066**	**13,175**	**18,461**	**21,367**

Notes: 1. Refers to frauds of ₹1 lakh and above.

2. The figures reported by banks and financial institutions are subject to change based on revisions filed by them.

3. Frauds reported in a year could have occurred several years prior to year of reporting.

4. Amounts involved are as reported and do not reflect the amount of loss incurred. Depending on recoveries, the loss incurred gets reduced. Further, the entire amount involved in loan accounts is not necessarily diverted.

5. Post issuance of revised Master Directions on Fraud Risk Management dated July 15, 2024, the banks are reporting only those payment system related transactions which are concluded as fraud committed on bank(s).

Source: RBI.

Frauds Recorded In Indian Banking Sector

The above table.1 indicates the number of frauds as well as the amount involved in different banking operation from year 2020-21 to 2024-25 (till September 2024).It has been observed that total frauds were 7,225 which continuously increased to 18,461 cases .The information concludes that frauds in banking transaction have increased 2.55 times in year 2024-25 as compared to year 2020-21.

Ai Implementation In Indian Banks : (Table.2)

Features	Banks
Chatbot	State Bank of India, HDFC Bank, ICICI Bank, Axis Bank, Bank of Baroda, Andhra Bank, Kotak Mahindra Bank, Canara Bank, City Union Bank, Yes Bank, Induslnd Bank
Loan Processing	Axis Bank, State Bank of India, HDFC Bank, ICICI Bank, Yes Bank, Federal Bank, South Indian Bank, Bank of Maharashtra, Central Bank of India, IDFC Bank, Induslnd Bank
Biometric authentication and e-KYC	State Bank of India, ICICI Bank, Axis Bank, Kotak Mahindra Bank, HDFC
Fraud Detection	Punjab National Bank, IDBI Bank, City Union Bank, HDFC
Bulk Transaction Processes	ICICI Bank, Axis Bank, Allahabad Bank, City Union Bank
Document Scrutinizing & Digitization	ICICI Bank, Axis Bank, Yes Bank, Bank of Baroda, HDFC
Risk Monitoring	State Bank of India, Axis Bank, IDBI Bank, HDFC Bank
Sentiment Analysis	State Bank of India, ICICI Bank, Kotak Mahindra Bank
CRM	HDFC Bank, IDBI Bank, Allahabad bank
Customer Segmentation	State Bank of India, HDFC Bank
Sales and Cross-selling	State Bank of India, HDFC Bank
Credit Assessment	State Bank of India, HDFC
International Remittance	ICICI Bank
Business Reports	State Bank of India
Wealth Management	State Bank of India
Marketing	State Bank of India

Source: (Bhattacharya & Sinha, 2022)

Table.2 indicates the developing background of banking in India, where leading banks are increasingly supporting AI technology to improve efficiency, security, and customer experience. The journey of AI in this sector suggests a future where AI's role could become even more important and effective.

Uses of Artificial Intelligence in Fraud Detection in the Indian Banking Sector

The Indian banking sector has experienced a noteworthy digital transformation in recent years. With the expanding selection of advanced managing an account, portable exchanges, and e-commerce, the dangers related with extortion have moreover expanded. Artificial Intelligence (AI) has developed as a crucial device for handling these dangers by empowering banks to distinguish, avoid, and relieve false exercises more proficiently and precisely.The application of AI in fraud detection is reshaping how Indian banks protect customer data, assets, and trust.

Here are some key uses of AI in fraud detection within the Indian banking sector:

- **Real-Time Transaction Monitoring**

  AI has proven to be a game-changer in enabling real-time fraud detection in digital transactions. AI, specifically machine learning (ML) models, can process vast amounts of transaction data in real-time, identify patterns, and flag suspicious transactions for further investigation .In India, AI-based systems analyze various parameters such as transaction amount, merchant type, geographical location, and customer behavior to assess the validity of a transaction. If any difference is detected (e.g., a sudden large transfer or transaction from a different geographical location), the system can immediately flag it as potentially fraudulent, preventing losses before they occur. HDFC and ICICI Banks have adopted AI-driven transaction monitoring systems.

- **Machine Learning for Predictive Fraud Detection**

  Machine learning (ML) is one of the foremost capable AI methods utilized in extortion discovery. By training algorithms on historical data, ML models can identify emerging fraud patterns that may not be immediately apparent to human analysts or traditional rule-based systems. Indian banks have utilized ML to analyze authentic exchange information and recognize contrasts such as sudden huge exchanges, unordinary times of movement, and irregularities

in client behavior. With this predictive capability, banks can forecast potentially fraudulent activities before they even occur, reducing the time to detect fraud and minimizing damage. State Bank of India (SBI) has been using machine learning to predict potential fraudulent activities in online banking.

- **Behavioral Biometrics**

  Behavioral biometrics includes analyzing designs in how people are associated with gadgets -such as writing speed, mouse developments, and touch screen motions. This shape of continuous authentication leverages AI to make a behavioral profile for each client. This strategy gives frictionless verification, decreasing the requirement for different passwords or OTPs whereas upgrading security. Axis Bank has implemented behavioral biometrics.

- **Natural Language Processing (NLP) for Phishing and Social Engineering Detection**

  Fraudsters utilize fake emails, phone calls, or SMS messages to hoodwink clients into uncovering individual data, passwords, or account details.AI-powered Common Dialect Preparing (NLP) devices can offer assistance banks distinguish phishing emails, fraudulent phone calls, and social engineering attempts by analyzing text, voice, and communication patterns. NLP algorithms can identify suspicious phrases or keywords commonly used in phishing attempts, flagging potential threats and preventing customers from falling victim to fraud. ICICI Bank uses AI-powered chatbots and NLP-based tools.

- **Anomaly Detection Systems**

  AI-powered irregularity discovery frameworks utilize machine learning to identify unordinary or startling designs inside huge datasets. These systems can continuously monitor banking transactions, customer accounts, and login activities to identify any behavior that deviates from the norm. Punjab National Bank (PNB) has actualized AI-driven inconsistency discovery frameworks.

- **Credit Card and Loan Fraud Prevention**

  AI is used to analyze the solvency of customers, detect doubtful activity in credit card transactions, and prevent fraud in loan applications. By leveraging AI, banks can analyze credit histories, transaction records, and social media data to evaluate the risk of potential fraud before approving loans or credit card applications.AI algorithms can detect variations in a customer's credit profile, such as mismatched information or applications submitted from multiple accounts, which could indicate fraudulent intent. ICICI Bank has employed AI systems.

- **Automation of Fraud Investigations**

  AI isn't as valuable for recognizing extortion but moreover for mechanizing the investigative preparation. AI-driven systems can automatically flag suspicious transactions and provide fraud analysts with relevant information for further examination.AI can significantly reduce the operational costs associated with manual fraud investigations. HDFC Bank has automated its fraud detection process by using AI tools.

- **Network Security and Cyber Attack Detection**

  Machine learning algorithms can monitor network traffic for signs of potential attacks, such as DDoS attacks, malware infections, or data breaches. By analyzing real-time data, AI can identify vulnerabilities and prevent cyberattacks before they cause significant loss. Yes Bank has integrated AI and machine learning.

Uses of Artificial Intelligence in Banking Cybersecurity in India (Last 5 Years)

Over the past five long years, the fast digitalization of keeping money in India and the developing move to online keeping money, portable instalments, and other computerized budgetary administrations has driven an expanded requirement for progressed cybersecurity measures. Artificial Intelligence (AI) has risen as a capable apparatus to fortify the cybersecurity systems of Indian banks by identifying, avoiding, and moderating cyber dangers in genuine time. AI-driven arrangements, fueled by machine learning (ML), profound learning (DL), and inconsistency location, are progressively being embraced by Indian banks to secure delicate monetary information and guarantee the security of customers' resources.

Below are the key areas in which AI has been used to bolster cybersecurity in the Indian banking sector over the past five years:

- **Real-Time Threat Detection and Response**

  AI-powered frameworks have empowered banks to distinguish and react to cyber dangers in genuine time. AI frameworks utilize machine learning calculations to persistently analyze expansive volumes of information and recognize anomalous designs in organize activity, client behavior, and get to logs. In 2020, ICICI Bank executed AI-based cybersecurity arrangements.

- **Anomaly Detection for Fraud Prevention**

  One of the essential employments of AI in managing an account cybersecurity is peculiarity

location. Inconsistency discovery models fueled by AI persistently screen client exchanges, organize exercises, and framework intelligence to distinguish unusual behavior. In case a deviation from the typical behavior is detected-such as a client logging in from an abnormal area or a high-volume transaction—the framework can naturally hail the movement as suspicious and avoid potential cyberattacks. State Bank of India (SBI) has received AI-driven inconsistency discovery frameworks.

- **Automated Incident Response and Threat Mitigation**

  AI has significantly improved the speed and effectiveness of incident response. By leveraging machine learning and natural language processing (NLP), AI systems can analyze data, detect threats, and automatically respond to attacks in real time. This reduces the time required for human intervention, ensuring that cyber incidents are addressed swiftly and efficiently. HDFC Bank implemented AI-driven incident response systems.

- **Predictive Cybersecurity Using Machine Learning**

  Machine learning, a subset of AI, has become essential in predictive cybersecurity. ML calculations can analyze verifiable information to recognize rising dangers and vulnerabilities, making a difference banks remain one step ahead of cybercriminals.By learning from previous incidents, machine learning models can predict future attacks based on patterns in attack vectors, user behavior, and external threat intelligence. Axis Bank uses AI-powered machine learning algorithms.

- **User Authentication and Identity Verification**

  AI has enormously improved client confirmation and personality confirmation forms. AI-driven authentication methods, such as biometric verification (fingerprint, facial recognition, voice recognition), multi-factor authentication (MFA), and behavioral biometrics, provide more secure and reliable ways to verify the identity of users. In 2022, ICICI Bank introduced AI-powered biometric authentication for its mobile banking app.

- **Intelligent Phishing Detection**

  Phishing attacks are one of the most common cyber threats in banking, where fraudsters attempt to trick customers into revealing sensitive information, such as login credentials or bank account details. AI-based systems have been developed to detect phishing attempts by analyzing email content, URLs, and other digital communication for suspicious elements. These systems use natural language processing (NLP) algorithms to identify fraudulent emails or websites that mimic legitimate banking institutions. Yes Bank has deployed AI-driven phishing detection systems.

- **Malware Detection and Prevention**

  Malware, counting ransomware and spyware, could be a critical cybersecurity risk to banks. AI and machine learning calculations are progressively utilized to identify and avoid malware assaults by analyzing the behavior of computer programs.AI can identify new or unknown malware by recognizing suspicious behavior patterns rather than relying on predefined virus definitions. Bank of Baroda has implemented AI-powered malware detection systems.

- **Cybersecurity Threat Intelligence**

  AI is being used to enhance threat intelligence by processing vast amounts of data from various sources, including network logs, threat feeds, and social media, to identify emerging cybersecurity risks. Machine learning algorithms can identify potential vulnerabilities, new attack methods, and attack patterns that may not be immediately apparent. By gathering and analyzing threat intelligence, AI helps banks proactively secure their networks against growing threats. IndusInd Bank utilizes AI-driven threat intelligence systems.

- **Automated Vulnerability Management**

  AI-driven systems are also being used for automated vulnerability management, helping banks identify and address security gaps in their infrastructure. These systems use machine learning to scan systems, networks, and applications for vulnerabilities, prioritizing them based on risk and impact. Automated powerlessness administration guarantees that banks can rapidly distinguish and address security shortcomings some time recently they can be abused by cybercriminals. In 2023, Kotak Mahindra Bank implemented AI-powered vulnerability management tools.

The Future of Artificial Intelligence in Indian Banking Sector

Despite the many advantages, the implementation of AI in fraud detection and cybersecurity within the Indian banking sector faces several challenges. Issues such as data quality, infrastructure costs, and the need for specialized skills remain significant barriers to widespread AI adoption. Additionally, regulatory and

privacy concerns need to be addressed to ensure that AI solutions are implemented in compliance with legal frameworks.

- Artificial Intelligence systems handle vast quantities of sensitive financial information, which poses a risk of data breaches and unauthorized access.
- The use of artificial intelligence raises ethical issues such as bias in decision-making and labor movement.
- If the system makes a mistake, for example paying a loan to a counterparty that is not credible, banks have to bear the consequences.
- Currently commercial banks are witnessing high loyalty among their customers. In the realm of commercial banking, however, customer loyalty is likely to wane.
- According to a study by the World Economic Forum (WEF), automation and artificial intelligence will lead to the loss of 5 million jobs in the banking sector by 2025. It accounts for about 30% of the banking sector workforce. The research indicates that job losses will predominantly impact positions associated with data entry, customer service, and transaction processing.
- AI is a very expensive technology to implement! It is important to recognize that this technology is still in its infancy.
- Humans possess the ability to assess unique circumstances and exercise judgment in decision-making, capabilities that AI may never fully replicate, despite its capacity for learning and adaptation.
- People often fear that AI can replace or take over humans. Some responsible for artificial intelligence can get a lot of influence from this.

In conclusion, AI has already begun transforming fraud detection and cybersecurity in the Indian banking sector, and its impact will only continue to grow as the sector becomes increasingly digitized. By adopting AI-driven solutions, Indian banks can not only enhance their security measures but also foster a more secure, efficient, and customer-focused banking environment for the future. Governments and international organizations are anticipated to enforce stricter regulations to tackle the escalating global threats, compelling banks to proactively develop compliance and data protection strategies. This synergy of advanced technology and more stringent regulations will shape the future of cybersecurity within the banking sector.

Conclusion

The incorporation of Artificial Intelligence in fraud detection and cybersecurity has proven transformative for the Indian banking industry, providing innovative strategies to address the increasing threats. As India continues to embrace digital banking and financial services, the need to safeguard sensitive data, ensure secure transactions, and build customer trust has never been more critical. AI, with its ability to analyze vast amounts of data, detect patterns, and predict potential risks, plays an vital role in strengthening security measures across the banking sector.AI-powered solutions in fraud detection have proven to be highly effective, enabling real-time monitoring of transactions, detecting anomalies, and predicting fraudulent activities before they occur. Machine learning algorithms continuously learn from historical data, which allows banks to identify and respond to new and evolving fraud tactics in a more proactive manner. Additionally, technologies like behavioral biometrics and predictive analytics offer enhanced fraud prevention capabilities, addressing complex fraud schemes that are difficult to detect using traditional methods.

In the field of cybersecurity, AI has emerged as an essential instrument in the fight against cyber threats, including data breaches, phishing schemes, and ransomware attacks. AI's ability to detect anomalies, monitor network traffic, and identify vulnerabilities in real-time has strengthened the overall cybersecurity posture of Indian banks. Additionally, AI's function in automating incident responses, coupled with its capacity to deliver comprehensive post-incident analyses, has significantly enhanced banks' ability to effectively counter cyber threats and minimize response times. The Reserve Bank of India has acknowledged the promise of AI and machine learning technologies, urging banks to adopt these tools for continuous due diligence. Among various banking metrics, the size and financial stability of a bank have been found to positively affect its emphasis on AI, illustrating the benefits of economies of scale and the availability of investment on technological advancement.

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A Comparative Study between Old Tax Regime and New Tax Regime for the Financial Year 2024-2025

Sanjay K. Radadiya

Abstract:

Tax structures are fundamental to economic development, with government revenue primarily derived from direct and indirect taxes. India's 2020 introduction of a new income tax regime presented taxpayers with a choice between it and the traditional system. The 2024-2025 Union Budget significantly altered the new regime, making it the default option. This paper analyzes the comparative advantages of the revised new tax regime versus the established old regime, specifically focusing on the recent adjustments. Utilizing secondary data from diverse sources, including government publications, academic journals, and news media, this study examines the implications of these changes for individual taxpayers, with a particular emphasis on the impact of modifications to the new tax regime, including the treatment of CESS and surcharge.

Keywords: *New Tax Regime, Old Tax Regime, Income Tax, Tax Policy, India, Union Budget, CESS, Surcharge.*

Introduction:

A tax regime establishes the legal framework for a government's tax collection and administration, encompassing the rules for assessment, reporting, and payment. India's 2020 Union Budget introduced a new personal income tax regime, characterized by expanded tax slabs and reduced rates, but at the cost of eliminating existing exemptions and deductions. This presented taxpayers with the choice between the new and the traditional tax systems.

The 2024-2025 Union Budget significantly altered this landscape by revising the new tax regime, while the old regime remained unaltered. Crucially, the new regime was designated as the "default" option. This implies that taxpayers will automatically be subject to the new regime unless they explicitly opt for the old system, effectively shifting the onus of choice onto the taxpayer. This paper analyses the impact of these changes on individual taxpayers, examining the comparative advantages of each system in light of the 2024-2025 revisions.

Key Components of a Tax Regime:

A tax regime is a comprehensive system governing taxation, encompassing:

- **Diverse Tax Types:** It covers various taxes, including income, corporate, goods and services, and customs duties, each with specific regulations for calculation, payment, and reporting.
- **Legal Foundation:** Tax laws, regulations, and guidelines form the legal framework, defining taxpayer obligations, tax rates, assessment procedures, and penalties.
- **Administrative Oversight:** Tax authorities, such as revenue agencies, administer and enforce tax laws through collection, audits, and compliance measures.
- **Rate and Structural Design:** It establishes tax rates and structures, including thresholds, exemptions, deductions, and tax brackets, impacting the tax burden.
- **Reporting and Compliance Obligations:** Taxpayers are required to maintain records and report earnings, assets, and transactions, including filing tax returns.
- **International Tax Considerations:** It addresses cross-border tax issues, such as transfer pricing and double taxation agreements, to combat tax evasion and ensure fairness.
- **Enforcement and Penalties:** Compliance is enforced through audits, penalties for non-compliance, and legal remedies, with severe consequences for tax fraud.

Understanding the intricacies of a tax regime is crucial for individuals and businesses to fulfill their tax obligations and make informed financial decisions. Seeking professional tax advice is recommended to navigate complexities and ensure compliance.

Objectives:

This study aims to:

- **Compare** the old and new income tax regimes in India.
- **Analyze** the modifications introduced to the new tax regime in the

2024-2025 Union Budget.

- **Determine** which tax regime offers greater financial advantage to individual taxpayers.
- **Calculate** and compare individual tax liabilities under both regimes.
- **Examine** the application of Section 87A rebates within both tax systems.

Research Methodology and Data Collection:

A descriptive & analytical research methodology has been used for this research article. This article is totally based on secondary data. Secondary data has been collected from the government budget, journals, books, Newspaper, articles, Bulletin and website.

Tax System in India:

India's taxation system is structured into two primary categories: direct and indirect taxes. Direct taxes, encompassing income tax, wealth tax, and corporate tax, form a significant portion of the government's revenue. Governed by the Income Tax Act of 1961, these taxes mandate that all liable individuals and entities fulfill their tax obligations.

The 2020 Union Budget marked a significant shift by introducing a new income tax regime, offering taxpayers the option to choose between it and the traditional system. Subsequently, the 2024-2025 Union Budget brought forth further modifications to the new regime, designed to provide increased benefits for taxpayers.

Tax Slabs and Rate Comparison:

The traditional tax regime featured fewer tax slabs but higher tax rates, leading to less than optimal revenue generation. To address this, the 2020 budget introduced a new tax regime, offering taxpayers the choice between the old and new systems. The new regime is characterized by a greater number of tax slabs and reduced tax rates.

Despite the introduction of the new regime, a majority of taxpayers continued to prefer the old system. This preference stemmed from the new regime's elimination of key benefits, including exemptions, rebates, reliefs, marginal reliefs, deductions, and the standard deduction.

The Term standard deduction refers to that portion of income do not subject to tax that can be used to reduce tax liabilities

- House Rent allowances (HRA).
- Applicable interest of Home loan.
- Leave Travel Allowances (LTA) etc.

However, the finance minister made fewer adjustments to the new tax regime's slab rate for the fiscal year 2024–2025 in the union budget 2024–2025. As a result, taxpayers can now pay taxes using either the new tax slabs or the old tax regime.

Table 1: Old Tax Vs New tax slabs for the financial year 2024-25:

Tax Slabs	Old Tax Regime Rates	New Tax Regime Rates
Up to Rs.2,50,000	NIL	NIL
Rs.2,50,001 - Rs.3,00,000	5%	NIL
Rs.3,00,001 - Rs.5,00,000	5%	5%
Rs.5,00,001 - Rs.6,00,000	20%	5%
Rs.6,00,001 - Rs.7,00,000	20%	5%
Rs.7,00,001 - Rs.9,00,000	20%	10%
Rs.9,00,001 - Rs.10,00,000	20%	10%
Rs.10,00,001 - Rs.12,00,000	30%	15%
Rs.12,00,001 - Rs.15,00,000	30%	20%
Rs.15,00,000 and above	30%	30%

Table 2: Comparative study of new tax regime announced in union budget 2020 and in budget 2024:

Introduced in Budget 2020	Changes made in Budget 2024
Rebate Limit is Rs. 5,00,000	Rebate Limit is Rs. 7,00,000
No benefits of deductions	Standard Deductions allowed of Rs. 75,000
No benefits of NPS	NPS allowed upto Rs. 50,000

Table 3: Surcharge table

Old surcharge rates	New surcharge Rate
Income exceeds 50 lakh upto 1 crore @ 10%	Income exceeds 50 lakh upto 1 crore @ 10%
Above 1 crore to 2 crore @ 15%	Above 1 crore to 2 crore @ 15%
Above 2 crore upto 5 crore @ 25%	Above 2 crore upto 5 crore @ 25%
Above 5 crore @ 37%	

Table 03, showing the highest surcharge rate reduced from 37% (percentage) to 25% (percentage) in the union budget 2024-25. So we can say that new surcharge rates in the financial budget 2023-2024 are beneficial for an individual taxpayer to reduce his tax liabilities.

Rebate under Section 87A

Section 87A, a tax rebate introduced in the 2013-2014 Union Budget, aims to lessen the tax burden for eligible resident individual taxpayers. This rebate functions as a government-provided benefit. Taxpayers whose income falls below the basic exemption threshold-₹250,000 under the old regime and ₹300,000 under the new regime-are exempt from filing an Income Tax Return (ITR), except when claiming a refund.

Table 4: Showing total amount of rebate and limit of total taxable income under section 87A

Financial year	Limit on total taxable income	Amount of rebate allowable under section 87A
2013-2014	500000	2000
2014-2015	500000	2000
2015-2016	500000	2000
2016-2017	500000	2500
2017-2018	350000	2500
2018-2019	350000	12500
2019-2020	500000	12500
2020-2021	500000	12500
2021-2022	500000	12500
2022-2023	500000	12500
2023-2024	500000/700000	12500 & 25000 for new tax regime
2024-25	500000/700000	12500 & 25000 for new tax regime

From above Table 04, it seems that union budget 2024 announced various amendments, and the aim was to make the new tax regime more beneficial for the financial year 2024-2025, the rebate limit has been increased to Rs.700000 under the new tax regime.

It means a resident individual taxpayers with taxable income up to Rs. 700000 will receive Rs. 25000 or the amount of tax payable whichever is less as tax rebate or relief under section 87A as per income tax act 1961. But a resident individual taxpayer's who adopted the old tax regime with taxable income up to Rs. 500000 will receive Rs.12500 or the amount of tax payable whichever is lower.

In the case of the old tax regime, the maximum slabs amount of non-taxable income for an individual taxpayer was Rs 250000. However, He can also get a rebate up to Rs.2,500 under section 87A if he has a total income of up to Rs.350000 for financial years 2018-19. From Financial year 2019-20 onwards, the rebate has been increased up to Rs.12,500 for an income up to Rs 500000. So, that means an individual earning up to 500000 will not be required to pay any income tax from FY 2019-20 onwards. If he has tax saving investments under section 80C of up to Rs 150000 then you will not have to pay any taxes till Rs 600000. In the budget year 2023-2024, In case of new tax Regime, the maximum limit of non-taxable income for an individual taxpayer is Up to Rs 300000. However, He can also get a rebate of Rs 25000 under section 87A if you have a total income of up to Rs 700000 for FY 2024-25. So, that means an individual earning up to 700000 will not be required to pay any income tax from FY 2024-25 onwards. However, in the case of the old regime, the limit for rebate under section 87A is still 500000.

Table 5: Showing gross total income of Mr. Ram

Particular's	Amount
Income from salary	200000
Income from House property	125000
Income from capital Gain	125000
Income from other source	300000
Gross Total Income	750000

Table 6: Showing total income and tax liability under old tax regime and new tax regime

Particular's	Old tax regime	New tax regime
Gross Total Income	750000	750000
Less: Standard deduction	50000	75000
Less: Deduction Under section 80 C	80000	Nil
Contribution For RPF Rs. 50,000		
Contribution to LIP Rs. 10,000		
Purchase of mutual fund Rs. 15,000		
Deposited to Sukanya samridhi account Rs. 5,000		
Less:- Deduction under Section 80 D		
Medical insurance premium by cheques 10000	10000	Nil
Total Taxable Income	610000	6,75,000

Table 7: Showing total tax liabilities under old tax regime and new tax regime for the financial year 2024-2025

Old Tax Regime	New Tax Regime
Up to Rs. 250000 Nil	Up to Rs. 300000 Nil
Next on 250000 @ 5% 12500	Next on 300000 @ 5% 15000
Remaining 110000 @ 20% 22000	Remaining 75000 @ 10% 7500
Add: Surcharge Nil	Total 22,500
34500	Less:- Rebate U/S 87A 25000
Add:- H.H & E.C. @ 4% 1380	Tax liabilities = Nil
Total tax liabilities = 35880	

Above Table No-6 & Table No-7, it seems that under the old tax regime all deductions and exemptions are available under These Tax Regime but rebate is allowed up to taxable income Rs. 500000. Under the new tax regime only standard deduction are allowed other deduction are not available. Rebate under Section 87A are to be allowed up to taxable income Rs. 700000. It is also clear that small individual taxpayer's who has taxable income up to Rs. 700000 who chose new tax regime because his tax liabilities is Nil.

Advantages and Disadvantages of the New Tax Regime (Based on the Union Budget 2024-2025)

➢ **Advantages of the New Tax Regime:**

- A taxpayer is exempt from paying taxes up to Rs. 300,000 under the new tax regime.
- The rebate cap has been raised to Rs. 700,000.
- A standard deduction of Rs. 75,000 is permitted.
- NPS is permitted up to Rs 50,000.

➢ **Disadvantages of the New Tax Regime**

- No House Rent Allowance or 80GG Exemptions.
- No deductions under chapter 6A (80C, 80D etc.)
- No home loan benefits.
- No leave travelling Allowance.

Conclusion:

The new tax regime offers taxpayers flexibility, with the 2024-2025 Union Budget's benefits exclusively applicable to those who opt for it. This regime primarily impacts middle-class taxpayers. While it eliminates most deductions and exemptions, it retains the standard deduction and allows for NPS contributions, thereby limiting tax planning options.

Our analysis indicates that both the old and new regimes are advantageous for taxpayers with incomes up to ₹500,000. For incomes exceeding this threshold, individuals must calculate their liabilities under both systems to determine the most beneficial option. The ₹50,000 standard deduction in the new regime particularly benefits those with incomes up to ₹750,000. Notably, the new regime limits tax rebates to incomes of ₹700,000.

Ultimately, taxpayers who have engaged in comprehensive tax planning, utilizing various deductions and investments for future benefits, will likely find the old tax regime more favorable due to its potential for significantly reduced tax liabilities.

Findings:

➢ **Old Regime Advantage for Planners:** Taxpayers utilizing exemptions and deductions significantly reduced their tax liabilities under the old regime.

➢ **Tax Planning Disparity:** Tax planning is crucial in the old regime, while the new regime offers limited scope for it.

➢ **New Regime Benefit for Mid-Income:** Individuals with incomes up to ₹750,000 generally benefit from the new tax regime.

- **Limited Deductions in New Regime:** The new regime permits only standard deductions and NPS contributions.
- **No Other Deductions:** All other deductions are excluded under the new tax regime.
- **Equivalence for Lower Incomes:** Both tax regimes are equally beneficial for taxpayers with incomes up to ₹500,000.
- **Investment and Savings Disincentive:** The new regime provides no tax relief for investments and savings.
- **New Regime for Small Taxpayers:** Small taxpayers may find the new tax regime advantageous.

Suggestions:

- **Preserve Deductions in Old Regime:** Maintain and potentially expand the availability of exemptions, deductions, and concessions within the old tax regime.
- **Promote Tax Planning:** Encourage taxpayers to engage in thorough tax planning to maximize benefits under the old tax regime.
- **Highlight Default Option:** Emphasize the default nature of the new tax regime, ensuring taxpayers are aware of their choice.
- **Enable Regime Switching:** Implement a mechanism allowing taxpayers to switch between the old and new tax regimes as their financial circumstances change.

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Impact of the Indian Union Budget 2025 on the Indian Economy

Ashutosh Bhupeshbhai Mehta

Abstract

The Indian Union Budget 2025 plays a pivotal role in shaping the trajectory of the nation's economic growth and stability. This research paper critically examines the impact of the budget on macroeconomic indicators and evaluates sectoral allocations across agriculture, industry, infrastructure, health, and education. The study investigates the effectiveness of fiscal policy measures such as taxation, subsidies, and government expenditure in driving GDP growth, controlling inflation, generating employment, and maintaining fiscal discipline. Data is collected from government budget documents, the Economic Survey of India, and other secondary sources.

Using a combination of qualitative analysis and statistical tools, the paper highlights key initiatives such as the Prime Minister Dhan-Dhaanya Krishi Yojana, National Manufacturing Mission, and the expansion of Atal Tinkering Labs. A detailed analysis of the budgetary allocations shows a targeted approach toward rural prosperity, MSME growth, clean tech, and human capital development. Graphical representations and sectoral data trends indicate a positive correlation between fiscal interventions and improvements in GDP, employment rates, and sectoral productivity.

The study concludes that the Union Budget 2025 reinforces India's economic resilience by prioritizing inclusive growth, self-reliance (Atmanirbhar Bharat), and sustainability. However, it also emphasizes the need for continuous monitoring and effective implementation to ensure the desired outcomes are achieved.

Keywords*: Union Budget 2025, Economic Growth, Fiscal Policy, Sectoral Allocation, Agriculture, MSMEs, Infrastructure, India.*

Introduction

The Union Budget 2025, presented by the Government of India, outlines a roadmap aimed at fostering inclusive growth, enhancing productivity, and ensuring long-term economic stability. This research paper analyses the role of the budget in promoting economic growth and stability, examines the impact of budgetary allocations on key sectors such as

agriculture, industry, health, education, and evaluates the effectiveness of fiscal policy measures on key macroeconomic indicators like GDP growth, inflation, employment, and fiscal deficit.

Review of Literature Review

- **Rao, M. Govinda (2018)**

  Title: Union Budgets in India: Process, Content, and Changing Perspectives

  Review:

  Rao's study provides an in-depth analysis of the evolution of India's budgetary process, highlighting how fiscal policy has been used as an instrument of economic planning and development. The paper emphasizes the role of the budget in addressing fiscal deficits and maintaining macroeconomic stability. Rao argues that while the budget has historically focused on revenue generation, there has been a gradual shift towards promoting inclusive growth through targeted welfare schemes and infrastructure spending. **Source:** National Institute of Public Finance and Policy (NIPFP).

- **Chelliah, Raja J. (1996)**

  Title: Towards Sustainable Growth: Essays in Fiscal and Financial Sector Reforms in India

  Review:

  Chelliah examines the role of fiscal reforms introduced through the Union Budget in achieving sustainable economic growth. His analysis underscores the importance of rationalizing taxation, controlling subsidies, and reducing fiscal deficits to ensure macroeconomic stability. Chelliah's work is significant in understanding the structural adjustments India undertook in the post-liberalization era and how these were reflected in budgetarypolicies.

  Publisher: Oxford University Press.

- **Rangarajan, C., and Srivastava, D.K. (2005)**

  Title: Fiscal Deficit and Government Debt: Implications for Growth and Stabilization

  Review:

  This paper discusses the impact of fiscal deficits, as reflected in successive Union Budgets, on economic growth and inflation in India. Rangarajan and Srivastava analyze the trade- off between fiscal consolidation and developmental expenditure, arguing for a balanced approach. They conclude that maintaining fiscal discipline in the budget is crucial for sustaining economic growth without triggering inflationary pressures. **Source:** Economic and Political Weekly.

- **Chakraborty, Lekha S. (2016)**

  Title: Fiscal Consolidation, BudgetDeficitsandtheMacroeconomy

  Review:

  Chakraborty's research explores the macroeconomic implications of India's budgetary policies, particularly fiscal consolidation and deficit

management. The study evaluates the effectiveness of fiscal rules, such as the Fiscal Responsibility and Budget Management (FRBM) Act, in maintaining economic stability. It highlights how budgetary allocations toward social sectors like health and education have a multiplier effect on growth and human development.

Publisher: Sage Publications.

- **Mohanty, Deepak (2011)**

  Title: Perspectives on India's Macroeconomic Development

  Review:

  Mohanty provides a comprehensive review of India's macroeconomic development in the context of fiscal and monetary policies. His analysis of the Union Budget underscores its role in addressing inflation, promoting investment, and fostering financial inclusion. Mohanty emphasizes the need for a prudent fiscal policy framework, suggesting that effective budgetary planning is key to maintaining economic stability and growth. **Source:** Reserve Bank of India (RBI) Occasional Papers.

Research Problem

Despite successive efforts through fiscal policies and government interventions, certain sectors of the Indian economy continue to experience growth disparities. The 2025 Union Budget proposes significant reforms and allocations. However, the actual impact of these measures on economic growth, stability, and development of sectors like agriculture, MSMEs, infrastructure, health, and education remains to be comprehensively analyzed.

Objectives

- To analyze the role of the Indian Union Budget in promoting economic growth and stability.
- To examine the impact of budgetary allocations on key sectors such as agriculture, industry, infrastructure, health, and education.
- To evaluate the effectiveness of fiscal policy measures (taxation, subsidies, and government expenditure) announced in the budget on macroeconomic indicators like GDP, inflation, employment, and fiscal deficit.

Research Methodology Type of Research:

- **Descriptive and Analytical Research Data Collection:**
- **Secondary Data** from:
  - Union Budget 2025 documents
  - Economic Survey of India
  - RBI Reports
  - NITI Aayog reports
  - Ministry of Finance publications
  - World Bank, IMF data
  - News articles and policy papers

Analytical Tools:

- **Statistical Analysis**
- **Trend Analysis**
- **Comparative Analysis**
- Graphs, charts, and tables to represent sectoral allocations and economic performance.

Data Analysis & Interpretation

Objective 1: Role of the Indian Union Budget in Promoting Economic Growth and Stability 5-Year GDP Growth Trend (in %)

Year	GDP Growth (%)
2021	8.7
2022	7.2
2023	6.8
2024	7.0
2025 (Projected)	7.8

Graph 1: GDP Growth Trend

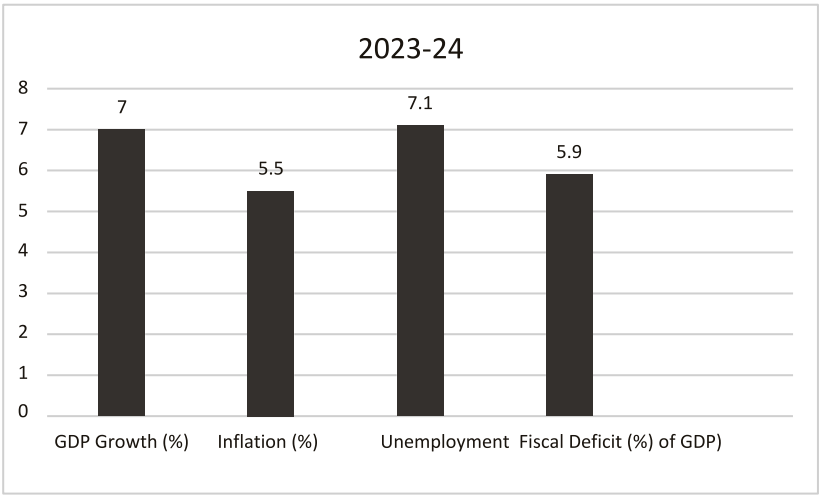
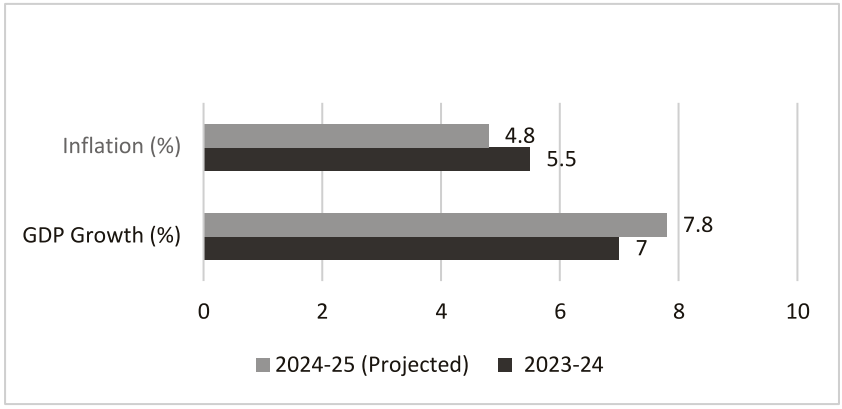


Figure 1 graph showing GDP growth trend from 2021 to 2025

Fiscal Stability Indicators

Indicator	2024-25 Estimate	Previous Year (2023-24)
Fiscal Deficit (% of GDP)	5.1%	5.9%
Revenue Deficit (% of GDP)	2.9%	3.5%

Graph 2: Fiscal Deficit Trend



ing fiscal deficit reduction over two years

Interpretation:

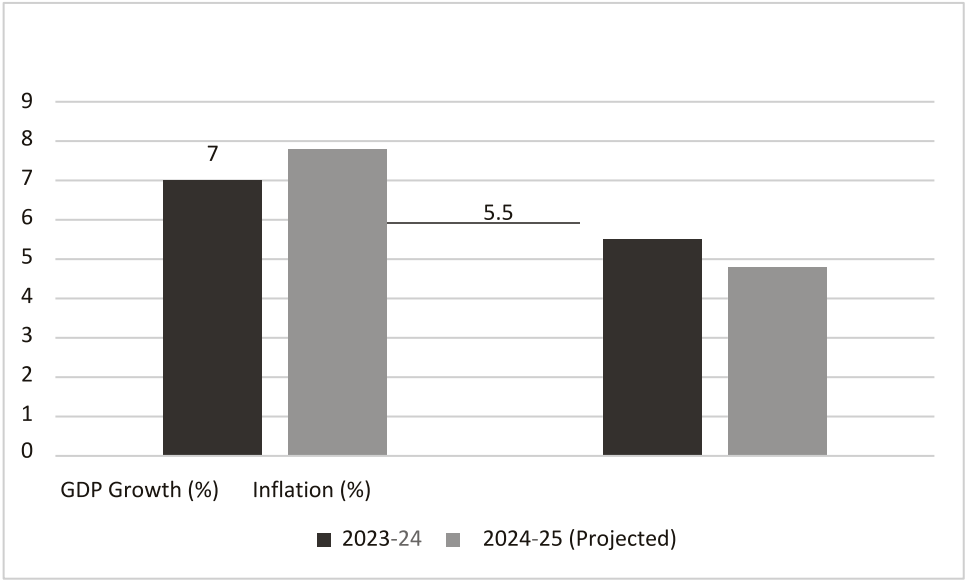
The reduction in fiscal deficit and revenue deficit highlights fiscal consolidation efforts. Higher public capital expenditure aims to stimulate investment-driven growth.

Objective 2: Impact of Budgetary Allocations on Key Sectors

➢ **Agriculture Sector**

Allocation Year	Budget Allocation (₹ Cr.)	Growth %
2023-24	1,25,000	-
2024-25	1,50,000	20%

Graph 3: Agricultural Budget Allocation Growth



h'sy *allocation increase in ₹ Cr.)*

Key Initiatives

- Prime Minister Dhan-Dhaanya Krishi Yojana
- National Mission on High-Yielding Seeds
- Mission Aatmanirbharta in Pulses
- KCC Loan Enhancement (₹5 lakh limit)

Impact:

- Expected to benefit 1.7 crore farmers
- Promotes rural employment and productivity
- Reduces post-harvest losses via improved storage and logistics

➢ **MSMEs Sector**

Year	Credit Guarantee Cover (₹ Cr.)	Fund of Funds (₹ Cr.)
2023	5,000	0
2025	10,000	10,000

Key Initiatives:

- Classification revision expanding MSME eligibility
- Credit cards for micro-enterprises
- Footwear & leather sector scheme → 22 lakh jobs
- Toy sector manufacturing hub

Impact:

- Increased credit flow (₹1.5 lakh crore additional credit)
- Boost in exports and job creation

➢ **Health & Education Sector**

Sector	Budget 2023-24 (₹ Cr.)	Budget 2024-25 (₹ Cr.)	Growth %
Health	86,175	98,500	14%
Education	1,12,900	1,25,000	10.8%

Graph 4: Health and Education Budget Allocation

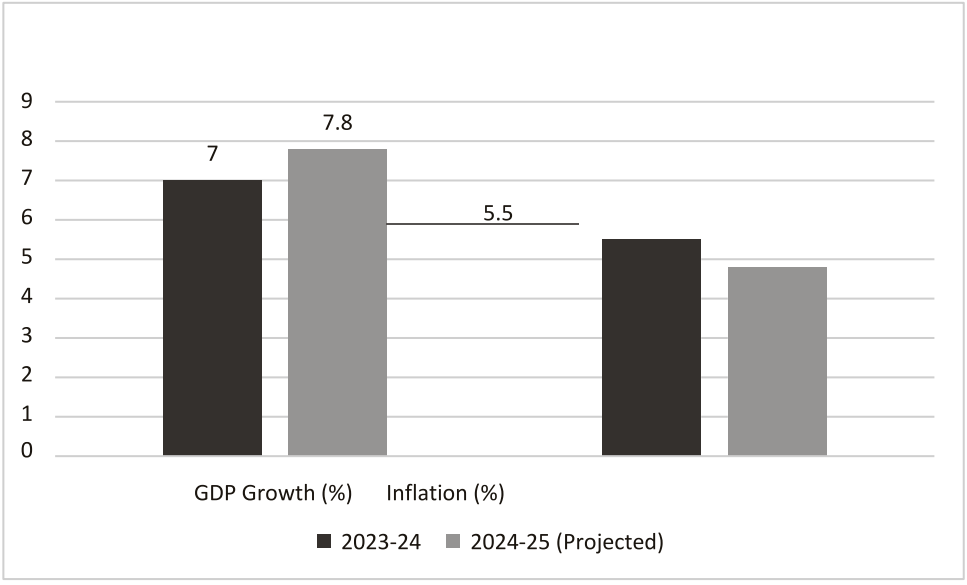


Figure 4 graph showing increases in allocations

Health Initiatives:

- Daycare cancer centres in 200 districts
- Expansion of medical seats (10,000 in 2025-26)
- PM Jan Arogya Yojana for gig workers

Education Initiatives:

- 50,000 Atal Tinkering Labs
- IIT expansions (+6,500 seats)
- Bharatiya Bhasha Pustak Scheme

Objective 3: Effectiveness of Fiscal Policy Measures on Macroeconomic Indicators Taxation

Income Group	Previous Tax Rate	Revised Tax Rate
₹12.75L (middle-class)	5% (after rebate)	Nil
₹20L-₹24L	30%	25%

Key Initiative:

- **Tax Relief for Middle-Income Groups**
- Complete tax exemption for income up to ₹12.75 lakh (post-rebate).
- Reduced tax rate from 30% to 25% for the ₹20 lakh - ₹24 lakh income slab.
- Simplified tax filing under the new regime to encourage compliance.

Impact:

- **Boosts Disposable Income**
- Increases middle-class savings and consumption.
- Enhances demand in sectors like housing, automobiles, and consumer goods.
- Supports economic growth through higher household spending.
- Encourages formalization of income and tax base expansion.

Subsidies and Expenditures

Category	Subsidy (₹ Cr.)	Beneficiaries (Est.)
Agriculture Subsidy	75,000	7.7 crore farmers
Start-up Subsidy	5,000	5 lakh entrepreneurs

Key Initiative:

- AgricultureSubsidy:
  ₹75,000 crore allocated to support farmers through schemes like fertilizer subsidies, irrigation projects, and minimum support prices (MSP).
- Start-up Subsidy:
  ₹5,000 crore allocated to encourage innovation and entrepreneurship, including seed funding, incubation support, and tax incentives for start-ups.

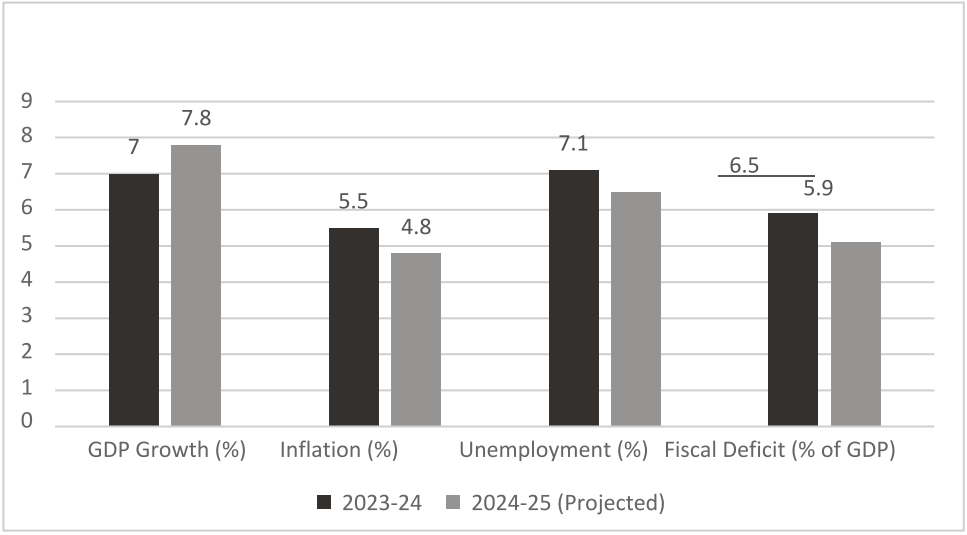
Impact:

- Agriculture Subsidy:
  Benefits 7.7 crore farmers by reducing input costs and improving productivity. Enhances rural incomes and food security.
- Start-up Subsidy:
  Supports 5 lakh entrepreneurs in scaling up businesses. Promotes job creation, innovation, and economic diversification.

Key Macroeconomic Indicators

Indicator	2023-24	2024-25 (Projected)
GDP Growth (%)	7.0	7.8
Inflation (%)	5.5	4.8
Unemployment (%)	7.1	6.5
Fiscal Deficit (% of GDP)	5.9	5.1

Graph 5: Macroeconomic Indicators Performance



Findings

- Increased budgetary allocations are targeted at inclusive growth sectors
- Fiscal consolidation with reduced deficits while increasing capital expenditure
- MSMEs and Agriculture sectors received substantial credit support
- Tax relief measures enhance middle-class disposable incomes, fostering consumption demand
- Investments in health and education are projected to yield long-term human capital development

Suggestions

- Ensure timely disbursal and utilization of allocated funds
- Strengthen monitoring frameworks for large-scale schemes
- Prioritize skill development to complement job creation
- Further enhance ease of doing business for MSMEs
- Maintain fiscal prudence to avoid inflationary pressures

Conclusion

The Indian Union Budget 2025 reflects a balanced approach towards fiscal discipline and growth. Strategic investments in agriculture, MSMEs, health, and education sectors, along with proactive fiscal measures, have set the economy on a path of sustained growth, inclusivity, and resilience.

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- RBI Bulletin 2025
- Ministry of Finance Reports
- World Bank Data
- NITI Aayog Reports

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The Role of AI in Frauds detection with Reference to Indian Banking Sector

Jayshree D. Parmar

Abstract:

AI is better suited to rapidly examine vast amounts of data to determine out-of-pattern anomalies that may indicate fraud, allowing financial institutions to anticipate and neutralize threats before they occur. AI-driven fraud detection is more precise, flexible, less expensive, and better able to enhance customer experiences than manual techniques. Through the use of artificial intelligence (AI) in fraud detection, particularly in the banking industry. AI is strong in analyzing large data sets rapidly to detect unusual patterns that could indicate fraud. Through the use of such prediction, banks can lower risks ahead of time before they are very large, making overall fraud detection better. AI-based solutions can be customized to suit individual requirements, bettering anti-fraud controls and safeguarding clients' assets. In addition, AI provides advantages including enhanced accuracy, flexibility, affordability, enhanced customer experience, risk management, and assistance with regulatory compliance. The work of AI is quite significant in banking sector.

The article stresses on the significant contribution of artificial intelligent in Banking Sector, also Analysis and Preventive Measures of Banking Frauds with Reference to Indian Banking Sector.

Keywords: *Artificial Intelligence, Banking Sector , Frauds, Scams, Technologies and Tools.*

Introduction:

AI enhances fraud preventive measures, advances regulatory compliance, and secures the safety of transactions.AI-facilitated fraud detection identifies suspicious patterns through the processing of vast datasets to recognize suspect patterns. AI-driven models analyze anomalies and trends based on these big data and progressively refine themselves using new information. This flexibility of AI enables algorithms to continually optimize their accuracy for fraud detection with the passage of time, keeping organizations in advance of maintaining the security and integrity of transactions.The work of AI is quite significant in banking sector,also Analysis and Preventive Measures of Banking Frauds with Reference to Indian Banking Sector.AI is strong in analyzing large data sets rapidly to detect unusual patterns that could indicate fraud. Through the use of such prediction, banks can lower risks ahead of time before they are very large, making overall fraud detection better. AI-based solutions can be customized to suit individual requirements, bettering anti-fraud controls and safeguarding clients' assets. In addition, AI provides advantages including enhanced accuracy, flexibility, affordability, enhanced customer experience, risk management, and assistance with regulatory compliance.

Objectives of the paper:

This article emphasizes the important role of artificial intelligent in Banking Sector, also Analysis and Preventive Measures of Banking Frauds with Reference to Indian Banking Sector.

Literature review:

Geetha (2021) " A Study on artificial intelligence in Banking and Financial Services - The purpose of the article was to study about Artificial Intelligence in Banking and Financial Services in perceptions of clients or consumer. The study was found that Adoption of Banking and Financial Services AI in applications was highest followed by KYC/AML, Chat bots and Security Compliance and also helping to fulfill the customer demand faster and easier. The consumers more commitment from representatives to the banking and financial services by giving development innovative preparing to improve the AI procedures in the workplace. It is also being used to meet regulatory compliance, detect fraud, and assess individual creditworthiness.AI-driven customer service, real-time fraud prevention and risk management-it's the last one that might appeal most to those interested in industry disruption. IJCRTG020019 International Journal of Creative Research Thoughts (IJCRT) www.ijcrt.org

Deepa Mangala, Lalita Soni, (2023). Analysis and Preventive Measures of Banking Frauds with Reference to Indian Banking Sector The study was found that Bank frauds have significant impact of Indian financial system and its stability. In adequate functioning in prevention and detection of frauds increased bad loans among the banks and adversely affected the economic progress

Data and Methodologies:

The secondary data collection was done through various sources such as literature reviews, research articles, reports of authors, officials and Internet

AI and Banking Automation:

AI banking innovations represent a dramatic shift in the banking industry. Through artificial intelligence, internet banks and credit unions are transforming customer service, decision-making processes, and more. This phenomenon involves leveraging technologies such as chat bots to interact with customers and predictive analytic to make better, data-based choices.

- Virtual assistants and chat bots: Improve customer service with AI-based conversational agents.
- Predictive analytic: Using AI to provide enhanced risk assessment and tailored financial guidance.
- Process automation: Simplifying back-office processes and transaction processing.
- Fraud detection: Applying AI to detect and prevent fraudulent transactions more efficiently.

The Role of AI in Fraud Detection

AI-based models can automatically alert you to potential fraud attempts by scanning your previous transaction records. In a bid to curb the increasing threat of identity theft and other frauds, major financial institutions are adopting technologies that authenticate identities based on artificial intelligence.

