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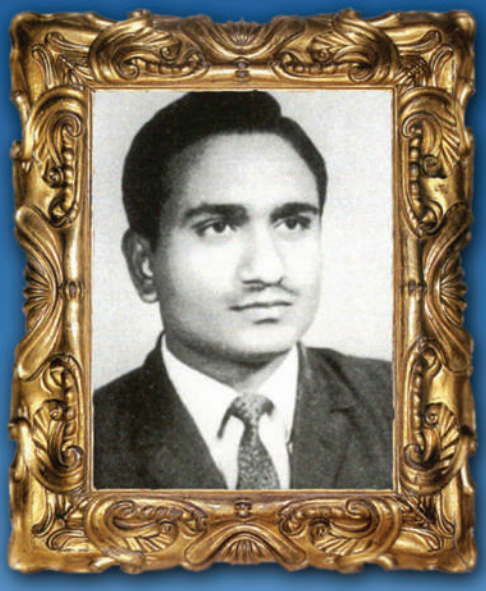
A TRUE VISIONARY

"You see things and you say **Why***? But I dream of things that never were and say* **Why** *not?"*

- George Bernard Shaw



Shri Jagannath Gupta
(1950 - 1980)

Also a true visionary...who dared to dream!
He lives no more but his dreams live on....and on!

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And more dreams to come!

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Editor's **Desk**

Need for Sustainable & Socially Responsible Business Practices

In today's rapidly evolving business landscape, sustainable and socially responsible business practices are no longer just buzzwords but essential strategies for long-term success. These practices not only address the growing consumer demand for ethical operations but also contribute significantly to the overall health of our planet and society.

Sustainability in business encompasses a wide range of activities aimed at reducing environmental impact. This includes minimizing waste, lowering carbon emissions, and optimizing resource use. Companies that adopt sustainable practices are often seen as forward-thinking and responsible, which can enhance their reputation and customer loyalty. For instance, businesses that implement energy-efficient technologies or adopt renewable energy sources not only cut costs in the long run but also play a pivotal role in combating climate change.

On the other hand, social responsibility involves a company's commitment to ethical practices and contributing positively to the communities in which they operate. This can include fair labor practices, community engagement, and ensuring diversity and inclusion within the workplace. By fostering a culture of fairness and respect, businesses can attract and retain top talent, enhance employee satisfaction, and create a more innovative and productive workforce.

The integration of sustainable and socially responsible practices often leads to a symbiotic relationship where the benefits to society and the environment also translate into tangible business advantages. For instance, companies that prioritize sustainability often see increased investor interest as more stakeholders seek to support enterprises that align with their values. Similarly, socially responsible companies tend to build stronger relationships with their customers and communities, leading to greater brand loyalty and market share.

However, the journey towards sustainability and social responsibility is not without its challenges. It requires significant investment, long-term commitment, and sometimes a shift in corporate culture. Businesses must also navigate the complexities of measuring and reporting their impacts accurately and transparently. Yet, those that embrace these challenges and lead with integrity can not only achieve competitive advantage but also make a profound impact on the world.

In conclusion, sustainable and socially responsible business practices are indispensable in today's world. They offer a pathway to resilience, innovation, and ethical growth, ensuring that businesses can thrive while contributing positively to society and the environment. As consumers, investors, and regulatory bodies continue to raise their expectations, the future belongs to those companies that prioritize sustainability and social responsibility at the core of their operations.