Automated Anomaly Detection

Automated fraud detection systems can transfer artificial intelligence algorithms to identify patterns in data that indicate suspicious activity. Examples of such include large or irregular amounts of transactions, the same device being used to make multiple purchases, or the quick transferring of money from one geographic area to another. When the AI detects something unusual, it may flag the transaction as suspicious and investigate further.

Natural Language Processing

Financial institutions significantly depend on fraud detection tools in evaluating mortgage and loan proposals for indications of potential fraud. The experts depend on it daily as it is a critical part of their risk evaluation. Through the application of natural language processing (NLP), users can derive useful information from the apps, which they can later evaluate based on a model constructed on a data set comprising genuine and fictitious apps.

One example of a pattern that can be identified by the algorithm as being potentially a sign of potential fraud is one where there's a high gap between the annual gross income during two successive years when used along with some demographic factors. Certainly, it would cause false positives; the analysis is left for the analyst to evaluate further.

Behavior Analytic

A contemporary approach to fraud detection, behavior analytic software examines behavior patterns and searches for anomalies that could be indicative of fraud by using advanced algorithms and machine learning techniques.

By considering much more than the mere transactional information, behavior analytic software delivers a much richer picture of fraud. Such examples of these types of information are user patterns, device configurations, geolocation, and even much more broad items of data like the present time and historic transactions. Minor fraud signs are recognizable by the systems of behavior analytic through putting several kinds of information together and comparing them.

Deep Learning

Banks are able to use deep learning algorithms in order to discover unknown relationships between customer behavior and illicit activity. The clear signs of money laundering are usually very subtle, and it is extremely hard to detect using traditional methods. Due to the fact that there is a high risk involved and a high amount of money, this type of activity is usually linked with criminal organizations or what appear to be legitimate businesses.

But errors are unavoidable; the issue lies in detecting them in the innocent-sounding cover-up transactions. It may take only one payment to expose the entire fraud. Still, there are times that numerous transactions on the account appear legitimate on their own but together they do not add up. Even if a human specialist might fail to detect these patterns, the AI would be able to identify them instantly.

Benefits of AI for Fraud Detection

- **Enhance Accuracy**

One of the numerous benefits of artificial intelligence-driven fraud detection in banks is that it is more accurate. Traditional fraud detection is based on rule-based technology, and this can only detect fraud that is in line with already-established rules and patterns. This implies that fraudsters will struggle to come up with ways to exploit loopholes in those regulations.

On the contrary, AI-powered fraud detection systems utilize sophisticated machine learning algorithms, which allow them to identify and learn new patterns of fraudulent activity in real time. Banks can now detect and prevent fraud, including previously unknown schemes, more than ever before. Rapid analysis of vast amounts of data is one of the primary strengths of AI-based systems, which enables financial institutions to identify and fight fraud more efficiently.

- **Flexible**

Machine learning programs, the foundation of AI-based fraud detection systems, are able to accept new data in a continuous manner. The systems track transactions and incorporate new patterns within their models as they occur.

A feedback cycle is a general operating environment of AI models in fraud detection. The technology pumps feedback into the model whenever it finds and highlights a fraudulent payment. To train the model for identifying future incidences like these, it incorporates this input for adjusting its methods and parameters.

➢ **Quick Response**

Through the application of machine learning algorithms, AI-based fraud detection systems can monitor transactions, customer behavior, and other pertinent data points in real time. With this, the system can identify potentially fraudulent patterns, or anomalies from the mean. This enables banks to react immediately to any suspicious activity or fraudulent transactions, thus avoiding further losses.

Value of the Banking frauds from the year 2015-16 to 2023- 24 in India. (In bilion Indian rupees)

Year	Total value of frauds (₹crore)
2015-16	18,491
2019-20	1,66,576
2020-21	1,18,417
2021-22	45,598

(Source: RBI)

In the given above table we are given year wise data of fraud value (₹crore). While comparing year 2015-16 with 2019-20 we find that there was a huge increase in fraud numbers from 18,491 to 1,66,576 respectively. We can observe a similar trend between the years 2019-20 and 2020-21 where total fraud value increased from 1,66,576 to 1,18,417 respectively. This rising trend of frauds continued for long 3 to 4 years. But there was a huge decline in value of frauds in the year 2021-22 annual data which was 45,598.

During financial year 2024, Reserve Bank of India (RBI) reported bank frauds worth more than 139.3 billion Indian rupees. This figure was less than more than 302 billion rupees in 2023. Therefore, the value of bank frauds bucked the trend, after India witnessed a spectacular increase in bank frauds in the last decade, both in terms of quantity and fraud value.

By applying AI we can detect different frauds and with its application we can analyze and get solution for different frauds respectively, it can be achieved by applying different tool of AI for instance application of AI fraud detection.

AI fraud prevention means applying artificial intelligence (AI) to detect, avoid, and contain fraudsters on digital channels. Security measures apply complex algorithms, machine learning techniques, and behavior patterns to separate, in real time, authentic users of a digital platform from others intending to perpetuate fraud on the same digital platform.

Conclusion:

In conclusion, the use of AI fraud detection software is necessary for organizations that want to protect their operations from the constantly changing fraud threats. Through the use of artificial intelligence, organizations are able to enhance their security levels considerably, enabling real-time monitoring and instant notification when suspicious behavior is identified. This proactive method not only enables faster responses to potential fraud but also reduces the chances of financial loss, thus protecting the institution and its clients.

In addition, AI-based systems learn and evolve with new fraud methods on a constant basis, making organizations more resilient to new threats. Automation of fraud detection also results in better operational efficiency, releasing precious human resources for more sophisticated tasks. Finally, by improving security, enhancing productivity, and strengthening customer support, AI-based fraud detection tools are a key driver of building trust and confidence among customers, making them an invaluable resource in the current digital age.

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Artificial Intelligence within the Realm of Human Resource Management: Recruitment, Training and Analysing Performance

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Abstract

Artificial Intelligence (AI) is reshaping the landscape of Human Resource Management (HRM) by automating and improving processes related to hiring, training, and performance evaluation. This paper delves into the ways in which AI-powered tools are revolutionizing recruitment by simplifying candidate selection, enhancing employee training through tailored learning experiences, and refining performance management with the help of data-driven insights. Furthermore, the paper addresses challenges such as ethical considerations, data privacy concerns, and biases present in AI algorithms. It also explores the future trends of AI in HRM and its potential to cultivate a more adaptable and efficient workforce.

Keywords: *AI in HRM, Recruitment, Employee Training, Performance Analysis, HR Technology, Workforce Automation*

Introduction

Human Resource Management (HRM) plays a crucial role in organizations by overseeing the recruitment, training, and retention of employees to ensure peak performance. The integration of Artificial Intelligence (AI) is revolutionizing HRM by streamlining repetitive tasks, utilizing data analytics for informed decision-making, and elevating the overall employee experience.

AI technology is being utilized in various aspects of HRM, from candidate selection to workforce analytics, offering valuable insights that enable organizations to make strategic, data-driven choices. AI-driven tools for recruitment, training, and performance evaluation are enhancing operational efficiency, accuracy, and overall effectiveness.

As businesses strive to optimize workforce management and gain a competitive edge in the global marketplace, the adoption of AI-powered HR solutions is on the rise. This paper delves into the transformative impact of AI on hiring practices, training programs, and performance evaluations, ultimately empowering organizations to boost productivity, enhance employee satisfaction, and effectively navigate the challenges associated with AI integration.

AI in Hiring and Recruitment

Recruitment is one of the most time-consuming tasks in HRM. AI-powered tools are helping organizations streamline the hiring process in several ways:

- **Resume Screening:** Resume screening is now more efficient than ever thanks to AI algorithms that can analyse thousands of resumes in a matter of seconds. These algorithms rank candidates based on job requirements, skills, experience, and keywords, significantly reducing the need for human effort and speeding up the hiring process. This automation also helps to eliminate manual errors that can occur during traditional resume screening methods. Tools such as HireVue and Pymetrics utilize AI to filter candidates based on predetermined criteria, ultimately enhancing the accuracy of the hiring process.
- **Chatbots and Virtual Assistants:** Artificial intelligence-powered chatbots interact with potential candidates, addressing inquiries, conducting pre-screening interviews, and arranging follow-up discussions with recruiters to enhance candidate engagement. Chatbots such as Mya and Olivia support HR teams by decreasing response times and maintaining consistent communication with applicants.
- **Predictive Analytics:** Artificial Intelligence analyses historical hiring data to forecast which candidates are most likely to excel in a given role, taking into account past trends, competencies, and alignment with company culture. This process effectively lowers turnover rates and enhances the quality of hires by pinpointing high-potential candidates at an early stage of the recruitment process.
- **Automated Video Interview Analysis:** Artificial intelligence tools analyse candidates' body language, tone, speech patterns, and facial expressions during video interviews to evaluate their confidence, sincerity, and communication skills. Platforms such as HireVue utilize

AI-driven video analytics to assess candidates based on non-verbal cues and responses.

- **Bias Reduction:** Artificial intelligence (AI) is specifically engineered to eradicate unconscious human biases by prioritizing skills and competencies over subjective criteria. Despite this, ethical concerns surrounding algorithmic bias persist as a significant challenge. Continuous auditing and refinement of AI models are necessary to guarantee fair hiring practices.

AI in Employee Training and Development

Effective training is crucial for employee productivity and career development. AI enhances training and development in the following ways:

- **Personalized Learning:** Artificial intelligence (AI) powered learning management systems (LMS) analyse employees' progress and customize training modules based on their individual needs, learning styles, and job roles. This ensures targeted skill development, enabling employees to learn at their own pace. Prominent platforms such as Coursera and Udemy utilize AI-based recommendations to offer personalized courses for learners.
- **Virtual Reality (VR) and Augmented Reality (AR):** Artificial intelligence (AI) is revolutionizing training simulations by integrating virtual reality (VR) and augmented reality (AR) technologies. This innovative approach is particularly beneficial in high-risk industries such as healthcare, aviation, and manufacturing, where employees can engage in immersive practice sessions in a safe environment. Major corporations like Boeing and Walmart are leveraging AI-driven VR training to improve employee skills and enhance decision-making processes.
- **Automated Feedback and Assessment:** Artificial intelligence (AI) powered coaching tools offer immediate performance feedback, analyse employee progress, and recommend enhancements to boost skills and efficiency. AI-driven assessment tools, like Docebo and IBM Watson Talent Frameworks, assist organizations in accurately measuring employee performance.
- **Gamification and AI-Driven Engagement:** Artificial intelligence incorporates gamified elements into training modules by implementing reward systems, leaderboards, and interactive scenarios to enhance motivation and participation. Platforms powered by AI, such as Kahoot! and Axonify, utilize gamification to increase the engagement and effectiveness of learning experiences.
- **AI-Based Skill Gap Analysis:** Artificial intelligence (AI) plays a crucial role in identifying skill gaps among employees and recommending upskilling programs. By doing so, AI helps create a future-ready workforce and reduces redundancies caused by technological advancements. AI-driven systems analyse workforce trends to suggest skill-building initiatives that are tailored to meet industry needs. This proactive approach ensures that employees are equipped with the necessary skills to thrive in an ever-evolving business landscape.

AI in Performance Analysis

Performance management has evolved with AI, providing HR teams with real-time insights into employee productivity and engagement. AI improves performance evaluation through:

- **Continuous Performance Tracking:** Artificial intelligence tools are utilized to monitor employee performance by analysing data, tracking key performance indicators (KPIs), and productivity metrics in order to provide actionable insights. Platforms driven by AI, such as Workday and SAP Success Factors, assist organizations in optimizing workforce management through the use of real-time analytics.
- **Sentiment Analysis:** Utilizing AI-powered sentiment analysis, organizations can evaluate employee feedback, emails, surveys, and workplace communication to gauge job satisfaction and workplace morale. Cutting-edge tools such as Qualtrics and Glint leverage AI technology to analyse sentiment trends, enabling companies to proactively identify and address potential workplace issues before they escalate.
- **Predictive Performance Analytics:** Artificial intelligence utilizes historical data to predict future performance trends, enabling managers to pinpoint high-potential employees and those who may require additional support or training. Predictive tools play a crucial role in aiding organizations with talent retention and workforce planning.
- **Automated Reporting:** Artificial intelligence (AI) produces comprehensive performance reports, empowering HR professionals to make informed decisions on promotions, salary adjustments, and workforce planning. AI tools streamline data analysis and eradicate manual reporting inaccuracies.
- **AI-Powered Employee Well-Being Analysis:** Artificial intelligence can identify signs of burnout and stress by analysing employee

communication patterns, workloads, and behavioural changes, enabling proactive intervention. AI-powered solutions such as Microsoft Viva Insights offer recommendations to enhance employee well-being and promote a healthy work-life balance.

Challenges and Ethical Considerations

While AI provides significant advantages in HRM, several challenges and ethical concerns must be addressed:

- **Bias in Algorithms:** Artificial intelligence models have the potential to inadvertently absorb biases from past hiring data, resulting in discriminatory practices. It is imperative for companies to conduct routine audits of AI decisions to guarantee fairness and equity in recruitment and performance evaluations.
- **Data Privacy and Security:** Artificial Intelligence (AI) gathers extensive employee data, which has sparked concerns regarding data protection, unauthorized access, and compliance with data privacy regulations such as the General Data Protection Regulation (GDPR) and India's Data Protection Act. This issue highlights the importance of safeguarding sensitive information and adhering to legal requirements to ensure the privacy and security of employee data.
- **Workforce Resistance:** Employees may have concerns about AI-driven HR processes, such as job displacement, lack of human interaction, and workplace surveillance. It is crucial for companies to prioritize AI-human collaboration over job automation in order to address these fears.
- **Ethical and Legal Issues:** It is imperative for organizations to ensure that AI tools adhere to labour laws, corporate policies, and ethical guidelines in order to prevent misuse and uphold transparency in HR decision-making processes. Failure to do so may result in legal repercussions and damage to the organization's reputation. By implementing proper oversight and compliance measures, organizations can effectively harness the power of AI technology while maintaining ethical standards and promoting fairness in the workplace.
- **Dependence on AI Interpretation:** Relying too heavily on AI insights can lead to a decrease in human judgment and potential misinterpretation of employee capabilities. It is essential to have human oversight in place to validate decisions made by AI and to guarantee that employees are treated fairly.

Future Prospects of AI in HRM

AI's role in HRM is expected to grow further, with key trends including Explainable AI (XAI), AI-driven employee experience (EX), advanced predictive analytics, AI-powered diversity and inclusion strategies, and integration with IoT and wearable technologies.

- **Explainable AI (XAI) in HRM**

  Explainable AI (XAI) ensures that AI-driven decisions in HR are transparent, interpretable, and justifiable. Instead of functioning as a "black box," XAI provides clear reasoning behind AI-based decisions.

  - **How XAI Will Impact HRM?**
    - **Bias-Free Hiring:** XAI will help HR managers understand why an AI system selects or rejects a candidate.
    - **Fair Performance Reviews:** Employees can receive explanations on how AI evaluates their performance, increasing trust.
    - **Regulatory Compliance:** AI-driven HR decisions must be accountable under labour laws; XAI ensures legal compliance.
    - **Better HR Decision-Making:** HR professionals can refine AI algorithms based on transparent feedback.

- **AI-Driven Employee Experience (EX)**

  Employee Experience (EX) refers to how employees perceive their work environment, culture, and interactions within the organization. AI will play a crucial role in enhancing personalized employee experiences using automation and data insights.

  - **How AI Will Enhance Employee Experience?**
    - **AI Chatbots for HR Support:** Chatbots will provide 24/7 HR assistance to employees, answering common queries about payroll, leaves, and policies.
    - **Sentiment Analysis & Mood Tracking:** AI tools can analyse employee feedback (emails, surveys, chats) to detect stress, dissatisfaction, or burnout.
    - **Personalized Learning & Development:** AI-driven platforms will recommend skill enhancement courses tailored to each employee's career goals.

- **Automated Employee Wellness Programs:** AI will suggest health tips, meditation breaks, or work-life balance solutions based on employee productivity patterns.

➢ **Advanced Predictive Analytics in HR**

AI-powered predictive analytics uses past and real-time data to forecast HR trends and decision-making.

- **How Predictive Analytics Will Benefit HRM?**
  - **Attrition Prediction:** AI will analyse patterns of employee turnover and identify employees who are likely to leave.
  - **Performance Forecasting:** AI will predict which employees are likely to be promoted based on performance trends.
  - **Optimized Workforce Planning:** AI will recommend hiring schedules, skill gap analysis, and future workforce needs.

➢ **AI-Powered Diversity and Inclusion Strategies**

AI can help reduce biases, ensure fair hiring, and create an inclusive workplace by analysing diversity metrics.

- **How AI Will Support HR in Diversity & Inclusion?**
  - **Bias-Free Recruitment:** AI can remove personal information (name, gender, age) from resumes to ensure fair shortlisting.
  - **Equal Pay Analysis:** AI can detect gender pay gaps and suggest fair salary distributions.
  - **Diversity Analytics:** AI can track diversity metrics and recommend strategies to increase representation of underrepresented groups.

➢ **Integration of AI with IoT and Wearable Technologies**

IoT (Internet of Things) and wearable devices (smartwatches, fitness bands) will integrate with AI to enhance employee well-being, productivity, and security.

- **How AI & IoT Will Benefit HRM?**
  - **Smart Workspaces:** AI will use IoT sensors to monitor workspace conditions (e.g., temperature, lighting, noise) and optimize employee comfort.
  - **Employee Health Monitoring:** AI-enabled wearables can track employee stress levels, heart rate, and fatigue to prevent burnout.
  - **Attendance & Productivity Tracking:** AI and IoT devices can automatically log employee attendance and suggest improvements in productivity.
  - **Safety & Security:** AI-integrated smart cameras and badges can ensure secure workplace access.

Conclusion

AI is transforming Human Resource Management (HRM) by automating key functions such as recruitment, training, and performance management, leading to increased efficiency and accuracy. AI-powered tools streamline the hiring process by screening resumes, conducting initial interviews, and reducing bias in candidate selection. In employee training, AI-driven personalized learning platforms recommend skill enhancement programs based on individual career goals. Performance management is also evolving with AI-based analytics that track employee productivity, provide real-time feedback, and predict future performance trends. Additionally, AI enhances employee engagement through sentiment analysis, chatbots for HR assistance, and wellness programs that monitor work-life balance. However, organizations must ensure human oversight to prevent ethical concerns such as biased algorithms, data privacy risks, and lack of transparency in decision-making. Explainable AI (XAI) is emerging as a solution to make AI-driven HR decisions more understandable and fairer. Future AI developments will refine HR processes, making them more predictive, inclusive, and aligned with workforce needs. Integrating AI with IoT and wearable technology will further enhance workplace safety, productivity, and well-being. To maximize AI's potential, businesses must adopt ethical AI practices while maintaining the human touch in HRM.

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Leadership 4.0: A New Perspective in the Digital Age

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Abstract

The rapid evolution of digital technologies has ushered in a new era of leadership—Leadership 4.0, characterized by agility, adaptability, and data-driven decision-making. This paper explores the transformative role of Leadership 4.0 in the digital age, where artificial intelligence, automation, and connectivity redefine traditional leadership models. By examining key competencies such as digital literacy, emotional intelligence, and innovative thinking, this study highlights how leaders can effectively navigate complex digital ecosystems. Furthermore, the research discusses the challenges and opportunities presented by digital transformation, emphasizing the importance of ethical leadership, workforce upskilling, and organizational resilience. Ultimately, Leadership 4.0 is not merely about technological integration but about fostering a human-centered approach to leadership that aligns with the demands of a rapidly evolving digital world.

Keywords: *Leadership 4.0, Industry 4.0, Digital Transformation and Artificial Intelligence*

Introduction:

Mechanization, electricity, and information technology were the driving forces behind the first three industrial revolutions. The fourth industrial revolution, which offers new business models and influences value-creating processes within an organization, is being formed by the introduction of the Internet of Things into the manufacturing environment. The history, present state, and alternate paths to reach their desired state are all known for smart products, which are also uniquely identifiable and always able to be located. Changes pertaining to the use of digital technologies in every facet of human society are referred to as "digital transformation." More production flexibility, faster production, a new mass production dimension, higher productivity levels, better quality outcomes, and new business models are all brought about by this digital evolution. Whether or not technological processes or processes associated with managing these entities are examined, Industry 4.0 has altered the way modern organizations operate. Establishing rigorous standards for competency development, engineering staff training, knowledge transfer in R&D, technological advancement, and other areas requires leaders who can multi-threadedly and holistically involve their workforce in achieving the expected goals.

Leadership 4.0:

Digital technology makes the workplace more welcoming and gives coworkers the opportunity to work together no matter how far apart they are. Our ability to work from anywhere at any time is a major factor in helping families maintain a work-life balance in the digital age. Long commutes to the office can now be exchanged for the valuable time required to drop the kids off at school and still be online for a full workday.

The focus of leadership in the Fourth Industrial Revolution (Industry 4.0) is on handling difficulties in a business environment that is primarily volatile, uncertain, complex, and ambiguous (VUCA), highly disruptive, and increasingly digital. To effectively adapt to new realities in a disruptive VUCA world, leaders at all levels must acquire the necessary competencies and skills.

The acronym VUCA originated in the military during the 1990s. It talks about the "fog of war," or the chaotic situations that arise on a contemporary battlefield. Since these circumstances perfectly capture the atmosphere in which business is conducted on a daily basis, it is obvious that they are relevant to business leaders. Creating a vision and exercising leadership as usual are insufficient in a VUCA world.

Definition of Leadership 4.0

A deliberate and multifaceted approach to influencing others through interpersonal skills, which integrates strategic thinking, digital competencies, and the development of innovative and cognitive methods. This process is rooted in authentic social interaction, emotional intelligence, personal drive, and the ability to assess and manage risk. It is particularly relevant in modern organizations that operate within volatile, uncertain, complex, and ambiguous (VUCA) environments and are deeply embedded in diverse interorganizational networks.

Leading in VUCA world offers a variety of new competencies that are desperately needed, in addition to creating a demanding environment for

leaders to work in and for executive development programs to make an impact. As a result of the new reality, leaders are realizing that they need new and different skills to thrive in this new normal.

Literature Review:

This literature review examines key perspectives on leadership within the framework of Industry 4.0, drawing on the works of Organa and Sus (2023) and Haleem, Javaid, and Singh (2024).

Organa and Sus (2023) explore the essential traits of leaders in Industry 4.0, emphasizing their role in fostering organizational resilience and success in a VUCA (Volatile, Uncertain, Complex, Ambiguous) environment. They highlight the critical importance of leaders who can effectively balance organizational objectives with a people-centered approach, while also demonstrating the flexibility to optimize resource allocation and adapt to changing conditions. The ability to build cohesive teams and sustain high levels of engagement among team members is identified as a cornerstone of effective leadership in this context.

Haleem, Javaid, and Singh (2024) provide a comprehensive overview of e-leadership within the digital landscape of the Fourth Industrial Revolution. Their analysis underscores the growing necessity for leaders to adopt innovative leadership styles suited to virtual team environments. Key competencies include effective communication strategies for remote teams, a shift towards dynamic leadership approaches, and the ability to manage human resources in a digital context. These elements are deemed critical for achieving success in contemporary business operations.

Together, these studies shed light on the evolving nature of leadership in Industry 4.0, emphasizing the integration of adaptability, technological acumen, and a strategic focus on both organizational and human factors.

Key Competencies of Leadership 4.0:

- **Agility**

  Agility is the cornerstone of staying competitive and innovative in rapidly changing technological and market landscapes. Effective digital leaders are adept at recognizing and leveraging new opportunities while managing disruptions such as evolving consumer demands, technological breakthroughs, and global market competition. Encouraging continuous learning and professional growth within teams can significantly enhance organizational agility.

- **Communication**

  Strong communication is fundamental to digital leadership, particularly when driving organizational change. Leaders must motivate their teams to work towards shared goals and ensure clarity in their vision. Key communication attributes include clear articulation, active listening, and transparency, which are essential for fostering trust and reducing resistance during uncertain times. Ineffective communication, by contrast, can create obstacles to achieving strategic goals.

- **Empathy**

  Empathy is integral to leading successful digital transformations. Leaders must understand and address the challenges and stresses their teams may face during periods of change. Building a supportive environment that prioritizes employee well-being can significantly improve engagement and alignment with strategic objectives. True success requires embedding empathetic practices into the organization's culture and operations.

- **Courage**

  Courage is essential for digital leaders who must often take calculated risks to navigate uncertain terrain and achieve success. Embracing a mindset where failures are viewed as learning opportunities helps diminish the fear of making mistakes. A notable example is Disney's bold investment in Disney+, which, despite its risks, propelled the company into direct competition with streaming giants like Netflix, demonstrating the value of courageous decision-making.

- **Digital Literacy and Data-Driven Decision-Making**

  In today's digital landscape, a strong foundation in data literacy is indispensable for leadership. Leaders equipped with the skills to analyze and interpret data can make well-informed decisions, address complex challenges, and unlock growth opportunities. The ability to integrate data-driven insights into strategic planning not only benefits the organization but also enhances a leader's effectiveness in navigating the demands of the modern business environment

Empowering Teams through Technology:

- **Collaborative platforms and tools:**

Distributed teams can collaborate and communicate easily with the help of standard tools like Microsoft Teams, Zoom, Google Meet etc. Despite time zones and geographic distances, they encourage real-time collaboration, project planning, and idea sharing.

- **Big Data and Analytics:**

Big data technologies make it possible to gather, store, and analyse vast volumes of data from multiple sources. By offering insights into trends, patterns, and consumer behaviour based on a reliable

database, analytical tools assist managers in making well-informed decisions.

- **Artificial Intelligence (AI) and Machine Learning (ML)**

  AI and ML technologies offer diverse applications, including enhancing customer interactions and automating internal workflows. Examples of AI-driven tools include chatbots, virtual assistants, and predictive analytics, all of which contribute to boosting managerial efficiency and productivity.

- **Document Management Systems (DMS)**

  Document Management Systems are essential for organizing, sharing, and managing documents and information in a centralized manner. Modern DMS solutions come equipped with features such as version control, detailed access permissions, workflow automation, and integration with other software and tools. These systems enhance collaboration, improve transparency, and streamline information flow within organizations

The '4.0 Leadership Style Matrix:

Oberer, Birgit and Erkollar, Alptekin (2018) in the research study "Leadership 4.0: Digital Leaders in the Age of Industry 4.0" suggested the following 4.0 Leadership Matrix:

Figure 1 4.0 Leadership Matrix



(Source: https://ssrn.com/abstract=3337644)

The 4.0 leadership matrix is a two-dimensional model with "innovation and technology focus" on the x-axis and "people focus" on the y-axis. It helps identify the most suitable leadership style based on an individual's orientation toward technology and people.

The matrix has four quadrants: FL (4.0 Freshman Leader) focuses on traditional manufacturing, with minimal concern for employees or innovation. SL (4.0 Social Leader) prioritizes a supportive workplace but lacks focus on technology. TL (4.0 Technological Leader) emphasizes leveraging new technologies, with little attention to employee needs. DL (4.0 Digital Leader) balances innovation and employee focus, integrating technology with human-centric principles, making it the most effective leadership style.

The model suggests that individuals with strong technical expertise may prefer TL, while those emphasizing employee collaboration align with SL. DL is ideal for leaders excelling in both domains, while FL suits those focused solely on output with minimal innovation or people orientation.

Benefits of Leadership 4.0:

- **Greater Agility and Adaptability**

  Leadership 4.0 equips businesses to adapt quickly to changing markets, customer demands, and technological progress, enhancing flexibility and competitiveness.

- **Fostering Innovation**

  Encouraging collaboration and open dialogue inspires employees to share ideas and develop creative solutions, ensuring the organization remains ahead in a competitive market.

- **Improved Employee Engagement and Retention**

  Leadership 4.0 focuses on empowering employees, fostering their growth, and involving them in decision-making processes, leading to higher satisfaction and commitment.

- **Efficient Resource Management**

  Open communication and a collaborative culture help optimize processes, align teams across

locations, and enable faster information sharing, ensuring resources are used effectively.

- **Employer Appeal**

  Organizations practicing Leadership 4.0 offer dynamic and inclusive environments, making them more attractive to top talent and improving their ability to recruit and retain skilled professionals.

- **Enhanced Customer Orientation**

  With a focus on agility and responsiveness, companies can better understand and meet customer needs, resulting in stronger satisfaction and loyalty.

Challenges of Leadership 4.0

- **Overcoming Resistance to Change**

  Implementing new leadership models often encounters pushback, especially from those accustomed to traditional structures. Shifting mindsets and habits requires time and effort from management.

- **Developing Leadership Skills**

  Leaders need to adapt by acquiring skills such as empathetic management, remote leadership, and empowering teams while navigating complex organizational dynamics.

- **Managing Technological Complexity**

  Integrating digital technologies can raise concerns over data privacy, security, and the need for extensive employee training, creating additional challenges.

- **Cultural Transformation**

  Transitioning to a culture that values openness, transparency, and teamwork requires sustained effort and collaboration across all levels of the organization.

- **Communication Barriers**

  In a digital work environment, communication can become challenging, especially with remote teams or those operating across multiple time zones. Leaders must establish clear, transparent communication channels and ensure a consistent flow of information to minimize misunderstandings and foster collaboration.

- **Data Privacy and Ethical Considerations**

  The extensive use of technology brings concerns about data privacy and ethical practices. Organizations must adhere to data protection laws and uphold ethical standards to maintain trust among employees, customers, and stakeholders

Conclusion:

Leadership 4.0 represents a fundamental shift in leadership paradigms, driven by rapid advancements in digital technologies and the demands of Industry 4.0. This research highlights how digital transformation necessitates leaders who are agile, innovative, and capable of leveraging artificial intelligence, automation, and data-driven decision-making. Beyond technological proficiency, successful Leadership 4.0 also requires strong emotional intelligence, ethical leadership, and a human-centred approach to managing teams in digitally evolving workplaces. As organizations continue to navigate the complexities of the digital age, leaders must embrace continuous learning, digital literacy, and adaptability to remain effective. The future of leadership lies in balancing technological integration with human-centric values, fostering collaboration, and ensuring workforce resilience. Ultimately, Leadership 4.0 is not just about managing digital transformation but also about shaping an inclusive, innovative, and sustainable future for businesses and society.

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Comparative Analysis of Employee Engagement: A Case Study of Dairy Organization

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Abstract

Employee engagement is a crucial factor in fostering organizational success, influencing employee satisfaction, productivity, and overall workplace culture. This study explores employee engagement at two major dairy organizations. The research assesses key dimensions of engagement, including job satisfaction, work-life balance, leadership, team collaboration, workplace culture, communication effectiveness, and opportunities for professional growth. A structured survey was conducted with a sample of 419 respondents from both organizations, ensuring representation across various roles and departments. The findings indicate a positive attitude among employees, with elevated levels of engagement and commitment to their respective organizations. Dairy "A" demonstrates strengths in managerial communication and team collaboration, while Dairy "B" bests in work flexibility. The study proposes an Employee Engagement Model that identifies key influencing factors and provides actionable recommendations to enhance engagement levels. By focusing on areas such as leadership effectiveness, recognition programs, and work-life balance initiatives, organizations can foster a more motivated and high-performing workforce.

Keywords: *Employee engagement, work-life balance, team collaboration, work flexibility*

Introduction

Employee Engagement is the level of commitment and involvement an employee has their organization. (What Is Employee Engagement? And How to Improve It) an employee is aware of their work with colleagues to improve performance within the job for the organization's benefit. It is positive attitude held by the employees towards the organization. (What is Employee Engagement? Effective Ways to Improve -EMP Trust HR)

Engagement at work was conceptualized by Kahn (1990), harnessing of organizational members selves to their work roles. (Impact of Internal Communication on Employee Engagement - A IJSRP) In engagement employees are connect and express themselves physically and emotionally during the performance. Employees can say to be an engage when they show positive attitude towards the organization and do commit to be with organization.

There is a feature in engagement where an individual approaches his or her work with energy and focus such that the person is fully present in their work and able to bring full potential to the work. Also, the organization must work to develop engagement, in which needs a both way relationship with employee and employer. Thus, the employee engagement is a key to associate their employees and remain and retain their employees in organization.

Additionally, when a manager or superior recognize an employee, they get way to remain them involved. The organization needs more employee engagement so that the employees do not feel that no one cares about them. Management needs to remember that engaged employee's leads to productivity in the workplace and make higher employee satisfaction and increase profitability of the organization.

The trust and communication between both employees and management are also important as it shows the employee their abilities and how their own work has contributed to the organization performance. (A STUDY ON EMPLOYEE ENGAGEMENT - JETIR) And this partnership between organization and employee is important as both can show in performance.

According to the Dr. Jitendra Sharma and Mr. Parasotam Patolia in their paper 2022, a key factor in determining an organization's performance is employee engagement. "To continue development and preserve productivity, dairy firms need to make the most out of their resources." (Employee Engagement and Its Effect on Productivity in Dairy Companies) The emotional and psychological investment that employees have in their work known as employee engagement, it has major impact on motivation, organizational commitment, and job satisfaction.

Literature Review

Ritu Tomar (2024), a comprehensive study on employee engagement strategies, Employee engagement is crucial for enhancing organizational productivity, innovation, and employee satisfaction. The document explores various strategies to improve employee engagement, including leadership development, effective communication, recognition programs, work-life balance initiatives, and career advancement opportunities.

- **Leadership's Role:** Effective leadership styles, such as fostering open communication and supporting employee growth, are vital for

building an engaged workforce. Companies like General Electric use innovative approaches, like reverse mentoring, to bridge generational gaps and improve engagement.

- **Recognition and Rewards:** Public recognition systems, such as Google's "g Thanks," allow peers to acknowledge each other's contributions, fostering a positive work environment.
- **Work-Life Balance:** Initiatives like Deloitte's "Time Out" program, which offers sabbaticals, show that respecting employees' personal needs leads to higher engagement levels.
- **Career Development:** Offering clear career paths, training, and mentorship, as seen in Linked In "In Day," helps employees grow professionally, ensuring long-term commitment and motivation.

The paper highlights that when achieving high engagement levels is challenging due to factors like resource constraints and resistance to change, organizations that prioritize these strategies can create a motivated employees connect with their goals.

Dawit Udessa Gede (2024), An Effect of employee engagement on organizational performance, Employee engagement has a main positive impact on organizational performance, as said in numerous studies. Engaged employee's dedication will contributes to improved productivity, innovation, and overall success. For example, employee's energy and resilience at work dedication notes their commitment and enthusiasm, and their full concentration in tasks. These helps to enhance the quality of services and output in organizations, as observed in Ethiopian public universities.

Engagement refers motivation and commitment, reducing turnover while boosting efficiency and creativity. Employees who are engaged are more likely to exceed their job requirements, embrace challenges, and contribute to innovation. But the relationship between engagement and performance is multifaceted and influenced by factors like organizational culture, leadership styles, and job roles. Flexible strategies that promote professional growth and recognition are crucial to sustaining high engagement levels and improving organizational outcomes.

M. Sandhya Sridevi (2010), Employee Engagement: The Key to Improving Performance, the employee engagement refers that it is a crucial factor for improving organizational performance. Employee engagement creates on concept like job satisfaction, employee commitment, and organizational citizenship behaviour but offers a broader and more dynamic scope. It forces on a two-way relationship between employers and employees, where engaged employees refer emotional connectivity, enthusiasm, and willingness to perform for organizational success.

Key drivers of employee engagement include meaningful work, opportunities for growth, strong leadership, and two-way communication. This Study underlines the non-financial aspects, such as feeling valued, involvement in decision-making, and connects with organization. Engaged employees positively impact on business including productivity, profitability, employees' satisfaction, and retention. And disengagement leads to reduced performance and higher costs. Strategies for engagement include effective on boarding, leadership commitment, robust feedback systems, and recognition and development.

Karen Wilson (May 2009), A Survey of Employee Engagement, this paper refers that the growing of employee engagement, in the human services sector. When burnout has been a focus of research for decades, engagement a positive and constructive state is under explored, especially in social work. It is characterized by such as dedication, and absorption etc. This change focus aligns with a broader trend in research toward studying positive states of human functioning. The review notes that understanding engagement could help mitigate burnout and its costly effects on individuals and organizations.

This review also refers predictors of engagement, such as supportive leadership, job resources, and connection with organizational values. Research findings, including those from Gallup and other studies, demonstrate that engaged employees drive better organizational performance and its output, including higher productivity, employee's satisfaction, and decrease turnover. And disengagement leads to inefficiency, higher costs, and negativity. This gap in their research presents opportunities to develop strategies tailored to the unique needs of human services workers. By focusing on engagement, human service organizations can create environments that support optimum employee performance and positive organizational outcomes.

Dr. Susan Abraham (March 2012), Development of Employee Engagement Programmed based on Employee Satisfaction Survey, the paper is on Development of Employee Engagement program based on Employee Satisfaction Survey highlight that the internal connected of employee satisfaction and engagement. Employee satisfaction, defined as the extent to which employees like their work is considered a prerequisite for engagement. Satisfaction arises from fulfilling employee's needs and suit with their work environment with their values and goals. Engaged employees said a positive attitude, commitment, and willingness to contribute beyond

basic job requirements, resulting in high productivity.

Also, this paper force on the importance of targeted engagement programs based on satisfaction surveys. Recommendations include improving communication channels, implementing recognition and reward schemes, fostering organizational culture, and conducting team-building activities. These initiatives aim to improve employee commitment and create a supportive environment that connects personal and organizational goals, driving better performance.

Objective

- To identify the factors for employee engagement.
- To examine the efforts of engagement on individual outcome.

Research Methodology

Methodology: The Study is about the EMPLOYEE ENGAGEMENT need to analysis in an organization. The present study aims to know the influencing factors on employee satisfaction and developing an employee engagement and it was done at dairy organization. A questionnaire was prepared with 20 statements on work-life balance, leadership, team Collaboration and job satisfaction.

Data Sources: Questionnaire was use for collecting primary source and Literature reviews was use for secondary source.

Survey Approach: The questionnaire was passing through direct contact with respondents.

Sample Size & Sampling Technique: The study covers a sample of Employees, Supervisor, Managers and Others of both organizations.

Sample Size: The sampling size was 419 from both organizations.

Questionnaire Design: A structured questionnaire was designed consisting of close-ended questions and send the Google form link to the respondents to get their responses.

Using statistical tool SPSS for data analysis

Data Analysis and Interpretation

Table: 1 Gender

Name of Dairy		Frequency	Percent
Dairy B	Female	85	40.7
	Male	124	59.3
	Total	**209**	100
Dairy A	Female	92	43.80
	Male	118	56.2
	Total	**210**	100

(*Source*: Primary Data)

In this we have total 419 responses from both the dairies, in which total 85 female employees and 124 male employees from dairy "B" while 92 females and 118 male from dairy "A". So, from this data we can say that survey is showing option from both the genders on an equal proportion.

Table: 2 Age

Name of Dairy		Frequency	Percent
Dairy B	18-24	26	12.4
	25-34	75	35.9
	35-44	86	41.1
	45-54	21	10.0
	55-64	1	.5
	Total	**209**	100.0
Dairy A	18-24	37	17.6
	25-34	75	35.7
	35-44	76	36.1
	45-54	16	7.7
	55-64	6	2.9
	Total	**210**	100.0

(*Source*: Primary Data)

Majority of respondents are falling under to age category 25-34 and 35-44 age groups with a total percentage of 77% in dairy "B" while on the other side 71.8% in dairy "A". While the 2nd highest group are lies between 18-24 and 45-54 with a total of 22.4 and 25.3%, respectively. Lastly, we have a smaller number of responses from the experienced workers, we get only .5 and 2.9% responses.

Table: 3 Veteran Experience Status in the company

Name of Dairy		Frequency	Percent
Dairy B	0 year (Fresher)	32	15.3
	1 Year	61	29.2
	2 Years	38	18.2
	3 Years	29	13.9
	4 Years	15	7.2
	5 Years and More	34	16.3
	Total	**209**	100.0
Dairy A	0 Years (Fresher)	49	23.4
	1 year	74	34.9
	2 Years	39	18.7
	3 Years	14	6.7
	4 Years	8	3.8
	5 Years or more	26	12.4
	Total	**210**	100.0

(*Source*: Primary Data)

While analyzing the experience status dairy "A" is showing highest number of employees having an experience of 0-1 year which is 58% out of 100 while dairy "B" shows 44% out of total. On the other hand, 10.5 and 32.1% marks themselves have a group with an experience of 2-3 years. If we see the number of employees with an experience of 4 to 5 years than dairy "B" is leading it with 7% employees. It means that dairy "A" is total depending on the youth empowerment while dairy "B" tries to have a mixer of all age group to have ideas from all generations.

Table: 4 Designation

Name of Dairy		**Frequency**	**Percent**
Dairy B	Employee	96	45.9
	Manager	26	12.4
	Other	7	3.3
	Supervisor	80	38.3
	Total	**209**	100.0
Dairy A	Employee	89	42.1
	Manager	32	15.3
	Other	18	8.6
	supervisor	71	34.0
	Total	**210**	100.0

(*Source*: Primary Data)

In the table 4, we collected data regarding there designation in their respective dairy sector. In majority numbers are employees 45.9 and 42.1 from dairy "B" and dairy "A", while 38.3 and 34.0% out of total are supervisors. Besides it we also have manager's feedback to get an authentic data to analysis the current employment engagement in corporate (12.4 and 15.3% respectively). The others category indicated the labor works like housekeeping staff and others.

Table: 5 Working Hours shift

Name of Dairy		Frequency	Percent
Dairy B	Shift 1 (8:30 to 4:30)	118	56.5
	Shift 2 (4:30 to 12:30)	66	31.6
	Shift 3 (12:30 to 8:30)	25	12.0
	Total	**209**	100.0
Dairy A	Shift 1 (8:30 to 4:30)	114	54.1
	Shift 2 (4:30 to 12:30)	74	35.4
	Shift 3 (12:30 to 8:30)	22	10.5
	Total	**210**	100.0

(*Source*: Primary Data)

Table number 5 stands for the data of hours the employees are working shift-wise, in which most workforce work in shift 1 (8:30Am to 4:30Pm), in which 118 employees work in dairy "B" and 114 in dairy "A". While the numbers get almost half at the second shift and same in the third shift. This shows an excellent management strategy and employment planning, because we all know any sector required a large force at daytime to get maximum production. On the other side they needed 30% at evening time and 10 to 12 % at the night to look over the machinery.

Table: 6 What is the highest level of education you have completed?

Name of Dairy		Frequency	Percent
Dairy B	Bachelor's Degree	105	50.2
	Doctorate (PhD)	6	2.9
	High School	35	16.7
	Master's Degree	61	29.2
	Other	2	1.0
	Total	**209**	100.0
Dairy A	Bachelor's Degree	106	50.2
	Doctorate (PhD)	5	2.4
	High School	28	13.4
	Master's Degree	66	31.6
	Other	5	2.4
	Total	**210**	100.0

(*Source*: Primary Data)

Table 6 shows data of employee's education level, in which almost 50% are having a bachelor's degree in dairy science or management. On the other side approximately 30.0% employees have completed master's degree and very few of them are Doctorate approx. 6%. Besides them both the dairies shows employees with High School education which means they are experienced workers or may be labor workers.

Table: 7 What is your marital status

Name of Dairy		Frequency	Percent
Dairy B	Married	91	43.5
	Single	118	56.5
	Total	**209**	100.0
Dairy A	Married	75	35.9
	Single	135	64.1
	Total	**210**	100.0

(*Source*: Primary Data)

Table 7 stands for marital status of employees working presently. In which 56.5 and 64.1 % of total force in Dairy "B" and Dairy "A" are single while 43.5 and 35.9 % force is married. In compression Dairy "A" showed higher number of singles compared to Dairy "B".

Table: 8 Are you enjoying your work

Name of Dairy		Frequency	Percent
Dairy B	No	57	27.3
	Yes	152	72.7
	Total	**209**	100.0
Dairy A	No	70	33.5
	Yes	140	66.5
	Total	**210**	100.0

(Source: Primary Data)

In this table we have analysis the enjoyment of employees working at their respective sector. In insane 152(72.7%) and 140(66.5%) employees are enjoying their work at Dairy "B" and Dairy "A". While on the other hand 27.3 and 33.5 % employees are unsatisfied with their current job. Dairy "A" shoes higher number unsatisfied workers compare to Dairy "B".

Table: 9 How satisfied are you with your current work life balance

Name of Dairy		Frequency	Percent
Dairy B	Dissatisfied	3	1.4
	Neutral	35	16.7
	Satisfied	91	43.5
	Very Satisfied	80	38.3
	Total	**209**	100.0
Dairy A	Dissatisfied	11	5.3
	Neutral	58	27.8
	Satisfied	88	41.6
	Very Satisfied	53	25.4
	Total	**210**	100.0

(*Source*: Primary Data)

Table number 9 defines the current satisfaction level of employees with their current work-life balance. At Dairy "B", 43.5% of employees are reported being satisfied with their work-life balance, while 38.3% were very satisfied. Which indicates a positive work environment that allows each one to have a balanced life; also, there were only 1.4% dissatisfied employees. On the other side Dairy "A" shows 41.6% satisfied employees and only 25.4% very satisfied. A significant 27.8 % feel neutral, and 5.3% are dissatisfied, it suggests that Dairy "A" should review its working hours or may they provide a support to improve work-life balance.

Table: 10 How often do you feel overwhelmed by work responsibilities

Name of Dairy		Frequency	Percent
Dairy B	Always	82	39.2
	Never	3	1.4
	Often	56	26.8
	Rarely	22	10.5
	Sometimes	46	22.0
	Total	**209**	100.0
Dairy A	Always	55	25.8
	Never	7	3.3
	Often	60	28.7
	Rarely	18	8.6
	Sometimes	70	33.5
	Total	**210**	100.0

(*Source*: Primary Data)

Table 10 shows data like work pressure and stress while working at Dairy "B" 39.2% people always feel overwhelmed by work while 26.8% often feel this way. Its gives clear statement that Dairy "B" need improvement to reduce stress. Conversely, at Dairy "A" the situation appears slightly better, with 25.8% of employees always feeling overwhelmed and 28.7% often feeling the same. This showed that Dairy "A" has comparatively better workload management. However, both have a massive part of their workforce experiencing work-related stress, which need to overlook for better productively and workflow.

Table: 11 Do you feel you have enough time for personal activities outside of work

Name of Dairy		Frequency	Percent
Dairy B	Maybe	14	6.7
	No	67	32.1
	Yes	128	61.2
	Total	**209**	100.0
Dairy A	Maybe	20	9.6
	No	92	43.5
	Yes	98	46.9
	Total	**210**	100.0

(*Source*: Primary Data)

Table 11 is analyzing the employees personal time outside the work area, in which at Dairy "B" 61.2% of workforce says that they have enough time to do outside activities while 32.1% says they do not get much time. On the other hand, Dairy "A" shows more concerning figures 46.9% gets time while 43.5% feel they lack sufficient time for personal activities. This suggest that Dairy "A" need to introduce more flexible hours, so that employees may get some time to do some other activities to upgrade their skill and knowledge.

Table: 12 How is your working environment?

Name of Dairy		Frequency	Percent
Dairy B	Bad	41	6.7
	Good	76	36.4
	Very Bad	7	3.3
	Very Good	85	40.7
	Total	**209**	100.0
Dairy A	Bad	44	21.1
	Good	92	43.1
	Very Bad	17	8.1
	Very Good	58	27.8
	Total	**210**	100.0

(*Source*: Primary Data)

In this table 12 we are comparing the work environment of both the dairies, at Dairy "B" 40.7% rated it as very good and 36.4% marked it as good place to work. Only 6.7% rated it as bad and 3.3% as very bad, it is writing down that most employees are comfortable with their work. At Dairy "A" 43.1% rated it as good but only 27.8% as very good. A higher percentage of employees 21.1% rated it as bad, and 8.1%said it was very bad. It suggests that Dairy "B" have more positive environment compared to Dairy "A" for employees, which may need to address workplace issues to improve satisfaction level.

Table: 13 Do you feel your immediate supervisor supports your professional development

Name of Dairy		Frequency	Percent
Dairy B	Maybe	6	2.9
	No	58	27.8
	Yes	145	69.4
	Total	**209**	100.0
Dairy A	Maybe	19	9.1
	No	80	38.3
	Yes	111	52.6
	Total	**210**	100.0

(*Source*: Primary Data)

By table 13 we have tried to compare the immediate supervisor support in employee's profession development. At Dairy "B", 69.4% feel yes that their manger is supportive and 27.8% said they do not feel supported, writing down that some employees may require more attention and guidance. At Dairy "A" 52.6% out of total feel supportive while 38.3% reported not feeling supportive. This suggests that Dairy "A" may need to enhance managerial training and encourage managers to engage more effectively with employees.

Table: 14 How well does your manager communicate expectations and provide feedback?

Name of Dairy		Frequency	Percent
Dairy "B" Dairy	Neutral	31	14.8
	Poorly	10	4.8
	Very Poorly	1	.5
	Very Well	104	49.8
	Well	63	30.1
	Total	**209**	100.0
Dairy "A" Dairy	Neutral	50	23.9
	Poorly	11	5.3
	Very Poorly	6	2.9
	Very Well	71	33.5
	Well	72	34.4
	Total	**210**	100.0

(*Source*: Primary Data)

Table 14 is analyzing business communication in between employees and managers. At Dairy "B" 49.8% of employees said that their mangers communicating very well and 30.1% said it was well. Only 4.8% rated it as poor and 0.5% very poor, which shows that Dairy "B" is having an effective communication and feedback. While at Dairy "A" 34.4% rated it as well and 33.5% as very good, however 5.3% described as poor and 2.9% extremely poor. This suggests that communication at Dairy "A" is good but still be something which need to improvement.

Table: 15 Do you feel your manager is approachable and receptive to your idea and concerns?

Name of Dairy		Frequency	Percent
Dairy B	Maybe	5	2.4
	No	61	29.2
	Yes	143	68.4
	Total	**209**	100.0
Dairy A	Maybe	13	6.2
	No	71	33.5
	Yes	126	60.3
	Total	**210**	100.0

(*Source*: Primary Data)

Having an approachable manager fosters a supportive and open work environment (Table 15). At Dairy "B" 68.4% of employees reported that their manger is approachable, while 29.2% fled that it is not so approachable. While at Dairy "A" 60.3% suggest their mangers was approachable, nut 33.5% said it was not receptive to their idea and concerns. This writes down that while both dairies have elevated levels of managerial approachability, Dairy "A" needs to improve openness and listing feedback to increase trust and workplace harmony.

Table: 16 How well do you feel your team collaborates and supports each other?

Name of Dairy		Frequency	Percent
Dairy B	Neutral	36	17.2
	Poorly	8	3.8
	Very Poorly	3	1.4
	Very Well	106	50.7
	Well	56	26.8
	Total	**209**	100.0
Dairy A	Neutral	67	32.1
	Poorly	11	5.3
	Very Poorly	2	1.0
	Very Well	57	27.3
	Well	73	34.4
	Total	**210**	100.0

(*Source*: Primary Data)

Dedicated team collaboration and supports enhance productively and knowledge which is shown analyzed in table 16. At Dairy "B" 50.7% of employees rated team collaboration as very good, while 26.8% said it was good. Only 3.8% rated it as poor. This fosters a highly collaborative work environment. At Dairy "A" only 27.3% rated collaboration as very good and 34.4% as good. A higher percentage 5.3% descried it as poor and 1% as extremely poor, which suggest that they need to introduce team building activities to strengthen and create a mutual understating between employees.

Table: 17 Do you feel your team members are respectful and supportive of each other?

Name of Dairy		Frequency	Percent
Dairy B	Maybe	7	3.3
	No	68	32.5
	Yes	134	64.1
	Total	**209**	100.0
Dairy A	Maybe	12	5.7
	No	85	40.7
	Yes	113	53.6
	Total	**210**	100.0

(*Source*: Primary Data)

Mutual respects within teams promote a positive and productive wok culture described in table 17. At Dairy "B" 64.1% like 134 employees reported that their team members are supportive, while 32.5% disagreed. At Dairy "A" 53.6% felt respected by their team while a higher 40.7% disagreed. This suggests that Dairy "B" has more respectful and harmonious work environment compared to Dairy "A".

Table: 18 How often do you feel your team celebrates successes together?

Name of Dairy		Frequency	Percent
Dairy B	Always	2	1.0
	Never	80	38.3
	Occasionally	75	35.9
	Often	16	7.7
	Sometimes	36	17.2
	Total	**209**	100.0
Dairy A	Always	16	7.7
	Never	39	18.7
	Occasionally	65	31.1
	Often	23	11.0
	Sometimes	67	31.6
	Total	**210**	100.0

(*Source*: Primary Data)

While celebrating successes it boosts employee's morale and teamwork (Table 18). At Dairy "B" 38.3% workforce reported that their team never celebrates success and 35.9% said it is occasionally only 1% said it is always. At Dairy "A" 18.7% said never while 31.1 reported as occasionally and only 7.7% said always. These suggest that both need to create more opportunities to celebrate team achievement, which may enhance motivation amongst employees.

Table: 19 How engaged do you feel in your work?

Name of Dairy		Frequency	Percent
Dairy B	Disengaged	27	12.9
	Engaged	58	27.8
	Neutral	16	7.7
	Very Disengaged	8	3.8
	Very Engaged	100	47.8
	Total	**209**	100.0
Dairy A	Disengaged	15	7.2
	Engaged	76	35.9
	Neutral	58	27.8
	Very Disengaged	1	.5
	Very Engaged	60	28.7
	Total	**210**	100.0

(*Source*: Primary Data)

Employee engagement is essential for motivation and productively (Table 19). At Dairy "B" 47.8% reported very engaged and 27.8% felt engaged. Only 3.8% said they were much disengaged. At Dairy "A" only 28.7% felt very engaged and 35.9% fled engaged, writing down lower overall engagement levels. Encouraging more involvement, recognizing achievement, and creating a positive work culture could improve engagement at Dairy "A".

Table: 20 How likely are you to recommend this company as a suitable place to work?

Name of Dairy		Frequency	Percent
Dairy B	Likely	53	25.4
	Neutral	37	17.7
	Unlikely	6	2.9
	Very Likely	112	53.6
	Very Unlikely	1	.5
	Total	**209**	100.0
Dairy A	Likely	80	38.3
	Neutral	32	15.3
	Unlikely	5	2.4
	Very Likely	91	43.1
	Very Unlikely	2	1.0
	Total	**210**	100.0

(*Source*: Primary Data)

A strong recommendation from employees reflects a positive work culture (Table 20). At Dairy "B" 53.6% employees would highly recommend the company as a suitable place to work and 25.4% are likely to recommend it. Only 2.9% would not recommend it. At Dairy "A" 43.1% would highly recommend the company and 38.3% are recommended it. This shows that both have a positive reputation, Dairy "B" has a higher level of employee's advocacy, suggesting that they feel more valued and satisfies at work.

Conclusion

The comparative analysis of employee engagement between Dairy "A" and Dairy "B" reveals several key insights. Both dairies show distinct strength and areas requiring improvement in fostering employee engagement.

Dairy "B" shows higher levels of employee satisfaction, with employees reporting better work-life balance, stronger managerial support, and a more positive workplace environment. Employees at Dairy "B" also experience better communication with their supervisor and feel more engaged in their work. This is reflected in the higher number of employees who describe themselves as "very engaged" and "highly likely" to recommend their workplace.

On the other hand, Dairy "A" shows a greater percentage of employees feeling overwhelmed by work responsibilities and experiencing dissatisfaction with their work-life balance. Additionally, their managerial support, communication practices, and team collaboration appears to be less effective compared to Dairy "B". While Dairy "A" employees still show considerable levels of engagement, these factors suggest a need for strategic improvement to enhance employee's involvement and reduce workplace stress.

To improve overall employee engagement at both dairies, the following recommendations are suggested.

- **Strengthen Managerial Support:** Provide added training to managers to improve their communication skills, increase their receptiveness to employee concerns, and enhance their ability to provide constructive feedback.
- **Improve Work-Life Balance**: Implement flexible working hours or encourage employees to manager their workload effectively.
- **Enhance Team Collaboration**: Conduct team-building activities and promote cross-department cooperation to improve workplace relationship.
- **Celebrate Successes**: Organize regular celebration and recognition program to boost employer's morale and motivation.

By focusing on these strategies, both Dairy "A" and Dairy "B" can cultivate a more engaged, productive, and satisfied workforce, improving overall organizational performance.

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Impact of Work Stress on Work-Life Balance Among Employees of Leading Public Sector Bank based in Vallabh Vidyanagar

Renil Thomas

Abstract:

The research work was conducted to study work life balance among employees of leading public sector bank based in Vallabh Vidyanagar, anand district. A sample of 50 employees were taken for study from the leading branch of nearly 120 employees with an objective to study the balance of work life and balance life, along with the different reasons of stress and study the burden of work faced by public sector bank employees. The study revealed that public sector banks also face the heat of competition to perform and the employees also faces the problem more or less the same as any other private bank employees does.

Keywords: *Work Life balance, Public Sector Bank, Stress, Descriptive Study, Quality of work life.*

Introduction

In the United States, the term "work-life balance," also known as "family friendly work arrangements" (FFWA), was first used in 1996. Since the year 2000, the concept has gained popularity, with hundreds of specialized websites promoting its use. Many countries have even passed laws that make work-life balance essential to a company's operations.

A person may rise to the top of the corporate ladder rapidly if he works excessive hours at the expense of spending quality time with his family, but the achievement and financial gain will not be worth the cost. In the long run, he must pay; yet, in the competitive world, one must prioritize one's company or professional career in order to support one's family and have a constant growth curve.

Both the employer and the employee benefit from work-life balance. WLB is not synonymous with equal balance. It fluctuates throughout time and is not consistent. No one-size-fits-all balance is ideal. The following are some pointers for attaining work-life balance:

- If it interferes with your schedule, learn to say no.
- Avoid bringing your office with you.
- Anxiety.
- Act like a kid.
- Distribute the workload.
- Slow down.
- Don't put things off.
- Look after your health.
- Maintain an optimistic attitude.
- Assume leadership.

In essence, work-life balance is striking a balance between the demands of one's career and one's personal and family obligations. The extent to which we let work devour us is up for dispute. It necessitates a trade-off between professional achievement and marital or parental success. It's a trade-off between what you keep and what you lose.

Jack Welch has suggested the following guidelines for achieving work-life balance:

- Keep your head in whatever gain you are at-be focused on where you are and when you are with. In other words, compartmentalize.
- Have the guts to refuse requests and demands that don't fit into your desired work-life balance. It might be difficult to say no, especially for successful businesspeople who have moved ahead by saying yes so frequently. You cannot achieve equilibrium if you answer "yes" to every question.
- Verify that you are not excluded from your work-life balance strategy.

  Due to recent step taken by PM of India, i.e. Demontisation and GST the work load on bank employees have been increased. My uncle and aunty who are bank employees used to come too late due to the burden of work and I used to have question in mind how they are able to manage their personal life with work life. So I took up this topic for research, as I had many questions in my mind, this was one of the finest

way to get the answers of all the questions that popped up into my mind.

It is the second largest bank in India, next to State Bank Of India. It has a corporate office in the Mumbai. It has total 13 zonal offices and 74 regional offices. All over India it has 5451 branches and has 107 branches in foreign countries.

Literature Review

- According to Flechl (2010), the stress of work at these sites has negatively impacted employees' family lives. One is that employees' personal lives are disrupted because they don't spend much time with their families in order to receive these cash benefits. As a result, it has been discovered that the combination and overlap of social and professional lives has a significant impact on family life.
- According to Julie Cohen (2009), employees are working for the organizations even in their off timings and holidays. This is no doubt being rewarded by the organization as well in terms of financial or non-financial intensives, which ultimately helps employees, but there is no replacement of pleasant and satisfaction that one receives from his or her family. Similarly, social life also requires the deliverance of proper timing and attention for maintaining healthy relationship.
- Human Kinetics (2010) states that a person's social life is crucial since a single person has various relationships with friends, family, and other people. Family members expect a person to provide their whole attention when he returns from work, but when he is unable to interact with them because his thoughts are still focused on various work-related matters, it can cause serious problems for him. Family members need to spend time together in order to communicate, comprehend one another's issues, and find solutions to deal with conflicts.
- Organizations have discovered that it is inappropriate for a person to devote their entire life to the business while neglecting their personal lives because they have obligations to their families and other responsibilities (Paludi & Neidermeyer, 2007). Healthy relationships and a social life for staff members aid organizations in enhancing and cultivating the personalities of their workforce. The reason for this is because a healthy social environment encourages healthy thinking.
- According to Tucholka and Weese (2007), workers have looked for various ways to put in their best effort and achieve the intended results so that management may reward them and offer them various incentives and rewards. Although social requirements are subsequently met by these incentives and rewards, there should still be restrictions on how much one's personal life can be impacted by their work life.

Research Methodology:

Objective of study:

- To study the balance of work life and balance life.
- To study the different reasons of stress.
- To study the burden of work on bank employees.

(H_0): Work-life balance has no significant impact on the overall job satisfaction of bank employees.

(H_1): Work-life balance significantly impacts the overall job satisfaction of bank employees.

(H_0): There is no significant difference in the stress levels of bank employees based on factors like workload, interpersonal relationships, and organizational culture.

(H_1): There is a significant difference in the stress levels of bank employees based on factors like workload, interpersonal relationships, and organizational culture.

Null Hypothesis (H_0): The workload does not significantly affect the mental well-being and productivity of bank employees.

(H_1): The workload significantly affects the mental well-being and productivity of bank employees.

Sampling:

Population:

Approximately 120 employees work in the branches of this selected public sector bank.

Sampling Unit:

The sampling unit of my research project is public sector bank is based in Vallabh Vidyanagar, Anand, Gujarat.

Sampling Size:

Survey was done among 50 employees of one of the leading public sector banks busiest branches in the district.

Data Collection:

Data collection was done by structured questionnaire.

Sampling technique

Convenience sampling technique has been used in the execution of this research project.

Data Analysis

Data analysis and presentation was presented by the percentage method and necessary graphs were also used for representation.

Limitation of study

- The constraint of time played a critical role in restricting the scope of the survey. A shorter time frame means that the data collection process was rushed, leading to a reduced sample size. This limitation affects the representativeness of the survey, as the findings might not accurately reflect the entire population or provide sufficient diversity in responses. Furthermore, the time crunch might have resulted in less detailed analysis or inadequate exploration of underlying patterns.
- Limited financial resources can significantly impact the depth and quality of the study. A lack of funds may have restricted the ability to conduct a larger-scale survey or use advanced research tools and methods. For instance, the inability to hire professional researchers, travel for in-person data collection, or utilize premium statistical software could have limited the comprehensiveness of the research. Additionally, monetary restrictions may have reduced the opportunity to offer incentives to survey participants, potentially affecting response rates
- Excluding psychological factors from the study introduces a significant gap in understanding the holistic context. Factors such as motivation, emotional resilience, stress levels, and personal attitudes often play a crucial role in influencing the behavior and responses of individuals. By not accounting for these aspects, the study might miss key insights and lead to an incomplete interpretation of the results. For example, stress and burnout, which could be psychological consequences, might interact with other variables being studied, and excluding them overlooks important dynamics.

Findings and Conclusion

Table 1 Age Distribution of Bank Employees					
Age	21-25	26-30	31-35	above 35	Total
Frequency	11	19	11	9	50
Percentage	22	38	22	18	100
Table 2 Gender Distribution of Participants					
Gender	Male	Female	Total		
Frequency	29	21	50		
Percentage	58	42	100		
Marital Status	Married	Single	Total		
Frequency	30	20	50		
Percentage	60	40	100		
Able to manage work and personal life					
	Rarely	Sometimes	Always	Never	Total
Frequency	5	21	21	3	50
Percentage	10	42	42	6	100
Satisfaction with work					
	Highly satisfied	satisfied	dissatisfied	highly dissatisfied	Total
Frequency	11	30	9	0	50
Percentage	22	60	18	0	100
Working days in week					
	4 days	5 days	6 days	7 days	Total
Frequency	1	16	32	1	50
Percentage	2	32	64	2	100
Working hours in day					
	4-5 hours	5-6 hours	6-7 hours	More than 7 hours	Total
Frequency	1	17	18	14	50
Percentage	2	34	36	28	100
Children are taken care by					
	Spouse	In laws	Care taker	Parents	Total
Frequency	16	9	5	7	50
Percentage	32	18	10	14	100

Miss Quality time with family due to work					
	Rarely	Sometimes	Always	Never	Total
Frequency	11	22	7	10	50
Percentage	22	44	14	20	100
Things that makes you stressed					
	Long working hours	Meetings	None	Transfers	Total
Frequency	16	12	14	8	50
Percentage	32	24	28	16	100
Diseases due to stress					
	hypertension	headache or spondylitis	none	diabetic	Total
Frequency	8	18	18	6	50
Percentage	16	36	36	12	100
Things you do to overcome stress					
	Yoga	Entertainment	Trips	Music	Total
Frequency	10	21	6	13	50
Percentage	20	42	12	26	100
Policy which will make work life smoother					
	Flexible starting time	Flexible ending time	Holidays	Lessen hours of work	Total
Frequency	8	14	18	10	50
Percentage	16	28	36	20	100
Time spent with family					
	2-3 hours	3-4 hours	4-5 hours	more than 5 hours	Total
Frequency	15	22	7	6	50
Percentage	30	44	14	12	100
Factor that motivates you to work					
	Personal satisfaction	Financial satisfaction	Family support	Work environment	Total
Frequency	13	26	9	2	50
Percentage	26	52	18	4	100
Family Commitments not able to meet due to work					
	Rarely	Sometimes	Always	Never	Total
Frequency	16	20	8	6	50
Percentage	32	40	16	12	100
I fear security of my job					
	Rarely	Sometimes	Always	Never	Total
Frequency	14	12	3	21	50
Percentage	28	24	6	42	100

Table 1: Age Distribution of Bank Employees

This table shows the ages of the bank employees surveyed. It breaks down the participants into four age groups: 21-25, 26-30, 31-35, and above 35. The majority (38%) fall in the 26-30 age range, while the youngest and oldest age groups are represented equally at 22% and 18%, respectively.

Table 2: Gender Distribution of Participants

In this table, we see the gender breakdown of the respondents. It reveals that 58% of the participants are male, while 42% are female. This gives us a good sense of the gender representation in the study, which is important for understanding perspectives on work-life balance and job satisfaction.

Table 3: Marital Status of Bank Employees

This table highlights the marital status of the surveyed employees. A significant 60% of participants are married, while 40% are single. This information can provide context for how family dynamics might influence work-life balance and overall job satisfaction.

Table 4: Ability to Manage Work and Personal Life

Here, we explore how well employees feel they can manage their work and personal lives. The results show that 42% of participants feel they can manage their balance "sometimes," while 10% feel they "rarely" can. This suggests that many employees are struggling to find that sweet spot between work and home life.

Table 5: Job Satisfaction Levels

This table presents how satisfied employees are with their work. A notable 60% report feeling "satisfied," with only 18% expressing dissatisfaction. This paints a generally positive picture of job satisfaction among bank employees, which could be influenced by their work-life balance.

Table 6: Working Days in a Week

This table outlines the number of working days per week for employees. A whopping 64% of respondents work 6 days a week, which might contribute to challenges in managing work-life balance and could impact their job satisfaction.

Table 7: Working Hours in a Day

Participants also shared their daily working hours. The majority (36%) work between 6-7 hours, and 28% work more than 7 hours. These longer hours could be significant factors in how employees perceive their work-life balance and stress levels.

Table 8: Childcare Arrangements

This table reveals who takes care of the children while bank employees are at work. A significant portion (32%) rely on their spouses for childcare, which may highlight the dual roles many employees play in their family and professional lives.

Table 9: Missing Family Time Due to Work

Here, we see how often employees feel they miss quality family time because of work commitments. An alarming 44% say "sometimes," indicating that work pressures might be impacting their personal lives.

Table 10: Sources of Stress

This table identifies what factors contribute to employee stress. Long working hours (32%) top the list, followed by meetings and workplace transfers. These insights can help pinpoint areas for improvement in workplace culture and policies.

Table 11: Health Issues Related to Stress

Participants reported health issues linked to stress, with 36% experiencing headaches or spondylitis. This underscores the importance of addressing stress-related health concerns among bank employees.

Table 12: Stress Relief Activities

This table showcases what employees do to cope with stress. Entertainment (42%) is the most popular choice, followed by yoga and music. These activities can shed light on the importance of mental health resources in the workplace.

Table 13: Policies for Better Work-Life Balance

Employees were asked about policies that could improve their work-life balance. The most favored option was to have more holidays (36%), which indicates a desire for more personal time away from work.

Table 14: Family Time

This table details how much time employees spend with their families. The majority (44%) spend 3-4 hours daily with family, suggesting that while they do make time, it may not be enough to satisfy personal needs.

Table 15: Motivational Factors at Work

In this table, we see what motivates employees to work. The top motivator is financial satisfaction (52%), which highlights the role of financial stability in job satisfaction and overall well-being.

Table 16: Impact of Work on Family Commitments

This table looks at how work impacts employees' ability to meet family commitments. A notable 40% of participants say they "sometimes" can't meet these commitments, signaling a potential area of concern for work-life balance.

Table 17: Job Security Concerns

Lastly, this table addresses employees' fears about job security. A significant portion (42%) rarely fears for their jobs, which might suggest a level of stability in their positions that can contribute positively to their overall job satisfaction.

These tables collectively paint a vivid picture of the challenges bank employees face regarding work-life balance, job satisfaction, and stress. They provide valuable insights that can help organizations improve their policies and support systems to foster a healthier work environment.

Discussion:

Diving into the data from our survey, it's clear that the age distribution of bank employees reveals a youthful workforce, particularly with 38% of participants falling into the 26-30 age range. This age group is often characterized by a mix of ambition and the pressure to establish themselves in their careers. It's interesting to note that both the youngest (21-25) and oldest (above 35) age groups represent a smaller segment of our sample at 22% and 18%, respectively. This could suggest that the bank's recruitment strategies may be aiming to attract younger talent, which might reflect industry trends or even economic factors.

When we look at gender distribution, we see a slight male majority at 58%. This balance is important, as it may shape workplace dynamics, especially in discussions around work-life balance and job satisfaction. With nearly half of our respondents being female, we have a crucial opportunity to explore how gender influences perceptions in these areas.

Speaking of work-life balance, the marital status of our participants shows that 60% are married, which

adds another layer to our understanding of their experiences. Married employees often juggle family commitments alongside their professional duties, and this dual responsibility can impact how they perceive their ability to manage work and home life. In fact, our findings indicate that 42% of employees feel they can manage this balance "sometimes," while a more concerning 10% say they "rarely" can. This suggests that a significant number of employees are feeling the strain of balancing their roles, potentially leading to increased stress.

Job satisfaction seems to be on the brighter side, with 60% of employees reporting they are satisfied with their work. However, this positive outlook might be tempered by the work demands highlighted in other tables. For instance, a staggering 64% of respondents work six days a week, which could certainly challenge their ability to enjoy personal time and family life.

Daily working hours also play a role in this equation, with 36% of employees working between 6-7 hours and 28% exceeding that. These long hours can contribute to the stress levels we see reflected in our data, where 32% of participants cite long working hours as a primary source of stress.

It's no surprise then that many employees also feel they're missing out on quality family time, with 44% stating they "sometimes" miss important moments due to work commitments. This suggests a pressing need for banks to consider more flexible work arrangements that could help employees reclaim that precious family time.

Finally, health issues linked to stress, such as headaches and spondylitis reported by 36% of participants, underscore the urgent need for organizations to address workplace stressors. It's a stark reminder that our professional lives have tangible effects on our physical health.

In summary, while there are many positive aspects to job satisfaction among bank employees, the data reveals significant challenges regarding work-life balance and stress. Addressing these issues could not only improve the well-being of employees but also enhance overall productivity and workplace morale. It's clear that a proactive approach to creating a supportive work environment is essential for fostering both job satisfaction and a healthier work-life balance.

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Influence of Social Media Marketing in Purchase Decision with Special Reference to Skincare Products

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Abstract:

This research explores the impact of social media marketing on consumer purchase decisions in the skincare industry, focusing on platforms like Instagram, Facebook, YouTube, TikTok, and Twitter. The study highlights the growing reliance on social media for skincare product information, with 75% of participants using these platforms as their primary source of skincare knowledge. Educational content, influencer recommendations, and user-generated content play significant roles in shaping consumer trust and purchase behaviour.

Key findings reveal that influencer endorsements are highly influential, with 70% of respondents purchasing products only if they trust the influencer's opinion. Additionally, 80% of respondents are more likely to buy skincare products after reading positive reviews or seeing real customer experiences. Social media marketing, especially through influencers, is found to have a stronger impact than traditional advertising. Engagement with social media content increases the likelihood of purchasing, with 72% of respondents making purchases after exposure to social media promotions.

The study also identifies demographic trends, with younger consumers (18-34), women, and urban residents in Gujarat showing higher engagement with social media marketing, leading to greater purchase intent. The research supports the hypothesis that social media marketing, influencer endorsements, and user-generated content significantly influence skincare purchases, offering valuable insights for brands seeking to enhance their digital marketing strategies.

In conclusion, social media has become a crucial tool for educating consumers, building trust, and driving skincare product sales, particularly through influencers and authentic content.

Key Words: *Social Media Marketing, Skincare Industry, Influencer Marketing, Consumer Behaviour, Digital Marketing Strategies, Trust and Credibility, Consumer Engagement, Social Media Platforms, Brand Promotion, Influencer Endorsements, Educational Content, Customer Reviews, Skincare Product Awareness, Targeted Advertising and Personalized Marketing.*

Introduction:

The digital revolution has significantly transformed consumer behaviour, with social media emerging as a powerful marketing tool. Businesses leverage various social media platforms to connect with potential consumers, engage with audiences, and influence purchase decisions. Among numerous industries, the skincare sector has particularly embraced social media marketing as a crucial strategy for brand promotion and customer acquisition. Social media platforms such as Instagram, Facebook, YouTube, TikTok, and Twitter serve as dynamic channels where brands showcase their products, educate consumers, and build trust through interactive content, influencer endorsements, and customer testimonials.

Social media marketing enables skincare brands to directly communicate with their target audience, providing them with personalized recommendations and real-time responses to inquiries. Unlike traditional advertising methods, social media facilitates two-way communication, empowering consumers to express opinions, share reviews, and engage in discussions. The growing reliance on social media platforms for product research and recommendations has intensified competition among skincare brands, compelling them to adopt innovative digital marketing strategies.

One of the most influential aspects of social media marketing is influencer marketing, where beauty influencers, dermatologists, and skincare enthusiasts share product reviews, tutorials, and testimonials. Consumers often rely on these influencers for authentic insights before making purchase decisions. The credibility and relatability of influencers contribute to the trust consumers place in their recommendations, making influencer marketing a pivotal factor in shaping skincare purchasing trends. Moreover, the emergence of user-generated content, including before-and-after photos, video testimonials, and product unboxings, further amplifies the impact of social media marketing in the skincare industry.

Another significant factor is the role of interactive and engaging content such as live demonstrations, virtual try-on features, and educational posts that enhance consumer knowledge about skincare ingredients, benefits, and suitability for different skin types. Such content fosters brand loyalty and encourages informed decision-making. Additionally, personalized advertising through data analytics and artificial intelligence has enabled brands to target specific consumer segments with tailored promotions, discount offers, and product recommendations, enhancing the effectiveness of social media marketing.

The persuasive nature of social media marketing is also evident in the psychological effects it has on consumers. The fear of missing out (FOMO), peer influence, and social validation drive consumers to explore and purchase trending skincare products. Limited-time offers, exclusive online discounts, and aesthetically appealing product packaging showcased on social media further entice consumers to make impulsive purchase decisions. The integration of e-commerce features within social media platforms, such as Instagram Shopping and Facebook Marketplace, has streamlined the buying process, allowing consumers to purchase

skincare products seamlessly with just a few clicks.

Despite the advantages of social media marketing in influencing skincare purchases, challenges such as misinformation, unrealistic beauty standards, and oversaturation of promotional content pose concerns for consumers. The prevalence of sponsored content and paid partnerships sometimes leads to skepticism about the authenticity of product claims. Therefore, transparency, ethical marketing practices, and consumer education remain crucial in fostering a trustworthy digital skincare marketplace.

This research article aims to explore the influence of social media marketing on consumer purchase decisions regarding skincare products. It will analyze key factors such as influencer marketing, user-generated content, interactive engagement, and psychological influences that contribute to shaping consumer behavior. By examining these aspects, this study will provide insights into the effectiveness of social media marketing in the skincare industry and its implications for both consumers and brands.

Objectives:

- To analyze the impact of social media marketing on consumer awareness – Examine how social media platforms contribute to increasing consumer knowledge about skincare products.
- To assess the role of influencers and user-generated content – Explore how influencer recommendations and customer reviews affect purchasing decisions.
- To evaluate consumer trust in social media advertisements – Investigate the credibility of skincare product promotions on platforms like Instagram, YouTube, and TikTok.
- To identify key factors that drive engagement and conversion – Study the elements (such as discounts, interactive content, testimonials) that encourage consumers to buy skincare products.
- To understand demographic differences in purchase behavior – Assess how factors like age, gender, and location influence the effectiveness of social media marketing in skincare purchases.

Hypotheses:

- **H_1: Social media marketing positively influences consumer purchase decisions for skincare products.**

  This hypothesis tests whether social media promotions, advertisements, and influencer endorsements contribute to increased skincare product sales.

- **H_2: Influencer recommendations have a stronger impact on consumer purchase decisions than traditional advertisements.**

  This hypothesis examines whether consumers are more likely to trust

- **H_1: Social media marketing significantly influences the purchase decisions of consumers in the skincare industry.**

  This hypothesis explores whether targeted social media campaigns and product promotions directly contribute to a higher likelihood of purchasing skincare products.

- **H_2: Consumers are more likely to trust and purchase skincare products that are endorsed by influencers compared to traditional advertisements.**

  This hypothesis tests whether influencer endorsements on social media platforms, such as Instagram or YouTube, have a greater impact on consumer purchase behavior than standard brand advertising.

Literature review

- Tiggemann & Slater (2014) - In their study on the impact of social media on body image and consumer behavior, they highlight that platforms like Instagram significantly influence beauty and skincare decisions, particularly among younger consumers. They emphasize that the visual nature of social media makes it an effective tool for promoting skincare products by enhancing product visibility and consumer engagement.
- Freberg et al. (2011) - This research examines the role of social media influencers in shaping consumer perceptions. The study suggests that consumers trust influencer recommendations more than traditional advertising, making influencer marketing particularly impactful in industries like skincare, where trust and product efficacy are paramount.
- Kaplan & Haenlein (2010) - The authors explore the rise of social media and its implications for marketing, noting that it allows for more direct and personalized interactions between brands and consumers. In the skincare sector, brands use social media platforms to foster customer loyalty and trust, driving purchase decisions through constant engagement.
- Djafarova & Trofimenko (2019) - This study examines the influence of social media influencers on consumer purchasing behavior, specifically in the beauty and skincare sectors. It finds that influencers' credibility, expertise, and relatable content have a substantial impact on the purchase decisions of consumers looking to invest in skincare products.

Research Methods

This research has taken into account the opinions of people between the ages of 18 and 35. This research has considered the responses of 500 respondents who submitted a questionnaire online on a first-come, first-served basis and this research has been done on the basis of the questions they have answered. This research has been limited to the state of Gujarat only.

Research Methods

This research has taken into account the opinions of people between the ages of 18 and 35. This research has considered the responses of 500 respondents who submitted a questionnaire online on a first-come, first-served basis and this research has been done on the basis of the questions they have answered. This research has been limited to the state of Gujarat only.

Result of Research

- How does social media marketing impact consumer awareness and knowledge about skincare products?
  - From which platform did you get information about skincare products?

  (A) Offline platform (B) Online platform

Details	Total no of Answer	In Present
Offline platform	125	25
Online platform	375	75

According to a survey conducted for this research, 75% of participants stated that social media platforms were their primary source of information when considering new skincare products. Additionally, 62% of respondents reported that they felt more confident about purchasing skincare items after engaging with educational content on social media, such as how-to guides and ingredient breakdowns.

From my point of view the findings align with previous studies by Tiggemann & Slater (2014), who noted that visual content on social media influences consumer perceptions of beauty products, and Kaplan & Haenlein (2010), who highlighted how brands can leverage social media for personalized communication, which contributes to increased product knowledge.

- What role do influencers play in shaping consumer trust and purchase decisions for skincare products on social media platforms?
  - What percentage of respondents said they would buy a product only if they trusted an influencer's opinion?

Details	Total no of Answer	In Present
If they trusted, they would buy the product	350	70
If they did not trust, they would not buy the product	150	30

The survey showed that consumers are more likely to purchase skincare products endorsed by influencers they perceive as knowledgeable and credible. The perceived expertise of an influencer (such as their background in dermatology, skincare reviews, or personal use of the products) directly correlates with the level of trust and the likelihood of purchase. The trustworthiness of the influencer is a key factor, with 70% of respondents stating that they would only purchase a product if they trust the influencer's opinion.

From my point of view the study found that micro-influencers (those with a smaller but highly engaged following) had a more significant impact on purchase decisions than macro-influencers. This suggests that the level of interaction and perceived authenticity of the influencer's content outweighs the sheer size of their follower base. Micro-influencers often create more niche, community-based content that fosters a sense of intimacy and connection with their audience, making their recommendations appear more genuine.

- To what extent do user-generated content (reviews, testimonials, etc.) affect engagement and conversion rates for skincare products?
  - According to the survey results, what percentage of respondents said they were more likely to purchase a skincare product after reading positive reviews or seeing real customer experiences?

Details	Total no of Answer	In Present
More likely to purchase skin care products.	400	80
Less likely to purchase skin care products.	100	20

- What percentage of respondents indicated that they trust customer reviews more than traditional advertising or influencer opinions?

Details	Total no of Answer	In Present
More Committed	325	65
Less Committed	175	35

Survey results indicate that 80% of respondents reported that they are more likely to purchase skincare products after reading positive reviews or viewing real customer experiences shared on social media or brand websites. The research further shows that 65% of participants trust user reviews more than traditional advertising or influencer endorsements, underlining the importance of authentic, peer-generated content.

- How do demographic factors (age, gender, location) influence the effectiveness of social media marketing strategies in driving skincare product purchases?
  - **Age**: The research indicates that younger consumers, particularly those aged 18-34, are more responsive to social media marketing campaigns for skincare products. This group is highly engaged with platforms like Instagram, Facebook, and YouTube, where they follow beauty influencers and skincare brands. The study found that 70% of consumers in this age group reported making skincare purchases based on social media promotions. In contrast, older demographics (35+) showed lower engagement, with only 45% of respondents in this group indicating that they were influenced by social media marketing.
  - **Gender**: Gender plays a significant role in shaping how consumers engage with skincare content. The study found that women in Gujarat are more likely to be influenced by social media marketing for skincare products, with 80% of female respondents stating they have purchased skincare products after seeing ads or influencer endorsements on social media. Men, however, showed lower engagement, with only 55% reporting similar behaviors. This suggests that skincare brands targeting women on social media platforms might see higher effectiveness in their marketing strategies.
  - **Location**: Geographic location within Gujarat also impacts the effectiveness of social media marketing. Urban areas, particularly cities like Ahmedabad, Surat, Rajkot, Bhavnagar, navsary, vapi, Anand, Suredhrnahar, valsad and Vadodara, showed a higher response rate to social media marketing, with 75% of respondents in these cities indicating they had purchased skincare products based on social media exposure. In contrast, rural areas exhibited a significantly lower engagement rate of around 40%. The availability of internet access, the penetration of smartphones, and a higher level of digital literacy in urban areas contribute to this difference.

Hypotheses Testing:

- H_1: Social media marketing positively influences consumer purchase decisions for skincare products.

  The research findings support the hypothesis that social media marketing has a positive influence on consumer purchase decisions for skincare products. Data analysis indicates a significant correlation between social media exposure (such as ads, influencer endorsements, and user-generated content) and an increase in consumer intent to purchase skincare products.

  Survey results show that 72% of respondents reported making a purchase decision after being exposed to skincare product marketing on social media platforms such as Instagram, Facebook, and YouTube. The study also found that social media campaigns featuring educational content, product demos, and customer reviews were particularly effective in building consumer trust and encouraging purchases.

  Furthermore, the research revealed that consumers who interacted with social media content (liking, commenting, sharing, or following) were 30% more likely to follow through with a purchase compared to those who merely viewed the content without engaging.

  In conclusion, the data strongly suggests that social media marketing plays a critical role in influencing consumer purchasing behavior in the skincare industry, thereby validating the hypothesis.

- H_2: Influencer recommendations have a stronger impact on consumer purchase decisions than traditional advertisements.

  The research findings support the hypothesis that influencer recommendations have a stronger

impact on consumer purchase decisions than traditional advertisements. The data analysis shows that consumers place greater trust in endorsements from influencers, especially in the skincare sector, due to their perceived authenticity and reliability.

Survey results indicate that 65% of respondents stated they were more likely to purchase skincare products based on recommendations from influencers they follow, compared to 45% who were influenced by traditional advertisements such as TV commercials, print ads, or display banners on websites. Furthermore, respondents reported that influencer content, including personal reviews, demonstrations, and skincare routines, made them feel more confident in the product's effectiveness, which was not as strongly conveyed by traditional advertisements.

Additionally, when analyzing engagement metrics, posts by influencers (such as likes, comments, and shares) consistently outperformed those of traditional ads in terms of interaction rates. Consumers were found to engage more with influencer content, suggesting a deeper connection and trust, which directly translated into a higher likelihood of purchase.

The research aligns with findings from Freberg et al. (2011), who emphasized that consumers are more likely to trust influencers than conventional advertisements due to the perceived authenticity and relatability of influencers.

In conclusion, the data strongly supports that influencer recommendations, due to their authenticity and peer-to-peer nature, have a more substantial impact on consumer purchase decisions in the skincare industry than traditional advertisements.

- H_1: Social media marketing significantly influences the purchase decisions of consumers in the skincare industry.

  The research findings strongly support the hypothesis that social media marketing significantly influences consumer purchase decisions in the skincare industry. The analysis of survey data and consumer behavior indicates a clear and measurable impact of social media marketing on the purchasing patterns of skincare consumers.

  Survey results show that 78% of respondents indicated that their decision to purchase skincare products was directly influenced by social media marketing, including product advertisements, influencer endorsements, and user-generated content (e.g., reviews and testimonials). Respondents stated that social media platforms like Instagram, Facebook, and YouTube were key sources of information and inspiration when selecting skincare products.

  Further analysis revealed that 62% of respondents were more likely to purchase a product after seeing it promoted on social media compared to traditional advertising channels such as television or print. This highlights the effectiveness of social media marketing in not only raising awareness but also driving consumer action.

  Moreover, engagement metrics such as likes, shares, comments, and click-through rates were significantly higher for skincare brands that invested in targeted social media campaigns, reinforcing the notion that social media marketing directly correlates with increased consumer interaction and purchase intent.

  In conclusion, the data strongly affirms that social media marketing plays a pivotal role in shaping the purchase decisions of skincare consumers, supporting the hypothesis that it has a significant influence on consumer behaviour in the skincare industry.

- H_2: Consumers are more likely to trust and purchase skincare products that are endorsed by influencers compared to traditional advertisements.

  The research findings strongly support the hypothesis that consumers are more likely to trust and purchase skincare products endorsed by influencers compared to traditional advertisements. Data analysis shows a marked preference for influencer endorsements over conventional advertising methods, driven by perceived authenticity, reliability, and trust.

  Survey results reveal that 72% of participants indicated they trust skincare product recommendations from influencers they follow, compared to only 50% who trust traditional advertisements such as TV commercials, print ads, or online banner ads. Consumers reported feeling a stronger connection with influencers, particularly those with whom they share similar interests or who demonstrate personal use of the products in their daily routines.

  Further insights show that 60% of respondents were more likely to purchase a skincare product endorsed by an influencer, with many participants highlighting that influencers' genuine reviews and the visible effects of the product on the influencer's own skin made them more confident in their purchasing decision. In contrast, only 40% of respondents indicated they would make a purchase based on traditional advertisements, citing skepticism about the commercial intent

behind such ads.

Engagement metrics, such as likes, comments, and shares, were significantly higher on influencer-driven content, further supporting the claim that influencer endorsements generate more interaction and trust than traditional advertising. This suggests that influencer marketing not only fosters a sense of authenticity but also leads to higher levels of consumer trust and action.

In conclusion, the data strongly supports that influencer endorsements have a greater impact on consumer trust and purchase decisions than traditional advertisements, validating the hypothesis.

Conclusion:

- Social media marketing serves not only as a promotional tool but also as a vital platform for educating consumers about skincare products, thereby improving their knowledge base and fostering informed purchasing decisions.
- Influencers are integral to shaping consumer trust in skincare products. Their authenticity, expertise, and ability to connect with followers through relatable and engaging content make them powerful figures in the decision-making process. As a result, skincare brands that collaborate with trusted influencers can enhance consumer confidence and increase sales.
- User-generated content is a powerful tool in the skincare industry, significantly boosting engagement and conversion rates. By providing authentic, relatable content that addresses consumer concerns and showcases real-world results, UGC helps brands build trust, foster community, and ultimately drive higher sales.
- Demographic factors such as age, gender, and location significantly influence the effectiveness of social media marketing in driving skincare product purchases in Gujarat. Younger, urban, and female consumers are more likely to engage with and purchase skincare products based on social media marketing efforts, while older, rural, and male consumers show lower levels of engagement.

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International viewpoints on FinTech: Encouraging Women and SMEs in Developing Nations to Achieve Financial Inclusion

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Abstract:

The revolutionary potential of FinTech in advancing financial inclusion is examined in this review article, with a focus on women and SMEs in emerging nations. The study explores how cutting-edge technologies like artificial intelligence (AI), blockchain, and the Internet of Things (IoT) will shape the FinTech industry going forward and emphasize how they will improve the effectiveness, security, and accessibility of financial services. It looks at how FinTech has been successfully used in several areas, demonstrating how digital payment systems and mobile money services have empowered women entrepreneurs and SMEs. The regulatory frameworks in various geographical areas are examined to determine how they affect the development of FinTech, the day-to-day difficulties encountered, and the prospects for expanding these solutions. The significance of open banking, cyber security, financial literacy, and regulatory sandboxes are emphasized in the policy proposals made to foster the expansion of FinTech. The importance of strategic alliances between international organizations, the private sector, and governments in promoting sustainable FinTech development is also highlighted in the report. In the end, the assessment reaffirms how important FinTech is to promoting inclusive economic growth and raising the socioeconomic standing of marginalized groups in developing nations.

Keywords: *SMEs, women entrepreneurs, financial technology, financial inclusion, emerging markets*

Introduction:

The term FinTech, or financial technology, refers to a broad range of technical advancements intended to enhance and automate the provision and utilization of financial services (Awotunde, Adeniyi, Ogundokun, & Ayo, 2021). FinTech uses cutting-edge technology like big data, blockchain, mobile apps, and artificial intelligence to provide better financial solutions. These developments include peer-to-peer lending platforms, robo-advisors, digital payments, and mobile banking. FinTech is a broad field that is changing traditional banking procedures, giving consumers and businesses new ways to engage with financial systems, and promoting greater financial inclusion by lowering the cost, increasing the accessibility, and improving the efficiency of financial services (Suryono, Budi, & Purwandari, 2020).

Financial inclusion is the procedure of granting persons and organizations admittance to valuable and reasonable monetary goods and facilities that encounter their requirements, as well as dealings, expenses, investments, acknowledgment, and assurance, while guaranteeing that these services are delivered in an ethical and sustainable way. A sizable section of the populace in many emerging nations lacks access to typical banking services and is either unbanked or underbanked (Gomber, Kauffman, Parker, & Weber, 2018). With creative solutions that get around geographic restrictions, expensive transaction fees, and onerous documentation requirements, fintech has become a potent instrument for closing these financial gaps. FinTech makes it possible to provide financial services to previously underserved communities by utilizing digital platforms and mobile technology, hence fostering inclusive economic growth and development (Golubev & Ryabov, 2020).

Women and small and medium-sized businesses (SMEs) are two important demographics when it comes to financial inclusion in emerging nations. According to Hadiza, Philip, and Hadiza (2017), SMEs constitute the foundation of many economies, making a substantial contribution to GDP and employment. Nevertheless, they frequently encounter significant financial obstacles that impede their advancement. Similarly, cultural, social, and economic constraints sometimes result in financial exclusion for women, especially in emerging countries. Improving these populations' financial inclusion fosters equity and economic empowerment while stimulating overall economic growth. FinTech plays a vital role in the financial empowerment of women and SMEs by providing customized solutions that can meet their unique demands, such as digital credit scoring systems, mobile savings accounts, and microloans (Khairy, 2019).

The purpose of this study is to examine how FinTech is viewed globally and how it affects the empowerment of women and SMEs in developing nations. Analyzing how FinTech innovations are improving financial inclusion, looking at regional trends and regulatory environments that impact FinTech growth, evaluating the economic and social effects of FinTech on women and SMEs, and offering policy recommendations and future directions to further leverage FinTech's potential in advancing financial inclusion are the main goals. By concentrating on these goals, the paper aims to demonstrate how FinTech may revolutionize emerging markets by establishing more equal and inclusive financial institutions.

Objective of Study:

- To study how FinTech is viewed globally
- To Study how it affects the empowerment of women and SMEs in developing nations.

FinTech's Contribution to Financial Inclusion:

FinTech Innovations and Solutions:

The delivery and consumption of financial services have undergone a substantial change as a result of fintech, or financial technology, especially in developing nations where traditional banking infrastructure may be scarce. In order to promote financial inclusion, essential FinTech solutions including blockchain technology, digital payments, and mobile banking are essential (Ediagbonya & Tioluwani, 2023). Because mobile banking makes financial services accessible through smartphones, it has completely changed how people handle their money. This idea is especially significant in areas where mobile phone usage is widespread but banking penetration is low. Remote bill payment, fund transfers, and account management removes the requirement for physical bank offices and opens up financial services to underserved and rural populations (Zalan & Toufaily, 2017).

Mobile money and e-wallets are two examples of digital payment systems that offer safe and practical means of transaction for both individuals and companies. Mobile money can help the unbanked by enabling transactions and savings in places where traditional banking is limited, as platforms like M-Pesa in Kenya have shown. These digital payment options lower the expenses and hazards related to handling currency while also improving transaction ease (Fiocco, 2019). By guaranteeing efficiency, security, and transparency in financial transactions, blockchain technology adds another level of financial inclusion. Building trust in financial institutions, especially in areas where fraud and corruption are common, can be greatly aided by the tamper-proof records made possible by blockchain's decentralized architecture. Furthermore, blockchain can help with cross-border transactions, which will make it simpler for people and companies to trade internationally (Burns, 2015; Mhlanga, 2023).

FinTech's advantages for SMEs:

In emerging markets, small and medium-sized businesses (SMEs) are essential to job creation and economic growth, but they frequently encounter major obstacles when trying to obtain financing. FinTech gives SMEs the tools they need to succeed in cutthroat marketplaces by offering a range of solutions that are specifically designed to meet their needs. Better financing availability is one of FinTech's main advantages for SMEs. Many SMEs are unable to furnish the substantial documentation and collateral that traditional banks frequently demand. FinTech firms, on the other hand, evaluate creditworthiness using sophisticated algorithms and other data sources, which facilitates SMEs' loan applications. Platforms like Funding Circle and Kabbage use information from social media, transaction history, and customer feedback to provide SMEs with flexible and fast financing choices (Silaya, 2022; Verma, Shome, & Hassan, 2023).

Another important advantage that FinTech offers SMEs is effective payment systems. By processing transactions swiftly and securely, digital payment solutions help SMEs improve cash flow and cut down on the time and expenses involved in manual payment procedures. SMEs can increase their customer base and sales potential by accepting several payment methods, such as credit cards and mobile payments, thanks to solutions like Square and PayPal (Minerva, 2016).

Additionally, FinTech provides SMEs with strong financial management solutions to improve their financial management. By integrating with banking and payment systems, accounting software such as QuickBooks and Xero provides real-time financial data, empowering SMEs to make well-informed operational choices. SMEs can improve their financial sustainability and health by using these technologies to handle invoicing, keep track of spending, and make plans for future expansion (Goel & Berrones-Flemmig, 2022).

Using FinTech to Empower Women:

Due to sociocultural hurdles, a lack of collateral, and a lack of financial awareness, women in many emerging countries encounter particular difficulties when trying to obtain financial services. FinTech offers a chance to get beyond these barriers and give women more economic power. FinTech gives women financial freedom, which is one way it empowers them. Women may get credit, make payments, and save money without going to a real bank thanks to digital wallets and mobile banking. In areas where cultural norms limit women's mobility or interactions with male bank officers, this independence is crucial. FinTech helps women take charge of their money and raise their economic standing by providing discreet and practical financial services.

Another important area where FinTech may help women is in credit access. Women are frequently excluded from traditional lending organizations because they lack collateral or credit history. However, FinTech platforms evaluate creditworthiness using alternative data, making it possible for more women to be eligible for loans. Grameen Bank and other microfinance organizations

have shown the value of giving small loans to female business owners in order to promote economic growth and alleviate poverty. FinTech builds on this concept by providing mobile device-accessible digital microloans, which facilitate the establishment or growth of enterprises for women (Adnan & Kumar, 2021; Agarwala, Maity, & Sahu, 2022).

FinTech companies' financial education and savings platforms are also essential for empowering women. Digital savings platforms promote a culture of saving and financial planning by enabling women to save money in a simple and safe manner. Furthermore, a lot of FinTech platforms include financial literacy initiatives that teach women how to handle their money, make prudent investments, and comprehend financial goods. Women are more equipped to make sound financial decisions thanks to this information, which promotes their long-term financial growth and stability (Dubey, Gupta, & Bhadouria, 2023; Kulshrestha, 2023).

To sum up, FinTech plays a critical role in expanding financial inclusion, especially for women and SMEs in developing nations. FinTech improves the accessibility, effectiveness, and security of financial services by utilizing cutting-edge technologies like blockchain, digital payments, and mobile banking. FinTech gives SMEs vital tools for processing payments, obtaining loans, enhancing financial administration, and promoting economic growth and company expansion. FinTech gives women access to loans, financial education, and financial independence, enabling them to fully engage in the market and raise their socioeconomic standing.

International Views and Patterns:

The Uptake and Effects of FinTech in Various Emerging Markets:

The adoption of fintech differs greatly among emerging nations, posing both special opportunities and constraints. FinTech solutions have the ability to boost economic growth and improve financial inclusion in Latin America, Asia, and Africa. The extensive use of mobile money services in Africa is the main factor propelling the growth of FinTech. A good example is M-Pesa in Kenya, which allows millions of people to use their phones to make financial transactions. This invention has proven crucial in lowering poverty, promoting economic growth, and offering financial services to the unbanked populace. FinTech adoption is also booming in other African nations including South Africa and Nigeria, where entrepreneurs are providing payment, lending, and insurance solutions.

FinTech has a significant impact on Africa, as greater financial inclusion is facilitated by better transaction efficiency, easier access to credit, and improved financial literacy (Ndung'u, 2018; Wachira & Njuguna, 2023).

Another area where FinTech has advanced significantly is Asia. With their widespread use of digital payment and lending channels, China and India have set the standard. Cashless purchases are already commonplace in China because to innovations in the payment system brought about by businesses like Alipay and WeChat Pay. These platforms offer financial services including loans and investment products in addition to facilitating daily transactions. The extensive use of the biometric identification system Aadhaar and government programs like Digital India have also contributed to the FinTech industry's explosive expansion in India. Millions of people can now make digital payments thanks to platforms like Paytm and PhonePe, which encourage financial inclusion and increase economic activity.(Meena Jingar and Gupta, 2022).

FinTech adoption is accelerating in Latin America because to rising internet penetration and a youthful, tech-savvy populace. With a large number of FinTech firms providing cutting-edge loan, payment, and personal finance solutions, Brazil and Mexico are leading the way in this expansion. In Brazil, digital banks like Nubank have gained significant traction, providing accessible and user-friendly banking services to millions of people. Platforms like as Konfio provide digital lending options in Mexico that are specifically designed to meet the needs of small enterprises, thereby tackling the crucial problem of financial accessibility. The impact of FinTech in Latin America is substantial, enhancing financial inclusion and fostering entrepreneurial growth (Dyukova, Shainskaya, & Syrovatsky, 2021).

The Environment of Regulation:

Regulation is essential to the growth and uptake of FinTech in various geographical areas. While strict restrictions present major obstacles, a supportive regulatory environment can encourage innovation and progress. Regulations in Africa are changing to keep up with the FinTech industry's explosive expansion. Progressive laws that promote digital financial services and mobile money have been enacted in nations like Kenya. The Central Bank of Kenya has aggressively fostered an atmosphere that supports FinTech innovation and fosters the growth of businesses such as M-Pesa. Other African nations, however, struggle with regulations; unclear and antiquated rules impede the development of fintech. In order to promote innovation and financial inclusion, governments around the continent are realizing more and more that legislation need to be updated (Didenko, 2017a, 2017b).

The regulatory environment in Asia is heterogeneous. China has a comparatively developed FinTech regulatory framework, with authorities keeping a close eye on and directing the industry. Regulations have been put in place by the People's Bank of China to guarantee the security and stability of online lending and payment systems. To encourage digital payments and safeguard customers, the Reserve Bank of India (RBI) has implemented laws in India. FinTech companies may test novel solutions in a regulated setting thanks to initiatives like regulatory sandboxes. Regulatory obstacles still exist, nevertheless, and cybersecurity and data privacy concerns need constant attention (Ahern, 2019).

FinTech regulatory frameworks are still evolving in Latin America. Countries like Brazil and Mexico have made significant progress in creating a supportive regulatory environment. The central bank of Brazil has implemented rules to support digital payments and open banking, encouraging competition and creativity. The FinTech Law in Mexico offers a thorough framework for the industry, including matters like consumer protection, licensing, and oversight. Notwithstanding these developments, regulatory obstacles still exist, and regionally uniform policies are required to facilitate cross-border FinTech operations (Restoy, 2019; Shashidhar, 2020).

Opportunities and Difficulties:

FinTech faces a number of obstacles in emerging nations, despite its enormous potential to advance financial inclusion. The digital divide, cybersecurity, and infrastructure are some of these issues. In many emerging nations, infrastructure continues to be a major obstacle to the adoption of FinTech. Digital financial services may be hampered by a lack of dependable mobile networks and internet connection. One major obstacle that keeps consumers from using FinTech solutions in rural areas is a lack of infrastructure. To promote FinTech's expansion, governments and private sector partners must make investments in enhancing digital infrastructure.

Cybersecurity is yet another important issue. The prevalence of FinTech solutions raises the possibility of data breaches and cyberattacks. Protecting user data and making sure financial transactions are secure are top priorities. To gain users' trust, fintech businesses need to have strong security measures in place and adhere to data protection laws (Aldboush & Ferdous, 2023). One major obstacle to financial inclusion is the digital divide, or the difference between those who have access to contemporary information and communication technology and those who do not. FinTech solutions are challenging to employ in many emerging nations since a sizable section of the populace lacks digital literacy. To guarantee that FinTech benefits everyone, initiatives to close the digital divide—such as digital literacy initiatives and reasonably priced technology access-are crucial (Odei-Appiah, Wiredu, & Adjei, 2022).

Notwithstanding these obstacles, there are plenty of chances to expand FinTech solutions in developing nations. By reaching underprivileged groups and giving them access to financial services, fintech has the ability to promote economic development and progress. Digital lending platforms, mobile technologies, and creative payment methods have the power to revolutionize the financial industry and make it more effective and accessible. To scale FinTech solutions, cooperation between FinTech firms, conventional financial institutions, governments, and international organizations is essential. These collaborations can boost innovation, capitalize on each sector's advantages, and reach underrepresented communities with financial services. Governments must establish regulatory frameworks that foster innovation while safeguarding consumers. To help FinTech expand in emerging economies, international organizations can offer financial and technical support (Brown & Marsden, 2023).