Madhu Vij

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EXPLORING THE FUTURE OF CUSTOMER-CENTRIC BANKING: A COMPREHENSIVE EXAMINATION OF CHATBOT SERVICE QUALITY AND DEVELOPMENT OF ADVANCED CHATBOT INTERFACES FRAMEWORK FOR INDIAN BANKING

Poornima Kapadan Othayoth*, Shivi Khanna**

Purpose: *This study investigates the role of customers in Indian Banks and their interaction with Chatbot services in a technology-driven environment. Focusing on 586 Chatbot users, the research examines the impact of Chatbot Service Quality (CSQ) on Customer Loyalty (CL) and explores the moderating role of Customer Value (CV), with Customer Satisfaction (CSAT) as a mediating factor.*

Design/Methodology/Approach: *Utilizing apurposive sampling method, data was collected from students, business owners, and working professionals in Indian Banks. Structural equation modelling with SPSS AMOS was employed for data analysis.*

Findings: *The study finds a positive impact of Chatbot Service Quality on Customer Loyalty. Additionally, it identifies that Customer Value moderates the association between Chatbot Service Quality and Customer Loyalty, with Customer Satisfaction playing a significant mediating role.*

Originality/Value: *This study contributes original insights by relying on real-world data from Chatbot users. The proposed framework serves as a practical tool for banks, offering valuable guidance for future research in the evolving landscape of technology-driven banking.*

Keywords : *Customer Loyalty, Customer Value, Service Quality, Chabot, Banking, Customer Satisfaction*
JEL Code: *M300, M310, M30*

I. Introduction

In today's dynamic business environment, the banking industry is undergoing a significant transformation driven by technological advancements and changing consumer expectations. With the advent of the Internet, corporations worldwide are redefining their customer interaction strategies, and the banking sector in India is no exception. Over the past three decades, Indian banks have embraced cutting-edge technology to deliver superior services, with a particular emphasis on Artificial Intelligence (AI) and its applications. Among these, Chatbots have emerged as crucial tools in customer support, offering real-time assistance and personalized interactions (Jun and Cai, 2001; Bruhin et al., 2020).

Chatbots have seamlessly integrated into messaging platforms, facilitating personalized services and enhancing customer satisfaction. Several Indian banks have adopted Chatbots into their operations. However, despite these advancements, there remains a gap in meeting customer expectations and delivering satisfactory value (Lahteenmäki and Natti, 2013). To address this gap, it is essential to understand how customers perceive AI-enabled services like Chatbots and how these services influence factors such as loyalty, satisfaction, and value creation. Thus, this study aims to explore the factors of Chatbot service quality that impact customer loyalty, satisfaction, and value, and whether customer value and satisfaction mediate the relationship between Chatbot service quality and loyalty. By delving into these research questions, this study seeks to enhance our understanding of the dynamics within Chatbot services offered by Indian banks and contribute to the broader discourse on customer-centric approaches in the banking industry.

II. Literature Review and Conceptual Framework

2.1 Chatbot Services

Information technology has become an indispensable tool across various sectors, significantly impacting society's functioning (Hardi et al., 2020). Among its many applications, chatbots stand out as a remarkable innovation, allowing for human-like interaction through natural language processing (Shawar and Atwell, 2007). From their humble beginnings with Eliza in the 1960s, chatbots have

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evolved into sophisticated systems capable of handling diverse queries by leveraging the power of recurrent neural networks (RNN) (Le, 2015). As a result, they are increasingly deployed to enhance operational efficiency and improve customer service across industries (Gartner, 2019).The extensive research conducted on chatbots delves into various aspects, including user characteristics, usability, and adoption rates (Park et al., 2012; Chung et al., 2020; Trivedi, 2019; Min Kyu and Heejun, 2019). Furthermore, studies investigate consumer perceptions and acceptance levels across different sectors, shedding light on factors influencing adoption and continued usage (Meyer-Waarden et al., 2020; Sanny et al., 2020; Nguyen, Chiu and Le, 2021).Despite the wealth of research, empirical evidence regarding chatbot interactions within the banking sector remains relatively scarce. This gap prompts a focused examination of Chatbots Service Quality (CSQ) in banking and its implications for customer satisfaction and continued usage. Understanding how CSQ influences customer perceptions and behaviors in the banking context can provide valuable insights for improving service delivery and enhancing customer experiences. Thus, this study aims to address this knowledge gap and contribute to the broader understanding of chatbot adoption and effectiveness in the financial services industry.