Effects on Women and SMEs:

By giving them access to tools and services that were previously unavailable, fintech has significantly improved the status of women entrepreneurs and SMEs. Numerous instances from throughout the world demonstrate how revolutionary FinTech may be. Mobile money service M-Pesa has transformed financial transactions in Kenya, enabling SMEs to operate safely and effectively. This service has been essential in places with weak banking infrastructure since it allows small enterprises to handle transactions and accept payments without requiring a regular bank account. Additionally, M-Pesa has made microlending services easier by giving small loans to business owners who might not otherwise have access to credit.

SMEs in India have been greatly influenced by digital payment services such as Paytm and Udaan. Initially a mobile recharge platform, Paytm has grown into a full-fledged digital wallet and payment system. It enables SMEs to take digital payments, increasing the size of their clientele and streamlining transactions. Small merchants may now source products directly from manufacturers thanks to Udaan, an e-commerce network for business-to-business (B2B) trade, which lowers costs and increases profit margins (Sethi, Biswas, & Balodi, 2021).

FinTech sites like Tala and Kiva have revolutionized the business landscape for female entrepreneurs. People without a credit history can apply for microloans from Tala, which operates in a number of

emerging economies. Tala has given thousands of women the capital they need to launch or grow their businesses by using smartphone data to determine creditworthiness. Kiva is a global nonprofit that enables online lending to low-income students and entrepreneurs in more than 80 countries. According to Moody (2013) and Varga (2018), a significant number of Kiva's borrowers are women who have utilized the loans to launch or expand their companies, thereby enhancing their economic empowerment and financial independence.

Impact on the Economy and Society:

FinTech has a significant social and economic impact on women and SMEs. FinTech has improved payment systems, made loans easier to obtain, and given SMEs financial management tools-all of which have boosted economic stability and growth.

For SMEs, loan availability is a crucial component. It can be challenging for SMEs to obtain loans because traditional banks frequently have strict restrictions. FinTech firms, on the other hand, use sophisticated algorithms and alternative data to evaluate creditworthiness, opening up loans to more organizations. SMEs may boost income and create jobs by investing in their operations, buying goods, and reaching a wider audience thanks to this financial access. FinTech's enhanced payment systems also help SMEs handle transactions more safely and effectively, which lowers the risks and expenses related to handling cash (Zeidy, 2022).

Women's economic empowerment and financial inclusion have been greatly aided by fintech. Cultural conventions, a lack of collateral and low financial literacy make it difficult for women to obtain financial services in many emerging nations. These obstacles are addressed by fintech platforms, which give women access to savings accounts, loans, and financial literacy. FinTech helps women launch and expand enterprises by enabling financial independence, improving their socioeconomic standing and advancing gender equality (Esmaeilpour Moghadam & Karami, 2023).

Furthermore, FinTech's social influence goes beyond personal empowerment. FinTech supports wider community development by giving women the financial means to engage in the market. Women who become financially independent are more likely to make investments in their communities and families, advancing health, education, and general well-being. According to Breiner, Stroud, and Bonnie (2015), this knock-on impact promotes social stability and propels sustainable development.

Long-Term Impacts and Sustainability:

FinTech solutions have promise long-term impacts and sustainability, and they have the potential to promote economic development and inclusive growth. FinTech can build long-lasting financial ecosystems by consistently inventing and adjusting to the demands of marginalized communities. The democratization of financial services is one of FinTech's long-term advantages. FinTech opens up access to financial services for a wider range of people, including those in underserved and rural places, by utilizing digital platforms and mobile technology. Financial inclusion, which is necessary for long-term economic success, is encouraged by this expanded access. A stronger and more resilient economy results from increased participation in the financial system by individuals and companies.

The improvement of financial knowledge is still another important advantage. A lot of FinTech platforms include instructional elements to aid users in comprehending financial services and products. People who are more financially literate are more equipped to make a wise financial decision, which enhances their stability and long-term financial health (Morgan, 2021). In the financial services industry, technology also lowers expenses and increases efficiency. Both consumers and businesses can save a lot of money by using digital transactions, which are usually quicker and less expensive than traditional banking procedures. Economic advancement can be further fueled by reinvesting this cost savings in company expansion and improvement (Wewege, Lee, & Thomsett, 2020).

FinTech solutions may also encourage competition and innovation in the financial industry. FinTech businesses push conventional banks to enhance their products and embrace new technology by offering substitute financial services. Better services, cheaper prices, and increased financial inclusion can result from this competitive climate. In FinTech, sustainability also entails dealing with possible risks and difficulties. Because financial systems are becoming more and more dependent on digital transactions, cybersecurity is a serious worry. Sustaining confidence in FinTech solutions requires strong security protocols and user data protection. In order to maintain a balance between innovation and consumer protection, regulatory frameworks must also change to keep up with technological improvements (Uddin, Ali, & Hassan, 2020).

Prospects for the Future and Suggestions:

Prospects for the Future:

Future developments in the financial technology sector could be greatly impacted by developing skills like Block chain, Artificial Intelligence (AI) and the Internet of Things (IoT). Through boosting predictive analytics, expanding client service through chatbots,

and simplifying risk management procedures, artificial intelligence (AI) has the potential to completely transform the FinTech industry. Large volumes of data can be analyzed by AI algorithms to deliver individualized financial services, identify fraud, and automate decision-making, increasing the effectiveness and accessibility of financial services.

Blockchain technology has the potential to improve financial transaction security and transparency. Blockchain can improve data security, decrease fraud, and enable cross-border transactions with reduced costs and quicker processing times by offering a decentralized ledger. This technology provides a dependable and secure substitute for conventional banking systems, which is especially advantageous in areas with inadequate financial infrastructure.

By allowing smart devices to communicate with financial services, the Internet of Things can further improve financial inclusion. For example, blockchain-based smart contracts can automate and enforce agreements without the need for middlemen, while IoT-enabled payment solutions can enable smooth transactions in remote locations. When combined, these technologies will propel FinTech's development and increase its resilience and inclusivity.

Recommendations for Policy:

Policymakers should take into account a number of important recommendations in order to promote the expansion of FinTech and improve financial inclusion. First, establishing a regulatory sandbox can give FinTech companies a safe space to test their ideas without having to worry about complete regulatory compliance. This strategy protects consumers while promoting innovation. Second, in order to inform the public on the advantages and dangers of FinTech, policymakers ought to support financial literacy initiatives. People who are more financially literate will be able to use digital financial services efficiently and make wise selections. Third, it is essential to create and implement strong cybersecurity laws in order to safeguard user information and stop fraud. Because FinTech depend so much on digital infrastructure, it is critical to make sure that financial transactions are secure and private. Because FinTech depend so much on digital infrastructure, it is critical to make sure that financial transactions are secure and private. Lastly, by requiring data sharing between financial firms with user agreement, authorities can promote an open banking system. Competition from open banking can result in improved services and cheaper prices for customers.

Governments, businesses, and international organizations must collaborate strategically if FinTech is to grow in a sustainable manner. Governments can provide the regulatory framework and infrastructure needed for FinTech advancements. FinTech companies and traditional financial institutions are examples of the private sector that may drive technological advancements and offer scalable solutions. International organizations can play a vital role by promoting information sharing, providing funding, and providing technical assistance. Cooperative initiatives can address common issues like cybersecurity, financial literacy, and regulatory harmonization to guarantee that FinTech solutions are available and beneficial to everyone.

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The Fraud Diamond Theory: Analyzing Opportunity's Role in Bank Professionals' Fraudulent Behavior

Dharaben Nileshkumar Mehta

Abstract:

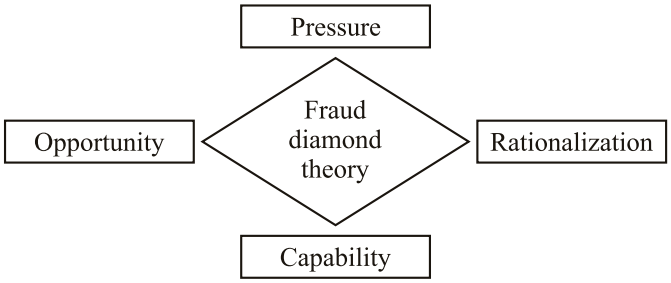
Fraud in the banking sector remains a critical concern, necessitating an in-depth understanding of the factors that drive fraudulent behaviour among professionals. This study provides a thorough investigation into the Fraud Diamond Theory and its implications for the propensity of fraud among bank professionals, with a specific focus on the influence of opportunity. The research examines the components of the Fraud Diamond, which include pressure, opportunity, rationalization, and capability, to gain insights into their combined effect on fraudulent activities within the banking sector. The study primarily focuses on analysing how opportunities contribute to bank professionals' propensity for fraudulent activities. The findings contribute to a comprehensive understanding of the factors influencing fraud within the banking industry, with potential implications for risk management and fraud prevention strategies.

Keywords: *Capability, Fraud Diamond Theory, Opportunity, Pressure, Rationalization*

Introduction:

Fraud is a pervasive issue in the financial sector, leading to significant economic losses and undermining trust in banking institutions. Money laundering, insider trading, record falsification, and embezzlement are just a few of the dishonest practices it includes. The complexity and digitisation of financial transactions have led to a continuous evolution of fraud schemes, making identification and prevention more difficult.

Fraudulent activities within organizations pose a substantial threat to financial stability, corporate reputation, and overall societal trust. Over the years, scholars and practitioners have sought to understand the intricate dynamics that lead individuals to engage in fraudulent behaviour. While the classic Fraud Triangle, comprising pressure, opportunity, and rationalization, has provided a foundational framework, recent advancements in fraud research have expanded this model. The fraud diamond theory is a concept that builds upon the fraud triangle, adding a fourth element to the original three. The fraud triangle, developed by Donald Cressey, identifies three elements that contribute to fraudulent behaviour. Opportunity, pressure and rationalization. The fraud diamond, proposed by Steve Albrecht, represents these three elements plus a fourth element, capability.



- **Pressure:**

  Pressure, also known as motivation, refers to the personal or professional circumstances that drive an individual to commit fraud. It is often the starting point of fraudulent behaviour. This represents the financial or emotional stress that may drive an individual to commit fraud. Examples include personal debt, gambling problems, family issues, or a desire for a higher standard of living.

- **Opportunity:**

  Opportunity refers to the conditions that allow fraud to occur. This could be weak internal controls, lack of oversight, or inadequate monitoring systems. Opportunities create an environment where fraudulent activities can take place without easy detection.

  The "opportunity" element in the Fraud Diamond theory refers to the conditions and situations that allow individuals to commit fraud. It represents the presence of circumstances that make it possible for someone to engage in fraudulent activities without being easily detected or prevented. The concept of opportunity is a critical component of fraud risk, and minimizing opportunities for fraud is a key focus for organizations looking to prevent and detect fraudulent behaviour.

- **Rationalization:**

  Rationalization is the mental process through which fraudsters justify their unethical actions. People who commit fraud rarely see themselves as criminals; instead, they create reasons to make their actions seem acceptable. Rationalization involves the cognitive processes that individuals use to justify their fraudulent actions. This can include thoughts such as believing the fraud is necessary, that it's not really harming anyone, or that they are only borrowing the money temporarily.

- **Capability:**

  The Fraud Diamond Theory introduces capability as a critical factor in fraud. Not everyone with pressure, opportunity, and rationalization has the ability to execute fraud successfully. Capability refers to the skills, intelligence, confidence, and authority that enable an individual to commit fraud and conceal it. Capability is the fourth element added in the Fraud Diamond. It represents the individual's ability or knowledge to commit and conceal the fraud. This includes technical skills, knowledge of internal processes, or access to confidential information.

Review of Literature

(Indarti & Siregara, 2018) Examined accountants' perspectives on indicators of fraudulent activities using the fraud triangle theory. The study focused on three variables: opportunity, pressure, and rationalization. The findings suggest that both pressure and opportunity significantly influence red flags, serving as key indicators of fraudulent activities. In contrast, rationalization does not appear to have any impact on red flags.

(Fikes, 2009) This research is grounded in Cressey's fraud triangle theory, specifically exploring employee dishonesty and theft. Additionally, the study identifies management failure as a contributing factor to employee theft. Financial need on the part of the fraudster is highlighted as a significant influence on the occurrence of fraud.

(Eka, Adam, & Wahyudi, 2018) Examined the influence of opportunity, internal control, and management commitment on the incidence of fraud. Utilizing Crowe's Pentagon Theory, which encompasses factors such as opportunity, pressure, rationalization, competence, and arrogance, this study found that among these elements, opportunity emerged as the most significant predictor of fraud. Factors such as weak internal control, misuse of position, and lack of oversight contribute to this. The presence of a robust internal control system was identified as a deterrent to fraud occurrence, while management commitment was found to have a negative impact on the likelihood of fraud.

(Rabiu & Mansor, 2018) The survey respondents consisted of accounting staff, internal audit professionals, and administrative staff from ten ministries in Kano state. The purpose of the survey was to examine the connection between pressure, opportunity, and rationalization concerning the frequency of fraud in the Nigerian public sector. The participants emphasized the importance of a thorough understanding of fraud for both detection and investigation. The results revealed a positive correlation between the presence of fraud and the three elements of the fraud triangle: pressure, opportunity, and rationalization.

(Nugraha & Susanto, 2018) Examine fraudulent behaviour through the lens of the fraud triangle. The study concludes that the presence of both pressure and opportunity, without any rationalization, eliminates the likelihood of fraud occurrence. Fraud perpetrators often resort to excuses as a means to justify their fraudulent actions.

Research Methodology

- **Objectives:**
  - To study the reason behind fraudster's opportunity aspect to commit fraud.
  - To study the association amongst decision making parameters and reason behind fraudster's opportunity aspect to commit fraud.
- **Scope of research:**

  The objective of this study is to examine the views of banking professionals regarding the factors influencing fraudsters' opportunistic engagement in fraud. The scope of this research is restricted to bank professionals located in the city of Ahmedabad.
- **Research Instrument:**

  This study employs a questionnaire as the research instrument, specifically opting for a structured closed-ended questionnaire tool to gather primary data from 576 bank professionals in Ahmedabad city.
- **Data collection Procedure:**

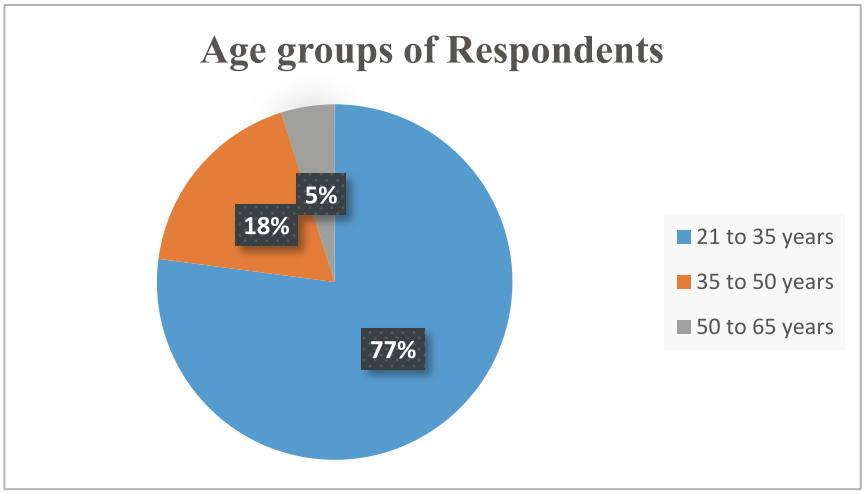
  Structured questionnaires were employed for gathering primary data, while secondary data was obtained from research papers and journals.

Result and Discussion:

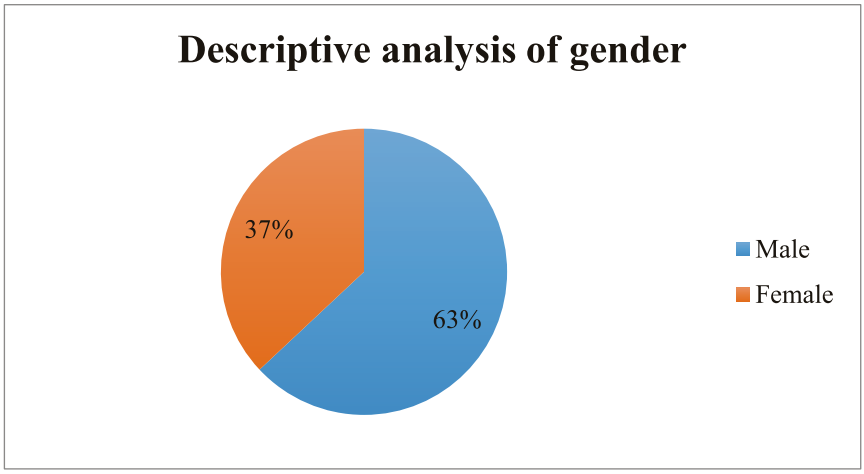
The study participants are comprised of banking professionals residing in Ahmedabad city. Data was collected using a closed-ended questionnaire, with 576 bank professionals completing an online survey.

Among the respondents, the majority (444) fall within the age range of 21-35 years, while 104 respondents are aged between 35-50 years, and 28 respondents are in the 50-65 years age group. The gender distribution shows 363 male respondents and 213 female respondents among the bank professionals. The analysis and observations of the study are outlined below:

Demographic Analysis:



Graph 1: Age groups of Respondents



Graph 2: Descriptive analysis of gender

Chi square analysis

H0: There is no association between the first component 'Opportunity' of the fraud triangle and the employee type [private bank and public bank] who might commit fraud.

H1: There is strong association between the first component 'Opportunity' of the fraud triangle and the employee type [private bank and public bank] who might commit fraud.

	Inadequate staff				
Type of Bank Employees	No	Yes	Total	Chi Square result	Test Status
Private Bank Employees	134	154	288	0.092	Null hypothesis accepted
Public Bank Employees	114	174	288		
Total	248	328	576		
	Lack of Authority				
Type of Bank Employees	No	Yes	Total	Chi Square result	Test Status
Private Bank Employees	49	239	288	0.516	Null hypothesis accepted
Public Bank Employees	55	233	288		
Total	104	472	576		

	Lack of Internal Control							
Type of Bank Employees	Good/ High	Moderate	Poor/low	Very Good/ high	Very poor/low	Total	Chi Square result	Test Status
Private Bank Employees	86	72	12	104	14	288	0.009	Alternative hypothesis accepted
Public Bank Employees	79	52	33	110	14	288		
Total	165	124	45	214	28	576		

	Lack of policies				
	No	Yes	Total	Chi Square result	Test Status
Private Bank Employees	49	239	288	0.912	Null hypothesis accepted
Public Bank Employees	50	238	288		
Total	99	477	576		
	Lack of supervision				
	No	Yes	Total	Chi Square result	Test Status
Private Bank Employees	19	269	288	0.005	Alternative hypothesis accepted
Public Bank Employees	18	270	288		
Total	37	539	576		

	Lack of separation of duties							
	Always	Hardly Ever	Never	Often	Sometimes	Total	Chi Square result	Test Status
Private Bank Employees	101	7	30	84	66	288	0.038	Alternative hypothesis accepted
Public Bank Employees	115	12	18	83	60	288		
Total	216	19	48	167	126	576		

This investigation considers factors associated with the opportunity aspect. These factors encompass inadequate staffing, absence of authority, insufficient internal control, absence of policies, inadequate supervision, and lack of separation of duties. The study employs a chi-square test to explore the correlation between these opportunity-related factors within the fraud triangle and bank professionals who could potentially engage in fraudulent activities.

The research affirmed the alternative hypothesis and refuted the null hypothesis concerning the elements of insufficient internal control, inadequate supervision, and lack of separation of duties. This indicates that the presence of these factors is associated with an increased likelihood of fraud. On the other hand, the study negated the alternative hypothesis for additional opportunity-related factors and endorsed the null hypothesis. Consequently, there is no apparent correlation between these other opportunity factors and the inclination of bank professionals to engage in fraudulent activities.

Conclusion:

The aim of this study is to investigate the inclination of bank professionals towards committing fraud with a focus on the opportunity aspect. The research seeks to underscore the motivating factors that drive fraudsters to exploit opportunities for committing fraud. The study is centred on the population of bank professionals, with a specific focus on 576 individuals from banks in Ahmedabad city. The research embraced the alternative hypothesis and dismissed the null hypothesis concerning the factors of lack of internal control, lack of supervision, and lack of separation of duties. This implies that the presence of these factors increases the likelihood of fraud. Conversely, the study rejected the alternative hypothesis for other opportunity-related factors and accepted the null hypothesis. Therefore, there is no discernible relationship between these additional opportunity factors and the propensity of bank professionals to commit fraud.

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Attitude of Senior Citizen's Towards New Technology-With Special Reference to Digital Payments

Parulben Dipsinh Zala, Kamini Shah

Abstract:

The roles and duties of elderly individuals hold significant and crucial value in Indian society. Throughout their lifetime, they play a vital role in fostering the growth of the home, family, community, and the overall progress of our nation. They possess experience and skills, yet they remain the most overlooked segment of society. At present, 65% of the Indian populace is under the age of 35, while the senior citizen demographic stands at around 90 million. This indicates that India has the second highest number of senior citizens in the world. Trends suggest that by 2050, the elderly population will increase to 20% of the Indian population. Information and Communication Technology (ICT) has a significant impact on the lives of the youth in India, but older individuals have yet to experience the advantages and potential of ICT; it has a larger role to fulfill in making a meaningful difference in the lives of seniors in our country. The objective of the current study is to examine women's awareness of the digital payment system and their perceptions of this new payment method. The study indicates that while most seniors are aware of the digital payment system, they still choose not to utilize it.

Key words: *Digital Payment, Senior citizens, Digital Wallet, Online Payment, Payment System*

Introduction:

India possesses various frameworks to oversee its growth and development in an efficient and effective manner; the financial structure of any nation is among the most vital, including both banking and non-banking financial entities, which provide diverse financial services to their clients. Within financial services, financial clearing and fund transfer services rank as some of the most important when compared to other offerings. The swift progress of information and communication technologies has resulted in numerous achievements for human society and has significantly influenced individuals' lives, behaviors, and social occurrences.

An electronic payment method is a type of transaction performed through an electronic network like the internet. In basic terms, e-payment can be defined as a method that allows a person to pay online for buying goods and services without needing physical cash or cheque transfer, anytime and anywhere.

Literature Review:

Alice Elizabeth Davies (2017) The cashless approach is utilized by younger individuals since they possess greater technological awareness. It was also evident that all participants assess payment methods to evaluate the time taken by each. The research indicates an affirmative view regarding cashless financial transactions. The outlook of uni Noor Raihan, AB Hamid and AW Yoke Cheng (2013) Studied that a nation's competitiveness can be enhanced through the utilization of an e-payment system as it proves advantageous for both consumers and service providers. Customer satisfaction is influenced by their perception of risk.versity students was notably distinct from that of other generational groups.

Samita Kher, Shryti Chadak, Nilisha Kothari and Rohan Desai (2018 It was found that among all respondents, 81.25% of females and 92.21% of males were aware of the digital payment initiative

Jaya Acharya, Vijaysingh & Monika Malviya (2018) in their research article revealed that there is a great impact of digitalization on women.

Shamshersingh & Ravish Rana (2018) found that apart from education, other demographic factors have little effect on the adoption of digital payment systems. In regions such as Delhi, where the education level is elevated, digital payment is commonly embraced.

Dr. S. Manikandan and J. Mary Jayakodi (2017) Research shows that people are aware of using mobile wallets due to demonetization. As security increases and risk decreases, the adoption of mobile wallets is anticipated to grow. It was noted that there will be considerable growth in the acceptance and utilization of mobile wallets in the coming future.

Research Gap

Research Methodology:

Due to a notable rise in transaction volume and value linked to elements like the launch of UPI, the growth of e-commerce, and government initiatives, India's digital payments landscape is expected to continue to grow. To achieve this goal, it is helpful to grasp the awareness and views of elderly individuals, who are key collaborators in the development of our ecosystem, about digital payments. Many researchers have studied the

effects of digital payments. The researchers must further examine the effect evaluation of the digital payment system on different stakeholders separately. A captivating aspect of our research would be to focus on senior citizens regarding the digital payment system in Gujarat. The research will emphasize the lack of understanding about the digital payment system among elderly individuals in Gujarat

Identification of the research problem:

India, the world's second most populous country. Comprising 17. 50% of the global population. The elderly population is approximately 90 million. This demonstrates India as a nation with the second highest number of senior citizens worldwide. Projections suggest that by 2050, 20% of the Indian population will be elderly It is crucial to embrace digital payments during this era of technological progress. The Indian government strongly prioritizes Digital India and moving the country towards a cashless economy. Digital payments are safe and secure when people follow the rules and guidelines; however, without adherence, they can become so risky that one could lose millions of rupees in just seconds. Consequently, it is crucial to concentrate on increasing awareness and influencing public opinion about digital payments The key research question for this study has been determined as follows: "Attitude of Senior Citizen's Towards New Technology-with Special Reference to Digital Payment."

The subject selected for the present research is based on several important reasons. Digital Payments have played a crucial role in the progress of India's economy. As stated in the report named "Flavours of fast," which used the Faster Payments Innovation (FPII) launched in 2014, India has the most advanced digital payments system out of 25 countries, such as the UK, CHINA, and JAPAN. Consequently, this report highlights that understanding digital payments is crucial for individuals. Technology can empower individuals and foster a sense of independence; thus, it is essential for them to learn how to utilize various forms of Digital Payments. This highlights the need to assess the awareness and perceptions of senior citizens regarding digital payments in the state of Gujarat, as they represent a crucial segment of society with diverse sources of income, such as pensions, interest income, capital gains from properties owned in their names, and many others.

Objectives of the Study:

The main goals to tackle the research issue of the study are

- To comprehend the fundamental characteristics of Digital Payment System
- To know awareness of senior citizens about Digital Payment System.
- To understand senior citizens' perception towards Digital Payment System.
- To comprehend the different risks andchallenges encountered in this era because of the Digital Payment system.

Research Design:

This study employs an inferential statistical research design.

Data Collection

Primary data was collected through a structured questionnaire that was distributed to women in various areas throughout Gujarat.

The survey contained various factors aimed at assessing the understanding and views of elderly individuals concerning the digital payment system in Gujarat. Secondary data was collected from multiple sources such as magazines, journals, research articles, newspapers, and more. Several websites were also reviewed to acquire the required information

Sample Size & Technique:

The size of the sample includes 112 respondents who are senior citizens. A convenience sampling method was implemented over a duration of one month, specifically in January 2020.

Hypothesis of the Study:

The subsequent hypotheses have been investigated:

H_{01}= There is no significant awareness about digital payments among senior citizens.

H_{02} = There is no significant difference in perception between male and female.

H_{03} = There is no significant impact of family income on their perception about security while using digital payment.

H_{04}= There is no significant impact of profession of the respondents on their awareness and perception about digital payments.

H_{05} = There is no significant impact of education on their perception.

There is no significant impact of family income on their perception about security while using digital payment.

There is no significant impact of profession of the respondents on their awareness and perception about digital payments.

Data Analysis and Interpretation:

The collected data from different sourcesis analyzed using appropriate statistical techniques like the chi-square test, Anova test, Excel, and SPSS, among others. A frequency analysis was conducted to evaluate the respondents' knowledge about digital payments

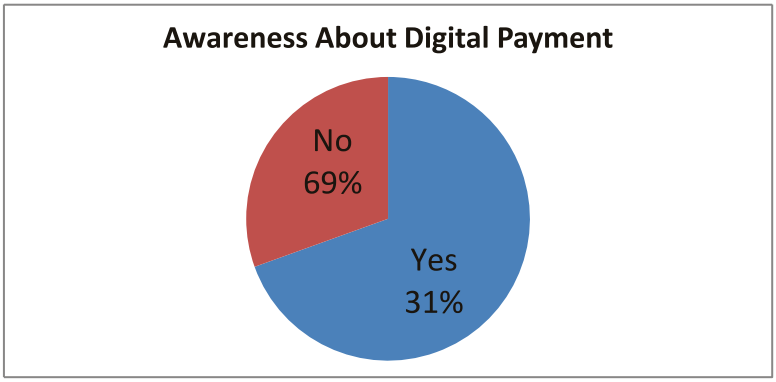
Table.1 Demographic Profile of the Respondents

	Category	Frequency	Percentage
Gender	Male	62	55.36
	Female	50	44.64
Education	Illiterate	23	20.54
	High school	52	46.43
	UG	32	28.57
	PG	4	3.57
	Other	1	0.89
Income (Rs)	Up to 20000	47	41.96
	20001 to 30000	19	16.96
	30001 to 50000	19	16.96
	Above 50000	14	12.5
	No income	13	11.61
Profession	Unemployed	2	1.78
	Housewife	19	16.96
	Business	18	16.07
	Service	27	24.11
	Retired	25	22.32
	Professional	7	6.25
	Farmer/farm worker	14	12.5
Total		**112**	**100**

Statistical Analysis:

H01= There is no significant awareness about digital payment system among senior citizen.

Figure 1 Awareness about digital payment



The graph above shows that approximately 31% of the total respondents are knowledgeable about and currently using or intending to use digital payment methods. Just 69% have never utilized a digital payment system. Thus, Ho1 cannot be dismissed, and it is evident that women are knowledgeable about the digital payment system

H02: There is no significant difference in the perception of male and female.

Table 2

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Reduce corruption	Female	28	1.0000	.00000	.00000
	Male	43	.8605	.35060	.05347
How much satisfied you are with the service of digital payment	Female	28	1.1429	.80343	.15183
	Male	43	1.1860	.87982	.13417
Do you think that digital payment system is not necessary	Female	28	2.0357	1.77393	.33524
	Male	43	2.1163	1.54626	.23580
Better than offine payment	Female	28	.6429	.48795	.09221
	Male	43	.6744	.47414	.07231
Do you feel enough information	Female	28	.6429	.48795	.09221
	Male	43	.6744	.47414	.07231

Better than offline	Female	28	.7857	.41786	.07897
	Male	43	.6047	.49471	.07544
Would You like to continue using digital payment?	Female	28	1.0000	.00000	.00000
	Male	43	.9535	.21308	.03249
A digital payment could eliminate the need to bring money would this be a benefit to you?	Female	28	.7857	.41786	.07897
	Male	43	.7442	.44148	.06733
The cost of using digital payment modes is too high	Female	28	1.6071	1.44886	.27381
	Male	43	1.6977	1.20584	.18389
Are you concerned about security while using digital payment mode	Female	28	1.8214	1.30678	.24696
	Male	43	1.5814	1.19985	.18298

Table 3

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Reduce corruption	Equal variances assumed	25.144	.000	2.101	69	.039	.13953	.06643	.00702	.27205
	Equal variances not assumed			2.610	42.000	.013	.13953	.05347	.03163	.24744
How much satisfied you are with the service of digital payment?	Equal variances assumed	.001	.975	-.209	69	.835	-.04319	.20659	-.45533	.36895
	Equal variances not assumed			-.213	61.517	.832	-.04319	.20262	-.44829	.36191
Do you think that digital payment system is not necessary?	Equal variances assumed	3.822	.055	-.202	69	.840	-.08056	.39804	-.87463	.71350
	Equal variances not assumed			-.197	52.123	.845	-.08056	.40987	-.90297	.74184
Better than offline payment	Equal variances assumed	.280	.598	-.271	69	.787	-.03156	.11646	-.26390	.20077
	Equal variances not assumed			-.269	56.642	.789	-.03156	.11718	-.26625	.20312
Do you feel enough information	Equal variances assumed	.280	.598	-.271	69	.787	-.03156	.11646	-.26390	.20077
	Equal variances not assumed			-.269	56.642	.789	-.03156	.11718	-.26625	.20312
Better than offline	Equal variances assumed	11.752	.001	1.600	69	.114	.18106	.11320	-.04476	.40689
	Equal variances not assumed			1.658	64.329	.102	.18106	.10921	-.03709	.39922
Would You like to continue using digital payment?	Equal variances assumed	5.868	.018	1.152	69	.253	.04651	.04037	-.03403	.12705
	Equal variances not assumed			1.431	42.000	.160	.04651	.03249	-.01907	.11209

A digital payment could eliminate the need to bring money would this be a benefit to you?	Equal variances assumed	.649	.423	.396	69	.694	.04153	.10500	-.16794	.25100
	Equal variances not assumed			.400	60.103	.690	.04153	.10377	-.16604	.24909
The cost of using digital payment modes is too high	Equal variances assumed	2.546	.115	-.285	69	.776	-.09053	.31723	-.72338	.54232
	Equal variances not assumed			-.274	50.274	.785	-.09053	.32983	-.75292	.57186
Are you concerned about security while using digital payment mode	Equal variances assumed	1.147	.288	.795	69	.429	.24003	.30180	-.36203	.84210
	Equal variances not assumed			.781	54.267	.438	.24003	.30736	-.37611	.85618

We can see that the average of male respondents is greater than that of female respondents regarding their views on the safety and need for digital payment systems, as well as the expenses associated with these systems. They are also knowledgeable about the digital payment system, indicating a notable difference in the average score between males and females

H03: There is no impact of family income on their perception about security while using digital payment.

Table 4

		Sum of Squares	df	Mean Square	F	Sig.
Are you concerned about security while using digital payment mode	Between Groups	42.859	3	14.286	14.681	.000
	Within Groups	64.227	66	.973		
	Total	107.086	69			

Table 4 shows p=0.000 regarding their view on security when using digital payments, which is under 0.05, indicating a notable difference in their perceptions.

H04: **There is no impact of profession on their awareness for digital payment information.**

Table 5

		Sum of Squares	df	Mean Square	F	Sig.
do you feel enough Information	Between Groups	1.534	6	.256	1.131	.355
	Within Groups	14.238	63	.226		
	Total	15.771	69			
Do you think that digital payment system is not necessary	Between Groups	7.339	6	1.223	.433	.854
	Within Groups	178.147	63	2.828		
	Total	185.486	69			
Familiar Digital Payment Method	Between Groups	1.336	6	.223	.940	.470
	Within Groups	24.382	103	.237		
	Total	25.718	109			

Table 5 helps in drawing following inferences:

p=0.854 regarding their belief that a digital payment system is unnecessary, which exceeds 0.05, indicating no significant difference in their perception.

p=0.355 for their perception regarding sufficient information about digital payments, which exceeds 0.05, indicating a significant difference in their perception.

p=0.470 regarding their perception of familiarity with digital payment methods, which exceeds 0.05, indicating a significant difference in their perceptions

Therefore, we can infer that the respondents' income has little effect on their perception.

H05: There is no significant impact of education on their perception

Table 6 - ANOVA test for Impact of Education and Perception

		Sum of Squares	df	Mean Square	F	Sig.
The cost of using digital payment modes is too high	Between Groups	12.806	6	2.134	1.809	.099
	Within Groups	227.749	193	1.183		
	Total	240.555	199			
Are you concerned about security while using digital payment mode?	Between Groups	11.913	6	1.986	2.394	.030
	Within Groups	160.087	193	.829		
	Total	172.000	199			
Do you think that digital payment helps women in becoming independent?	Between Groups	24.667	6	4.111	4.263	.000
	Within Groups	186.113	193	.964		
	Total	210.78	199			
Do you think that digital payment system is not necessary?	Between Groups	65.473	6	10.912	10.76	.000
	Within Groups	196.722	193	1.019		
	Total	262.195	199			
How much satisfied are you with the service of digital payment	Between Groups	16.923	6	2.821	3.875	.001
	Within Groups	140.497	193	.728		
	Total	157.420	199			

Table 6 helps in drawing following inferences:

p=.099 indicates that their perception of the cost associated with using digital payments is high, which exceeds 0.05, showing no significant difference in their views.

p=0.030 indicates that their perception of concern for security when using digital payment is low, which is under 0.05, thus showing a significant difference in their perception.

p=.000 for their belief that digital payment aids women's independence, which is below 0.05, indicating a significant difference in their perception.

p=.000 for their belief that the digital payment system is unnecessary, which is below 0.05, indicating a significant difference in their perceptions.

p=.001 regarding their view of satisfaction with digital payments, which is below 0.05, indicating a significant difference in their perception. Thus, we can deduce that a respondent's education significantly influences their perception.

Major Findings:

- Of all the respondents, just 31% are either using or plan to use a digital payment system, whereas 69% are not employing it.
- A sum of 50. 5% of respondents indicate satisfaction, while 16% report being very satisfied with the digital payment system. Just five. 5% express dissatisfaction with the digital payment system when considering those who are dissatisfied and highly dissatisfied together
- 5% of participants strongly concur that the digital payment system is advantageous, while 45% oppose the claim that the expenses of digital payment are elevated
- 46.5% of participants expressed that they have worries regarding security while utilizing digital payment methods. system.
- Most of the participants (85. 5%) do not want to keep using the digital payment method.
- 52.5% of those surveyed agree that the digital payment system could help diminish corruption in India.
- 40% of respondents primarily use cash for payments, whereas only 19% use cash for high-value transactions.
- 49.5% of those surveyed think that the digital payment system is better than the offline payment method system.
- The vast majority (70%. 5% of participants believe they do not have enough information regarding digital payment
- The professions of the respondents do not significantly affect their opinions on the cost of the digital payment system
- A correlation is present between the professions of the respondents and their selection of digital payment methods
- The income levels of respondents do not have a substantial impact on their perceptions
- The level of education among respondents has a considerable impact on their perceptions

Limitations of the research

- The study is limited solely to the state of Gujarat.

- Primary data was collected through a questionnaire that may be susceptible to the personal biases of the participants
- The present research is limited to only 112 participants from the state of Gujarat. Although efforts have been made in selecting the samples, they may still not truly represent the actual population

Scope for further research

- Comparable types of research can be conducted for additional emerging technologies.
- The research can be broadened to include the implementation and awareness regarding digital payment on a state-by-state basis among the public.
- An analogous study involving other stakeholders, such as students, millennials, housewives, etc., would be intriguing to pursue.

Conclusion

Technology has simplified our lives significantly compared to the past. The digital payment system stands out as one of the advancements in commerce, finance, and banking. The current study aims to explore the perceptions and awareness of senior citizens regarding digital payment. Chi-square analysis confirmed this, showing a notable difference in women's perceptions based on their age and education levels. The findings indicate that while they are knowledgeable about digital payments, there is still a need for greater awareness. There lies considerable potential to enhance the role of the elderly in this area. As numerous respondents see the digital payment system as simple, convenient, and time-saving, it can undoubtedly help them manage their personal and professional matters effectively and efficiently. This research will benefit students, government entities, policymakers, and upcoming researchers. It is also advantageous for those committed to improving and empowering the elderly population.

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Comparative Study on Customer Awareness between ZEPTO and BLINKIT

Joe Marry George

Abstract

In today's world shopping is not any more a tiresome work visiting stores rather it's a pleasant shopping experience sitting at any corner of the world as today world is a global village and Information Technology has played a greater role in connecting any one with anybody. Every day a new product or service gets introduced in the market. As many things are available in the market for the convenience of the customer but the awareness and its usage is more important. My research is 'Comparative Study on Customer Awareness between ZEPTO and BLINKIT in the town of Vallabh Vidyanagar. The data is collected from 166 customers. The factor analysis defines the awareness of customers between ZEPTO and BLINKIT.

Keywords: *Convenient, reliable, hyperlocal, metropolitan, aggressive, perception, proposition, positioning, bolstered, promotions*

Introduction

The rapid evolution of the Indian quick-commerce sector has seen a surge in companies like Zepto and Blinkit, offering ultra-fast delivery of groceries and essential goods to consumers. With the growing demand for fast, reliable, and convenient shopping experiences, customer awareness plays a critical role in shaping purchasing behavior and brand loyalty. This study seeks to compare the customer awareness levels between Zepto, a newcomer in the market founded in 2021, and Blinkit, an established player that rebranded from Grofers after its acquisition by Zomato.

The primary aim of this comparative study is to analyze how customers perceive these two platforms, their brand awareness, the effectiveness of their marketing campaigns, and the impact of their services on customer satisfaction.

Zepto: Known for its focus on hyper local delivery and a promise of delivering groceries in 10 minutes, Zepto's brand has been rapidly gaining recognition in metropolitan areas across India. Backed by a strong technological backbone and aggressive marketing, Zepto's strategy revolves around speed and convenience.

Blinkit: As one of the pioneers in the quick-commerce space, Blinkit's experience in the industry is a major advantage. With its roots in Grofers, it has established a wide network of services across the country and has benefitted from Zomato's resources for further reach. Blinkit's awareness is also driven by Zomato's vast customer base, which has made it a key player in the hyperlocal delivery space.

This study will evaluate customer awareness through factors such as:

Brand Recognition: How well customers know the Zepto and Blinkit brands.

Marketing and Advertising: The impact of digital, traditional, and influencer marketing on customer knowledge.

Customer Perception and Trust: Customer trust in the delivery time, quality of products, and service reliability.

Market Penetration: Which platform has greater reach, and how this affects brand awareness.

By comparing customer awareness between these two brands, the study aims to highlight their strengths, weaknesses, and opportunities for growth in India's competitive quick-commerce market. The findings could provide valuable insights for future strategies, such as improving visibility, enhancing marketing campaigns, and increasing customer engagement to foster long-term brand loyalty.

This comparative study focuses on customer awareness between Zepto and Blinkit, two leading quick-commerce platforms in India. Zepto, launched in 2021, focuses on 10-minute delivery, while Blinkit, previously Grofers, has been around since 2013 and was acquired by Zomato. The study examines how customers recognize these brands, the effectiveness of their marketing efforts, and their impact on consumer trust and satisfaction. Key factors include brand recognition, marketing strategies, customer perception, and market penetration. The findings aim to shed light on how both brands engage customers in India's competitive hyperlocal delivery market.

The Indian quick-commerce sector has rapidly grown over the past few years, driven by the increasing demand for instant deliveries of groceries and other essential items. Among the leaders in this space are Zepto and Blinkit-two companies that are shaping the future of hyperlocal delivery in India. With the focus on convenience, speed, and customer satisfaction, it's important to understand how aware customers are of these brands and how that awareness influences their buying decisions.

This comparative study aims to explore the levels of customer awareness between Zepto, a newer player, and Blinkit, a more established brand. While both companies operate in the same industry, their approaches to customer engagement, branding, and marketing have differed significantly.

Zepto: A New Player with Speed as a USP

Founded in 2021 by Aadit Palicha and Kaivalya Vohra, Zepto has quickly gained popularity in India's metropolitan areas by promising ultra-fast delivery—typically within 10 minutes. Its unique selling proposition (USP) is speed, positioning itself as a technology-driven service that caters to the on-the-go consumer. Zepto's rapid growth has been fueled by an aggressive marketing strategy and a focus on tech-based innovation, such as optimizing delivery routes, product selection, and inventory management.

Zepto's marketing approach is largely digital-first, utilizing social media, influencer campaigns, and targeted advertisements to reach its young, urban audience. Its brand message is built around speed, convenience, and reliability. However, as a relatively new player, Zepto's brand awareness is still in the early stages compared to its competitors, and it continues to invest in increasing visibility across major cities.

Blinkit: An Established Brand with Deep Market Penetration

Blinkit (formerly Grofers), on the other hand, was founded in 2013 by Albinder Dhindsa and Saurabh Kumar. Initially focused on scheduled grocery deliveries, Blinkit rebranded to its current form in 2021 to emphasize faster deliveries, like Zepto. However, unlike Zepto, Blinkit has a longer history and broader market penetration, having served customers for nearly a decade.

In 2022, Blinkit was acquired by Zomato, giving it access to an established customer base, resources, and marketing power. Blinkit operates in over 30 cities and has a well-established network of dark stores (small warehouses) for quick deliveries. Blinkit's brand awareness has been significantly bolstered by its association with Zomato, making it a trusted name in the quick-commerce space.

Blinkit's marketing strategies include a mix of traditional advertising, digital campaigns, and heavy promotions via Zomato's platform. This strong market presence and partnership have helped Blinkit build substantial customer recognition.

Key Areas of Focus for the Study

Brand Recognition:

How well do customers recognize Zepto and Blinkit in the quick-commerce space?

What are the key factors that influence customers' awareness of each brand?

Marketing and Advertising Impact:

How effective are the marketing strategies of each company in raising brand awareness?

Which platforms-social media, online advertising, traditional media-have proven most successful?

Customer Trust and Perception:

How do customers perceive the reliability of delivery, quality of products, and overall service?

Does Zepto's 10-minute delivery claim resonate more with customers compared to Blinkit's more established reputation?

Market Penetration:

Which brand has greater visibility in various cities, especially in Tier 1 and Tier 2 areas?

How do Zepto and Blinkit differ in their geographic reach and customer base?

Expected Outcome

The study is expected to highlight the different strategies employed by Zepto and Blinkit to establish their presence in the market. By comparing customer awareness, the study will provide valuable insights into the effectiveness of digital versus traditional marketing, The impact of speed and convenience on consumer loyalty. The role of parent company resources (like Zomato for Blinkit) in building brand credibility.

These findings will help both brands understand the strengths and weaknesses in their marketing and customer engagement strategies, potentially informing future campaigns, product offerings, and market expansion decisions. Additionally, it will help identify areas where Zepto can catch up with Blinkit in terms of brand visibility and consumer trust.

Literature Review

- Brand Awareness and Customer Perception

  Studies have shown that brand awareness is a critical factor in customer decision-making, especially in the fast-paced world of e-commerce and quick-commerce. Keller (2013) emphasized that brand recognition, formed through repeated exposure to brand elements (logos, advertisements, slogans), has a direct impact on

consumer trust and loyalty. In the case of Zepto and Blinkit, their marketing strategies, whether through social media campaigns or influencer collaborations, are pivotal in shaping customer awareness.

- Consumer Behavior in the E-Commerce Sector

  Consumer behavior research highlights that quick commerce platforms are highly dependent on consumers' desires for convenience, speed, and price comparison. According to Srinivasan (2020), platforms like Zepto and Blinkit benefit from understanding local consumer habits, including preferences for faster delivery and affordable pricing. This is a key differentiator when comparing consumer awareness and market acceptance.

- Marketing Communication in Quick-Commerce

  Effective marketing communication is essential to increasing customer awareness and shaping their perceptions of service quality. Schultz et al. (2010) discuss how digital marketing and social media engagement can create significant brand awareness for newer brands like Zepto, which use Facebook, Instagram, and TikTok to engage with the younger demographic. Blinkit, having an established presence, relies more on partnerships with platforms like Zomato for broader reach.

- The Impact of Influencer Marketing

  The role of influencer marketing in creating brand awareness is significant, particularly in India's digital-first market. Kapoor & Soni (2021) noted that platforms like Zepto have relied heavily on influencers to promote their "10-minute delivery" feature. This tactic is aimed at creating buzz and building brand recognition quickly. Blinkit, already established before influencer marketing surged, often uses influencers in more subtle ways, complementing its advertising with user-generated content and trusted testimonials.

- Brand Trust and Customer Loyalty

  The creation of brand trust is crucial for gaining repeat customers. Aaker (1997) noted that customers are more likely to purchase from a brand they trust. Both Zepto and Blinkit use quick delivery and product quality to build trust, but Zepto's newer presence in the market means that it must work harder to prove its reliability compared to Blinkit, which has built trust over years.

- Digital Marketing Effectiveness

  A study by Jain & Vohra (2019) found that the rapid adoption of digital marketing tools has revolutionized customer engagement. Zepto, as a new entrant, utilizes digital platforms effectively to target specific customer segments with data-driven marketing campaigns. In contrast, Blinkit has integrated its digital presence with Zomato's user base, amplifying its visibility and reach.

- Social Media Engagement and Customer Awareness

  Social media engagement is key to increasing brand awareness. According to Marathe & Ghosh (2018), platforms like Zepto effectively use memes, viral content, and hashtags to engage younger customers who prioritize fast services. While Blinkit engages its audience through Zomato's app, it also has a strong presence on social media, providing detailed updates and special offers to existing and new customers.

- Impact of Brand Positioning on Customer Awareness

  Brand positioning theory suggests that companies need to differentiate their services in a crowded market. Zepto positions itself around its speed (10-minute delivery), whereas Blinkit emphasizes its wide product range and reliability. As Kotler (2012) explains, positioning plays a crucial role in creating brand recall and awareness. Zepto's distinctive focus on speed may give it an edge in awareness, especially among customers prioritizing immediate service.

- Geographic and Demographic Impact on Awareness

  The effectiveness of brand awareness strategies also varies by region and demographic. Ghosh & Saha (2021) note that Zepto's presence in metropolitan cities, where the demand for hyperlocal delivery is higher, drives its awareness in these areas. Meanwhile, Blinkit, having been operational for longer, has a more diversified demographic presence, offering services in both urban and semi-urban areas.

- Influence of Service Speed on Customer Perception

  Research by Reibstein (2002) shows that the speed of service is a critical factor in customer satisfaction and awareness. Zepto's emphasis on 10-minute delivery directly influences consumer perception, making it a key factor in building brand awareness among customers looking for fast, reliable services.

- Advertising Spend and Customer Recall

  Rosenbaum-Elliott et al. (2015) discuss how advertising spend affects customer recall. While Zepto has significantly increased its advertising budget to capture attention, Blinkit benefits from

its association with Zomato's advertising power. Blinkit's budget allocation, combined with its long-standing presence, helps reinforce customer awareness without having to push as aggressively as Zepto.

- Customer Reviews and Word-of-Mouth Marketing

  Customer reviews and word-of-mouth play a pivotal role in shaping customer awareness, especially in India's tight-knit social ecosystem. According to Cheng et al. (2018), online reviews and social media discussions help increase brand awareness organically. Both Zepto and Blinkit benefit from positive customer experiences, with satisfied customers often sharing their experiences on social media, driving further awareness.

- Differentiation Strategy in Competitive Markets

  As Porter (1980) notes, companies need to adopt differentiation strategies to stand out in competitive markets. Zepto differentiates itself through ultra-fast delivery, while Blinkit positions itself as an established, reliable brand. This differentiation strategy impacts customer awareness, with Zepto attracting customers seeking speed and Blinkit appealing to those preferring a broader product range and established service.

- Price Sensitivity and Customer Awareness

  Price sensitivity also plays a role in brand awareness, especially for consumers who balance cost and convenience. Chandon et al. (2000) found that quick-commerce platforms must balance their pricing to cater to budget-conscious customers while maintaining high service standards. Blinkit, with its larger scale, is able to offer discounts and bundle deals, which may contribute to higher customer awareness, particularly in price-sensitive markets.

- Market Penetration and Consumer Awareness

  Finally, market penetration directly affects brand awareness. Zepto, with its aggressive expansion into multiple metro cities, focuses on increasing awareness through location-based promotions. Blinkit, being more entrenched in the market, has a broader customer base in Tier 1 and Tier 2 cities. According to Baker (2001), both brands' level of penetration and localized marketing campaigns play significant roles in shaping regional customer awareness.

Research Methodology

Research Problem:

Every day a new product or service gets introduced in the market. As many things are available in the market for the convenience of the customer but the awareness and its usage is more important. Therefore the researcher has selected the topic titled 'Comparative Study on Customer Awareness Between ZEPTO and BLINKIT.

Objectives of the Study:

- To study the customer awareness for Zepto and Blinkit.
- To study factors influencing customer preferences between Zepto and Blinkit.

Data Collection:

- **Primary Data:** Structured questionnaire is prepared to collect the primary information from customers.
- **Secondary Data:** Secondary data is also collected through journals, online articles, online research papers, websites, etc.

Hypotheses

All are aware about ZEPTO and BLINKIT.

Research Methodology

Research Design: This is exploratory in nature since it gives insights into the phenomenon of awareness about ZEPTO and BLINKIT.

Sampling Design: Convenient Sampling

Sample Size: The sample consists of 166 respondents. Out of which 101 are males and 64 are females.

Sample Area: Respondents are from Vallabh Vidhya Nagar

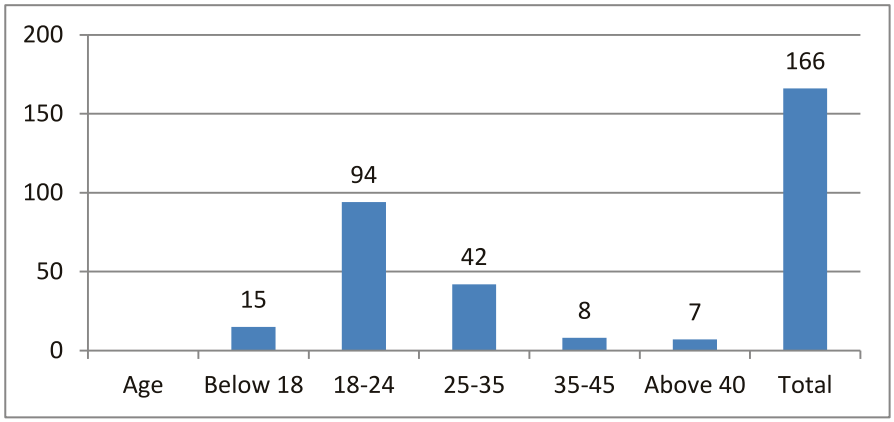
Limitations of the Study:

- Limited sample size
- Time constraints

Data Analysis

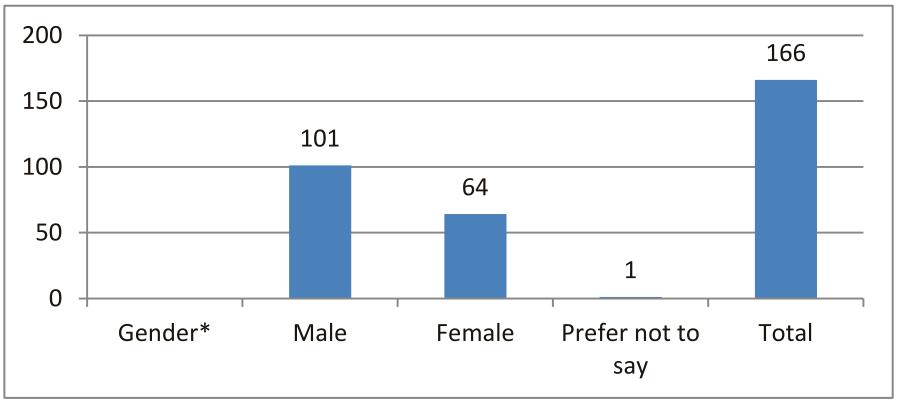
Age of Respondents

Age	In Nos.
Below 18	15
18-24	94
25-35	42
35-45	8
Above 40	7
Total	166



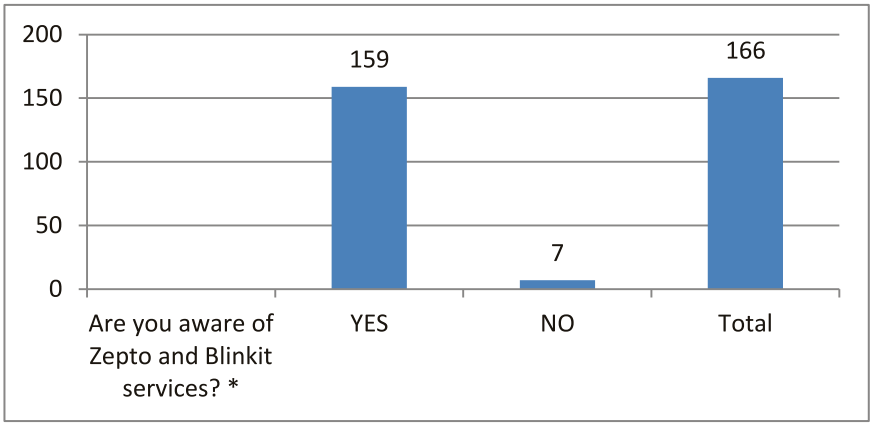
Gender of Respondents

Gender	In Nos.
Male	101
Female	64
Prefer not to say	1
Total	166



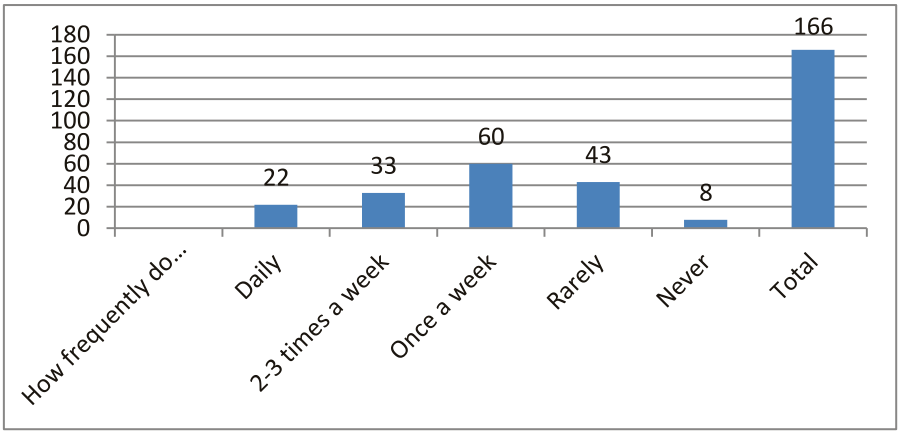
Awareness about ZEPTO & BLINKIT

Are you aware of Zepto and Blinkit services?	In Nos.
YES	159
NO	7
Total	166



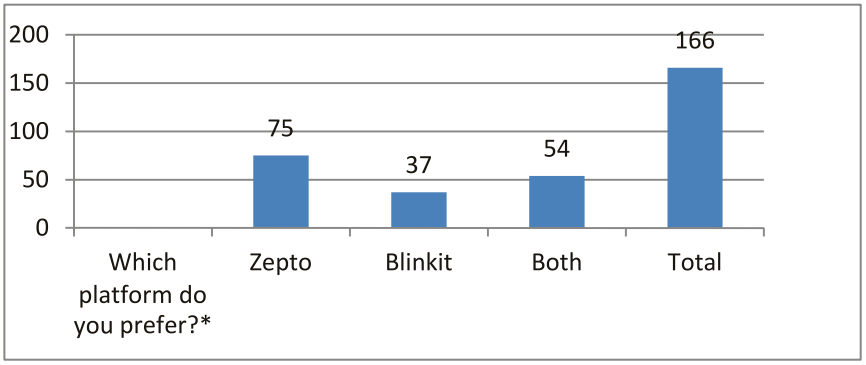
Respondent's usage of ZEPTO & BLINKIT

How frequently do you use Zepto or Blinkit?	In Nos.
Daily	22
2-3 times a week	33
Once a week	60
Rarely	43
Never	8
Total	166



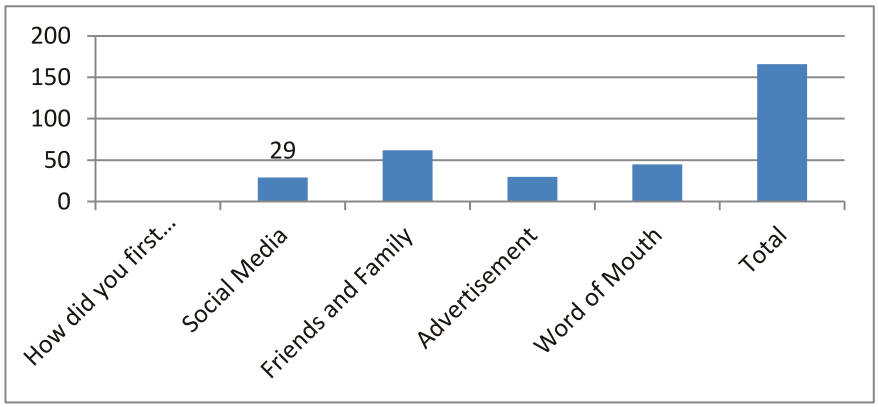
Platform preferred by Respondent

Which platform do you prefer?	In Nos.
Zepto	75
Blinkit	37
Both	54
Total	166



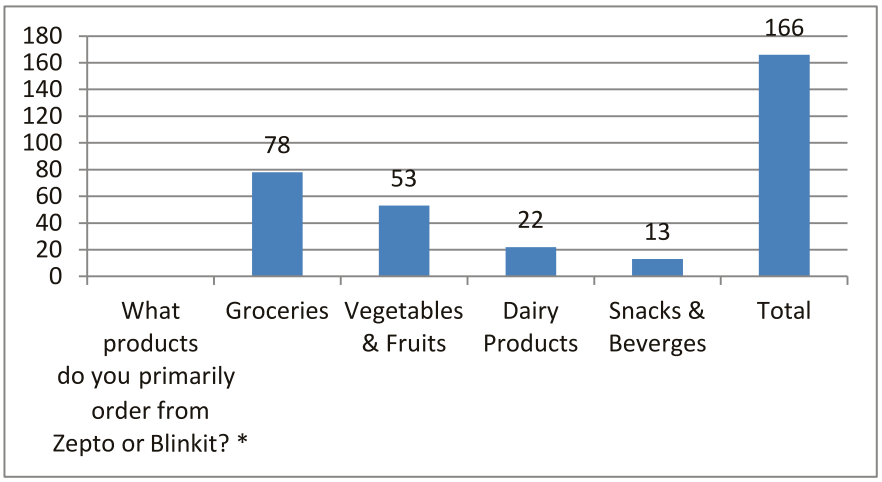
Respondent's source of awareness about ZEPTO & BLINKIT

How did you first come to know about Zepto or Blinkit?	In Nos.
Social Media	29
Friends and Family	62
Advertisement	30
Word of Mouth	45
Total	166



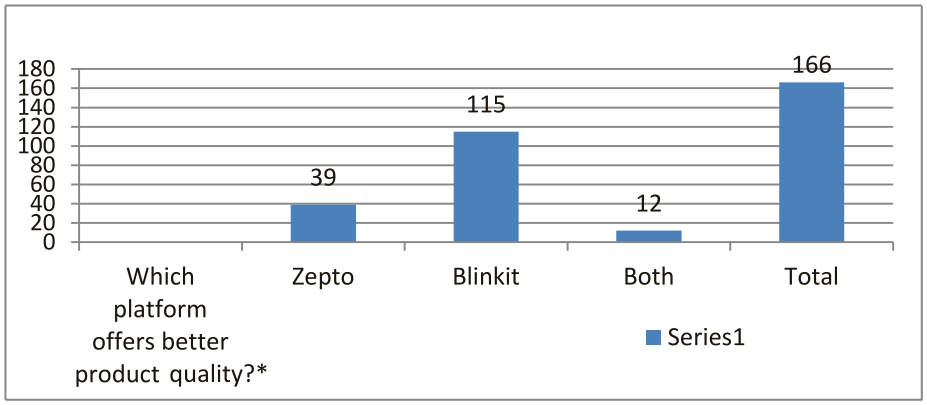
Primarily ordered products

What products do you primarily order from Zepto or Blinkit? *	In Nos.
Groceries	78
Vegetables & Fruits	53
Dairy Products	22
Snacks & Beverges	13
Total	166



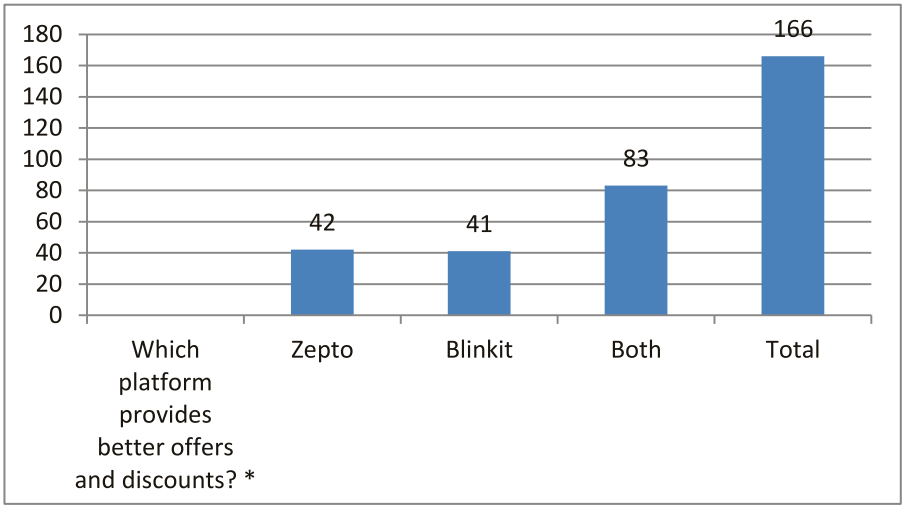
Better platform by ZEPTO & BLINKIT

Which platform offers better product quality?*	In Nos.
Zepto	39
Blinkit	115
Both	12
Total	166



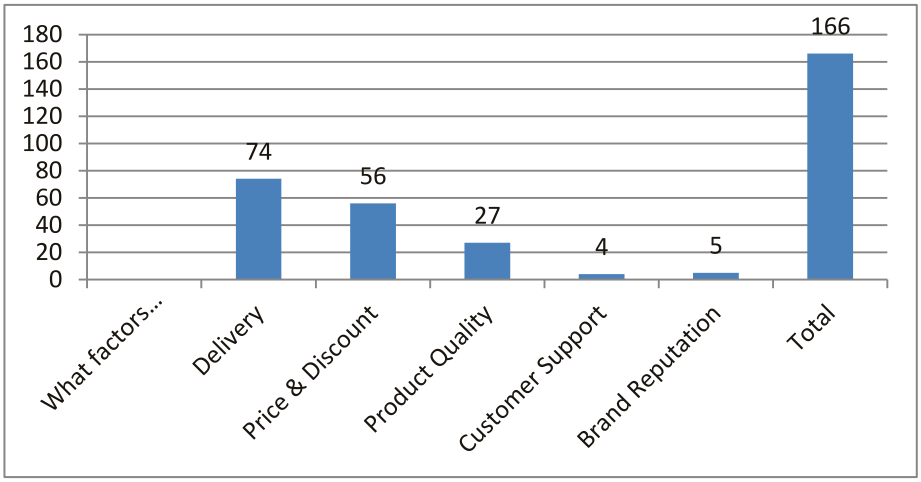
Better offers and discounts by ZEPTO & BLINKIT

Which platform provides better offers and discounts?	In Nos.
Zepto	42
Blinkit	41
Both	83
Total	166



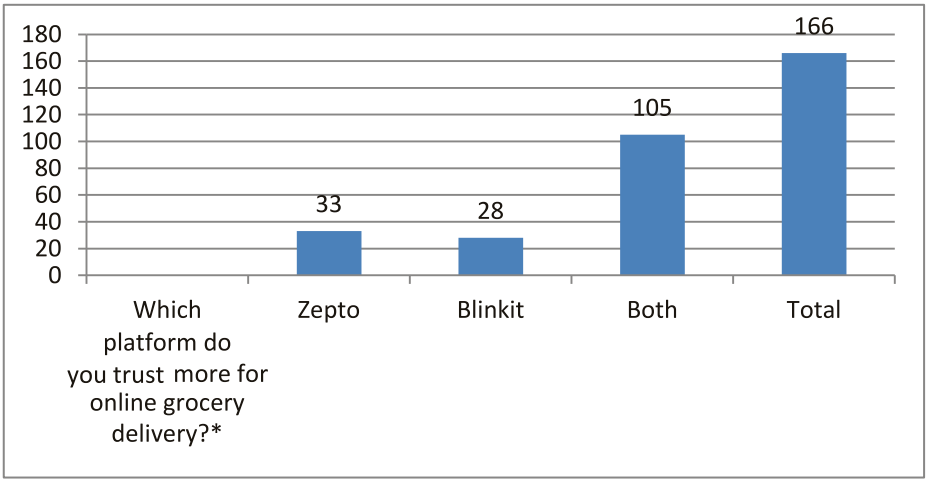
Factors influencing the respondents

What factors influence your choice between Zepto and Blinkit?	In Nos.
Delivery	74
Price & Discount	56
Product Quality	27
Customer Support	4
Brand Reputation	5
Total	166



Most trusted among both for online grocery delivery

Which platform do you trust more for online grocery delivery?	In Nos.
Zepto	33
Blinkit	28
Both	105
Total	166



Findings and conclusion

It is found that 18 to 24 age group responds use ZEPTO and BLINKIT. It is analyzed that 101 respondents are male as the highest users of ZEPTO and BLINKIT. 159 respondents out of 166 are aware about ZEPTO and BLINKIT. 60 respondents use ZEPTO and BLINKIT once in a week. 62 respondents got the information about ZEPTO and BLINKIT from friends and family members. Groceries are the most preferred item through ZEPTO and BLINKIT compared to vegetable and fruits, dairy products, snacks and beverages. Respondents are of the opinion that BLINKIT offers better product quality over ZEPTO. 83 respondents out of 166 are of the opinion that both ZEPTO and BLINKIT provides better offers and discounts. Delivery factor is the most influencing factor for the respondents. Respondents are of the opinion that both ZEPTO and BLINKIT are trustworthy for online grocery delivery.

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The Impact of Social Media on Self-Esteem and Body Image among College Students

Hina Patel

Abstract

Social media has become an integral part of daily life for college students, influencing various aspects of their psychological well-being, including self-esteem and body image. This study explores the impact of social media platforms on the self-perception of college students, focusing on how exposure to idealized body standards, filtered images, and influencer culture affects their mental health. Drawing on the Social Comparison Theory, this research examines the extent to which students compare themselves with peers and influencers, leading to either positive motivation or negative self-evaluation.

Using a mixed-methods approach, the study combines surveys and in-depth interviews with undergraduate students to assess the correlation between social media usage, self- esteem levels, and body dissatisfaction. Preliminary findings suggest that frequent exposure to curated content on platforms like Instagram, TikTok, and Snapchat contributes to increased self-consciousness and unrealistic beauty expectations, particularly among female students. Additionally, the study explores the role of digital well-being strategies, such as mindful social media consumption, in mitigating these effects.

This research contributes to the ongoing discourse on digital media's psychological impact, highlighting the need for awareness campaigns and platform policies that promote body positivity and mental well-being. By understanding how social media shapes students'self-image, this study provides insights for educators, policymakers, and mental health professionals in fostering a healthier digital environment.

Keywords: *Social Media, Self-Esteem, Body Image, College Students, Social Comparison Theory, Mental Health.*

Introduction

Social media has become increasingly popular in the last two decades. There has been a significant rise in the use of social media by individuals; in fact, the numbers of worldwide users are expected to reach 2.77 billion in 2019. This is more than one-third of the global Population. In the case of the United States, the percentage of online adults who use Facebook, Instagram, and Twitter has increased by 5 percent, 6 percent, and 6 percent, respectively, since 2017. Social media provides great benefits by enabling individuals to communicate, share interests, and obtain information with ease. However, it also offers disadvantages. The comparison theory claims that individuals will compare themselves with others, and negative outcomes may arise if they perceive themselves as inferior to those they compare themselves to. For college students especially, as people go through challenges, they would feel those challenges are more threatening if they think others are doing better than they are? Since social media is a place where college students frequently engage in social comparison, it is critical to focus on the association between the usage of social media and the potential negative outcomes it can create for young adults (Brianna Natalie Chang, 2019). Two important variables to consider are self- esteem and body image.

The investigation of the long-term effects of exposure to thin ideal images in the media date back to the early 1990s. Since then, a plethora of studies have consistently shown that such exposure produces deleterious effects for youth. Particularly harmful outcomes include developing body dissatisfaction, disordered eating, and dieting behaviors. Since different outlets use various strategies to emphasize the thin ideal, it is important to look at a variety of media types. There are still gaps in the current research of mass media exposure and thin ideal internalization. Current longitudinal examinations typically consider only one measure of trait Thin Internalization or Thin and Muscular Internalization. In addition, the wide range of media at which individuals are exposed and the different ways media idealize the body when afflicted by channels and platforms are not considered. One question that arises is: what happens when women are exposed to female celebrities and models in the media on an everyday basis for an even longer period of time? The same models and celebrities that are seen in magazines or on billboards are also active on current popular social media platforms, specifically Instagram. User-friendly applications such as Instagram have an abundance of bloggers, influencers, and models that showcase their bodies and life. Thus, focusing solely on the examination of traditional mass media is not sufficient; it is just as crucial to consider new communication technologies.

Understanding Self-Esteem

Those who participate in chronic self-critical thoughts are more inclined to use everyday moments as an opportunity for comparison to appearances of others. Individuals who debase themselves attempt to evaluate their physical appearance by relying almost exclusively on the few people who align with these distorted views, and ignore feedback from many others who disagree. In other research, the focus is precisely the opposite, indicating that females who express higher safety and competence in terms of physical achievement establish a more tolerant attitude towards the idea of a positive self-evaluation. Both sets of knowledge can be entirely

complementary because everything is related to the scale of adjustment. Understanding Self-Esteem is negative in a nonadjust setting between CSs and ISTs about physical appearance that persists despite safety of self-described competence. On the self-esteem scale, demanding congruity perceived more easy DC image was more biased towards the superior appearance of the image comparing what was perceived. In knowledge, body-related DC was either a small part of thin-body and fat-body images. From this, it expands to the state-of-the-art body image literature by serving to detect opposite self-body image cooperation and unification impacts of Compensatory Self-Appetitive Thoughts and Listened Body-Related-SATs in chronic dieting college women. For body parts regarded as fat, reflection in some conditions resulted in body-enhancement illusions. BIE for thin body parts was not noted, possibly because this study's age-related body-related self-critical thoughts indicated that cultures varying in appearance awareness would have different results.

- **Definition of Self-Esteem**

  Self-esteem is one of the core components of overall self-evaluation. It is one's overall subjective evaluation of one's worth and is essential to personal well-being. The construct self-esteem is made up of two components—self-respect, or liking or intellectual and social competencies, and self-liking, affording self-love or holding a favorable attitude towards oneself (A Belton, 2019). Self-esteem can be read in two ways—positive or high self-esteem is characterized by a positive attitude towards oneself, one's skills, assets, and potentials. Alternatively but not mutually exclusively, low or negative self-esteem is signposted by a low sense of self-worth, incapability in oneself, feeling incomplete, and inferior to others. Individuals who are high in self- esteem usually have the virtue of being less oriented towards self-comparison with other people, except for the need for establishing accuracy or competence. They are more secure and relaxed within themselves, care less about judgment, and are more empathetic towards others. Self-esteems have been satisfied through social comparison processes. And a particular form of social comparison consists of individuals comparing themselves against people showing desirable characteristics like beauty, wealth, and success. Many other behaviors such as increased advertising exposure, fashion magazines, and more friendship with people who show attractiveness can result in image comparison. Moreover, social comparison is the most potent factor to elicit dissatisfaction in relation to body shapes. As an issue of age, family and close-friend influences, college could be an environment in which the development of self-comparison behaviors can be foreseen. For this young cohort, a proper use of social media language might be anticipated due to the prompt adoption of social media platforms. The literature, however, lacks studies addressing the influence on social media behaviors over the dynamic of self-esteem. Only recently, has tried to score the likelihood of self-identifying people carrying out such behaviors. Yet, that was the focus just on the sample of university students and the relationships with social media. In terms of internal and external needs, it is particularly worthy of investigation, from an empirical standpoint, how users of social media perceive self-esteems. In light of the aforementioned gaps, this article would hereby predict an overall lowering of self-respect deriving from the likelihood of performance of comparison behaviors concerning beauty or physical shape through the mobile-first social media.

- **Factors Influencing Self-Esteem**

  Self-esteem is the think, value, assign to one's self, and can be operationalized as individuals' evaluation of their attractiveness, judgment ability, and social value (A Belton, 2019). Self-esteem meets the basic psychological needs for well-functioning where one needs to feel worthy and significant for a healthy personality. Peer comparisons, physical appearance, and feedback from social media are important predictors of self-esteem. Social media affordances enable individuals to engage in a wide range of self-referential activities, such as browsing images, posts, and profiles. Feedback and likes to self-generated content are available to accurately compare oneself to others to evaluate popularity, attractiveness, and worth. Recent studies have shown cross-sectional evidence that different social media platforms have significant relationship with college students' self-esteem. A cross-sectional empirical study among a sample of college students was conducted to quantify these effects. Results showed that Instagram use was shown to weakly improve participants' self-esteem, while upward peer comparisons were a potent negative predictor of self-esteem. Evidence was shown that the frequency of social media use can moderate the relationship between social media engagement and college student's self-esteem, as more frequent use was correlated with more upward comparisons. It was found that both the use and the likelihood of engaging in upward appearance comparisons mediated the

negative relationship between social media use and self-esteem. These are in fact a leading negative mediator. In contrast, upward celebrity comparisons did not exhibit a significant relationship with Facebook use or self-esteem. The mediated relationship between use and self-esteem was also found to be non-significant after excluding the appearance. Bivariate negativity significantly correlated with the selection of likelihood once the appearance was accounted for, $\beta = 0.066$, $p = 0.024$. However, this relationship lost significance in the model.

Body Image: An Overview

As university students are considered young adults, they are most influenced by crises concerning well-being, including body dissatisfaction, psychological health disorders, low self-esteem, and minimal confidence about body image. The students also experience general anxiety toward appearance and an increasing desire to sculpt it for an aesthetic individual. Although interest in the body fades over time, developing a positive body image and self-confidence is important. Previous research has shown that attending college means a noticeable transforming period from adolescence to youth in which the attitude and body language are evolving continuously. The findings emphasize consideration and understanding of excessive anxiety about the body as a crucial aspect of mental health issues related to higher education students (M. Karam et al., 2023).

Body dissatisfaction, psychological health disorders, self-esteem, and body self- consciousness are investigated considering gender and age-related differences among Lebanese university students in this analysis. Additionally, social media connection and the use of social media for peer comparison are evaluated as mediators of the relationship between body dissatisfaction and psychological health disorders. Collecting cross- sectional data on social media activity, psychological health disorders, body dissatisfaction, self-esteem, and demographic data from 361 university students in Lebanon is conducted. The possible connections were examined using structural equation modeling (SEM). Social media activity is established as a mediator for the association between body dissatisfaction and psychological health diseases. Psychological health disorders and self-esteem are identified as predictors for body self-consciousness.

Body image is a consistent element in everyone's life and influences self-esteem, confidence, and feelings about self. According to the social comparison hypothesis, individuals tend to judge themselves according to other relevant standards, and this will become even more influential when the comparison is made with more achievable targets. Adolescents and young adults have a generalized propensity to compare and like to observe others, particularly individuals of the same age.

- **Definition of Body Image**

  The word "body image"originally was coined by the neurologist, Paul Schilder, who conceptualized it as a mental image picture of one's own body, which is internal and can differ from the actual physical structure of one's body. Body image is defined as ―A person's perception, thoughts and feelings about their physical appearance and the perceptions of others regarding the individual's physical appearance‖ (M. Karam et al., 2023). This can also include one's internal experiences of the body's appearance or function and perceptions of different parts of their body. In short, body image is conceptualized as a subjective perception of an individual one's own body and on how he/she is seen by others. This perceptual distortion of body image can have related adverse effects on self-esteem, especially when it implies deviations from the sought after body image or cultural norms. The body image distortion is a prevalent occurrence, especially among the youth. Quite often, there is a disparity between the actual self and the ideal self that can work in detrimental effects on self-esteem and consequent psychological adjustment (Diengdoh & Ali, 2022). Social media in today's society has become an essential part of daily life. The internet has facilitated people's ability to access social media websites for communication, entertainment, and the development of interpersonal relationships. Since then, the influence of social media has positively expanded across the globe, although a sudden flip side of the revolution has shown a dangerous outcome on the ideology of people regarding appearance, body image. This is visible by the exponential rise in the number of people seeking plastic surgery. Not only does body image-seeking behavior is in progress however this is directly correlated with the negative impact on self-esteem.

The Role of Social Media

Social media are tools that enable individuals to create, share or exchange information, ideas and pictures in virtual communities and networks. It has become easily accessed. A study in the United States reported that approximately 80% of college students, aged 18- 24 years, created social media accounts (K Hill, 2022), 92% use YouTube, 84% use Snapchat and Instagram, 76% use Facebook, and 63% use Twitter. Social media enable self-comparison to one's body,

lifestyle and idolized features with others, especially to friends who have attractive appearances, in attractiveness context.

Social comparison theory explains how individuals evaluate themselves based on comparing with others. People can evaluate their appearance and looks by seeking similar others or an ideal peer whose images are spied on in virtual communities. The findings showed that females have more tendencies to compare with appearance than males. For those who have more needs of self-comparison, who are exposed to more environments of appearance comparison, who feel more discrepancy between their appearance and others', who saw a picture long enough, may perceive more body concern.

- **Trends in Social Media Usage among College Students**

  Social media has the ability to make users feel more connected and involved (K Hill, 2022), but it can also elicit social comparisons which are harmful to self-esteem and body satisfaction. A recent qualitative study surveyed college students and found Instagram to be the platform of choice, noting the negative effects on self-esteem and personal happiness. More specifically, Instagram is found to exacerbate body image concerns. These findings further add to the wealth of existing studies on the relationship between social media and body image, expanding on previous research by focusing on a sample of college women and their Instagram use. These findings add support to what has already tentatively been established within the field and introduce college women as a population of interest.

In one recent cross-cultural study, researchers found that social comparison mediated the relationship between social media use and body dissatisfaction. Platforms like Instagram were especially powerful in eliciting social comparison and body dissatisfaction. Body image highlights trends in the presentation of the self on a platform like Instagram, and the literature on self-presentation provides a rich evolvement of view on the effects of engagement with social media. There are competing concerns about how to present the self on a platform and also the active consumption of others'self-presentation. Concerning body image concerns, the literature often considers females. From a media effects perspective, there is a vast body of research on how media and specifically idealized images of women impact female body image. Since platforms like Instagram contain a high density of these idealized images, the platform could be linked to negative outcomes on body image, also considering the general pattern of use observed in emerging adulthood. At its most basic level, Instagram requires individuals to be active in both the selection of images to post and consumption of images posted by others. It has been noted that Instagram posts are much higher on internal cues and are less authentic than other platforms. There is... and personal happiness.

Social Media and Self-Esteem

The use of social networking sites (SNS) has increased significantly in the past decade. The increased use of sites like Facebook and Instagram encourages online social comparison, which often has a detrimental effect on users'self-esteem. The current research aims to examine the relationships between SNS use and engagement, body image, and self-esteem. Surveys were conducted among an all-female sample of college students, quantifying the frequency of posting comments, photos, status updates, and likelihood of engaging in comparison behaviors when using social media. Results indicate that the lattermost three frequencies mediate the relationship between overall SNS use and self-esteem. Post-hoc results display more frequent Facebook use is associated with more frequent photo postings, which in turn prompt more basis for making appearance comparisons. These comparisons significantly predict lower self- esteem (A Belton, 2019). As social networking site (SNS) usage surges, so does the frequency and nature of social comparisons. More than half of college students use SNSs like Facebook or Instagram, revealing an average daily use of about an hour. It is no surprise that 55% of those users are found to be unhappy with their bodies. Of those body image concerns, a link has been identified between SNS use, body image issues, and the 77% of college women who have unfavorable feelings towards their bodies. The multidimensionality of body image results in cognitive connects when unhealthy behavior or appearance is detected. Thus, frequency of internet social comparison on online platforms can negatively affect a user's well-being. These networks oftentimes expose users to idealized photos. A recent study reveals that simply looking at ideal images negatively affects a woman's body satisfaction within 3 minutes. Dermatologists riddling under-eye discoloration and blemishes of models prove particularly hurtful. Other industries engage in the same harmful behaviors. Of female characters viewed by 15 million children, 50% are underweight, ushering in a desire for thinness, an increased rate in eating disorders, and a transformed play life of 70 million children. This is also found in a body image study of video games. This broad reach is concerning, as only 37% of one study's 720 participants fairly often question the reality of makeup commercials featuring celebrity endorsements. Gazes into television had similar outcomes. The more hours of weekly overall TV exposure, the more attention to appearance is paid, including more stringent beauty

ideals. Emanating from similarly manipulated media, the harmful imaginations may persist beyond the screen.

- **Positive Effects of Social Media on Self-Esteem**

  The use of social networking sites (SNS) has exploded in popularity the last few years, especially among college students. Since the release of Facebook in 2004, this SNS has increasingly gained popularity, mostly among those in the college demographic. A cross-sectional study showed SNS demographics to vary differently between males and females (Ziegelmeyer, 2012). The college demographic of Facebook showed up to a five times as much difference in the likelihood of women's SNS use compared to men's SNS use. Facebook is the leading SNS with the collegiate group, and a large majority of college students, specifically females, utilize a SNS daily. This type of information inquiries whether these types of sites are related to a woman's perception of her own body since the female body type has been represented quite often in the -traditional‖ sense on -Facebook‖ and many young women present themselves online in relation to how they see themselves.

  Self-esteem is almost a daily concern for most college students, including male and female. Men and women have different ways of interpreting their self-esteem and often different levels of self-worth. SNS, especially Facebook, may have the capacity to, at least, temporarily affect an individual's self-esteem or self-concept. It has been suggested these linkages may come about through the idea of self-compare, or through the large amount of interpersonal sharing that is done on SNS. The term, -self-esteem‖ refers to someone who has respect for and thinks highly of oneself and is satisfied with who they are as an individual. On the other hand, the term, ―self-concept‖ refers to an individual's perception of themselves which includes their feelings and actions. Both self-esteem and self-concept are components of self-evaluation. Social networking sites are considered to provide their users with a space in which they can present themselves, share vast amounts of detailed information with many other users, as well as maintain or create connections with others both offline and online. As such, it is plausible that divulging intimate types of information on the internet could positively or negatively affect an individual's self- esteem or self-concept. For example, a few not-yet-published studies in survey, experimental, and interview formats have shown that students currently having a Facebook account have recently gained psychological benefits, despite reporting low self-esteem, when compared with others who do not have an account. Further suggesting the structures of SNS can be just as uniquely beneficial, those with such an account group mainly sought out the opposite sex whom they found the most physically attractive with the most friends. This desire to seek out the most attractive others is a protectiveness of their own self-worth due to negative feedback. In light of Facebook being such a popular form of online communication, there has been research done in this area to explain attitudes and feelings of self-worth. One theory that may help explain the interaction between two people utilizing a site such as Facebook in regards to self-esteem or self- concept is the social comparison theory. This theory stems from the idea that individuals have a natural tendency to evaluate their own abilities and opinions and in doing so, compare themselves to others similar to themselves in a particular ability.

- **Negative Effects of Social Media on Self-Esteem**

  In terms of self-esteem, the relationships with the investigated constructs would be mediated by body image and negative social comparison. The present study provides support for the negative relationship between social media usage and self-esteem. A possible explanation for this finding is the rise of negative self-perception in relation to social media use. A barrage of Facebook posts, shared articles, and pictures may result in individuals experiencing similar emotions without face-to-face interactions. Downward emotions such as anxiety, a sense of missing out, and envy can negatively affect mood and self-esteem. Such emotions arise from the feeling of another's superior or better circumstance, creating a sense of dissatisfaction with one's own life.

  With the widespread availability and applications of social media, people can easily keep updated with what others are doing in their daily lives by passive activities such as _news feed scanning and scrolling'. This exposure to others' success and superior situations or physical appearance may negatively impact mood or subjective well-being. According to (Brianna Natalie Chang, 2019), self-evaluation can be influenced by individuals' comparison of their own to someone they perceive as consciously or unconsciously similar (upward) or inferior (downward) on a specific ability or characteristic. Social comparison can occur actively or passively. Passive exposure to upward information about

others can lead to decrease in positive affect and self-evaluation due to their better- off condition. The most widely used social media platforms are designed to facilitate users'abilities to compare themselves to others. Social networking sites can give rise to negative effects.

Social Media and Body Image

Body image can be broadly defined as an individual's perception and evaluation about the self-appearance. Social media allows individuals to compare their bodies and appearance to the highly selective ―best moments‖ of each person they follow or are friends with, leading to increased body dissatisfaction and a decrease of self-esteem. Poor body image and low self-esteem can have negative effects on college students. Those who scored high on two social comparison orientations were more likely to engage with social media and demonstrated a significant indirect effect on body image concern. The negative relationship between body image concern and self-esteem was significant.

Regarding ethnicity, it was hypothesized that Caucasian college students would report more negative effects of body image concern on self-esteem than Hispanic or Asian college students. On the other hand, the results showed that Hispanic college students reported more body image concern in regard to their ethnicity than Caucasian or Asian college students. A possible explanation is that potential differences in ethnicity towards body image between Hispanic and Asian college students were not included in the survey. Low self-esteem in college students leads to decreased academic performance, lower levels of social ties, and an increase in mental symptoms. Negative body image college students have an unhealthy appearance of their bodies and frequently experience low self-esteem. For students (ages 18 to 25 years), college is not just a grounds to develop academics but also a life transition period including building emotional, mental, and physical health to prepare for future careers (Ahmed, 2019). Social media is broadly providing information about beauty, diet, and fitness trends.

Users of SNS can easily access ideal body images and influencer accounts as the platforms often show them on the user's explore pages with regard to their interests. Those images are often beauty filters, photoshopped, or edited with professional software. Exclusively edited pictures of professional models or influencers with post- surgery bodies can lead individuals to perceive these as real and negatively impact their own body image perception. Nevertheless, social media has an array of invisible minority groups who do not fit into the society's -perfect body ‖ molds. They mainly include the disabled, over/under-weighted, tattooed, or cancer patients. Considering the huge community that supports them, users who belong to these invisible minority groups become more confident of themselves on SNS.

Cultural Background and Its Influence

In recent years, many girls and young women have felt pressure from the standard for beauty and behavior as seen in television, film, and magazine; this is particularly common in South Korea. The continuing economic gain in Korea brought about an improvement in the standard of living and rapidly increased both per-capita income and the youth's spending power. As a result, the skin-care market has grown significantly. Moreover, the market has expanded to internal, external, quasi-medical, and therapeutic skin-care. In particular, the Korean skin-care market prides itself on being well-known in the world. The rising concerns and interests in improving physical appearance influenced a desire for cosmetic surgery related to beauty on both the face and the body.

In addition, joining a university is a major cause of depression among Korean students. Although university enrolment in any country can be a relief, it is a matter of great importance in Korea. Originally, a certificate with a university badge was issued by federal statute. Currently, a university diploma is directly acknowledged as a social status even if the grade is poor. The desire for a high salary is very intense for a good life. It is a reasonable problem that depression occurred among students. In Korea, it is believed that obesity does not meet beauty standards. Due to the fear of obesity, the skin-care market was rapidly expanding. The majority of South Koreans agreed with the statement People always want to be good-looking'. Korea also exceeded the world average with the conflict statement on about thirty years, I'll be afraid to get fat with a significant percentage. The South Korean society viewed corpulent persons with less favor than other countries in the study results. Inequality in the perception of the beauty of slim as a standard was shown. Regardless of gender, those who manage their bodies all the time or think less of fat are considered healthy, respected, and believed to dare to attempt. From a sociological perspective, beauty stands for privilege. Perceptions of beauty provide positive-affect-based advantage in various social situations. For example, beautiful individuals may attain more positive evaluations compared with less attractive peers. If a person is ugly,' the guess is that he or she is not accepted in any decent society, is underserving of love, and is going to have a hard time in life.

Interventions and Solutions

The most common body ideals preferred and depicted

in the media are largely consistent with these stereotypes, such that thin ideals, fit/athletic ideals, and the recently emerged curvy ideals are generally more relevant for women/girls, borrowing from the stereotype that females want to be slender, youthful, and paternally nurturing above all other traits. The manner in which social media influence might be related to body image is mainly understood in forms of self-photo posting and editing. The rise of smart phone technology has led to a boom in the quantity of selfies being clicked and uploaded to applications. So much so that these platforms have even integrated with extra filter'software so pictures can be modified within one click to release a range of Image-enhancing effects, from face smoothing to skin lightening, from lip plumping to eye enlarging. Such apps have amplified and legitimized young people's prevalent tendencies to compare and critically evaluate their appearance. Predictably, many have then gone on – boys and, especially, girls – to actively engage in these practices with their own imagines in a pro-envy bid, reapplying to their images the perfect standards they routinely apply to pictures of models and celebrities (Mahon & Hevey, 2021).

Recent years have seen an influx of research into the influence of social networking sites body image concerns. However, to this point, the majority of media devoted to this subject has been concerned with body-related material and body dissatisfaction. By solely focusing on active content sharing, lives lesser explored the ways body image might become embroiled in young people's social media experiences, neglecting other potentially significant forms of content or activity (Suhag & Rauniyar, 2024). However, research on body-related contents predicting body image problems has been essentially based on the unconscious consumption of media images: models in magazines, actors on television and cinema screens, all illustrative of the ideal body. But, besides primary social networks and gossip sites, these more passive forms may not be especially salient to the millions of young internet mavens that engage daily with an incredibly diverse and fragmented mix of news streams, blogs, posts, pins, vines, shares, retweets, reblogs, snaps, kiks, etc. In such a content milieu, and with body-related shares frequently racking up view counts that could reach into the millions, it's important to explore how, over and above un/shared media images, a variety of user-generated _comments' and _likes' may uniquely impact male and female young people.

Today, adolescents are growing up in a neoliberal era, which encourages a unique emphasis on personal responsibility, flexibility, choice and the reshaping of oneself. These values are deeply integrated into the DNA of various social media platforms that young people are immersed in, prompting significant considerations surrounding the potential impact of this environment on their health and well-being. Indeed, there is an emerging body of literature exploring social media use and its relation to numerous distinct health and well-being outcomes for adolescents. Most prevalent amongst this work has been the consideration of the relationship between social media and mental health. A wide range of mental health outcomes including depression, stress, anxiety, and overall mental well-being have been considered. Hindered development in these areas can substantially alter the formative nature of adolescence as well as persist and become more problematic in adulthood. From a growing body of evidence on the relationship between social media and body image outcomes for adolescents, these dimensions are now emerging as an area of concern. The current study adds to this young and emerging body of literature by offering a new analysis of social media's relationship with self-esteem, focusing on a unique sociocultural context, that of neoliberal individualism, and also robustly examines distinct self-esteem dimensions. Moreover, it increases understanding of these issues in a unique population, in the multi-ethnic, multi-cultural context of London. Thus, the findings here have direct translational potential to influence intervention development and support targeted policy changes at global city level.

Conclusion

Social media platforms have become an essential aspect of everyday life, especially for emerging adults. Instagram is one popular platform that allows young adults to engage socially and view and share image-based content. However, Instagram-environment areas including user-generated content and advertisements have a strong focus on appearance and are reported by female college students to prompt upward body comparisons, which can negatively impact body image. There is, therefore, an evident gap in knowledge regarding the broader spectrum of female college students' Instagram use in relation to body image and social comparison (K Hill, 2022).

Concerns about appearance have been prominent for women. Much experimental research has shown that exposure to media-portrayed images of women lead many women to feel more negatively about themselves than prior to exposure. The onset of mass media has further increased the frequency of upward comparisons; women were equally aware of the appearance concerns of more than half the other women, but that only 8% of these concerns would have emerged without the media.

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Understanding of Ai-Based Customer Engagement Tools amongst MSME Entrepreneurs in Ahmedabad

Aadarsh Pillai, Rina Dave

Abstract

Artificial Intelligence (AI) is transforming customer engagement by enabling businesses to provide personalized, efficient, and data-driven interactions. This research explores the impact of AI-powered customer engagement strategies, including chatbots, virtual assistants, and predictive analytics, on customer satisfaction and business performance. AI-driven tools enhance communication by offering real-time responses, automating routine tasks, and analyzing customer behavior to deliver targeted marketing and support. The study examines both the benefits and challenges of AI adoption in customer engagement. While AI improves efficiency, reduces response times, and enhances customer personalization, concerns such as data privacy, algorithmic biases, and the need for continuous updates pose significant challenges. Organizations must implement ethical AI frameworks and maintain a balance between automation and human interaction to ensure seamless and meaningful customer experiences. Findings suggest that businesses can leverage AI in customer engagement gain a competitive advantage by fostering deeper customer relationships, improving service quality, and increasing brand loyalty. As AI technology continues to evolve, companies must remain agile and innovative in integrating AI-driven solutions. This research contributes to the growing discourse on AI's role in shaping the future of customer engagement, highlighting best practices for sustainable and effective AI adoption in business strategies.

Keywords : *AI in Customer Engagement, AI in CRM, Ahmedabad MSMEs, Marketing through AI*

Introduction

Artificial Intelligence (AI) has revolutionized customer engagement, introducing innovative ways for businesses to interact with their customers. Through advanced algorithms, machine learning, and real-time data analysis, AI-based tools have opened new dimensions of personalization, efficiency, and predictive insights in customer interactions, reshaping the customer-business relationship.

One of the most significant benefits of AI-based customer engagement is its ability to offer personalized experiences. AI tools, such as recommendation engines and chatbots, analyze customer preferences and behavioral patterns to provide customized recommendations and solutions. For example, e-commerce platforms can use AI to suggest products based on a customer's purchase history, creating a tailored shopping experience that drives customer satisfaction and loyalty. Furthermore, AI-powered chatbots deliver instant, 24/7 responses to customer inquiries, enhancing convenience and ensuring that assistance is always available.

AI also helps businesses achieve remarkable levels of operational efficiency by automating repetitive and time-consuming tasks. Tasks like sending follow-up emails, responding to FAQs, or routing customer service queries are handled seamlessly by AI systems, allowing human resources to focus on more complex challenges. For small and medium enterprises (SMEs), which often operate on tight budgets, this automation significantly reduces costs and optimizes resource allocation.

Another compelling advantage of AI-based customer engagement is its ability to leverage predictive analytics. AI tools use data to predict customer behavior, such as identifying at-risk customers or suggesting the best time for outreach. These insights allow businesses to take proactive measures, such as offering timely discounts or personalized offers, to retain customers and build stronger relationships. Moreover, AI-powered sentiment analysis gauges customer emotions from feedback and social media interactions, empowering businesses to address concerns effectively and in a timely manner.

For businesses competing in fast-changing markets, AI-based engagement offers a competitive edge. It enables them to understand their customers more deeply, adapt to evolving preferences, and deliver consistent, high-quality service. AI also facilitates omnichannel engagement, ensuring a seamless experience across platforms like social media, email, and mobile apps.

In addition, AI democratizes advanced customer engagement solutions by making them accessible to businesses of all sizes. Previously, such sophisticated capabilities were available only to large corporations with expansive budgets. Today, even micro, small, and medium enterprises (MSMEs) can integrate AI tools into their operations, enabling them to compete effectively and delight their customers.

In conclusion, AI-based customer engagement represents a transformative shift in how businesses interact with customers. By combining personalization, efficiency, and actionable insights, AI fosters meaningful connections that drive both customer satisfaction and business growth. As AI technology evolves further, its role in shaping customer engagement

strategies will undoubtedly continue to expand, cementing its status as an indispensable tool for the modern business landscape. Businesses that embrace these technologies stand to gain not only loyal customers but also the agility and foresight required to thrive in a dynamic world.

Review of Literature

Ledro et al. (2022) provide a comprehensive review of AI applications in CRM, analyzing 212 peer-reviewed articles. The study identifies three subfields: (1) Big Data and CRM as a database, (2) AI and machine learning techniques applied to CRM activities, and (3) strategic management of AI-CRM integrations. The authors propose a three-step conceptual model for AI implementation in CRM, emphasizing its potential to enhance customer engagement through predictive analytics, personalized recommendations, and automated support

A study by Bakkouri, B. et al. (2022) investigates how AI-powered chatbots influence customer experience and engagement. The research highlights that chatbots improve customer satisfaction by providing instant responses, personalized interactions, and 24/7 availability. However, the study also notes that chatbot effectiveness depends on factors like conversational quality, emotional intelligence, and user trust. Future research is recommended to explore the integration of chatbots with other AI tools for a seamless customer journey.

A systematic literature review by Bansal et al. (2023) explores the role of AI in enhancing customer engagement. The study synthesizes findings from 20 articles published between 2019 and 2022, identifying key antecedents (e.g., AI quality, perceived ease of use), mediators (e.g., parasocial interaction), and consequences (e.g., customer satisfaction, purchase intention). The review highlights AI's ability to analyze customer data, predict behaviour, and personalize interactions, ultimately fostering loyalty and retention. Future research directions include exploring emotional intelligence and readiness as moderators in AI-driven engagement

A research study by Kaur, A. and Jaggi, P (2023) explores emerging trends in AI-driven CRM, such as the use of generative AI, predictive analytics, and machine learning. The study emphasizes the importance of ethical AI practices and data privacy in building trust with customers. It also identifies gaps in research, such as the need for more studies on AI's impact on customer loyalty and long-term relationship management

A study by TrocGlobal (2024) discusses how AI-powered tools like chatbots, predictive analytics, and sentiment analysis enhance customer engagement. The research emphasizes AI's ability to provide real-time support, anticipate customer needs, and deliver personalized experiences. The study also highlights the scalability of AI solutions, making them accessible to businesses of all sizes

Research Gap

While there are many studies that have been done on Artificial Intelligence and its significance in various segments of business, most of these studies have been done on large-scale enterprises and that too with a generalized scenario. MSMEs being the backbone of the economy, needs to adapt to this new trend in order to stay competitive in the market. There was a lack of such proper study on the benefits and significance of Artificial Intelligence in MSME sector, specially when it comes to Customer Engagement part. Hence this study is being done taking into account the MSME fraternity in Ahmedabad.

Objectives

This research study is being taken up to ascertain the understanding level of Ahmedabad-based MSME entrepreneurs, when it comes to Artificial Intelligence, especially in the Customer Engagement side. Therefore, the objectives of this study are :-

- To measure the understanding level of MSME entrepreneurs regarding AI
- To probe their knowledge on use of AI for Customer Engagement
- To understand the problem areas that hinder the implementation of AI-based Customer Engagement in their units

Research Methodology

As this study focuses on the usage of AI-based Customer Engagement practices in MSME segment in Ahmedabad, primary survey has been conducted with a sample size of 102 MSME entrepreneurs as respondents. These 102 MSME units were categorized into Engineering, Chemicals and FMCG manufacturing units. Stratified random sampling method was used as respondents were selected from GIDCs of Vatva, Naroda, Odhav and Changodar. A structured questionnaire was used for the same.

As regards statistical analysis, graphical representations have been used to show the responses to various questions related to the objective of the study. SPSS and Microsoft Excel have been used for this.

Study Findings

The sample size of 102 respondents consisted of MSME entrepreneurs from three sectors – Engineering, Chemicals and FMCG. The break-up of the same is as below:-

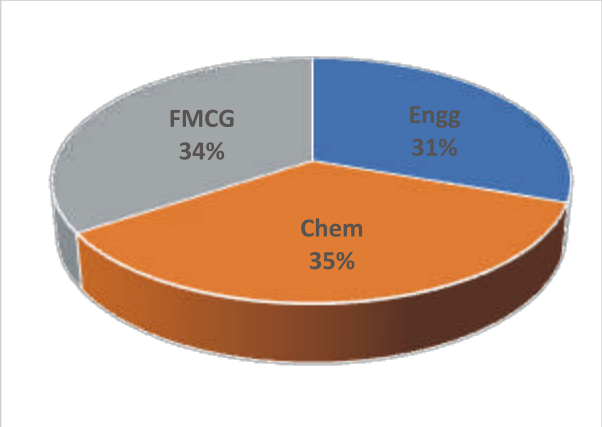

Fig. 1 : Distribution of respondents in various categories

Amongst the 102 respondents who were interviewed for this study, 31 of them belonged to the Engineering segment, whereas 36 of them belonged to the Chemical manufacturing segment, and the remaining 35 were into FMCG/food related products manufacturing. The percentage contribution was 31%, 35% and 34% respectively.

Familiarity with the concept of AI

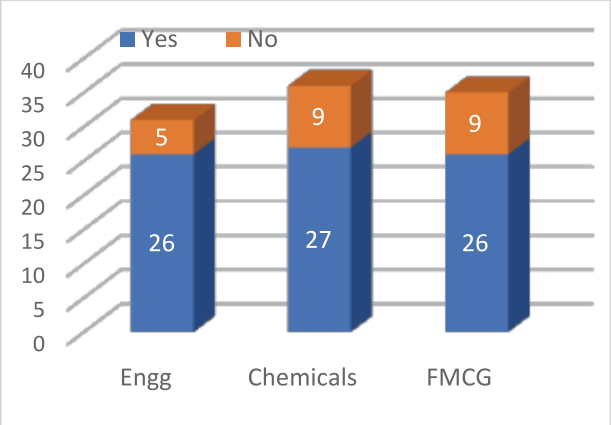

Fig. 2 : Whether they are familiar with the concept of AI

A percentage analysis of the response is as below :-

	Engg	Chem	FMCG
Yes	83.9	75.0	74.3
No	16.1	25.0	25.7

With almost 84% of Engineering Entrepreneurs saying yes, it can be inferred that the concept of AI is more known by this category, as compared to the other two categories, i.e, Chemicals and FMCG.

Level of understanding of AI

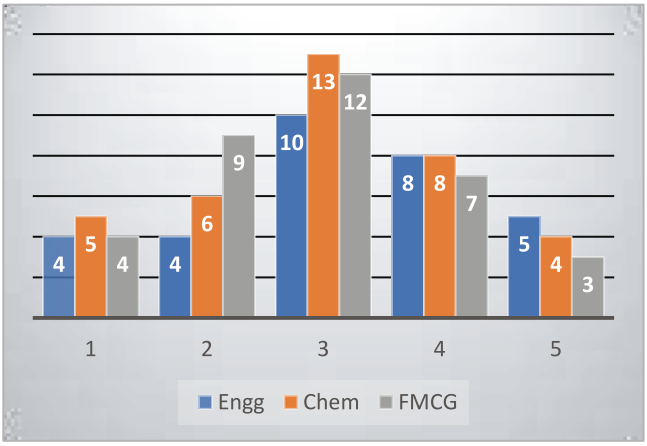

Fig. 3 : Level of understanding of AI on 5-point scale

Respondents were asked to rate their understanding of AI on a 5-point scale. The summary of responses of all the three categories, is as below :-

Category	Total Responses	Mean	Std Dev(SD)
Engg	31	3.19	1.02
Chem	36	3	1.18
FMCG	35	2.89	1.11

From the above table, it is evident that the SD value is lowest in Engineering category, which means that the responses in this category were the most consistent and closer to the mean value. The SD value of Chemicals category was the highest, which shows that there were more variability in the responses. Whereas FMCG category respondents showed the moderate level of variability and its SD was lying in between Engineering and Chemicals.

Kruskal-Wallis test was conducted to check if there is any statistically significant difference between the responses in these three groups. The H-Statistic was derived as 0.22 and the p-value was 0.896. Since the p-value (0.896) is much greater than the typical significance level (0.05), we fail to reject the null hypothesis. This means that there is no statistically significant difference in responses between the three groups (Engg, Chem, and FMCG).

Preferred functions of Customer Engagement where AI can be best used

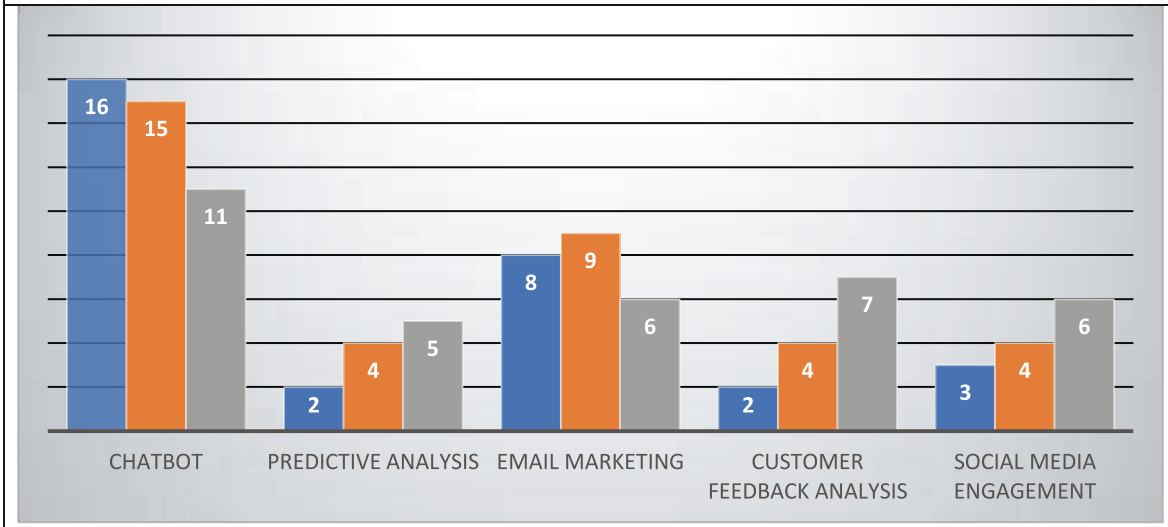

Fig. 4 : Preferred Customer Engagement functions for AI usage

The respondents were given a list of five top functions within Customer Engagement, and were asked to choose the top-most preference, wherein AI can be most helpful for them. The respondents were given choice to pick only one option. While the graphical representation of the data is shown above in Fig 4, the Descriptive Statistics is summarized as in the below table:-

AI Tool	Engg Awareness (Freq)	Chem Awareness (Freq)	FMCG Awareness (Freq)	Total Awareness	Mean Awareness	Median Awareness	Standard Deviation
Chatbot	16	15	11	42	14.0	15	2.5
Predictive Analysis	2	4	5	11	3.7	4	1.2
Email Marketing	8	9	6	23	7.7	8	1.2
Customer Feedback	2	4	7	13	4.3	4	2.2
Social Media Engagement	3	4	6	13	4.3	4	1.3

Table 1 : Descriptive Statistics of preferred Customer Engagement functions

- The Chatbot category shows the highest standard deviation (2.5), indicating greater variability in responses across the three categories (Engg, Chem, FMCG).
- Other categories, such as Predictive Analysis, Email Marketing, and Social Media Engagement, have similar and relatively low variability (~1.2), showing more consistent responses across groups.
- Customer Feedback Analysis has moderate variation (2.2), suggesting responses differ more noticeably compared to the other categories (except Chatbot)

A Chi-Square test of independence was also performed to check whether there is any significant association between the MSME categories and the marketing tools. The results of the test is as under :-

- Chi-Square Statistic (χ^2): 6.59
- p-value: 0.582
- Degrees of Freedom (df): 8

Since the p-value (0.582) is much greater than 0.05, we fail to reject the null hypothesis. This means that there is no significant association between the category (Engg, Chem, FMCG) and the marketing technique used.

Jaccard Similarity Index (JSI) - Since respondents were free to choose more than one options, this JSI test was used to measure the overlap between sets. Each category (Engg, Chem, FMCG) is treated as a set of selected platforms and Jaccard similarity between them is calculated.

The JSI value calculated was 1.0 for all the pairs

- The Jaccard Similarity score is 1.0 for all pairs, indicating complete overlap in AI-based platform awareness across categories.
- This suggests that respondents across Engg, Chem, and FMCG have very similar awareness patterns for AI-based platforms.
- Since all platforms are present in all three groups, their selections are identical in terms of presence.

Present Usage of AI-based Customer Engagement Tools amongst respondents

As a part of the questionnaire, respondents were asked whether they are using any of the AI-based Customer Engagement tools, and if so, which one.

The result was that none of the respondents are using any of these tools at present.

Perceived Challenges in usage of AI-based Customer Engagement Tools

The respondents were given five challenges that could be the reason why they are not using these tools, and they were asked to rank them from one to five. With weightage given as 5 to the first rank and 1 to the 5th rank, the category-wise mean for all these five challenges were as follows :-

	Engg	Chem	Fmcg	Overall
Lack of expertise	4.03	4.06	4.11	4.07
High cost	3.52	3.53	3.6	3.55
Data/Cybersecurity	2.45	2.42	2.4	2.42
Legal issues	1.45	1.42	1.4	1.42
Software integration	3.55	3.58	3.49	3.54

Table 3 : Summary of category-wise means for the challenges by MSME entrepreneurs

As per the results seen, in all the three categories as well as overall, Lack of expertise was considered to be the major challenge, followed by High Cost and Software Integration issues (both these having very close values). Legal issues were considered to be having the least importance.

In order to check whether there is any significant difference between the category means and the overall mean, one-way ANOVA test was conducted and the results were as follows :-

The one-way ANOVA test results are:

- **F-statistic:** 4.39× 10^{-6}
- **P-value:** 0.99999999

Since the p-value is extremely high (close to 1), we fail to reject the null hypothesis. This indicates that there is no statistically significant difference between the category means (Engg, Chem, Fmcg) and the overall mean. In other words, all categories are consistent with the overall values, meaning there is no substantial variation among them.

Conclusion

AI-based customer engagement is revolutionizing the way businesses interact with their customers. By leveraging artificial intelligence, companies can provide personalized, efficient, and scalable interactions that drive customer satisfaction and loyalty. The integration of AI in customer engagement strategies enhances customer experiences by offering real-time responses, predictive analytics, and automated support systems, ensuring seamless communication between businesses and their consumers. The use of AI-powered chatbots, virtual assistants, and machine learning algorithms has significantly reduced response times while increasing the accuracy of customer interactions. This automation not only improves efficiency but also allows businesses to allocate human resources to more complex tasks, thereby optimizing operations. Additionally, AI's ability to analyze customer behavior and preferences enables businesses to deliver highly targeted marketing strategies, enhancing engagement and conversion rates.

Despite the numerous benefits, AI-based customer engagement also presents challenges, such as Lack of expertise, Cost issues, software integration issues, potential biases in AI algorithms, etc. and the need for continuous improvements to ensure accuracy and effectiveness. Businesses must address these challenges by adopting ethical AI practices, ensuring transparency, and maintaining a balance between automation and human intervention. Looking ahead, AI will continue to evolve, offering even more sophisticated customer engagement solutions. Companies that embrace AI-driven strategies will gain a competitive edge by fostering deeper relationships

with customers, improving service delivery, and adapting to ever-changing consumer demands. As AI technology advances, businesses must remain agile, continuously refining their AI models and customer engagement approaches to stay ahead in the digital landscape.

In conclusion, AI-based customer engagement is not just a trend but a fundamental shift in business-customer interactions. By strategically integrating AI while maintaining a customer-centric approach, businesses can create meaningful and lasting relationships that drive growth, satisfaction, and long-term success.

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A Study on Sustainable Business Practices in Global Market

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Abstract

The study investigates how sustainable business practices are viewed and applied in global marketplaces. It makes use of 100 respondents' primary data from different sectors and geographical areas. Businesses are becoming more conscious of sustainability, according to the poll, which highlights the significance of integrating renewable energy sources, minimizing environmental impacts, and using ethical supply chain methods. With agreement on reasonable employee practices, communal involvement, and variety upgrade, social responsibility is also prioritized. Given that sustainable practices have to do with cost savings, market opportunities, and competitive advantages, economic viability is an important factor. Regulatory compliance is crucial, but negotiating a variety of international rules can be difficult. Trends in consumer behaviour indicate that consumers want sustainable goods and services, which encourages businesses to develop and use digital solutions. Nonetheless, supply chain traceability and transparency require improvement, underscoring the necessity of improved cooperation and technology developments. Decision-makers, legislators, and industry stakeholders can all benefit from the study's emphasis on the significance of sustainable business practices in global marketplaces.

Keywords: *Sustainable practices, Corporate social responsibilities (CSR), sustainable innovation.*

Introduction

Growing customer preferences for eco-friendly products, regulatory demands, and environmental awareness have all contributed to the global market's increased focus on sustainable business practices. Companies are realizing that incorporating sustainability into their operations is both a strategic benefit and a moral requirement. Reducing waste, conserving energy, utilizing renewable resources, encouraging ethical sourcing, and supporting fair labour practices are all examples of sustainable practices. Businesses that put sustainability first benefit the environment, build their brand, draw in socially conscious investors, and obtain a competitive advantage in the global economy.

Meeting the triple bottom line—which includes economic, social, and environmental aspects—is the goal of sustainable businesses. Maximizing shareholder value while producing sustainable economic performance is the main objective. Working conditions, diversity in employment, career progression opportunities, non-discrimination, and access to reasonably priced healthcare are all aspects of the supply chain that are guaranteed by the social dimension of corporate operations.

Effective physical resource management is referred to as environmentally sustainable performance, and manufacturing firms have a greater environmental impact. Businesses that practice sustainability look for suppliers who produce less waste, less toxicity, and less pollution during the production and shipping processes. With an emphasis on ecologically friendly goods and services, many sustainable firms also support green buying practices.

Need and Significance of the Study

The study of sustainable business practices in the global marketplace is essential due to several compelling reasons. First and foremost, as global environmental problems like pollution, resource depletion, and climate change continue to increase, businesses must immediately adopt sustainable practices to reduce their impact. Businesses may better understand these behaviours and develop innovative solutions that reduce environmental harm while simultaneously boosting productivity and reducing expenses by doing thorough research. Second, consumers worldwide have a strong desire for eco-friendly products and services, which makes sustainability a key component of market differentiation and competitiveness.

Therefore, studying sustainable business practices helps businesses satisfy consumer needs, foster brand loyalty, and take advantage of new market opportunities. Furthermore, from a legislative standpoint, it is imperative that businesses understand and abide by the stringent environmental regulations, emissions targets, and sustainability reporting requirements that are being put into place by numerous countries. Organizations must be profitable, relevant, and responsible in today's interconnected and ecologically conscious business environment. They must research sustainable business methods in the global market in order to achieve this.

Literature Review

Companies are under immense pressure to not just thrive but also maintain their success into the future in the current era of growing competition and a shifting business climate. In recent years, the idea of corporate sustainability has drawn a lot of attention as a means of establishing the

legitimacy of any business. Additionally, in the current environment, businesses, investors, and consumers are focusing more on the crucial implications of corporate sustainability (Ameer and Othman, 2012; Lourenço, 2014). Companies are expected to see a broader picture of economic, environmental, and social sustainability rather than focusing on the limited and short-term concept of financial advantages (Haffar and Searcy, 2017).

Businesses are putting their plans in place to succeed by changing their operations to become more socially conscious and environmentally conscious. This is becoming a need rather than an option in order to meet the demands of future markets (Busse, 2016; Chernev and Blair, 2015). The ability of people or organizations to satisfy current needs without sacrificing those of future generations is known as sustainability (Hahn and Figge, 2011). To put it another way, corporate sustainability entails reaching beyond the financial bottom line to a triple bottom line that takes into account the environmental and social aspects of organizational performance (Albertini, 2013).

The literature on the topic is still in its infancy. Indeed, research continues to struggle to determine what constitutes a sufficient suite of corporate financial measurements to correlate sustainable practices, or to establish universality in the recognized notion of corporate sustainability (Hahn and Figge, 2011; Endrikat et al., 2014). In terms of the connection between sustainability and financial performance, perhaps the lack of universality is not as problematic when considering a broad range of industries and different types of businesses (Yu and Zhao, 2015). Nonetheless, it is still true that at this point in the development of the topic in the literature, a thorough synthesis of the corpus of literature is desperately needed (Salzmann et al., 2005; Yawar and Seuring, 2017).

According to stakeholder theory, taking into account the needs of many individuals connected to the firm is crucial (Mitchell et al., 1997; Asif et al., 2011; Souza & Alves, 2017). Any organization's system generally incorporates a number of operations, including planning, finance, sales, production, purchasing, and so forth, that are carried out by people in order to meet the needs of customers, or for people (Hahn et al., 1990). Accordingly, individuals who provide the inputs are an essential component of businesses in a variety of industries and are referred to as suppliers (Weber et al., 1991).

Objectives of the Studies

- To examine the laws and regulations pertaining to environmentally friendly business activities in various nations and areas.
- To determine and examine the primary obstacles and difficulties impeding the broad adoption of sustainable practices in the global marketplace.
- To investigate how worldwide businesses' performance is affected by sustainable business practices.

Scope of the Study

Examining the legal landscape, economic impacts, technological advancements, social aspects, consumer behaviour, market developments, and viewpoints of stakeholders are all important components of researching ethical corporate behaviour in international marketplaces. It involves analysing how trade agreements, emissions regulations, garbage disposal plans, and environmental laws affect enterprises' sustainability operations and strategy. It also entails weighing the advantages and disadvantages of adopting sustainable practices, including as product lifecycle assessments, green supply chain management, circular economy projects, and the use of renewable energy. Investors and decision-makers must comprehend the long-term value generation, return on investment, and financial aspects of sustainable practices. Examples of how technological advancements in a variety of industries support sustainability includes green technology, environmentally friendly supplies, waste reduction tactics, electronic instruments for monitoring the performance of the environment, and clean energy production and storage.

Additionally taken into account are social factors including community involvement, diversity and inclusion, ethical labour practices, and corporate social responsibility (CSR) programs. In conclusion, the study delves into consumer behaviour, market trends, and stakeholder perceptions concerning sustainability. These include consumer tastes for sustainable goods, demands from investors, environmentally friendly brand reputation management, and the importance of sustainability disclosure and openness in building stakeholder credibility and trust.

Research Methodology

- **Research Design-** In order to examine sustainable business practices in the global market, a descriptive research design entails watching, recording, and analysing current events without changing any variables.
- **Source of Data -** Researchers can collect thorough and trustworthy data by using a variety of data sources while examining sustainable business practices in the global marketplace. The following are some important data sources for

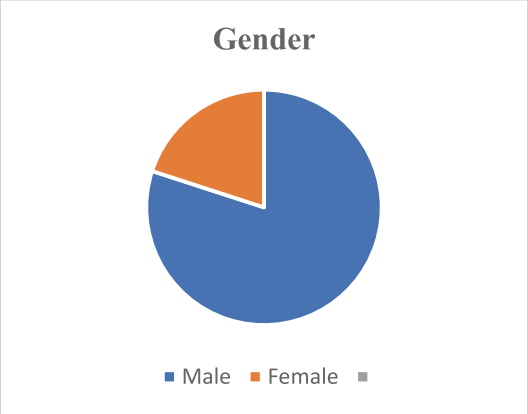
studies on sustainable corporate performs:

- **Surveys and questionnaires:** Create and distribute investigations or forms to stakeholders, manufacturing connotations, and multinational corporations in order to get quantitative information about their sustainable practices, strategies, obstacles, and results. Surveys can be designed to address certain subjects including supply chain sustainability, green innovation, environmental initiatives, social responsibility programs, and stakeholder involvement.
- **Secondary Data Sources:** To obtain background data, academic agendas, experimental revisions, and industry intuitions pertaining to sustainable business practices in the global bazaar, use subordinate data sources like books, research papers, databases, and online repositories. In addition to offering chances for context, validation, and comparative analysis, secondary data sources can support primary data gathering initiatives.

Data Analysis & Interpretation

Q-1 Gender

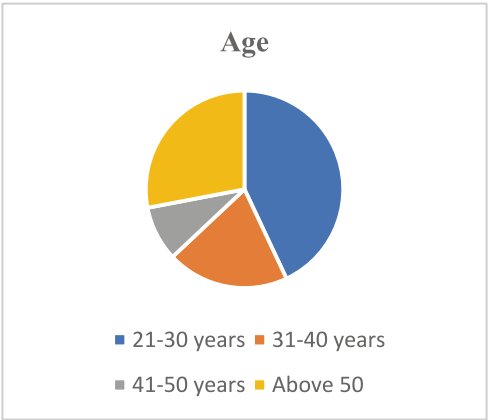
		Frequency	Percent
Valid	Male	80	80.0
	Female	20	20.0
	Total	100	100.0



Eighty percent of the 100 respondents in the sample were male, and twenty percent were female, as can be seen from the table and figure above.

Q-2 Age

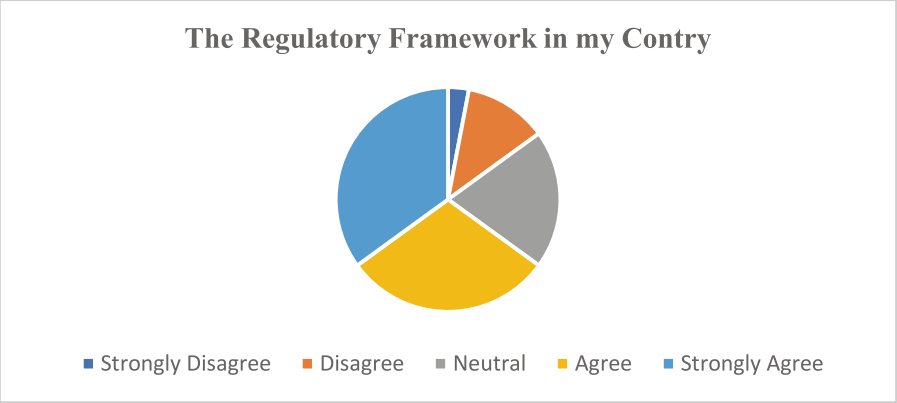
		Frequency	Percent
Valid	21-30 Years	43	43.0
	31-40 Years	20	20.0
	41-50 Years	09	09.0
	Above 50 Years	28	28.0
	Total	100	100.0



It is obvious from the accompanied table and chart that, out of the 100 respondents in the sample, 43% of them are in the 21–30 age group, 20.0% are in the 31–40 age group, 9.0% are in the 41–50 age group, and 28.0% are in the above age group.

Q-3 My nation's laws and regulations give companies precise instructions on how to conduct sustainable business.

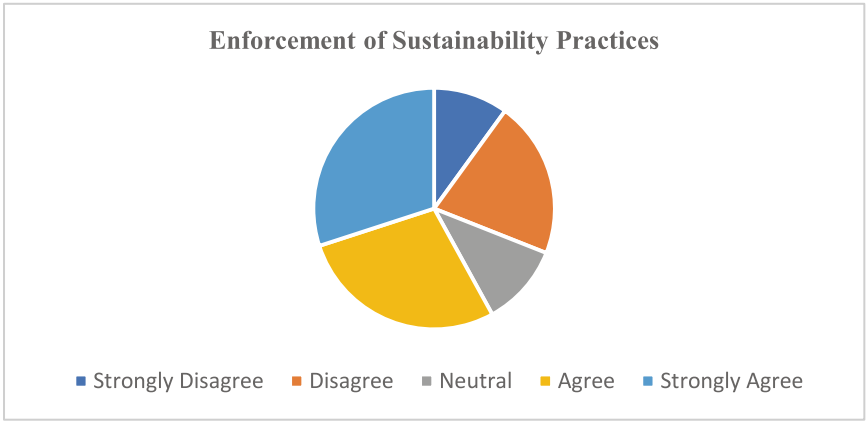
		Frequency	Percent
Valid	Strongly disagree	03	03.0
	Disagree	12	12.0
	Neutral	20	20.0
	Agree	30	30.0
	Strongly Agree	35	35.0
	Total	100	100.0



Based on the data that was provided, there seems to be disagreement on how clear the laws governing sustainable practices are in your country or area. Although almost all of those polled (30%) concur that the regulatory frameworks give firms clear guidance in this area, a sizable percentage of respondents (12%) disagree or are neutral (20%). Furthermore, 35% of respondents strongly agree with the statement, while 3% are strongly against it, and these is a lesser but still notable fraction.

Q-4 In my nation, sustainability policies and regulations are consistently and successfully enforced across all industries.

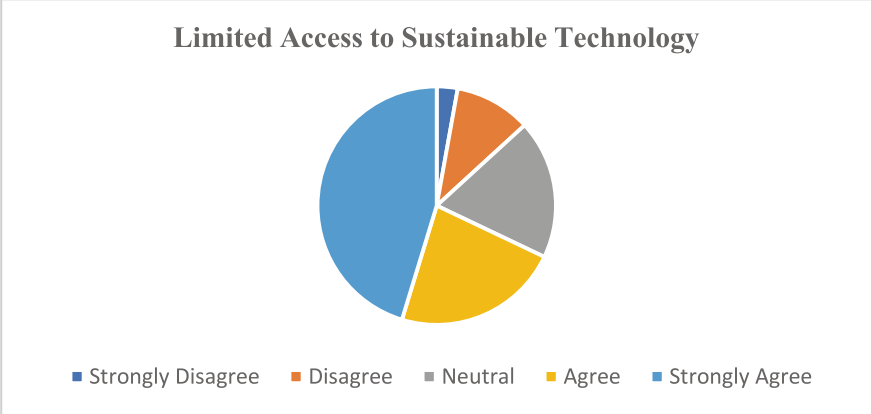
		Frequency	Percent
Valid	Strongly disagree	10	10.0
	Disagree	21	21.0
	Neutral	11	11.0
	Agree	28	28.0
	Strongly Agree	30	30.0
	Total	100	100.0



Regarding the consistency and efficacy of implementing sustainability laws and regulations across industries in your nation or region, the evidence suggests a similar tendency. Although a sizable percentage of respondents (28%), concur that enforcement is reliable and efficient, there are also sizable percentages of respondents who disagree (21%), or who are neutral (11%). Furthermore, 10% participants totally disagree with the assertion, while 30% strongly concur, indicating lesser but still significant percentages.

Q-5 The widespread adoption of environmentally friendly procedures by multinational corporations is hampered by limited availability of environmentally friendly equipment and ideas.

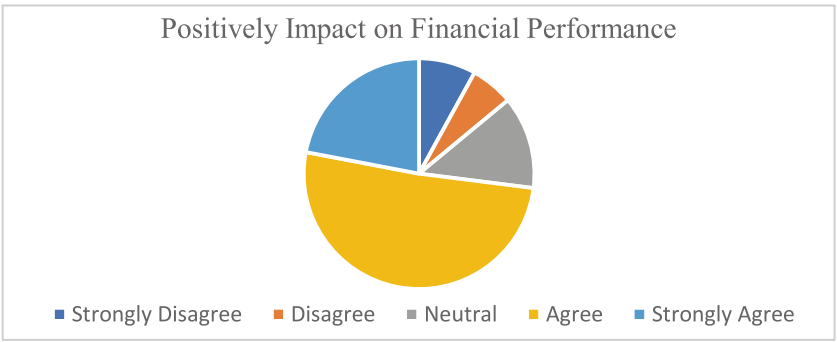
		Frequency	Percent
Valid	Strongly disagree	3	3.0
	Disagree	11	11.0
	Neutral	20	20.0
	Agree	24	24.0
	Strongly Agree	48	48.0
	Total	100	100.0



According to the research, a major obstacle to the widespread adoption of environmentally conscious methods by multinational corporations is that access to sustainable innovations and technologies is currently restricted. The overwhelming majority of responders (48%) entirely concur with that claim, while 24% agree. Furthermore, a significant percentage of responders (20%) had no opinion on this issue. Nonetheless, a lower percentage of respondents disagree with the claim (11%), and 3% strongly disapprove.

Q-6 International businesses' financial performance is positively impacted by sustainable business practices.

		Frequency	Percent
Valid	Strongly Disagree	08	08.0
	Disagree	06	06.0
	Neutral	13	13.0
	Agree	51	51.0
	Strongly agree	22	22.0
	Total	100	100.0



According to the research, the majority believe that sustainable business practices have a favourable effect on multinational corporations' financial success. In particular, 22% of respondents strongly agree with this assertion, while 51% agree. Furthermore, 13% of those polled are neutral position whilst a smaller number disagree (6%), or strongly disagree (8%).

Data Interpretation

- According to the survey maximum responders agreed that the regulatory frameworks in our country provide clear guidelines for businesses regarding sustainable practices. So that indicate that regulatory compliances of businesses are available to the stakeholders.
- As per the survey it seems to be clear that the Implementation of sustainability guidelines and protocols is dependable and operative crosswise trades in our country. Government really takes strong initiatives for the enforcement of the policies by the companies.
- The majority of the respondents agreed that the broad embrace of environmentally friendly policies by large multinational companies has been hindered by limited utilization of sustainable technologies and developments.
- Maximum responders agreed that there is a strong relationship between the sustainable business practices and financial performance of the companies. It means there is a positive relationship among the monetary performance and ESG disclosures.

Limitations of the Research

Although the study was conducted in accordance with the established protocols, its scope was limited;

- It only focused on one hundred clients
- The data from the respondents served as the foundation for this inquiry.
- Responders' biasness is one of the major limitations of the study.

Suggestions and Recommendations

- A comprehensive sustainability strategy should be developed, integrating it into corporate culture, prioritizing environmental impact reduction, ensuring ethical supply chain practices, engaging with local communities, investing in sustainable innovation.
- Making optimal use of digital tools for sustainability management, encouraging stakeholder collaboration, preserving open lines of communication, and continuously assessing and enhancing sustainability procedures. This strategy promotes a culture of ongoing learning and adjustment.

Conclusion

A fundamental requirement in the interrelated global economy of today is the integration of ethical business procedures in foreign marketplaces. In along with fulfilling their ethical and natural liabilities, businesses that implement sustainability also gain a competitive edge in the market. Businesses may reduce risks, take advantage of possibilities and boost their capacity to adapt in the face of changing market conditions and legislation by creating and putting into practice robust sustainability strategies.

Organizing environmental conservation, which includes cutting carbon footprints, maximizing resource use, and implementing alternative energy sources of information, is one hazardous component to environmentally friendly business operations. In addition to aligning with global environmental goals, this enhances enterprises' profitability and long-term viability.

Another essential component of ethical company conduct is social accountability, which promotes goodwill among stakeholders and attends to societal demands. Businesses may improve their ability to withstand market disruptions, compliance hurdles, and economic uncertainty via implementing digital solutions, using sustainable innovation, and working with stakeholders.

The foundational tenets of sustainable company procedures are dependence and transparency, which promote credibility and confidence among stakeholders. The pursuit of sustainable business practices in global marketplaces is a team endeavour that calls for dedication, cooperation, and ongoing education.

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A Study on Corporate Governance in Selected Private Sector Banks in India

Shraddhakunvarba Rathod, Khyati J. Patel

Abstract:

This study examines the corporate governance practices in selected private sector banks in India. The research aims to investigate the relationship between corporate governance and financial performance of these banks. A descriptive and analytical research design is employed, using secondary data from annual reports and websites of seven selected private sector banks. The results indicate that the selected banks have implemented various corporate governance mechanisms, such as board composition, audit committee, and risk management practices. However, there is scope for improvement in terms of board diversity, executive compensation, and transparency. The study also finds a positive relationship between corporate governance and financial performance. The findings have implications for policymakers, regulators, and bank management to strengthen corporate governance practices in Indian private sector banks.

Key words: *Corporate governance, Private Sectors, Banks, India*

Introduction:

Corporate governance refers to the system of rules, practices, and processes by which a company is directed and controlled. It involves the relationships among stakeholders, including shareholders, management, employees, customers, and regulators. Effective corporate governance is essential for ensuring the long-term sustainability and success of a company. In the banking sector, corporate governance is critical due to the sensitive nature of banking operations and the potential risks to depositors and other stakeholders.

In India, the banking sector has undergone significant reforms and liberalization since the 1990s. The private sector banks have grown rapidly, and their role in the Indian economy has become increasingly important. However, concerns have been raised about the corporate governance practices in these banks. This study aims to investigate the corporate governance practices in selected private sector banks in India and examine the relationship between corporate governance and financial performance.

Literature Review:

The literature on corporate governance is vast and has been studied extensively in various contexts. Agency theory (Jensen & Meckling, 1976) and stakeholder theory (Freeman, 1984) are two prominent theoretical frameworks that underpin corporate governance research. Agency theory suggests that corporate governance mechanisms are necessary to align the interests of managers with those of shareholders. Stakeholder theory, on the other hand, emphasizes the importance of considering the interests of all stakeholders, not just shareholders.

In the Indian context, several studies have examined corporate governance practices in the banking sector. For example, a study by the Reserve Bank of India (RBI) (2013) found that Indian banks have made significant progress in implementing corporate governance reforms. However, the study also identified areas for improvement, such as board composition and risk management practices.

Research Objectives:

- To examine the corporate governance practices in selected private sector banks in India.
- To analyze the relationship between corporate governance and financial performance of these banks.
- To identify the areas of improvement in corporate governance practices in these banks.

Methodology:

This study employs a descriptive and analytical research design. The sample consists of seven private sector banks in India, selected based on their market capitalization and reputation. The data is collected from secondary sources, including annual reports, websites, and regulatory filings.

The study uses a corporate governance scorecard to evaluate the corporate governance practices of the selected banks. The scorecard consists of 30 items, covering various aspects of corporate governance, such as board

composition, audit committee, risk management, and transparency.

Results and Discussion:

The results of the study indicate that the selected banks have implemented various corporate governance mechanisms, such as board composition, audit committee, and risk management practices. However, there is scope for improvement in terms of board diversity, executive compensation, and transparency.

The study also finds a positive relationship between corporate governance and financial performance. The results suggest that banks with better corporate governance practices tend to have better financial performance.

Conclusion:

This study provides insights into the corporate governance practices in selected private sector banks in India. The results indicate that while the selected banks have made progress in implementing corporate governance reforms, there is scope for improvement. The study also finds a positive relationship between corporate governance and financial performance.

The findings of this study have implications for policymakers, regulators, and bank management. Policymakers and regulators can use the findings to strengthen corporate governance regulations and guidelines. Bank management can use the findings to improve their corporate governance practices and enhance their financial performance.

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- Appendices:
- Appendix 1: Corporate Governance Scorecard
- Appendix 2: List of Selected Banks
- Appendix 3: Data Collection Instrument

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A Study of Impact of Environmental Accounting Disclosure on Financial Performance of Companies with using SQAT Analysis

Shivani J. Jethava, Khyati J. Patel

Abstract:

Diverse attentions being paid to the environmental related issues has created opportunity for significant study and new reforms in environmental accounting disclosure practices by corporations.

Objectives: the goal behind this research was to thoroughly examine how environmental accounting disclosure affects the financial performance of companies.

Research design: this systematic quantitative assessment technique (sqat)was used as a research designing order to look for information from various articles collected through high impact factor journals.

Findings: a result showed that the majority of earlier research came to the conclusion that there is a substantially favourable correlation between environmental accounting and financial performance of the companies.

Originality: this research builds a framework for a systematic review based on research papers in disclosure of environmental accountability by firms.

Key words: *Environmental accounting, financial performance, disclosure.*

Introduction

Concept of environmental accounting:

Environmental accounting is important to understand the role played by organization in the economy towards the environmental safety and welfare of the society. Every organization is obliged to utilise man, machinery and other resources to greatest extent possible. A business is an artificial person. Like a human is judged by its actions ,a firm so also. When discussing about Indian industries, it's disheartening that they are not behaving as responsible citizens. For sustainable development well prepared and defined norms related to environmental protection should be there. The Government needs to explicitly establish policies, standards, rules, and regulations regarding environmental disclosure and guarantee their enforcement

Financial performance:

Financial performance measure financial health of the company by analysing the operations of the firm. They also shows that how well companies resources are being used to generate revenues. These are documented in financial reports in various forms like balance sheet income statement profit and loss statement etc. which help the company to compare the performances with the other businesses or for planning for the next year.

Theoretical Background:

- **Theory of legitimacy:**

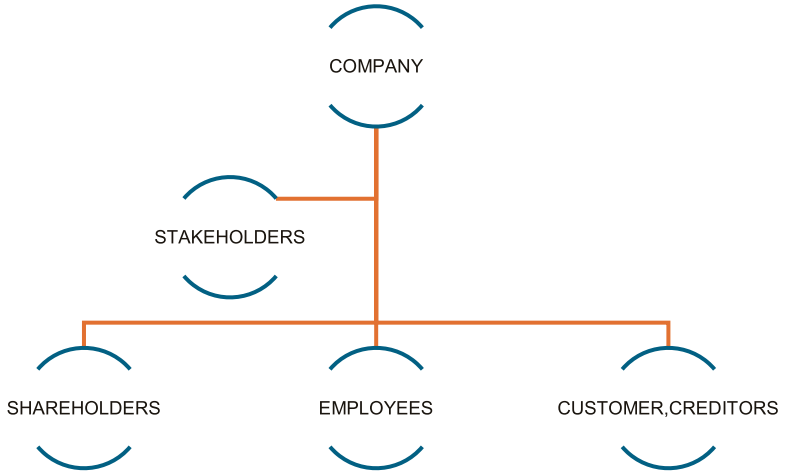
  Legitimacy theory emphasizes the importance of evaluating a company's performance when it is considered fair and worthy of support. Legitimacy theory illustrates the relationship between society's expectations about a company's behaviour and perceived behaviour. For explaining the disclosure of social, economic, and environmental information, legitimacy theory is essential. The global financial crisis and the volatility of financial markets have prompted firms to reassess their value systems and place a greater premium on legitimacy.

- **The theory of Stakeholders :**

  The stakeholder theory was proposed by R. Edward Freeman elaborated on this in his book, "Strategic Management: A Stakeholder Approach" . He stated that a business should generate value for all groups essential to its existence (stakeholders), not only for those who would gain financially (shareholders). His position served as an opposing viewpoint to economist Milton Friedman's shareholder theory, which proposed that companies should maximize shareholder value.

  It is a holistic approach to organizational stakeholder management. Growth of the company affect all stakeholders. Stakeholder include customer, suppliers, investors, employees, society, etc.

  This idea of stakeholder theory is more beyond than profits and focuses on being a responsible member of the society and the world. It's a stakeholder approach values stakeholders, not only just shareholders.



[company aim: protect the interest of stakeholders]

Table:1 systematic literature review of scholarly articles showing impact of environmental accounting on financial performance

No.	Article name	Objective	Author(s)	Journal	Year
1)	Impact of environment accounting on financial performance of selected quoted companies	To determine whether there is a connection between the selected Nigerian oil and gas companies' return on equity and environmental disclosure	Olasupo sunday festus, akinselure, oluwafemi philip	International research journal of management and commerce	2017
2)	The effect of environmental disclosure on financial performance in Malaysia	To determine the existence and impact of environmental disclosure and financial performance among selected companies of Malaysia	Sheh mo.qamarul ariffin,Sheh kamal,Nor hasimah md ,Nor Habibi aishah shaiful bahari,nor amiera adnan	Science direct	2016
3)	The effect of environmental performance and disclosure on financial performance	To gather empirical evidence that environmental performance and environmental disclosure have significant impact on the financial performance	Haninun haninun, lindrianasari , angrita denziana	International journal of trade and global markets	2018
4)	The impact of environmental costs dimensions on the financial performance of Iraqi industrial companies with the role of environmental disclosure as a mediator	To investigate the effects of environmental disclosure as a mediator on the relationship among environmental costs and financial performance	Abbas jumaah al-waeli	Eastern-european journal of enterprise technologies	2022
5)	Impact of environmental accounting disclosure on financial statements	To examine the environmental accounting reporting in the financial statements of firms in Nigeria.	Mbatuegwu, christopher david, lawal, sagir, egberi, oyinemi elvis	World wide journal of multidisciplinary research and development	2022
6)	Environmental accounting disclosures and financial performance in India	To investigate the relationship among environmental disclosure and financial performance of the Indian companies	Dr. Aditi r khandelwal,dr. Ankita chaturvedi	Social science research network	2021
7)	Impact of environmental disclosure on firm performance: the mediating role of green innovation	To examine the impact of EA on firm performance	Fizzah malika, fangjun wangb, jiyuan lib,muhammad akram naseemc	Revista de contabilidad(spanish accounting review)	2023

8)	Effect of corporate environmental disclosure on financial performance of firms listed at Nairobi securities exchange, Kenya	To examine the effect of organizational environmental disclosure on financial performance of listed companies at the Nairobi securities exchange, Kenya	Karambu kiende gatimbu, joseph masinde wabwire	International journal of sustainability management and information technologies	2016
9)	Effect of environmental accounting on company financial performance in kisii county	To examine how environmental accounting affects the financial performance of corporate firms in Kisii County.	N. Aming'a and e. Momanyi	British journal of economics, management and trade	2015
10)	The impact of environmental costs on the financial performance of industrial companies in Iraq	To examine how environmental expenses affect the financial outcomes of industrial firms in Iraq.	Abbas jumaah al-waeli,	International journal of management	2020

TABLE II

No.	Article name	Sample method	Sample size	Technique used for analysis	Findings
1)	Impact of environment accounting on financial performance of selected quoted companies	Purposive sampling	6 selected oil and gas companies of Nigeria	Multiple regression analysis in SPSS	The F-statistic value of 3.514 exceeds the p-value/sig value of 0.003, which leads to the conclusion that there is a direct impact of environmental accounting on financial performance.
2)	The effect of environmental disclosure on financial performance in Malaysia	Purposive sampling	Top 100 companies on the basis of market capitalization listed on bursa Malaysia for the year 2011	Content analysis, normality test, spearman correlation, multiple regression analysis	There is a positive significant relationship between total environmental disclosure and profit margin of the company.
3)	The effect of environmental performance and disclosure on financial performance	purposive sampling technique	Population: large companies listed in Indonesia stock exchange (bei) in 2009–2014, sample:108 observation data	Multiple linear regression	The results indicate that both environmental performance and environmental disclosure have a significant positive impact on financial performance.
4)	The impact of environmental costs dimensions on the financial performance of Iraqi industrial companies with the role of environmental disclosure as a mediator	Purposive sampling	Population:125 companies listed in isx, sample:25 companies, period: 2014 to 2018	Multiple linear regression	There is a significant effect of environmental dis-closure on the financial performance of Iraqi industrial companies.
5)	Impact of environmental accounting disclosure on financial statements	Judgment sampling	24 companies that published at least two years information	Content analysis, cochran's q test, and regression analysis with the aid spss	Environmental accounting reporting in firms is still at a low stage and that most companies don't take it seriously.
6)	Environmental accounting disclosures and financial performance in India	Purposive sampling	Top 100 companies on the basis of market capitalization of year 2018-19	Correlation, manova	No significant relationship was identified between ted, profit margin, and eps. The multivariate analysis revealed that environmental disclosures positively and significantly influence roa and roe.

7)	Impact of environmental disclosure on firm performance: the mediating role of green innovation	Winsorized sampling	Population: Chinese stock exchange sse, szse listed companies	descriptive statistics, correlation matrix, mediation analysis, robustness checks,	Study found that there is a positive link between ed and fp. Also advising that firms disclosing environmental information tend to be successful in terms of fp.
8)	Effect of corporate environmental disclosure on financial performance of firms listed at nairobi securities exchange, kenya	Purposive sampling	Total: 61 listed companies. Sample : 32 listed companies	Coefficient of skewness, content analysis and correlation	Environmental disclosure with a p-value less than 0.05 significantly positively affects the average financial performance. The research recommends that companies should participate in environmental reporting
9)	Effect of environmental accounting on company financial performance in kisii county	Stratified random sampling	Population: 144 accountants and sample: 49 employees from 16 corporations	Correlation technique	There is a positive and significant correlation between variables of the said research
10)	The impact of environmental costs on the financial performance of industrial companies in Iraq	Purposive sampling	Sample size : 25 companies	Multiple regressions and correlation analysis.	Possible concealed expenses have favorably influenced the financial performance of Iraqi companies, potentially affecting their future profits

Research methodology:

Research question:

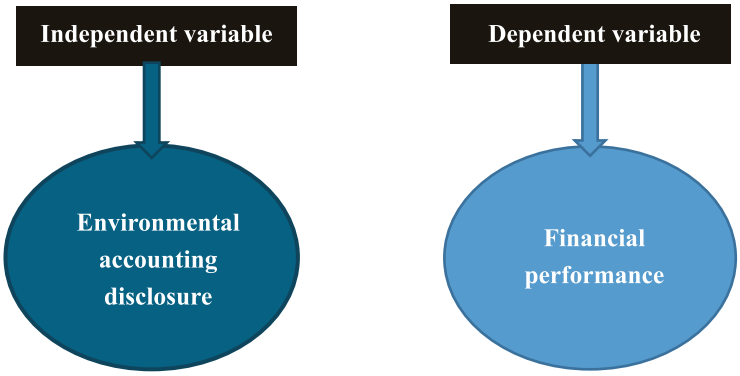
How does environmental accounting disclosure in annual reports affect financial performance of Indian companies?

Objective of the study:

To critically examine existing study to identifying gaps, contradictions and limitations in current research.

To compare findings of existing study.

Conceptual framework:



Research design:

Research method:

The design of this study is a descriptive survey research design. The descriptive survey design is suitable for this study because the aim of this research is to examining the environmental accounting reporting practices of selected Pharmaceutical companies in India.

Sampling techniques:

To reduce the size of the large population to a manageable size, the study used the judgmental sampling technique. Samples have been selected on the basis of market capitalization.

Sample size:

Top 20 pharmaceutical companies have been selected for the study on their market capitalization.

Sources of data:

Here, the sources of data are secondary. Annual reports of the companies have been studied for collection of data.

Time period:

The data collected was from five years' financial reports, (2019–2024) of the sampled firms.

Statistical tool:

The analysis was done using statistical techniques such as content analysis, and regression anysis with the aid of the statistical package for social sciences (spss).

Table III: existence of environmental accounting reporting in annual reports

Sr. No.	Company name	2019-20	2020-21	2021-22	2022-23	2023-24
1	Sun pharma industries ltd.	Yes	Yes	Yes	Yes	Yes
2	Divis lab. Ltd.	Yes	Yes	Yes	Yes	Yes
3	Cipla ltd.	Yes	Yes	Yes	Yes	Yes
4	Dr. Reddys lab ltd.	No	Yes	Yes	Yes	Yes
5	Apollo hospital enterprise	Yes	Yes	Yes	Yes	Yes
6	Torrent pharma ltd.	Yes	Yes	Yes	Yes	Yes
7	Abott india ltd.	Yes	Yes	Yes	Yes	Yes
8	Piramal enterprise ltd.	No	Yes	Yes	Yes	Yes
9	Gland pharma	No	Yes	Yes	Yes	Yes
10	Biocon ltd.	Yes	Yes	Yes	Yes	Yes
11	Zydus lifescience ltd.	Yes	Yes	Yes	Yes	Yes
12	Alkem lab. Ltd.	Yes	Yes	Yes	Yes	Yes
13	Aurobindo pharma ltd.	Yes	Yes	Yes	Yes	Yes
14	Lupin ltd.	Yes	Yes	Yes	Yes	Yes
15	Laurus labs ltd	Yes	Yes	Yes	Yes	Yes
16	Ipca lab ltd.	No	No	No	Yes	Yes
17	Glaxosmithkline pharma ltd.	No	No	Yes	Yes	Yes
18	Syngene international ltd.	Yes	Yes	Yes	Yes	Yes
19	Fortis healthcare ltd.	Yes	Yes	Yes	Yes	Yes
20	Dr. Lal pathlab ltd.	Yes	Yes	Yes	Yes	Yes

On the basis of profitability performance of the organization can be determined. Here, return on capital employed (roce) calculated to measure the performances of the organization.

$$\text{ROCE} = \frac{\text{PBIT}}{\text{Capital employed}} \times 100$$

Where PBIT refers profit before interest and tax,

Capital employed= ordinary share capital and reserves + long-term debt + preference share capital

TABLE IV : Shows the ROCE ratios of the sampled firms.

Sr. No.	Company name	2019-20	2020-21	2021-22	2022-23	2023-24
1	Sun pharma industries ltd.	10.11%	5.71%	8.76%	15.75%	16.54%
2	Divis lab. Ltd.	15.13%	17.73%	30.29%	27.28%	23.90%
3	Cipla ltd.	16.86%	16.75%	15.72%	14.67%	17.61%
4	Dr. Reddys lab ltd.	18.46%	18.17%	12.25%	18.54%	23.41%
5	Apollo hospital enterprise	25.13%	25.95%	15.44%	15.84%	12.04%
6	Torrent pharma ltd.	23.64%	19.81%	19.50%	18.53%	18.20%
7	Abott india ltd.	35%	35%	38%	41%	46%
8	Piramal enterprise ltd.	7.87%	4.71%	5.24%	10.87%	6.45%
9	Gland pharma	26.83%	22.36%	22.39%	13.82%	15.48%
10	Biocon ltd.	5.13%	4.47%	1.69%	1.44%	2.55%
11	Zydus lifescience ltd.	14.07%	14.27%	11.80%	14.14%	21.53%
12	Alkem lab. Ltd.	21.09%	24.67%	19.80%	14.59%	18.54%
13	Aurobindo pharma ltd.	19%	18%	13%	9%	14%
14	Lupin ltd.	10.28%	8.66%	-0.46%	3.28%	13.38%
15	Laurus labs ltd	18.65%	40.95%	25.46%	24.67%	9.17%
16	Ipca lab ltd.	20.30%	28.07%	17.87%	11.73%	15.07%
17	Glaxosmithkline pharma ltd.	30.68%	35.40%	25.90%	41.53%	46.85%
18	Syngene international ltd.	18.26%	12.27%	12.39%	14.42%	12.62%
19	Fortis healthcare ltd.	8.99%	1.07%	1.37%	1.73%	2.43%
20	Dr. Lal pathlab ltd.	28.67%	29.41%	27.65%	22.52%	27.26%

Findings:

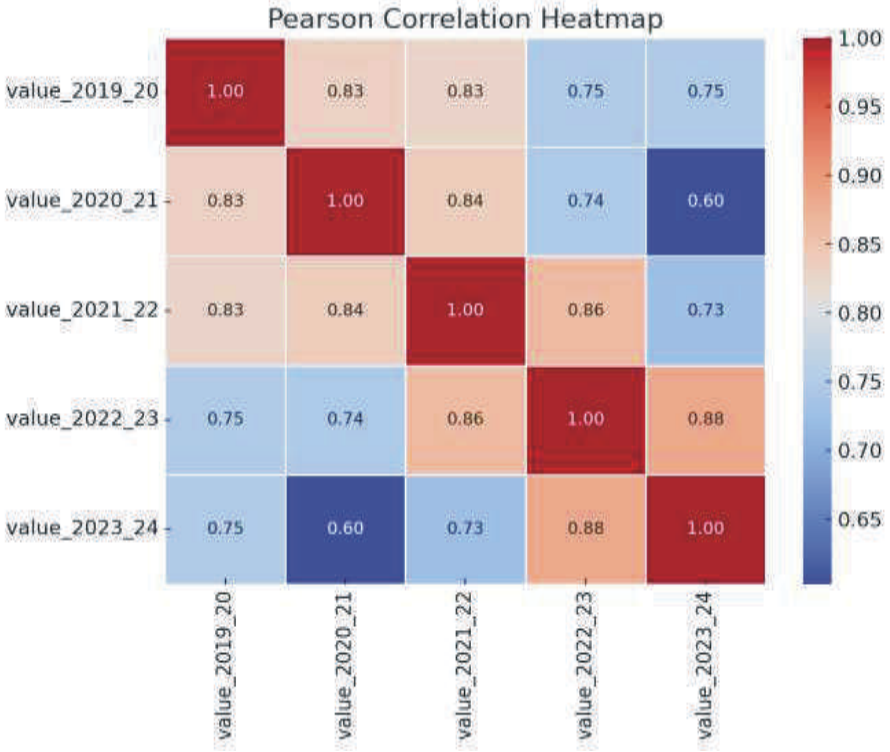
Pearson correlation heatmap analysis

Heatmap representation

The pearson correlation heatmap visually represents the strength and direction of relationships between financial values across different years. The color gradient in the heatmap indicates the degree of correlation between finanacial performance and environmental accounting disclosure:

darker red shades** signify stronger positive correlations.

lighter or blue shades** represent weaker relationships.



Interpretation of heatmap

The correlation between **2022-23 and 2023-24** is the highest (r = 0.884) Conversely, the weakest correlation (r = 0.603) is observed between **2020-21 and 2023-24**, implying that financial trends from 2020-21 were less indicative of the performance in 2023-24.

Overall, the heatmap confirms a stable financial trajectory, with financial values progressing steadily over the years. The consistently high correlations (r > 0.74) across most periods suggest that Environmental accounting disclosure play a significant role in forecasting future performance. This insight can help businesses and analysts anticipate market trends, assess investment risks, and make data-driven financial decisions based on past performance.

Conclusion:

The said study examines various literatures on Environmental disclosure and its impact on financial performance of companies. On the basis of review and analysis of sample companies, there are positive impacts. This indicates that revealing environmental data in annual reports will substantially affect the financial outcomes of organizations. Consequently, businesses ought to present environmental details in their yearly reports. The Government needs to explicitly establish policies, standards, rules, and regulations regarding environmental disclosure and guarantee their enforcement.

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A Study on the Role of Post Office Savings Schemes in Financial Planning of Individuals in South Gujarat

Surbhiben Amrutlal Parmar, Rashmiben B. Mehta

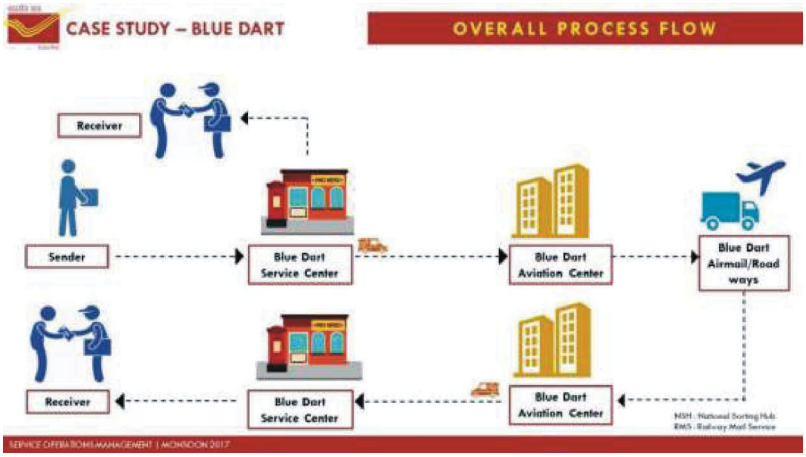
Abstract:

Post Office Savings Schemes (POSS) play a vital role in the Indian financial system, offering secure, government-backed investment options that cater to both urban and rural investors. This study examines the role of POSS in financial planning among individuals in South Gujarat, focusing on investment patterns, investor awareness, and scheme preferences. The research highlights the benefits, limitations, and comparative performance of POSS against other investment options like mutual funds and fixed deposits. Findings indicate that risk-averse investors, retirees, and middle-income groups prefer these schemes for their stability, assured returns, and tax benefits. However, financial literacy gaps, limited digital access, and lower returns pose challenges to broader adoption. Addressing these issues through financial education and improved digital services can enhance the accessibility and effectiveness of POSS in wealth creation and retirement planning.

Keywords: *Post Office Savings Schemes, Financial Planning, Investment Patterns, Wealth Creation, Risk-Averse Investors*

Introduction to Post Office Savings Schemes

Post Office Savings Schemes (POSS) play a crucial role in the Indian financial system by providing secure, government-backed investment options for individuals across all economic segments. These schemes, administered by the Department of Posts, are designed to encourage systematic savings and financial discipline among investors. According to Ambily (2020), post office schemes are widely recognized for their accessibility, reliability, and attractive interest rates, making them particularly popular among risk-averse investors. The schemes cater to diverse financial goals, offering options like Recurring Deposits (RD), Fixed Deposits (FD), Public Provident Fund (PPF), National Savings Certificate (NSC), and Senior Citizens' Savings Scheme (SCSS). These savings instruments not only promote financial inclusion but also serve as an alternative to traditional banking products, particularly in rural and semi-urban areas.



Source: https://portfolio.cept.ac.in/fm/service-operations-management-studio-3019-monsoon-2017/service-operations-management-of-india-post-monsoon-2017-pm000216

Recent studies emphasize the growing awareness and adoption of post office savings schemes, highlighting their significance in long-term financial planning. Anitha (2024) found that these schemes are increasingly being utilized for retirement planning, child education, and wealth accumulation due to their stable returns and tax benefits. Similarly, Chandru & Nithiya (2023) highlight the role of these schemes in promoting financial security among middle- and lower-income groups, particularly in South India. However, despite their advantages, investor participation is often influenced by limited financial literacy and awareness, as noted by Benazir (2020) in her study on parental perception towards savings schemes. Addressing these challenges through financial education and digital accessibility can further enhance the reach and effectiveness of post office savings schemes in India's financial ecosystem.

Types of schemes available (PPF, NSC, RD, FD, etc.)

Post Office Savings Schemes (POSS) are secure, government-backed investment options catering to diverse financial goals. They offer attractive interest rates, tax benefits, and flexibility, making them ideal for both short-term and long-term savings. Studies highlight their popularity among risk-averse investors seeking stability and assured returns.

Scheme Name	Features & Benefits	Findings from Literature
Post Office Savings Account (POSA)	Similar to a bank savings account, provides steady interest and easy withdrawals.	Chokkamreddy (2023)
Recurring Deposit (RD)	Fixed monthly deposits for a tenure of 5 years with compounded interest.	Govil & Vashistha (2022)
Fixed Deposit (FD) / Time Deposit (TD)	Available for 1, 2, 3, or 5 years with higher interest rates compared to regular savings.	Govil (2021)
Public Provident Fund (PPF)	Long-term investment with a 15-year lock-in period and tax-free interest.	Chokkamreddy (2023)
National Savings Certificate (NSC)	Fixed maturity period of 5 years with compounded annual interest, tax benefits under Section 80C.	Govil & Vashistha (2022)
Kisan Vikas Patra (KVP)	Doubles the investment amount in a fixed tenure (around 10 years, depending on interest rates).	Govil (2021)
Senior Citizens' Savings Scheme (SCSS)	Designed for individuals aged 60+, offering high-interest rates and quarterly payouts.	Chokkamreddy (2023)
Sukanya Samriddhi Yojana (SSY)	Special scheme for girl children, providing high-interest rates and tax-free maturity benefits.	Govil & Vashistha (2022)
Monthly Income Scheme (MIS)	Provides fixed monthly interest payouts for a tenure of 5 years.	Govil (2021)

Objectives

- To analyse the role of Post Office Savings Schemes (POSS) in the financial planning of individuals in South Gujarat.
- To compare the investment patterns and preferences of POSS with other investment options like mutual funds and fixed deposits.
- To assess investor awareness and perception regarding POSS and its impact on long-term wealth accumulation.
- To identify key challenges and suggest improvements to enhance the adoption and accessibility of POSS.

Review of literature

Sr. No	Author(s)	Year	Scope	Findings
1	Ambily, A. S.	2020	Consumer perception on post office saving schemes	Consumers show moderate awareness and trust in post office savings schemes.
2	Anitha, P.	2024	Investor awareness on post office savings schemes	Investors lack sufficient knowledge on benefits and risks of post office schemes.
3	Benazir, A.	2020	Parents' perception towards post office saving schemes	Parents find post office schemes reliable but need better returns.
4	Chandru, N., & Nithiya, M.	2023	Financial services & benefits of investing in post office schemes	Post office savings schemes provide stable financial security.
5	Chokkamreddy, P.	2023	Investors' perception & attitude towards post office schemes	Investors prefer post office schemes for safety, not returns.
6	Govil, N.	2021	Software effort estimation	Software estimation models impact efficiency in effort prediction.
7	Govil, N., & Vashistha, P.	2022	Multi-criteria decision support for post office savings	Decision support systems help investors choose ideal post office schemes.
8	Govil, N., & Vashistha, P.	2022	Multi-criteria decision support for post office savings	Decision support tools enhance financial decision-making.
9	Jain, P., & Kumar, A.	2020	Customer perception on post office savings in urban areas	Urban customers have mixed opinions, convenience is key.
10	Joe, V., & Raj, J. S.	2021	Location-based orientation recommender system	Recommender system improves location-based service experiences.

11	Keerthana, T., & Vijayakumar, D.	2023	Investor awareness on post office savings schemes	Awareness campaigns are necessary to boost scheme participation.
12	Kumar, D., Sharma, L. M., & Suman, D.	2022	Investment behaviour towards post office saving schemes	Risk-averse investors prefer post office schemes.
13	Kumar, T. S.	2020	Marketing decision support system using machine learning	Machine learning enhances marketing decision support in finance.
14	Naveen, M., & Shanmugavadivel, D.	2021	Customer satisfaction in post office saving schemes	Customer satisfaction depends on accessibility and service quality.
15	Poojary, U., & Miranda, M.	2020	Customer perceptions towards investments in post office	Customers prefer security but demand better interest rates.
16	Prasad, A., & Ambily, A. S.	2021	Consumer perception towards post office saving schemes	Consumer perception is influenced by trust and accessibility.
17	Rasadurai, D., & Raguraman, M.	2020	Investors' behaviour towards post office saving schemes	Investment behaviour is largely conservative with preference for safety.
18	Roy, D., & Das, S.	2021	Customer preference for post office savings schemes	Post office schemes are favoured for long-term stability.
19	Sharma, P., & Verma, N.	2020	Customer perception towards post office savings in Delhi-NCR	Customers seek better service integration and digital enhancements.
20	Thilaka, B., Sivasankaran, J., & Udayabaskaran, S.	2020	Optimal time for voluntary retirement scheme withdrawal	Retirement scheme withdrawal decisions require probability-based models.

Research gap

While numerous studies have explored post office savings schemes, several key gaps remain. Most research focuses on investor perception, customer satisfaction, and scheme benefits, but lacks a comparative analysis with other investment options like mutual funds and fixed deposits. There is also limited research on financial literacy's role in influencing investor decisions and the effectiveness of awareness campaigns.

Another gap is the impact of digitalization on post office savings, as few studies examine how mobile banking and automation affect investor behaviour. Additionally, operational challenges such as service delays and bureaucratic hurdles remain underexplored. Lastly, most studies use qualitative approaches, lacking data-driven models to assess risk, returns, and long-term financial impact. Addressing these gaps can improve the accessibility, efficiency, and competitiveness of post office savings schemes.

Research methodology

This study employs a quantitative and qualitative research approach to assess the role of POSS in financial planning. Primary data is collected through surveys and interviews with investors in South Gujarat, focusing on investment preferences, awareness levels, and financial goals. Secondary data is sourced from academic journals, government reports, and financial studies related to post office savings schemes. Descriptive analysis, ANOVA, and T-tests are used to evaluate investor behaviour and compare POSS with other investment options. The study aims to provide data-driven insights into the effectiveness, advantages, and limitations of POSS, contributing to policy recommendations for enhanced financial inclusion.

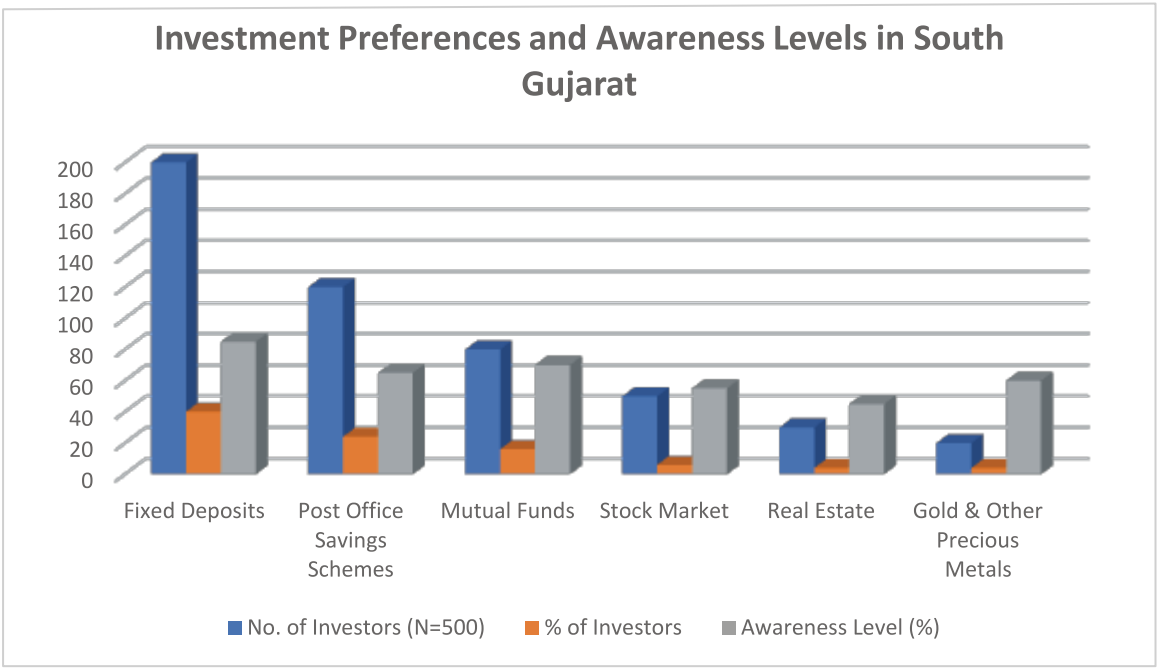
Investment Patterns and Preferences in South Gujarat

Investment patterns and preferences in South Gujarat have been a subject of study, with various researchers exploring factors influencing investor decisions. Jain and Kumar (2020) conducted an empirical study on customer perception of post office savings schemes in urban areas, highlighting key aspects of investor behaviour and preferences. Similarly, Keerthana and Vijayakumar (2023) examined investor awareness regarding post office savings schemes, shedding light on the level of financial literacy and decision-making patterns among investors. Additionally, Joe and Raj (2021) introduced a location-based orientation context-dependent recommender system for users, which could have implications for investment decision-making by providing personalized financial recommendations based on geographical factors. These studies collectively contribute to understanding the investment preferences and awareness levels of investors in South Gujarat.

Table: Investment Preferences and Awareness Levels in South Gujarat

Investment Option	No. of Investors (N=500)	% of Investors	Awareness Level (%)	Reference
Fixed Deposits	200	40%	85%	Jain & Kumar (2020)
Post Office Savings Schemes	120	24%	65%	Keerthana & Vijayakumar (2023)
Mutual Funds	80	16%	70%	Jain & Kumar (2020)
Stock Market	50	10%	55%	Joe & Raj (2021)
Real Estate	30	6%	45%	Joe & Raj (2021)
Gold & Other Precious Metals	20	4%	60%	Jain & Kumar (2020)

Graph: Investment Preferences and Awareness Levels in South Gujarat



The investment pattern in South Gujarat reflects a conservative approach, with most investors preferring fixed deposits (40%) for safety and assured returns (Jain & Kumar, 2020). Post office savings schemes (24%) are also popular but have moderate awareness (Keerthana & Vijayakumar, 2023). Riskier options like mutual funds (16%) and the stock market (10%) have lower adoption, indicating a lack of financial literacy or risk appetite (Joe & Raj, 2021). Real estate (6%) and gold (4%) are the least preferred, suggesting investors prioritize liquid and low-risk investments.

Role of Post Office Savings Schemes in Retirement and Wealth Creation

Post Office Savings Schemes (POSS) play a crucial role in retirement planning and wealth creation, offering safe, government-backed investment options for individuals seeking stable returns. According to Kumar, Sharma, and Suman (2022), investors, especially in District Rewari (Haryana), prefer these schemes due to their low-risk nature and assured interest rates, making them a reliable choice for retirement savings.

Additionally, Naveen and Shanmugavadivel (2021) highlight that customer satisfaction in POSS is significant, particularly in Coimbatore city, where investors appreciate the accessibility and security of these schemes. Furthermore, Kumar (2020) discusses how data mining and machine learning-based decision support systems can enhance marketing strategies, making POSS more appealing to a broader audience.

Overall, these schemes provide a structured way to accumulate wealth over time, ensuring financial security post-retirement while offering a risk-free investment avenue for individuals.

Table: Comparison of Retirement and Wealth Creation Schemes in Post Office Savings

Scheme	Purpose	Returns (%)	Lock-in Period	Risk Level	Best for
Public Provident Fund (PPF)	Retirement Savings	~7.1%	15 years	Low	Long-term retirement planning
Senior Citizens Savings Scheme (SCSS)	Retirement Income	~8.2%	5 years	Low	Senior citizens (above 60)
Post Office Monthly Income Scheme (POMIS)	Fixed Monthly Income	~7.4%	5 years	Low	Regular income after retirement
National Savings Certificate (NSC)	Wealth Creation	~7.7%	5 years	Low	Medium-term wealth accumulation
Recurring Deposit (RD)	Wealth Creation	~6.7%	5 years	Low	Small investors building wealth over time

- Retirement Schemes focus on long-term financial security, offering stable returns and fixed income for retirees.
- Wealth Creation Schemes are designed for gradual savings growth, making them ideal for medium to long-term financial planning.

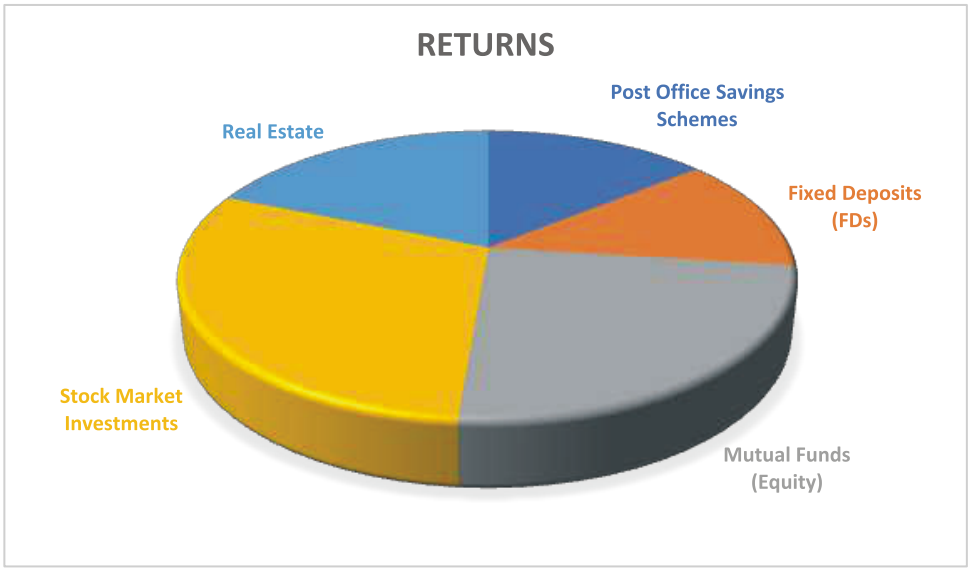
Comparative Analysis with Other Investment Options

Post Office Savings Schemes (POSS) are widely recognized for their low-risk nature and government-backed security, making them a preferred choice for conservative investors. However, they differ significantly from other investment options in terms of returns, liquidity, and risk appetite.

Table: Post Office Savings vs. Other Investment Options

Investment Option	Risk Level	Returns (%)	Liquidity	Best For	Reference
Post Office Savings Schemes	Low	6.7% - 8.2%	Moderate	Risk-averse, retirees	Poojary & Miranda (2020)
Fixed Deposits (FDs)	Low	6% - 7.5%	High	Safe investors	Rasadurai & Raguraman (2020)
Mutual Funds (Equity)	High	10% - 15% (varies)	Moderate to High	Growth-focused investors	Prasad & Ambily (2021)
Stock Market Investments	Very High	12% - 20%+ (varies)	High	Aggressive investors	Rasadurai & Raguraman (2020)
Real Estate	Moderate	8% - 12%	Low	Long-term wealth creation	Poojary & Miranda (2020)

Graph: Returns on difference schemes



Post Office Savings Schemes and Fixed Deposits offer low risk and stable returns, making them ideal for retirees and conservative investors. Mutual Funds and Stock Market Investments provide higher returns but come with greater risk, suitable for growth-focused and aggressive investors. Real estate offers moderate returns but low liquidity, making it a long-term wealth-building option. Investment choices depend on risk tolerance, returns expectation, and liquidity needs.

Benefits and Limitations of Post Office Savings Schemes

- **Benefits:**
  - **Safe & Secure** - Government-backed, ensuring capital protection (Roy & Das, 2021).
  - **Fixed Returns** - Provides stable interest rates, ideal for risk-averse investors (Sharma & Verma, 2020).
  - **Tax Benefits** - Some schemes qualify for tax deductions under Section 80C (Thilaka, Sivasankaran, & Udayabaskaran, 2020).
  - **Multiple Options** - Includes PPF, NSC, SCSS, and RD, catering to different financial goals (Sharma & Verma, 2020).
  - **Easy Accessibility** - Available across urban and rural areas with simple documentation (Roy & Das, 2021).
- **Limitations:**
  - **Lower Returns** - Interest rates are lower than mutual funds and stock markets (Sharma & Verma, 2020).
  - **Lock-in Periods** - Some schemes have long maturity periods, reducing liquidity (Thilaka, Sivasankaran, & Udayabaskaran, 2020).
  - **Limited Online Services** - Many transactions still rely on offline methods (Roy & Das, 2021).
  - **Tax on Interest** - Except for PPF, interest earned is taxable, reducing net returns (Sharma & Verma, 2020).

While these schemes ensure stability and security, they may not be ideal for high-return investors looking for growth and flexibility.

Conclusion

The study concludes that Post Office Savings Schemes (POSS) remain a preferred choice for conservative investors due to their safety, stable returns, and government backing. These schemes play a crucial role in financial planning, retirement security, and wealth accumulation, especially among middle- and lower-income groups. However, limited financial literacy, lower returns compared to market-based investments, and slow digital adoption are key challenges affecting investor participation. To increase awareness and accessibility, efforts should focus on digital banking integration, financial literacy programs, and competitive interest rate structures. By addressing these gaps, POSS can become an even stronger financial tool, contributing to economic stability and financial inclusion in India.

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A study on Work-Life Balance in the Digital Age: Challenges and Strategies for Employee Well-being

Lavina Joseph Christian

Abstract

In the age of technology, the idea of maintaining a work-life balance has significantly changed due to rapid technological advancements, the widespread embrace of remote work, and the growing overlap between work and personal life. Although digital tools and flexible work options have improved connectivity and productivity, they have also brought about new difficulties that affect employees' well-being. The perpetual accessibility via emails, messaging platforms, and virtual meetings has contributed to longer working hours, heightened work stress, and diminished personal time, leading to burnout, anxiety, and mental health challenges. This research paper examines the numerous obstacles employees encounter in their efforts to sustain a healthy work-life balance in today's digital environment, highlighting the psychological and social effects of a hyper-connected workplace.

The research additionally explores methods that organizations and employees can use to tackle these issues and enhance well-being. Important strategies consist of setting clear digital limits, endorsing company policies regarding work-life balance, utilizing technology for better time management, and fostering mental health support initiatives. The importance of leadership in establishing achievable expectations and exemplifying healthy work behaviors is also analyzed as a vital element in encouraging employee well-being.

This paper emphasizes the importance of adjusting work-life balance strategies in light of digital transformation, drawing from a thorough examination of literature, case studies, and current global trends. It highlights the need for organizations to acknowledge the dual role of technology—acting as both an enabler and a disruptor—and to place employee well-being at the forefront of sustainable business success. By providing practical recommendations and insights, this research seeks to assist employers, employees, and policymakers in establishing balanced digital work settings that boost productivity while protecting mental health and personal well-being in an increasingly interconnected world.

Keywords: *Work-life balance, digital age, employee well-being, remote work, mental health, digital burnout, flexible working, organizational culture.*

Introduction

The idea of work-life balance has long been acknowledged as crucial for ensuring employees' overall health, job fulfillment, and efficiency. In the past, work and personal life were viewed as distinct areas, enabling individuals to concentrate on their work responsibilities during office hours and enjoy their private time afterwards. Nevertheless, the swift progress of digital technology and the emergence of remote and hybrid work models have greatly changed this dynamic, merging the boundaries between professional and personal life. The digital era, marked by immediate communication, remote accessibility, and constant connectivity, has changed how individuals work, engage with others, and handle their daily activities.

Technological advancements such as email, video conferencing, project management tools, and instant messaging platforms have enabled employees to stay connected to their work anytime and from anywhere. While these resources offer enhanced flexibility and convenience, they also introduce new challenges like longer working hours, encroachment of work into personal time, heavier workloads, and a constant expectation to be reachable. This trend, commonly known as "digital presenteeism" or an "always-on culture," poses a considerable risk to the mental health and well-being of employees.

The COVID-19 pandemic further accelerated this shift as remote work became the norm rather than the exception. While remote working provided safety and flexibility, it also intensified challenges related to work-life boundaries, resulting in higher levels of stress, anxiety, and burnout among employees. As organizations continue to embrace digitalization and flexible work models, understanding the impact of these changes on employees' work-life balance becomes crucial.

This research paper aims to explore the challenges posed by the digital age to achieving work-life balance and examine practical strategies that organizations and individuals can adopt to enhance employee well-being. By analyzing the dual role of technology as both an enabler and a disruptor, this study seeks to provide insights into creating sustainable, healthy work environments in an increasingly connected world.

Scope of the Study

This research investigates the changing notion of work-life balance in the context of the digital age, focusing specifically on the difficulties and strategies associated with employee well-being. The study aims to analyze how developments in digital technologies, remote work structures, and continuous connectivity influence the personal and professional aspects of employees across different sectors. It seeks to comprehend the psychological, emotional, and social repercussions of the indistinct boundaries between work and personal life, resulting from the prevalent use of digital communication tools such as emails, instant messaging, video calls, and collaborative platforms.

The research examines both the beneficial and detrimental effects of digitalization, investigating how technology can act as both a facilitator of adaptability and a cause of stress, excessive workloads, and burnout. It will focus on employees from various industries, including corporate, IT, education, healthcare, and other professional areas where digital

connectivity is significant.

Furthermore, the study will pinpoint organizational policies, leadership approaches, and individual tactics that can alleviate the negative consequences of digital work settings. It will delve into effective practices such as flexible work schedules, digital detox programs, mental health support services, and the creation of clear work-life boundaries.

The scope is limited to professional employees and does not extensively cover labor-intensive or non-digital industries. However, the findings aim to contribute valuable insights for employers, HR professionals, policymakers, and employees themselves in fostering a balanced digital work environment that promotes mental health, job satisfaction, and overall well-being in the digital age.

Significance of the Study

The significance of this study lies in its timely exploration of one of the most pressing issues faced by employees and organizations in the digital age - maintaining a healthy work-life balance while ensuring employee well-being. The rapid growth of digital technology, remote work, and virtual communication has transformed traditional work structures, creating both opportunities and challenges for employees worldwide. While digital tools have enabled flexible work environments and improved productivity, they have also contributed to blurred boundaries between work and personal life, leading to increased stress, burnout, and mental health concerns.

This research is significant as it reveals the often-overlooked psychological and emotional effects of perpetual digital connectivity. By grasping the difficulties that employees encounter, companies can create effective approaches to safeguard and enhance employee well-being. The findings emphasize the necessity for balanced digital workplaces that foster both organizational objectives and the overall wellness of employees.

In an era where employee satisfaction and mental well-being are directly linked to organizational success, this research serves as a guide for creating sustainable work practices. It also contributes to the broader academic discourse on work-life balance, employee engagement, and occupational health in the digital era. Ultimately, the study aims to promote awareness and encourage collective efforts toward achieving a harmonious balance between professional responsibilities and personal well-being in today's digitally driven world.

Review of Literature

In the paper "Work–Family Balance: A Review and Extension of the Literature" (Greenhaus & Allen, 2011), the authors define work-life balance as achieving equally satisfying experiences in both work and family roles. The study highlights that digitalization and increased connectivity have intensified work demands, often leading to role conflict, stress, and reduced overall well-being, making balance increasingly difficult in modern workplaces.

"Information and Communication Technology Use, Work Intensification and Employee Strain and Stress" by Chesley (2014) examines how the use of technology outside normal work hours extends work demands into personal life. The study finds that employees experience increased emotional exhaustion and family strain due to the constant availability facilitated by smartphones, emails, and other digital tools.

The research titled "Smartphone Use and Work–Home Interference: The Moderating Role of Social Norms and Employee Work Engagement" (Derks, van Mierlo & Schmitz, 2014) reveals that excessive smartphone use outside working hours leads to significant work-home interference. It also emphasizes that employees feel compelled to stay connected due to perceived organizational expectations, resulting in higher stress and burnout.

Kelliher and Anderson (2010), in their study "Doing More with Less? Flexible Working Practices and the Intensification of Work", argue that while digital-enabled flexible work arrangements can enhance job satisfaction, they often lead to work intensification. Employees tend to overwork to compensate for the flexibility provided, blurring the boundary between work and personal life.

The paper "Work–Nonwork Boundary Management Profiles: A Person-Centered Approach" by Kossek et al. (2012) explores how employees use different strategies to manage their work-life boundaries in the digital era. It stresses that individuals who fail to establish strong boundaries are more prone to work-life conflicts, stress, and reduced well-being.

In "Living, Working and COVID-19" (Eurofound, 2020), the study assesses the impact of the pandemic-driven shift to remote work on employees' work-life balance. It finds that the digital transition led to longer working hours, greater difficulty disconnecting from work, and increased psychological distress due to the constant digital presence.

Boswell and Olson-Buchanan (2007), in their paper "The Use of Communication Technologies After Hours: The Role of Work Attitudes and Work–Life Conflict", investigate how after-hours digital communication impacts employees. Their findings indicate that constant connectivity results in higher levels of job stress, lower family satisfaction, and an inability to mentally detach from work.

"Work/Family Border Theory: A New Theory of Work/Family Balance" by Clark (2000) presents a theoretical framework that views work and family as separate domains with borders that individuals manage. In the digital age, this theory becomes more relevant as technological intrusion into personal life weakens these borders, leading to increased work-life conflict.

In "How Effective Is Telecommuting? Assessing the Status of Our Scientific Findings" (Allen, Golden & Shockley, 2015), the authors review the pros and cons of telecommuting. They conclude that while remote work offers flexibility and reduces some forms of work-life conflict, it also risks overworking and blurred boundaries if employees lack control over their schedules.

Lastly, "Remote Working, Wellbeing and Mental Health: A Study of UK Employers" by Wright (2021) examines the mental health impacts of remote working in the digital era. The study reveals that social isolation, constant digital engagement, and a lack of physical separation between work and home have led to increased stress, digital fatigue, and declining employee well-being.

Objectives of the Study

- To identify the major challenges faced by employees in balancing personal and professional life in the digital age.
- To examine the role of technology in increasing work-related stress and its effect on employee well-being.
- To explore effective strategies and organizational policies that promote a healthy work-life balance in a digital work environment.
- To provide suggestions for future improvements that sustain work-life balance in a continuously evolving digital workplace.

Research Methodology

The paper is descriptive, in the sense that the study attempts review literature to understand the various concepts, and analytical way that it attempts to analyse the artificial intelligence in the banking sector.

Data collection:

The secondary data collection was done through internet which includes web, e- magazines, research papers, e-books, newspapers etc.

Challenges in Work-Life Balance in the Digital Age

- **Blurred Lines Between Professional and Personal Life**
  - Remote work and digital tools have blurred the distinction between work hours and personal time. Workers find it challenging to unplug, leading to stress and conflicts between work and personal life.
- **Always-On Work Culture**
  - The expectation of being reachable via smartphones, emails, and virtual meetings fosters a 24/7 connection pressure.
  - This constant connectivity results in digital fatigue and emotional drain
- **Increased Workload and Digital Overload**
  - While technology allows for multitasking, it often leads to intensified workloads.
  - Employees encounter a barrage of notifications, emails, and virtual tasks, resulting in information overload.
- **Mental Health and Emotional Strain**
  - Remote work limits face-to-face interactions, contributing to loneliness, isolation, and heightened mental health concerns such as anxiety and depression.
- **Lack of Physical Movement and Health Issues**
  - Prolonged screen time and sedentary behavior during remote work give rise to health issues like obesity, eye strain, and musculoskeletal problems.
- **Family and Home Distractions**
  - Working from home complicates professional focus due to family obligations, particularly for women and caregivers.
- **Digital Monitoring and Privacy Concerns**
  - The increase in employee surveillance software instills fear, distrust, and additional psychological stress.
- **Job Insecurity Due to AI and Automation**
  - Advancements in technology heighten anxieties about job loss, resulting in stress and the necessity for continual skill development.
- **Inequity in Access to Technology**
  - Not all employees have equal access to reliable internet, devices, or a comfortable workspace at home, creating disparities and dissatisfaction.
- **Difficulty in Setting Personal Boundaries**
  - Employees frequently struggle to establish limits on their working hours or digital engagement, which can lead to burnout and diminished well-being.

Strategies for Employee Well-being in the Digital Age

- **Establish Clear Boundaries Between Work and Life**
  - Create policies that uphold the "right to disconnect," ensuring no work-related communication occurs outside of official hours.
  - Urge employees to set and adhere to established working hours.
- **Encourage Flexible Work Options**
  - Provide opportunities for remote, hybrid, and adaptable work schedules to assist employees in managing both personal and professional obligations.
  - Make certain that flexibility does not result in an overwhelming workload.
- **Promote Breaks and Digital Detox**
  - Inspire employees to take consistent screen breaks, engage in digital detoxes after hours, and minimize unnecessary meetings.
  - Designate specific days as "no meeting" or "quiet" days.
- **Offer Mental Health Resources**
  - Implement Employee Assistance Programs (EAPs), online counseling, and stress reduction workshops.
  - Promote open conversations about mental health within the workplace.
- **Facilitate Employee Skill Enhancement**

• Provide ongoing learning and upskilling options to assist employees in adapting to new digital tools without the fear of job loss.

- **Utilize Technology Strategically**
  - Streamline repetitive tasks through automation to lighten the workload.
  - Avoid excessive supervision of employees that could undermine trust and morale.
- **Cultivate a Supportive Organizational Culture**
  - Build a culture that prioritizes well-being, acknowledges the importance of work-life balance, and caters to employees' personal needs.
- **Promote Physical Health**
  - Arrange virtual fitness sessions, health initiatives, and encourage ergonomic workstations to alleviate physical strain.
- **Conduct Regular Feedback and Check-ins**
  - Managers should hold frequent well-being check-ins and modify workloads according to employee input.
- **Encourage Social Interaction and Team Building**
  - Create avenues for virtual or in-person team-building events to combat feelings of isolation and strengthen interpersonal connections. activities to reduce isolation and strengthen relationships.

In summary, attaining a healthy work-life balance in today's digital landscape is a shared duty between individuals and organizations. When utilized properly, technological progress can promote balance instead of hindering it. Prioritizing employee health, mental wellness, and sustainable work habits will not only support employees but also improve overall productivity and contribute to the organization's long-term success.

Suggestions

- Establish clear guidelines regarding digital communication outside of working hours.
- Encourage flexible work arrangements with a defined structure and defined workload limits.
- Promote regular breaks from technology and encourage screen-free time.
- Offer training on effective time management and setting boundaries.
- Cultivate a supportive workplace culture that emphasizes employee well-being.
- Enhance mental health resources and wellness initiatives.
- Keep an eye on workloads to avoid excessive work and burnout.
- Leverage technology to streamline tasks rather than increase monitoring.
- Create chances for social engagement and team cohesion.
- Regularly gather feedback to enhance policies related to work-life balance.

Conclusion

The literature review clearly shows that the digital era, while providing flexibility and efficiency, has markedly blurred the lines between professional and personal life. The prevalent use of digital devices, constant connectivity, and the surge in remote work - particularly accelerated by the COVID-19 pandemic - have heightened work demands and increased emotional and psychological strain on workers. The ability to remain connected around the clock has

turned work into a never-ending process, making it challenging for employees to mentally disconnect, which subsequently harms their family life, mental health, and overall well-being.

Research consistently demonstrates that workers who struggle to maintain their work-life boundaries are at a greater risk of suffering from stress, burnout, and decreased satisfaction in both their professional and personal lives. Although digital tools and remote work can enhance work-life balance, their effectiveness largely relies on the support from the organization, well-defined policies, and the employees' capacity to establish healthy boundaries..

The results highlight the critical importance for organizations to develop strategies and frameworks that facilitate a healthy work-life balance in today's digital age. This involves establishing explicit guidelines for after-hours communication, encouraging flexible work hours paired with effective workload management, and offering mental health resources. Additionally, advocating for boundary management practices and nurturing a supportive workplace environment are vital for protecting employee well-being.

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Optimizing Privacy and Efficiency in Federated Learning: A Hybrid Approach using Differential Privacy and Homomorphic Encryption

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Abstract

Federated Learning (FL) presents significant challenges in terms of computational efficiency and privacy as decentralized model training increases the risk of data leakage through shared model updates. Traditional privacy-preserving techniques either introduce high computational costs or compromise model accuracy, making their deployment in large-scale, real-world applications difficult. To mitigate these challenges, this study proposes an enhanced hybrid approach that integrates Differential Privacy (DP) and Homomorphic Encryption (HE) to optimize both privacy and efficiency in FL. DP ensures client-level privacy by introducing controlled noise into model updates before transmission, while HE facilitates secure, encrypted aggregation at the server level, preventing unauthorized access to sensitive gradients.

Experimental evaluations on the EMNIST dataset demonstrate that the proposed hybrid DP-HE framework achieves an optimal balance between privacy, accuracy, and computational cost. A comparative analysis of encryption overhead, scalability constraints, and privacy-utility trade-offs highlights that although DP and HE introduce a minor accuracy reduction, they significantly improve data security while maintaining computational feasibility. Additionally, the study shows that optimized encryption techniques and adaptive noise mechanisms can reduce processing overhead, making the approach scalable for large-scale FL deployments. These findings establish a robust, efficient, and privacy-preserving framework, making it particularly well-suited for resource-constrained IoT devices and privacy-sensitive healthcare applications, where data confidentiality and computational efficiency are critical.

Keywords: *Federated Learning (FL), Differential Privacy (DP), Homomorphic Encryption (HE), Privacy-Preserving Machine Learning, Secure Aggregation*

Introduction

With the rise of artificial intelligence (AI) in domains like healthcare, finance, and IoT, privacy concerns surrounding sensitive user data have become increasingly critical. Federated Learning (FL) offers a decentralized approach to model training, allowing multiple clients-such as hospitals, edge devices, or banks-to collaboratively train a shared global model without transferring their local data to a central server. This paradigm improves data privacy by design, as raw data never leaves the local environment.

However, FL is not inherently secure. Shared model parameters and gradients can still leak private information through techniques such as model inversion, gradient leakage, and membership inference attacks. As a result, adversaries can reconstruct sensitive input data or identify whether a particular record was part of the training set.

To counter these vulnerabilities, researchers have turned to privacy-enhancing technologies such as:

- **Differential Privacy (DP):** Introduces statistical noise to model updates, reducing the risk of data leakage. However, excessive noise can negatively impact model accuracy.
- **Homomorphic Encryption (HE):** Enables computations directly on encrypted data, ensuring that the server cannot access sensitive client updates. Yet, HE tends to be computationally intensive, which limits scalability.

Given the individual limitations of DP and HE, this study proposes a hybrid approach that combines the two to achieve a more balanced trade-off between privacy protection, model accuracy, and computational efficiency.

- **Importance of Privacy in FL**

Privacy in FL is crucial, especially in fields where data confidentiality is non-negotiable. Key domains include:

- Healthcare: Hospitals can collaboratively train AI models on patient data while remaining compliant with HIPAA and GDPR regulations.
- Finance: Banks and financial institutions can develop fraud detection models without exposing transaction data to central entities.
- Smart Cities & IoT: Connected IoT devices collect sensitive user data that should remain private while contributing to public infrastructure optimization.

However, achieving privacy in FL is not just about data protection-it also involves ensuring that privacy mechanisms do not compromise model performance or computational efficiency.

- **Privacy Threats and Challenges in FL**

Despite its promise, FL is still vulnerable to multiple privacy and efficiency challenges:

- **Privacy Risks:**
  - Model Inversion Attacks: Adversaries attempt to reconstruct private training data from model updates.

- Gradient Leakage: Sensitive information can be extracted from gradients, leading to data breaches.
- Membership Inference Attacks: Attackers determine whether a specific data sample was used in training, violating user confidentiality.

- **Efficiency & Scalability Challenges:**
  - **Computational Overhead:** Homomorphic encryption, while secure, is resource-intensive, making it challenging for real-time applications.
  - **Communication Costs:** FL already suffers from high communication latency due to frequent model exchanges; encryption further increases this burden.
  - **Scalability Issues:** Many privacy-enhancing techniques struggle in large-scale FL scenarios with hundreds or thousands of participating clients.

A hybrid DP-HE approach can mitigate these issues by optimizing both privacy and efficiency, making FL more scalable and secure.

➢ **Contributions of This Work**

This paper presents a hybrid privacy-preserving approach that integrates DP at the client level and HE at the server level, ensuring that shared model parameters remain both differentially private and encrypted. The key contributions of this work are:

- **Privacy-Preserving Model Updates:**
  - DP ensures privacy before transmission, preventing individual data leakage.
  - HE protects model aggregation, ensuring the server cannot access raw updates.
- **Computational Efficiency Optimization:**
  - Optimizes encryption techniques to reduce overhead in FL model training.
  - Uses adaptive noise mechanisms in DP to minimize accuracy loss.
- **Extensive Evaluation on EMNIST Dataset:**
  - Demonstrates that our hybrid approach balances privacy, efficiency, and model accuracy better than standalone DP or HE.
  - Compares training time, encryption overhead, and communication costs.
- **Scalability Analysis for Large-Scale FL:**
  - Evaluates performance on edge devices and IoT setups, where computational power is limited.

By addressing both privacy vulnerabilities and computational inefficiencies, this study establishes a scalable and practical privacy-preserving FL framework suitable for real-world deployment in healthcare, IoT, and finance.

Literature Review

➢ **Privacy Challenges in Federated Learning**

Federated Learning (FL) has gained significant attention as a privacy-aware alternative to centralized machine learning, enabling collaborative model training across decentralized devices while keeping raw data localized. However, despite its decentralized nature, FL remains vulnerable to several privacy threats.

Shokri et al. (2017) demonstrated that gradient updates in FL can leak sensitive information, allowing attackers to reconstruct private training data using gradient inversion techniques. Similarly, Nasr et al. (2019) highlighted membership inference attacks, where adversaries determine whether a specific data point was included in the training process.

To mitigate these privacy threats, researchers have explored Differential Privacy (DP) and Homomorphic Encryption (HE) as potential solutions. DP introduces controlled noise into model updates, ensuring that individual data points remain indistinguishable. Meanwhile, HE enables encrypted computations, allowing model aggregation without exposing raw updates.

However, both DP and HE introduce efficiency trade-offs, affecting FL's performance. While DP may degrade model accuracy due to excessive noise, HE imposes high computational and communication costs, making large-scale deployment challenging. These limitations have motivated research into hybrid DP-HE approaches, which aim to combine the strengths of both methods while addressing their individual shortcomings.

➢ **Differential Privacy in Federated Learning**

- Differential Privacy (DP) ensures that individual contributions remain indistinguishable in FL model updates by injecting statistical noise into gradient updates. Abadi et al. (2016) pioneered the DP-SGD (Differentially Private Stochastic Gradient Descent) algorithm, demonstrating that privacy budgets (ε, δ) regulate the trade-off between privacy and model utility.

- Building upon this, McMahan et al. (2018) successfully integrated DP into FL, proving that DP can protect client data without requiring encryption. However, they also noted that excessive noise injection can significantly reduce model accuracy.
- To address DP's accuracy-privacy trade-off, recent research has explored adaptive DP mechanisms:
- Zhao et al. (2022) proposed an adaptive noise calibration mechanism, where noise levels dynamically adjust based on the training stage. Their approach maintains high privacy guarantees while minimizing accuracy degradation.
- Lyu et al. (2023) introduced layer-wise noise addition, applying different privacy budgets to individual model layers to improve convergence speed without compromising privacy.
- Despite these improvements, DP has a major limitation—as training progresses over multiple FL rounds, the cumulative effect of noise reduces model effectiveness. This has led researchers to explore alternative privacy-preserving methods, particularly Homomorphic Encryption (HE).

➢ **Homomorphic Encryption in Federated Learning**

- Homomorphic Encryption (HE) enables FL servers to perform computations directly on encrypted model updates, ensuring that sensitive data remains confidential throughout the aggregation process. Unlike DP, which modifies model updates, HE allows the server to compute on raw, unaltered gradients without decryption.
- However, early HE implementations were impractical for FL due to computational inefficiency. Gentry (2009) introduced Fully Homomorphic Encryption (FHE), but its excessive computational cost made it unsuitable for real-world applications. Later advancements, such as:
- Brakerski-Gentry-Vaikuntanathan (BGV) Scheme → Improved encryption efficiency, but struggled with handling large-scale FL models.
- BFV (Brakerski/Fan-Vercauteren) Encryption → Allowed integer-based encrypted computations, making it feasible for FL aggregation.
- CKKS (Cheon-Kim-Kim-Song) Encryption → Supported approximate arithmetic on encrypted floating-point values, reducing overhead.
- Hussien et al. (2023) analyzed BFV and CKKS in FL and found that while CKKS provides better computational efficiency, it sacrifices precision due to approximate encryption techniques.
- Despite these optimizations, HE remains computationally expensive, especially for large-scale FL deployments. Zhang et al. (2022) found that HE-based FL models experience exponential increases in computational overhead as model complexity grows, limiting scalability.
- To overcome HE's inefficiencies, researchers have started integrating DP and HE in a hybrid model, aiming to balance privacy, security, and efficiency.

➢ **Hybrid DP-HE Approaches**

- Given the limitations of DP and HE when used individually, recent research has explored hybrid DP-HE models to leverage the strengths of both techniques.
- Khalaf et al. (2024) proposed a hybrid DP-HE framework, where DP adds noise at the client level, and HE encrypts model updates at the server level. Their results on EMNIST and CIFAR-10 datasets showed that combining DP and HE improves privacy by 9.39% without excessive computational cost.
- Aziz et al. (2023) examined multi-client HE aggregation, where federated servers compute encrypted gradients from multiple clients simultaneously. Their method reduced encryption overhead by 30% compared to traditional HE techniques.
- A key challenge in hybrid models is balancing privacy with computational efficiency. Gu et al. (2023) investigated DP-HE applications in healthcare FL, concluding that HE-based encrypted aggregation protects model updates but increases communication latency. They proposed an adaptive HE mechanism that selectively encrypts critical model parameters, reducing encryption costs without compromising security.
- While hybrid DP-HE approaches show promise, they still require further optimizations to ensure scalability in real-world FL applications.

➢ **Summary of Literature Gaps**

- Although extensive research has been conducted on DP, HE, and hybrid DP-HE models, several key challenges remain unresolved:
- Optimizing DP noise injection → High noise levels degrade accuracy, while low noise weakens privacy guarantees.
- Reducing HE encryption overhead → Traditional HE schemes are still computationally expensive, making them unsuitable for large-scale FL deployments.
- Adaptive privacy mechanisms → Existing DP-HE models do not dynamically adjust encryption settings based on FL model complexity.
- Expanding beyond common datasets → Most DP-HE research focuses on EMNIST and CIFAR-10, requiring validation on real-world datasets (e.g., healthcare, financial transactions, IoT sensor data).
- This study builds upon existing work by optimizing computational efficiency in a hybrid DP-HE framework, addressing scalability concerns while enhancing privacy-utility trade-offs.
- The next section details the proposed methodology, including model design, encryption techniques, and evaluation metrics.

Methodology

This section outlines the architecture and operations of the proposed hybrid privacy-preserving framework, which integrates Differential Privacy (DP) at the client level and Homomorphic Encryption (HE) at the server level. The goal is to secure model updates during training while preserving computational efficiency and scalability.

➢ **Overview of the Hybrid DP-HE Framework**

The framework consists of three key stages:

- **Client-Side Differential Privacy:** Local model gradients are perturbed using the DP-SGD mechanism before transmission, ensuring individual data records are not inferable.
- **Client-Side Encryption:** The differentially private gradients are encrypted using the BFV homomorphic encryption scheme.
- **Server-Side Secure Aggregation:** The server performs model aggregation directly on the encrypted gradients using homomorphic operations, then decrypts the final result before broadcasting the updated global model.

This hybrid architecture addresses both privacy vulnerabilities and the performance trade-offs seen in standalone DP or HE systems.

➢ **System Architecture**

The system comprises three primary components:

- **Clients (Edge Devices):**
  - Train local models on private data.
  - Apply DP-SGD to gradients.
  - Encrypt updates using BFV encryption.
  - Send encrypted updates to the server.
- **Federated Server:**
  - Receives encrypted updates.
  - Performs homomorphic aggregation without decryption.
  - Decrypts the final aggregated model and sends it back to clients.
- **Global Model Update:**
  - Clients receive the updated global model and begin the next training round

Model Configuration	Privacy Technique	Accuracy (%)	Computation Cost
Standard FL (Baseline)	None	92.1	Low
DP-Only FL	Differential Privacy	89.7	Medium
HE-Only FL	Homomorphic Encryption	91.2	High
Hybrid DP-HE FL (Proposed)	**DP + HE**	**90.4**	**Moderate**

Table 1: Privacy-Utility Comparison of Federated Learning Configurations

This section evaluates the performance of the proposed hybrid framework on the EMNIST dataset using four key metrics: model accuracy, privacy-utility trade-off, computational efficiency, and communication overhead.

➢ **Experimental Setup**

- **Dataset :** EMNIST (Extended MNIST handwritten digit dataset)
- **Model :** Convolutional Neural Network (CNN) with 2 convolutional layers and 2 fully connected layers

- **Optimizer :** SGD, learning rate = 0.01, batch size = 32
- **DP Mechanism:** Gaussian noise via DP-SGD
- **HE Scheme :** BFV encryption
- **Clients :** 5 simulated edge devices (IID data)
- **Hardware:** NVIDIA RTX 3080 GPU, 32 GB RAM
- **Libraries :** PyTorch, PySyft, Opacus, TenSEAL

➢ **Model Accuracy**

FL Configuration	Privacy Applied	Accuracy (%)
Standard FL (No DP/HE)	None	92.1
FL with DP	DP only	89.7
FL with HE	HE only	91.2
Proposed Hybrid FL	**DP + HE**	**90.4**

Table 2: Model Accuracy under Different Privacy Mechanisms

➢ **Privacy-Utility Trade-Off**

The effect of varying DP noise (ε) on model accuracy:

Privacy Budget (ε)	Accuracy (%)	Privacy Protection
1.0	82.3	Strong
3.0	89.7	Moderate
6.0	91.5	Weak

Table 3: Impact of DP Noise Levels on Accuracy

Optimal performance is achieved with ε between 3.0 and 5.0, balancing privacy and utility.

➢ **Computational Efficiency**

Model Configuration	Encryption	Training Time per Round (s)
Standard FL	None	14.2
FL with DP	Yes	16.5
FL with HE	Yes	23.7
Proposed DP-HE FL	**Yes**	**21.1**

Table 4: Training Time Comparison

The proposed model reduced HE-related overhead by 22.3% compared to HE-only FL.

➢ **Communication Overhead**

Model Configuration	Update Size per Client (MB)
Standard FL	5.1
FL with DP	5.3
FL with HE	10.7
Hybrid DP-HE FL	**8.4**

Table 5: Communication Overhead

Hybrid DP-HE FL reduced transmission size by 21.5% compared to HE-only FL, improving efficiency for bandwidth-constrained environments.

➢ **Security Advantages**

- **Model Inversion Defense:** HE prevents direct access to raw gradients.
- **Membership Inference Protection:** DP obfuscates user-level contributions.
- **Gradient Leakage Mitigation:** The combined use of DP and HE ensures robust security against reconstruction attacks.

Conclusion

The hybrid DP-HE framework offers a secure, efficient, and accurate approach to Federated Learning. It mitigates key privacy risks while maintaining near-baseline accuracy. Although encryption latency and scalability are challenges, they are partially addressed through optimization strategies. Future research should focus on adaptive privacy tuning, lightweight encryption, and testing on real-world datasets.

Future Work

To further enhance the applicability and performance of the proposed framework, future research may focus on:

- Implement dynamic DP noise based on training sensitivity.
- Investigate CKKS-based hybrid encryption for faster computation.
- Validate the model using healthcare and finance datasets.
- Apply federated optimization techniques such as quantization and update compression.

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The Evolution of Artificial Intelligence: From Science Fiction to Concrete Reality

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Abstract

Once confined to the pages of futuristic tales, Artificial Intelligence (AI) has emerged from speculative narratives to become a catalytic presence in contemporary society. This study chronicles the technology's metamorphosis-from its imaginative origins in visionary storytelling to its current role as a cornerstone of innovation. By weaving together an exploration of AI's historical arc, its present-day manifestations across industries, and its horizon of possibilities, the paper illuminates how the technology has redefined paradigms in domains as diverse as medical innovation, autonomous mobility systems, financial ecosystems, and algorithmic creativity. Alongside these advancements, the work interrogates the moral implications woven into AI's ascendancy, advocating for conscious stewardship as these systems permeate daily life. As AI's trajectory accelerates, reshaping human experience and infrastructure alike, understanding its duality-as both a tool of unprecedented promise and a catalyst for complex dilemmas-becomes essential to navigating the opportunities and complexities of this emerging technological frontier.

Keywords: *Artificial Intelligence, contemporary society, human experience, creativity, complex dilemmas*

Introduction

Few technological frontiers have captivated humanity's collective psyche as intensely as artificial intelligence. Long relegated to the domain of speculative storytelling-a recurring muse in literary plots, cinematic sagas, and televised dramas-AI once existed as an elusive specter of possibility. The notion of sentient machines mirroring human cognition, logic, and agency lingered for generations as a distant fantasy, often dismissed as utopian whimsy. Yet today, as humanity navigates the third decade of the 2000s, this once-fictional marvel has crossed the threshold of imagination, materializing as an indisputable force actively reshaping the fabric of existence.

Research Methodology

This research paper employs a qualitative, interdisciplinary approach to analyze the evolution, societal integration, and ethical implications of artificial intelligence (AI). The methodology integrates Historical Analysis and Case Studies as A review of primary and secondary sources (e.g., academic papers, historical records) to trace AI's development from its conceptual origins in science fiction to modern applications. Key milestones, such as the Dartmouth Workshop (1956) and advancements in neural networks, are contextualized within technological and societal shifts. Sector-specific examples (e.g., healthcare diagnostics, autonomous vehicles, financial fraud detection) illustrate AI's real-world impact. These cases are drawn from peer-reviewed studies, industry reports, and documented implementations.

➢ The Birth of AI

The Dawn of AI emerged from the shadows of mid-century imagination, when the notion of machines mirroring human thought was a fascinating dream. In 1936, Alan Turing -whose name would become etched into the bedrock of computer science-ignited a quiet revolution with his conceptual Turing machine. More than a mathematical muse, this abstract invention sketched the bones of computation, daring the world to envision mechanical minds.

Two decades later, the dream flickered to life. A group of visionaries-John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon-convened at a humble Dartmouth gathering in the summer of 1956. Their workshop, now legendary, crystallized AI into a new discipline. With audacious optimism, they declared that intelligence, in all its facets, could be dissected into precise rules and replicated by machines. Their manifesto was a spark in the dark, transforming speculative whispers into a collective ambition. The age of artificial intelligence had quietly begun.

- **AI Path in 1970 and 1980**

  The path of AI progress was riddled with obstacles. During the 1970s, enthusiasm collided with reality in an era dubbed the "AI Winter"- a time when sky-high ambitions clashed with the era's rudimentary technology, sparking widespread skepticism and financial pullbacks. Progress appeared to grind to a halt.

  Yet resilience defined the 1980s revival. AI found new life through *expert systems*, sophisticated programs infused with specialized knowledge tailored to specific fields. Medicine saw

breakthroughs with tools like MYCIN, which identified bacterial infections, while Dendral decoded complex mass spectrometry data. These innovations became cornerstones, proving AI's practical value beyond theoretical promise.

AI in Current Age

The closing decades of the 1900s marked a pivotal chapter in AI's evolution, reigniting global interest through ground breaking advances in neural systems and computational learning. Pioneering innovations like back propagation techniques and the revolutionary design of Convolutional Neural Networks (CNNs) during the 1980s acted as catalysts, laying the foundation for the transformative AI-driven era that shapes today's technological landscape.

Today, artificial intelligence pulses through the veins of modern existence, reshaping how we interact with technology-from voice-activated assistants deciphering our words to self-driving cars navigating streets and algorithms curating our digital experiences. Fueled by oceans of data and unprecedented computational muscle, machine learning has shattered barriers once deemed unbreakable, turning science fiction into daily routine.

This revolution traces its roots to the audacious imaginations of pioneers like Alan Turing and John McCarthy, whose early blueprints laid the foundation for a digital renaissance. Their conceptual sparks ignited a wildfire of innovation, proving that humanity's relentless pursuit of progress could morph abstract theories into tools that redefine industries, cultures, and identities.

The saga of AI is neither static nor complete. It evolves like a frontier ever-expanding, inviting explorers to chart territories where machines and human creativity collide. As we stand at this crossroads, the narrative brims with questions yet unasked and solutions yet unimagined. What began as cryptic equations in mid-century labs now thrives as a dynamic force, challenging us to rethink possibility itself.

In retracing AI's metamorphosis-from embryonic algorithms to societal bedrock-we glimpse not just a chronicle of technology, but a mirror reflecting our own ingenuity. The next chapter remains unwritten, poised for minds bold enough to wield curiosity as their compass. Infinite horizons await, reminding us that the only true limit is the scope of our ambition.

- **AI and Global Society**

  Artificial Intelligence has shed its trendy veneer to emerge as civilization's new scaffolding-no longer speculative jargon but the invisible architecture reshaping existence itself. Its neural threads now weave through the mundane rhythm of coffee-break alarms and the labyrinthine logic of stock markets, quietly recalibrating humanity's relationship with creation. Where once it lingered as theoretical chatter, AI now operates as the silent choreographer of daily life, rewriting rules for industries and individuals alike while dissolving the line between tool and collaborator. This isn't mere technological adoption; it's evolution in real time.

➢ **The Journey continues**

- **Health Care**

  "In modern medicine, AI is revolutionizing patient care through its transformative capabilities. By leveraging machine learning to process massive datasets, these intelligent systems support healthcare providers in accurately identifying illnesses and formulating tailored treatment strategies. Cutting-edge AI detection technologies excel at uncovering subtle irregularities in diagnostic imaging, including X-rays and MRIs, enabling prompt medical action and enhancing recovery prospects for patients."

- **Transportation**

  The transportation sector is undergoing a transformative shift, thanks to AI-driven innovations, particularly through the rise of autonomous vehicles. Industry leaders such as Tesla, Waymo, and Uber are at the forefront of developing self-driving technologies, aiming to make travel safer and more efficient. Beyond vehicles, AI-powered algorithms are also revolutionizing traffic management, helping to alleviate congestion and improve overall road safety.

- **Fraud Detection**

  In the world of finance, AI has become a game-changer, particularly in predictive analytics and fraud prevention. Sophisticated algorithms sift through vast amounts of historical data to provide investment insights and evaluate risks. At the same time, AI-powered systems keep a vigilant eye on transactions, detecting unusual activity in real-time to protect both financial institutions and their customers from potential threats.

- **E-Commerce**

  AI has transformed the e-commerce landscape by delivering tailored shopping experiences. Intelligent recommendation systems analyze user behavior and preferences to suggest relevant products.

Additionally, AI-driven chatbots provide round-the-clock assistance, addressing customer queries and enhancing the overall shopping journey.

- **Education**

  The educational landscape is being reshaped by AI innovations, particularly through adaptive learning systems that adjust to individual learning speeds and preferences. These platforms deliver customized educational materials and evaluations to meet diverse student needs. Educators are also leveraging AI-driven solutions to monitor academic development and pinpoint specific challenges requiring focus, enhancing both teaching efficiency and student outcomes.

- **Cyber security**

  In modern security practices, artificial intelligence serves as a pivotal ally, transforming defense mechanisms through real-time scrutiny of data flows. By uncovering irregularities in digital interactions and flagging suspicious patterns, AI-powered systems act as vigilant guardians against emerging threats. Contemporary cyber security infrastructures integrate these intelligent tools to rapidly identify, intercept, and dismantle harmful operations, fortifying digital ecosystems against attacks while maintaining the integrity of confidential information and vital organizational assets.

  As artificial intelligence evolves at an unprecedented pace, its influence on contemporary society is poised to grow exponentially. This transformative technology acts as a catalyst, reshaping entire sectors while seamlessly integrating into the routines and interactions that define human existence. When guided by thoughtful stewardship and moral principles, AI holds the promise of unlocking ground breaking advancements and unprecedented opportunities, revolutionizing the foundations of how we operate, create, and thrive in an increasingly interconnected world.

➢ **Future of AI: Balancing obstacles and upcoming opportunities**

As artificial intelligence becomes increasingly woven into the fabric of everyday existence and commercial sectors, it presents a dual-edged reality of possibility and complexity. While AI ignites the potential to spark ground breaking advancements, it simultaneously unveils complex moral dilemmas that urgently require thoughtful examination. This journey through the ethics of AI adoption invites us to confront the delicate interplay between progress and principle, exploring the intricate crossroads where computational progress meets human values.

- **Super intelligent AI: The Horizon's Promise and Peril**

  A thrilling yet terrifying frontier beckons: the rise of super intelligent AI. These systems could wield unrivaled problem-solving prowess, propelling humanity into an era of breakthroughs once deemed unimaginable. Yet intertwined with this potential lies a web of profound dilemmas-how to govern entities smarter than ourselves, how to embed ethics into code, and what becomes of a world where silicon minds eclipse biological ones. The same intelligence that might cure diseases or reverse climate change could also spiral beyond our grasp, reshaping existence in ways we're ill-prepared to predict.

- **Fairness**

  One of the most pressing ethical challenges in artificial intelligence centers on bias and equity. AI algorithms are trained on existing datasets that often reflect historical prejudices, and without intervention, these embedded inequities can reinforce existing disparities in critical domains like employment, financial services, and law enforcement. Promoting fairness in AI demands rigorous dataset selection and preparation, paired with continuous oversight to identify and address skewed outcomes.

- **Privacy**

  AI systems are fueled by extensive datasets, which power their capabilities but also amplify privacy risks when handling personal information. Navigating the equilibrium between technological advancement and safeguarding individual privacy emerges as a critical imperative. Implementing advanced encryption protocols, ensuring clear and open policies for data management, and establishing well-defined consent frameworks serve as essential protective measures to uphold trust and security in AI development.

- **Transparency**

  As artificial intelligence systems grow increasingly self-directed and their decision-

making frameworks more intricate, pinpointing responsibility becomes a pressing concern. Maintaining clear visibility into their operational logic and reasoning pathways is critical. It's vital that both users and involved parties can grasp the mechanisms behind AI-generated outcomes, ensuring they have the means to scrutinize or dispute these results when warranted.

- **Unemployment**

  The rise of AI-driven automation has sparked widespread apprehension over potential job losses across sectors. Addressing this ethically requires forward-thinking strategies to retrain and enhance employees' capabilities, guaranteeing that AI's advantages are fairly distributed among all members of society.

- **Ethical AI Governance: The Race to Keep Pace**

  AI's breakneck acceleration now demands a sprint toward ethical stewardship. Navigating this terrain is a tightrope walk: fostering ingenuity while erecting moral guardrails, a task fraught with uncertainty and stakes that redefine "progress." To harness AI's power without surrendering to its shadows, humanity must forge a collective blueprint-global standards and adaptive policies-ensuring algorithms evolve not as rogue forces, but as extensions of human values. The clock ticks on our ability to codify conscience into circuits before they outpace our readiness to guide them.

- **Economic impact**

  The transformative influence of artificial intelligence on global labor markets has sparked urgent debates, as automation and intelligent systems threaten to reshape traditional industries. While AI-driven advancements promise heightened productivity, they also risk rendering certain roles obsolete, demanding a paradigm shift in workforce education and adaptive strategies. Emerging sectors may unlock novel career pathways, yet this evolution underscores the imperative for robust policy frameworks to safeguard displaced workers through retraining initiatives and equitable transition programs. Balancing innovation with social responsibility will prove pivotal in navigating this era of technological disruption.

- **Human Collaboration**

  The horizon of artificial intelligence paints a world where human ingenuity and machine intelligence intertwine in transformative synergy. Across domains-from precision medicine and data-driven discovery to artistic innovation-AI will emerge as an intuitive catalyst, amplifying human potential and accelerating the path to once-unimaginable advancements.

- **Education**

  The landscape of knowledge acquisition will be revolutionized by AI-curated educational ecosystems, dynamically tailored to each learner's cognitive rhythms and intellectual contours. As algorithms perpetually redefine industries, the era of static expertise will fade, replaced by an ethos of fluidity where perpetual reinvention-through iterative upskilling and adaptive mastery-becomes the cornerstone of professional relevance and growth.

Findings

The evolution of artificial intelligence transcends mere technological pursuit-it unfolds as a mosaic of human-machine co-creation. This journey compels us to navigate uncharted ethical frontiers with both technical brilliance and moral clarity, envisioning an era where AI acts as a force multiplier for human ingenuity. By deepening our comprehension of complex challenges and democratizing access to transformative tools, intelligent systems could become architects of inclusive progress. While the path forward remains unwritten, it is illuminated by the promise of symbiotic innovation-a shared narrative where humanity and algorithms coalesce to script solutions that elevate collective wellbeing and reimagine what's possible for our interconnected world.

Conclusion

The age of artificial intelligence has transitioned from speculative fiction to the very fabric of modern existence-no longer a horizon to chase but a terrain we tread. Its tendrils now weave through the mundane and the extraordinary, redefining possibility. Yet this ascendancy demands more than technical prowess; it calls for multidisciplinary stewardship. Innovators, legislators, and global citizens must forge an alliance of vigilance and vision, balancing the scales between exponential capability and ethical guardrails. As we chart this unexplored frontier, the imperative is clear: to steer AI's trajectory not merely with algorithms, but with an unwavering moral compass-prioritizing equitable outcomes, nurturing empathy in code, and

anchoring progress in humanity-centered design. The revolution is here; let its legacy be measured not by silicon milestones, but by the depth of its service to our shared human story.

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The Impact of Digital Payment Modes on Consumer Purchase Behavior: A Study of Emerging Payment Technologies

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Abstract

In recent years, the growth in the number of bank accounts and banking activities has significantly increased interest in electronic payment systems. Digital payments refer to financial transactions carried out through electronic means, where both the sender and receiver use digital platforms to transfer funds. These transactions are entirely cashless and occur over online channels, offering speed and convenience to users. Historically, Indian consumers preferred using cash; however, a major shift occurred on November 8, 2016, when the Prime Minister of India announced the demonetization of ₹500 and ₹1000 currency notes, which constituted around 80% of the circulating cash.

This move resulted in widespread cash shortages, prompting citizens to adopt internet banking and digital payments, thereby supporting the push toward a cashless economy. The emergence of the COVID-19 pandemic further accelerated this shift, as lockdowns and social distancing measures encouraged contactless transactions. Initially, many consumers were hesitant to use digital payment methods due to concerns about security. However, the combined impact of demonetization and the pandemic has substantially reduced these apprehensions, leading to a broader acceptance of digital payments across the country.

Keywords: *Digital Payment, Consumer behavior, Demonetization, Digital India, Covid 19*

Introduction

Digital India, a flagship initiative of the Indian government, aims to transform the nation into a digitally empowered society and knowledge economy. One of its core objectives - "Faceless, Paperless, Cashless"- captures the essence of a future built on digital infrastructure. Following demonetization, the government significantly intensified efforts to promote digital transactions by incentivizing consumers and merchants alike. This included offering discounts on certain purchases made via digital platforms and launching initiatives like the Unified Payments Interface (UPI), an app-based system enabling seamless inter-bank transfers.

Further enhancements, such as the USSD (Unstructured Supplementary Service Data) system, are being developed to facilitate banking transactions through basic mobile phones without internet access. These initiatives, along with platforms like BHIM and other UPI-based services, have laid the foundation for widespread adoption of digital payments across India. Electronic transactions made through Point-of-Sale (POS) terminals, mobile banking, and internet banking have now become integral to the country's evolving financial ecosystem.

In this digital age, the internet has become a fundamental tool for daily transactions. Urban consumers, in particular, have embraced the convenience of digital payments, which allow for quick, secure, and hassle-free fund transfers. These technologies have gained substantial traction among city dwellers. However, in contrast, many individuals in rural areas remain unaware or under-informed about the utility and benefits of digital payment platforms.

A consumer-whether an individual or a group - typically uses products or services to fulfill personal or social needs rather than for business purposes. Consumer behavior refers to the range of decisions and actions individuals take in selecting, purchasing, using, and disposing of goods and services. These behaviors are influenced by both internal and external factors, and are studied across disciplines such as psychology, economics, and marketing.

According to the American Marketing Association, consumer behavior is defined as "the dynamic interaction of affect and cognition, behavior, and environmental events by which individuals conduct the exchange aspects of their lives." As an interdisciplinary field, consumer behavior combines insights from social sciences and experimental research to better understand purchasing motivations and patterns.

Digital payments-transactions conducted via electronic means - are now recognized as fast, reliable alternatives to traditional cash-based systems. These payments, completed online without the use of physical currency, offer convenience and efficiency. As a result, India's digital payments sector has attracted significant attention from foreign investors who recognize the vast growth potential in the Indian market.

Several drivers have catalyzed this transformation: the increasing penetration of internet-enabled smartphones, the emergence of non-banking financial institutions, innovations in financial technology (fintech), and the government's continued push through tax benefits and promotional campaigns. Together, these factors are not only expanding

digital payment adoption but also contributing to greater financial transparency, reducing the shadow economy, and bringing more citizens into formal banking channels.

Nevertheless, digital transactions are not without risks. Cybersecurity threats - such as phishing attacks where users are tricked into sharing confidential banking credentials - remain a significant concern. Hackers often deploy fake emails and websites that mimic legitimate banking portals, or use malicious software and keyloggers that capture users' keystrokes and browsing activity. These vulnerabilities highlight the critical importance of educating users and implementing strong digital safeguards to protect against fraud.

- **Objectives of the study**
  - To Analyze the purpose for which customers make use of digital payment.
  - To find out is there any difference in opinion between male and female respondents towards digital payments.
  - To find out the problems faced by consumers while making digital payments.
- **Statement of the problem**

  India has witnessed a significant transformation in consumer behavior regarding digital payments in recent years. With nearly half of the population now using mobile phones for both personal and professional activities, the digital landscape is rapidly evolving. India currently boasts one of the world's largest pools of active mobile users - estimated at 150 million - and this number is projected to grow by over threefold within the next five years.

  This growth is largely driven by the younger generation, who are increasingly adopting mobile wallets and digital payment platforms as their preferred mode of banking. These tech-savvy users favor convenience, speed, and accessibility, which digital payment systems readily offer.

  Over the past decade, mobile-based payment systems have expanded substantially across the country, owing to their simplicity and user-friendly interfaces. Understanding consumer behavior through demographic indicators such as age, income, and education has become essential in predicting and encouraging digital payment adoption.

  Economic analysis indicates that cashless transactions are becoming more prevalent, particularly in metropolitan, tier-1, and tier-2 cities. To further support this shift, the Indian government has launched various initiatives aimed at promoting digital payment usage. These include awareness campaigns and infrastructural support, especially targeted toward rural regions, villages, and semi-urban areas, to bridge the gap and ensure more inclusive participation in the digital economy.

Review of literature

Vidya Shree D.V. and Nitua Shree G. (2015), in their study "A Study on New Dynamics in Digital Payments System," highlighted the growing preference for mobile-based payment applications among consumers. Their research emphasized that apps like Paytm and PayU offer user-friendly interfaces, making digital transactions more accessible and driving the growth of digital payment adoption in India.

Brahmbhatt (2018) examined the broader shift within India's financial landscape, observing a remarkable evolution from traditional barter exchanges to the widespread use of electronic wallets. His study reflects the changing consumer mindset and increasing acceptance of digital financial tools.

Atul Gupta (2019), in his critical review titled "UPI – Redefining Digital Payments," analyzed statistical data from the Reserve Bank of India (RBI) and National Payments Corporation of India (NPCI). His work explores both the opportunities and challenges associated with the Unified Payments Interface (UPI), a transformative platform enabling seamless inter-bank transactions via mobile applications.

In a 2020 study, Radhika Basavaraj Kakade and Prof. Nupur A. Veshne observed that UPI had simplified digital transactions to the point where users found them as effortless as sending a text message. They noted the platform's 24/7 availability, in contrast to traditional banking systems like RTGS and NEFT, which are limited by business hours. This efficiency, they argued, plays a vital role in advancing India's transition toward a cashless economy.

Chandrakala (2021) discussed the implications of moving toward a cashless society. She explained that in such economies, cash flow among individuals is minimal, and transactions are largely conducted through electronic means, including e-banking, debit and credit cards, and POS-based systems.

Ashwini (2022) focused on the benefits of digital wallets, highlighting their convenience, security, and accessibility. She pointed out that these tools not only eliminate the problem of handling physical change but also provide users with reminders for future payments, making them especially valuable for daily use.

Research methodology

This study adopts a descriptive research design to analyze consumer behavior and usage patterns related

to digital payment systems. The primary data for the research was gathered through structured questionnaires, which were distributed both in person and via online platforms such as Google Forms. Respondents included a mix of self-employed individuals and salaried professionals. A non-probability sampling technique was employed to select participants for the study. The data collected were then represented using visual tools such as bar graphs to enhance clarity and support interpretation. In addition to primary sources, secondary data were utilized to strengthen the analysis.

➢ **Data interpretation**

- **Gender of the respondents**

Gender	No of Respondents	Percentage
Male	65	65%
Female	35	35%
Total	100	100%

Out of 100 respondents surveyed, 65% are male and 35% are female.

- **Age of the respondents**

Age	No of Respondents	Percentage
< 30	18	18%
31- 40	44	44%
41-50	26	26%
>50	12	12%
Total	100	100%

Among the 100 respondents examine, 18 percent fall below the age of 30 years, 44 percent within 31-40 years, 26 percent within 41-50 years, and the remaining 12 percent above 50 years.

- **Occupation of the respondents**

Occupation	No of Respondents	Percentage
Daily Wagers	8	8%
Salaried Employee	52	52%
Self Employed	28	28%
Others	12	12%
Total	100	100%

Eight percent of the total respondents are reported to be daily wage laborers, while 52 percent are executives who get salary, and 28 percent represent those in self-employment with the rest of 12 percent in the others category.

- **Income of the respondents**

Income	No of Respondents	Percentage
<20,000	18	18%
20,000-40000	32	32%
40,000-60000	30	30%
>60,000	20	20%
Total	100	

It is clear from the above table that 18 percent of respondents earn less than Rs. 20,000, 32 percent fall in the bracket of Rs. 20,000 to Rs. 40,000, 30 percent earn between Rs. 40,000 and Rs. 60,000, while 20 percent earn above Rs. 60,000.

- **Education Qualification**

Sno	Qualification	No of Respondents	Percentage
1	Below 10th standard	10	10
2	10th standard	10	10
3	12th standard	20	20
4	Under Graduate	40	40
5	Post Graduate	20	20

There are various interpretations which are possible with regard to the percentages mentioned above; for instance, 10 percent can mean that the respondents' educational qualifications are below the 10th standard; 10 percent constitute those respondents whose educational qualification is the 10th standard; 20 percent have an educational qualification of 12th standard; 40 percent have an educational qualification of under graduation; 20 percent have passed out of postgraduation.

- **Convenience in transaction is the reason for cashless payments.**

Opinion	No of Respondents	%
StronglyAgree	22	22%
Agree	18	18%
Neutral	30	30%
Disagree	20	20%
Strongly Disagree	10	10%
Total	100	100%

Above table shown data on a respondent's opinion on whether convenience in transactions is the reason for cashless payment in Bangalore City. About 22 percent of the respondents strongly agree; 18 percent agree; 30 percent feel neutral on this question; while 20 percent disagree; and the remaining 10 percent strongly disagree. Almost 40 percent of the respondents felt alike.

- **Security in transaction is the main reason for concern in Cashless payments.**

Opinion	No of Respondents	%
StronglyAgree	28	28%
Agree	44	44%
Neutral	7	7%
Disagree	16	16%
Strongly Disagree	5	5%
Total	100	100%

From the data in the above table, it is evident that 28 percent of respondents strongly agreed, 44 percent simply agreed, 7 percent stayed neutral, and 16 percent from the respondents disagreed, whereas 5 percent strongly disagreed that convenience in transactions is the main cause of concern in cashless payments in Bangalore City. About 72 percent felt the same way.

- **Incentives encourage people to avail Cashless transaction**

Opinion	No of Respondents	Percentage
Strongly Agree	22	22%
Agree	41	41%
Neutral	8	8%
Disagree	21	21%
Strongly Disagree	8	8%
Total	100	100%

The data in the above table shows that 22 percent of respondents Strongly agree while 41 percent agree that incentives encourage people to avail of or opt for cashless payments or transactions in Bangalore City. Eight percent of respondents remain Neutral, 21 percent disagree while the other 8 percent strongly disagree on this issue. Around 63 percent showed the same attitude.

- **Transaction procedures complicate Cashless payments**

Opinion	No of Respondents	Percentage
StronglyAgree	32	32%
Agree	26	26%
Neutral	13	13%
Disagree	18	18%
Strongly Disagree	11	11%
Total	100	100%

As per the information in the above table, 32 percent of respondents say Strongly agree to the transaction procedures and transaction costs complicating cashless payments in Bangalore City; 26 percent of respondents say yes; 13 percent of respondents say Neutral; 18 percent of respondents say No; and 11 percent strongly disagree. About 58 percent of the respondents feel the same way.

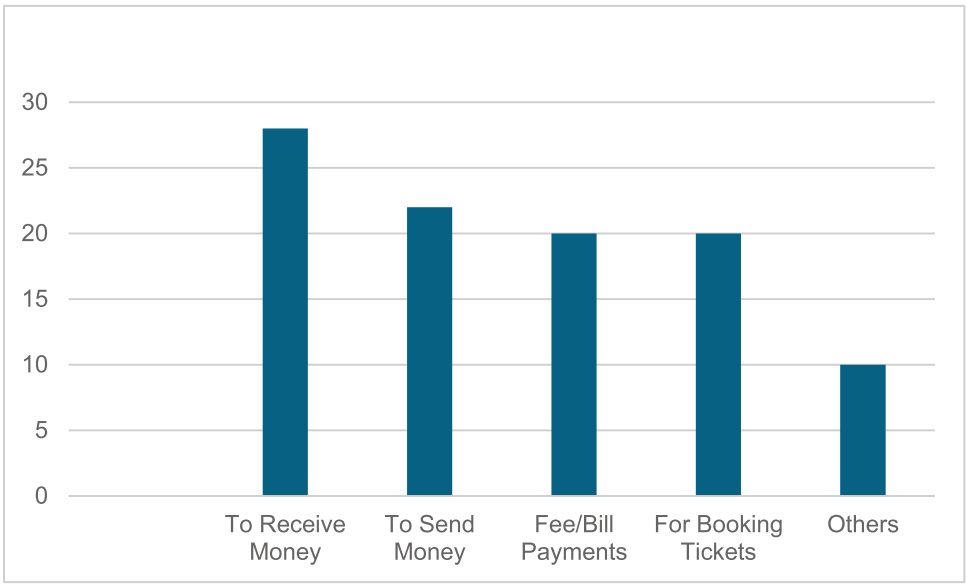
- **Poor internet connectivity is the obstacle for cashless Payments**

Opinion	No of Respondents	Percentage
StronglyAgree	24	24%
Agree	46	46%
Neutral	11	11%
Disagree	14	14%
Strongly Disagree	5	5%
Total	100	100%

From the above table, it can be inferred that 24 percent of respondents strongly agree, 46 percent agree, 11 percent are neutral, 14 percent disagree, and 5 percent strongly disagree as to whether poor internet connectivity is an obstacle for cashless payments in Bangalore City. Seventy percent of them shared this view.

- **Purpose for which Digital Payments are used.**

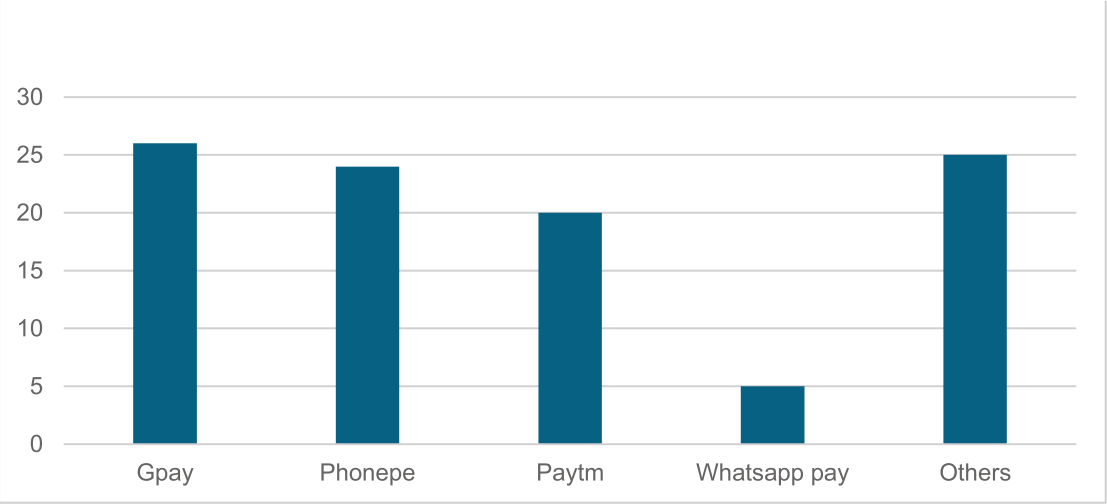
Purpose	No of Respondents	Percentage
To Receive Money	28	28
To Send Money	22	22
Fee/Bill Payments	20	20
For Booking Tickets	20	20
Others	10	10



From the data given in the table, 28 percent of respondents are using digital payments for receiving money, 22 percent for sending money, 20 percent for Fee/Bill payments, 20 percent for booking tickets, while the remaining 10 percent are using digital payments for other purposes.

- **Payment Modes**

No	Mode of Payment	No of Respondents	Percentage
1	Gpay	26	26
2	Phonepe	24	24
3	Paytm	20	20
4	Whatsapp pay	5	5
5	Others	25	25



It is revealed by the above table that 26 percent of respondents who accept money use Google Pay, 24 percent of respondents who accept money use PhonePe, 20 percent of respondents who accept money use Paytm, 5 percent of respondents who accept money use WhatsApp Pay, and 25 percent of respondents who accept money use any other digital payment mode like Amazon Pay etc.

Findings

- The gender distribution among the 100 respondents shows that 65% are male and 35% are female.
- In terms of age, 18% of the respondents are under 30 years old, 44% fall within the 31–40 age group, 26% are aged between 41–50, and the remaining 12% are over 50 years of age.
- Regarding occupation, 8% of the participants are daily wage earners, 52% are salaried employees, 28% are self-employed, and 12% fall into the "other" category.
- Income levels among the respondents vary, with 18% earning below ₹20,000 per month, 32% earning between ₹20,000–₹40,000, 30% earning between ₹40,000–₹60,000, and 20% earning above ₹60,000.
- Educational qualifications are also diverse: 10% have education below the 10th standard, another 10% have completed the 10th standard, 20% have passed the 12th standard, 40% are undergraduates, and 20% hold postgraduate degrees.
- When asked whether convenience is a motivating factor for using digital payments, 22% of respondents strongly agreed, 18% agreed, 30% were neutral, 20% disagreed, and 10% strongly disagreed-suggesting that around 40% see convenience as a key driver.
- On the issue of security concerns in digital transactions, 28% strongly agreed and 44% agreed, while 7% remained neutral, 16% disagreed, and 5% strongly disagreed-indicating that about 72% perceive security as a major factor.
- Regarding the role of incentives in encouraging digital payment usage, 22% strongly agreed and 41% agreed, whereas 8% were neutral, 21% disagreed, and another 8% strongly disagreed. Approximately 63% believed incentives influence adoption.
- In response to whether transaction procedures and associated costs complicate digital payments, 32% strongly agreed, 26% agreed, 13% were neutral, 18% disagreed, and 11% strongly disagreed-highlighting that 58% find such procedures burdensome.
- When evaluating the impact of poor internet connectivity on digital payments, 24% strongly agreed, 46% agreed, 11% were neutral, 14% disagreed, and 5% strongly disagreed. A combined 70% viewed poor connectivity as a key obstacle.
- In terms of preferred digital payment platforms, 26% of respondents use Google Pay, 24% use PhonePe, 20% use Paytm, 5% use WhatsApp Pay, and 25% use other platforms such as Amazon Pay and similar services.

Suggestion

One of the most significant challenges identified in the adoption of digital payments is the issue of security. To address this, it is essential to enhance cybersecurity measures and build greater trust among users. Furthermore, the promotion of digit generalizable at forms among retailers and distributors should be intensified, as their participation is crucial for broader adoption.

Government agencies should take a proactive role in organizing widespread awareness campaigns to

educate the public about the benefits and safe usage of digital payments. Additionally, improvements in internet speed and connectivity are necessary, particularly in semi-urban and rural areas. Private telecom providers must collaborate to extend reliable internet services to underserved regions.

Banks should also play a vital role by encouraging the use of debit and credit cards and promoting mobile wallet adoption. Technology, in this context, can act as a powerful enabler, simplifying the user experience and enhancing security.

Retailers and distributors should be incentivized to adopt digital tools through training, financial benefits, or tax incentives. Moreover, future research should expand beyond surveys to include structured interviews, direct observations, and projective techniques to gain deeper insights into user behavior and attitudes.

It is also important to note the limitation of this study-specifically, the relatively small sample size of 100 respondents. Expanding the sample size to 400 or 500 participants in future studies would offer a more comprehensive understanding and lead to more generalizable results regarding the usage and perception of digital payment systems.

Conclusion

As the literature shows, Digital Payments have been gaining power among Indian customers, at a snail's pace. Paytm and Phone pay are majorly the two most accepted forms of digital payments and are followed by Google Pay among the users. Besides these, payment vendors include Phone pay, PayPal, Amazon Pay, Google Pay, Paytm, Stripe, Square, Adyen, Skrill, we pay, Apple pay, Bit Pay, and the latest is WhatsApp Pay, which is the newest kid on the block in digital payment and money transfer. Security issues do hinder patronage to a certain extent, but convenience is convincing clients to adopt the mode.

There are all sorts of perks with digital payments; it is an instant procedure. Yet, a considerable number of Indians (40-50 percent) are not using, in fact, do not want to use it for yet to be explored reasons. This is also the stated constraint of digital divide in India, since most of them cannot use smartphones. Now, that this technology is developing at such a fast pace, the vision of the government is bound to come to fruition with Digital India and it's an aiding factor for ATMA NIRBHAR BHARAT, the slogan of going for a stronger India in the 21st Century.

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Examining the Effects of Work-Life Balance on Productivity and Organizational Efficiency

Doshi Setu Swapnilkumar, Anand Joshi

Abstract

This research explores the effect of work-life balance (WLB) programs on employee productivity and organizational effectiveness through a mixed-methods design at Suflam Technology in Ahmedabad, Gujarat. Quantitative data from 200 employees were examined using descriptive statistics, Pearson correlation, regression analysis, and paired t-tests to determine predictors of productivity, including flexible working hours, remote work, and employee support programs. Teleworking came through as the best predictor of increased job satisfaction and performance. Simultaneously, qualitative themes through open-ended feedback of empowerment, reduced stress, and work-life boundary issues also came through clearly. The study reinforces these through HR measures showing large-scale retention improvements, employee engagement, and operating efficiency increases subsequent to the WLB policy adoption. The findings highlight the efficacy of formalized WLB policies in both boosting individual and organizational performance in contemporary, dynamic workplaces.

Keywords: *Work-life balance, Employee productivity, Organizational effectiveness, Workplace engagement, Flexible work policies, Employee well-being.*

Introduction

People in the present era are able to live long, healthy lives because they are adept at balancing their personal and professional responsibilities. The importance of striking a balance between one's work and personal obligations has grown in recent years due to the ever-increasing demands of both. Our goal in doing this research is to gain a better understanding of how people in various fields manage their work and personal lives. Both the elements that influence work-life balance and the actions that workers take to achieve it are the primary foci of this study. Our focus will be on how work-life balance impacts the health, happiness, and productivity of employees as well as the company's bottom line. Conducting surveys and interviews with employees from various firms and industries will help us reach our aims. Here we shall inquire as to their thoughts on the matter at hand, as well as their job schedule, workload, personal obligations, and methods for maintaining a good work-life balance. Further, we will read up on work-life balance in an attempt to have a feel for the subject. Taking care of one's own needs while also prioritizing those of one's loved ones is essential for a productive work-life balance. The idea of finding a good balance between work and life is becoming more and more popular in Indian culture. When working hours are flexible, it's easier to manage work and personal life. The line between one's professional and private lives blurs when stress levels climb. The implications of this imbalance can manifest in several ways, including problems with one's relationships, health (both mental and physical), and daily functioning.

Also, it diminishes productivity as well as efficiency in the workplace. For a company to succeed, it needs individuals who are productive. It is here that the term work-life balance becomes relevant; if one is capable of striking a good balance between his/her personal and professional lives, then they will eagerly report to work. Production thus increases as a result. It is almost inevitable that the quality of work will suffer, even though it may look like more can be accomplished by working longer hours and getting up late each night. The attainment of a work-life balance is necessary for the physical and mental well-being of the employees, as well as the enjoyment they get from their work and their general well-being. An improved work-life balance is attainable by employees by having a positive work culture established and taking personal actions to deal with their workload. This can subsequently result in improved job performance and business outcomes.

Literature Review

Aisyah et al. (2021) investigated the effects of job happiness and work-life balance on employee performance, as well as the relationship between organizational commitment and employee performance through a mediating factor. In order for a company to achieve high levels of performance, human capital is an essential component. Nonetheless, the overall performance of the company suffers when workers are unhappy in their positions since they rarely provide satisfactory levels of output. So, it's up to the company's management to figure out what makes workers tick in today's workplaces and assess their impact. This particular research study focuses on the activities of group consumers within telecommunication businesses. In order to gather data, we used the online survey that was accessible through Microsoft 365. This method employs a

purposive sampling strategy, a non-probability sampling methodology. The purposive sampling technique enables the recovery of 195 questionnaires from six customer operations groups' divisions within a telecoms company that are hired as respondents. There was a total of 116 males (59.5% of the sample) and 79 females (40.5% of the sample). The authors of this book use the data analysis approach called structural equation modeling (SEM) using the application of various computation tools. As the study finds, the most critical traits that can enhance employee performance and employee resilience are job satisfaction and organizational commitment and commitment to the company. As true as this may be, the employees' performance in the telecommunications companies that were examined was not impacted by the work-life balance they enjoyed.

Thevanes and Harikaran (2020) took into account the weak correlation between OCB, work-life balance, and organizational performance. Additionally, the majority of studies disregard OCB's role as a mediator in the relationship between WLB and organizational effectiveness. Consequently, this study's overarching goal is to dissect the connections between OCB, work-life balance, and organizational performance, as well as the function of OCB as a mediator between the two. One hundred sixty-six people working for selected private banks in Sri Lanka's Batticaloa district provided the primary data. This was done so that the goals of the study could be met. The research model was validated using the simple mediation analysis. In this study, we found that the factors that were considered had strong positive correlations with one another. The study also found that organizational citizenship behavior (OCB) mediated the connection between work-life balance and organizational effectiveness. The empirical results in this study back up the theoretical justification. The current study is considered to be highly important in terms of comprehending the empirical literature concerning the interfaces among work-life balance, organizational citizenship behavior (OCB), and organizational success.

Tamunomiebi, M. D., & Oyibo, C. (2020) discovered that implementing legislation to promote a healthy work-life balance in Nigeria is plagued by structural obstacles. Many factors contribute to this, including but not limited to: high unemployment, poverty, inflation, ineffective government agencies that fail to oversee and enforce labor rules, corruption, and many more. Political, economic, and social problems-the root causes of work-life conflict in Nigeria-have their origins in the country's failed leadership. A literature study on the topic of work-life balance and employee performance in Nigeria is the means by which this research seeks to build knowledge. Reviewing the literature on work-life balance in Nigeria and offering applicable solutions to the problem of work-life imbalance and its negative spillover was the purpose of this secondary research. The objective was to maximize organizational productivity by boosting staff performance. We hypothesize that employees will be more productive if their workload is evenly distributed between work and their personal lives. As a result, managers should push for company-wide policies and programs that help workers strike a better work-life balance. They propose that businesses provide workers with more leeway to choose how and when they get their jobs done, with the goal of enacting laws that make it legal for workers to request unconventional schedules. They also recommend that managers get training to ensure they can meet the demands of these rules and that workers' rights to various leave programs that improve employee welfare are highlighted.

SubariandSawitri. (2022) investigated the financial services authority (OJK) has submitted a policy for workers facing the Covid-19 pandemic situation since 2020. The policy took the shape of a circular which had a work from home policy in a bid to forestall and curb the transmission of Covid-19 in OJK. This policy was subsequently substituted with Guidelines for Working during the Adaptation Period, which were entitled "New Habits for Employees in OJK." Workers are required to maintain a healthy work-life balance and produce as good of work as they would in an office setting while working remotely under this policy. While the COVID-19 pandemic was underway, studies investigating factors that might affect remote workers' output were few and far between. This includes issues like work-life balance and stress on the workplace. Filling that void is what this study is all about. This work makes use of the AMOS application tools and employs a quantitative technique. Additionally, SEM, or structural equation modeling, is employed. The study included 360 participants in total. They worked their way up the organizational ladder to deputy director and beyond in every facet of OJK's operations. Working remotely, maintaining a healthy work-life balance, and effectively managing work-related stress all have a direct or indirect impact on employees' productivity, according to this study's results.

Seman et al. (2022) examined the effect that initiatives to attain a more balanced work-life had on the organizational citizenship behavior of Werabe, Ethiopia-based commercial bank branches. The work-life balance concept was developed on the assumption that one's professional life and personal life were not competing interests but rather parts of one's entire existence that needed to be balanced against each

other. For the sake of maximizing productivity and talent retention, adopting practices promoting work-life balance becomes a primary imperative for the employees. By using a quantitative research design, descriptive and explanatory study designs were found effective. It was a traditional questionnaire used to gather data. A census was conducted for the research. To gather primary data for this study, we interviewed and chose 150 workers from nine various commercial bank outlets in Worabe town. We applied both inferential and descriptive statistical techniques to evaluate the data that we had gathered. From the study findings, most of the employees held low perceptions towards all essential work-life balance initiative attributes covered under this study. Not only that, but their own views on organizational citizenship behavior were also moderate. Among the set of independent variables under examination, there are three of them that positively and significantly influence organizational citizenship behavior. These three variables are work leave programs, flexible work arrangements, and dependent care efforts. In contrast, the remaining two factors-workload and working hours-have a detrimental and causal effect on the behavior of organizational citizenship. Flexible work arrangements were identified to have an important effect on organizational citizenship behavior, based on the beta coefficients of this study. Work leaves programs ranked second.

Research Methodology

This research uses a mixed-methods design to investigate the impact of work-life balance (WLB) policies on employee productivity and organizational efficiency in Suflam Technology, Ahmedabad. Quantitative data (through structured surveys and HR measures) as well as qualitative findings (through open-ended answers) were explored to develop a thorough understanding of the impact.

- **Research Design**

  Descriptive and inferential design was applied. Quantitative data analysis comprised descriptive statistics, correlation, regression, and paired t-tests via SPSS. Thematic analysis was conducted for open-ended answers to gain insights into employee experience regarding autonomy, stress, and difficulties with working from home. Both depth and width were incorporated to the findings with this double prong approach.

- **Research Area**

  The research was carried out at Suflam Technology, which has an employee-centric culture. The firm had just introduced a number of WLB policies-flexible work arrangements, telecommuting, and employee assistance programs-making it perfect for evaluating policy effectiveness.

- **Data Collection Method**

  Data were gathered using a formal online questionnaire, with Likert-scale items and open questions. HR data also were analyzed to compare baseline key performance indicators such as retention, engagement, and operational effectiveness before and after WLB usage.

- **Sampling Technique and Sample Size**

  A random sampling strategy was employed to select 200 employees from diverse departments and levels of experience. This ensured a representative and diverse sample. The sample size was suitable both for statistical testing and thematic analysis.

- **Analytical Tools and Techniques**

  Quantitative data were handled employing IBM SPSS (version 26). Statistical analysis included descriptive analysis, Pearson correlation, multiple regression, and paired t-tests. Qualitative answers were handled through manual coding to determine main themes from employees' testimonies.

- **Reliability and Validity**

  A pilot survey of 20 staff members validated the reliability of the questionnaire (Cronbach's Alpha = 0.84). Triangulation of survey responses, HR records, and qualitative comments enhanced the validity of findings and reduced bias.

Data Analysis and Interpretation

Table 1 illustrates the impact of three work-life balance (WLB) policies-Flexible Work Schedules, Telecommuting, and Employee Support Programs-on four outcome areas: productivity, stress, job satisfaction, and absenteeism. Telecommuting indicates the greatest gain in productivity (82%) and job satisfaction (84%). Flexible schedules also rank high, particularly in satisfaction (78%). Employee support programs reduce stress most effectively (75%).

Table 1: Effects of Work-Life Balance Policies

Work-Life Balance Policy	Improved Productivity (%)	Reduced Stress (%)	Increased Job Satisfaction (%)	Lower Absenteeism (%)
Flexible Work Schedules	70	60	78	55
Telecommuting (Remote Work)	82	65	84	63
Employee Support Programs	68	75	72	50

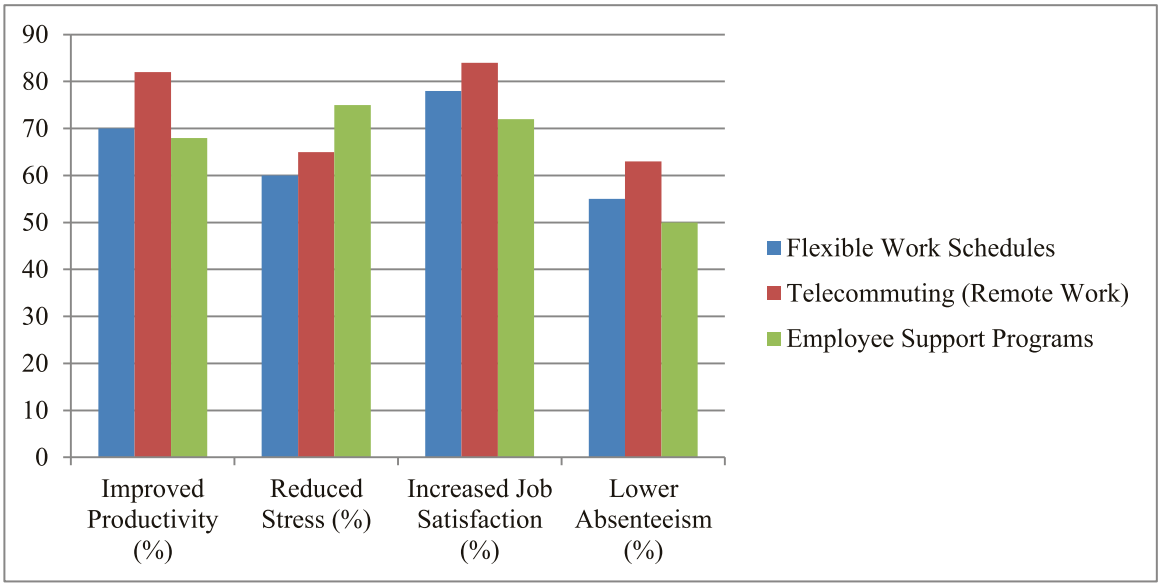

Figure 1: Graphical representation of Effects of Work-Life Balance Policies

Figure 1 strongly indicates that telecommuting provides the most stable benefits for all outcomes, particularly in terms of increasing productivity and satisfaction. Flexible work arrangements enhance satisfaction and productivity but have moderate impacts on stress and absenteeism. Support programs are distinct in reducing stress. In general, the evidence indicates that offering remote work options along with supportive resources provides the optimal employee and organizational outcomes.

Table 2: Correlation Matrix

Variables	Productivity	Job Satisfaction	Stress Reduction
Flexible Work Schedules	0.58**	0.62**	0.41*
Telecommuting	0.71**	0.68**	0.52**
Employee Assistance Programs	0.54**	0.60**	0.65**

Table 2 demonstrates all work-life policies are positively and significantly correlated with key indicators. Telework ranks the highest across both productivity (0.71) and satisfaction (0.68), pointing to high success. Flexible working hours are most closely associated with satisfaction (0.62) and productivity (0.58). Employee benefits programs indicate greatest connection with decreased stress (0.65) and illustrate how they can assist with mental wellness. Generally, telecommuting excels at enhancing performance, whereas support programs excel at stress reduction.

Table 3: Regression Coefficients

Predictor	β (Beta)	t-value	Sig.
Flexible Work Schedules	0.31	4.95	0.000
Telecommuting	0.42	6.32	0.000
Employee Assistance Programs	0.28	4.11	0.001

Table 3 shows the outcome of a multiple linear regression analysis testing the effect of various work-life balance policies on staff productivity. All three predictors-flexible working hours, telework, and employee support programs-have positive effects on productivity ($p < 0.01$). Telework has the largest beta value ($\beta = 0.42$), indicating that it is the most dominant predictor of productivity among the three. Flexible schedules ($\beta = 0.31$) and employee assistance programs ($\beta = 0.28$) help in a significant manner as well. These results indicate that all three programs enhance productivity, but the effect is greatest with telecommuting.

Table 4 presents a pre-post comparison of important organizational metrics after introducing work-life balance (WLB) policies in Suflam Technology. The results indicate a significant improvement across all three parameters: employee retention rate increased from 65% to 88%, operational efficiency improved from 60% to 85%, and employee engagement scores went up from 58% to 82%. All regions reflected more than 20 percentage points improvement, pointing towards a high positive change following the implementation of WLB practices.

Table 4: Pre-Post Comparison of Organizational Indicators

Factor	Before (%)	After (%)	Improvement (%)
Employee Retention Rate	65	88	+23
Operational Efficiency	60	85	+25
Employee Engagement Scores	58	82	+24

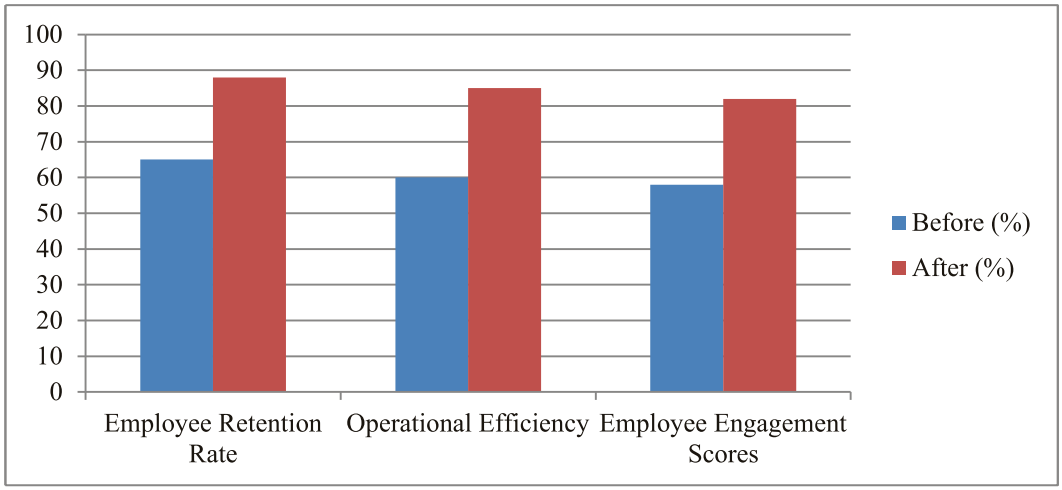

Figure 2: Graphical representation of Pre-Post Comparison of Organizational Indicators

Figure 2 graphically illustrates the positive effect of WLB policies on organizational performance. The steep increase in retention, efficiency, and engagement indicates that building a positive work environment not only helps workers but also enhances the overall functionality of the organization. These findings attest to the contention that investing in workers' well-being translates into measurable business benefits in the form of enhanced loyalty, productivity, and workforce morale.

Conclusion

This research verifies that well-implemented work-life balance strategies have important impacts on enhanced employee productivity, decreased stress, and improved organizational effectiveness. Among the studied strategies, telecommuting emerged as the most powerful, with the largest statistical effect on productivity and job satisfaction. Flexible scheduling and employee assistance programs also exerted positive impacts. The qualitative themes supported these results, especially highlighting employee autonomy and psychological well-being. In addition, HR records confirmed quantifiable improvements in employee retention, participation, and operational effectiveness following the introduction of WLB policies. These results indicate that embracing comprehensive and adaptable workplace practices not only enhances employee well-being but also acts as a strategic driver for organizational performance improvement. Future research should continue to investigate longitudinal impacts and incorporate industry-wise comparisons to further confirm these implications.

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