2.2 .Service Quality, and Customer Loyalty

In the competitive landscape of today's business world, meeting customer needs and expectations is paramount for organizations. Research indicates that Service Quality (SQ) plays a crucial role in shaping customer satisfaction and loyalty (Zaibaf et al., 2013). CSAT increases with perceived SQ and vice versa. Satisfaction can be measured by a formula (Pandey, 2012):

$$Satisfaction = \frac{Perceived\ Service}{Expected\ Service}$$

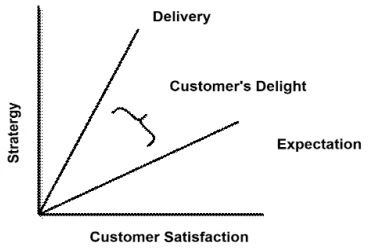

Fig i –CSAT(Pandey, C, 2012)

Several earlier studies have demonstrated the predictive relationship between CSAT and SQ (Bolton and Drew, 1991; Wang and Shieh, 2006; Chenet et al., 1999; Boulding et al., 1993; Sweeney et al., 1999). Additionally, it has been established that CSAT influences SQ (Parasuraman et al., 1988). Customer Loyalty (CL), characterized by a strong commitment to repurchase a product or service despite external influences, is a focus for companies aiming to cultivate satisfied and dedicated customers (Kuzniecova et al., 2013).

Perceived SQ significantly impacts customer loyalty, as satisfied customers are more likely to favor the provider and exhibit loyalty (Akbar and Parvez, 2009). Studies have shown that CSAT, employee loyalty, and SQ positively influence CL, especially in high-contact service industries (Yee, Yeung and Cheng, 2011). Moreover, research has explored the relationship between perceived SQ, CSAT, and CL in various contexts, such as the banking sector in Saudi Arabia (Otaibi and Yasmeen, 2014; Omoregie et al., 2019; Leninkumar, 2017).

CSAT and CL are strongly correlated, with satisfied customers more inclined to exhibit loyalty and make rational decisions, minimizing business risk (Fida et al., 2020). Satisfaction serves as the bedrock for loyalty (Munari et al., 2013). Furthermore, studies have shown that CSAT partially mediates the relationship between SQ and CL, with assurance and empathy playing significant roles (Chodzaza and Gombachika, 2013; Kuzniecova et al., 2013).Hence, the present study hypothesizes that:

$\mathbf{H}_{1:}$CSQ of the Banks has a significant influence on CL

$\mathbf{H}_{2:}$ CSAT mediates the relationship between the CSQ of the Bank and CL

Customer Satisfaction acts as a mediator in the connection between the Chatbot Service Quality (CSQ) of the Bank and Customer Loyalty (CL)

2.3. Customer Value and Service Quality:

Woodruff (1997) posits that Customer Value (CV) is a fundamental source of competitive advantage (Hapsari et al., 2016), emphasizing the importance of customer-centric approaches in industries like banking. Customer Perceived Value (CPV) (Zameer et al., 2014). When customers perceive that a company values them, they tend to exhibit loyalty.CPV serves as a metric for evaluating organizations' effectiveness and efficiency in service delivery and cost management. While Service Quality (SQ) aims to efficiently deliver standardized service components, understanding CPV is crucial. However, there's a complex relationship between CV and SQ; higher service quality doesn't always translate to higher perceived value, as customers may not uniformly

perceive value in the same level of service. In the banking industry, customer involvement, perceived quality, and perceived value significantly influence Customer Satisfaction (CSAT) (Hapsari et al., 2016). SQ, CV, and CSAT are interconnected and strategically important in retail banking (Pisnik, 2010). Perceived value strongly correlates with satisfaction (Malik, 2012).CSAT and perceived value impact Customer Loyalty (CL), even before being influenced by e-service quality (Kuo et al., 2011). High perceived value enhances the relationship between CL and CSAT, indicating a significant moderating effect of perceived value on the link between satisfaction and loyalty. This moderation suggests a favorable effect on the relationship between CL and satisfaction. Thus, the present study hypothesizes:

H3: *Customer Value moderates the relationship between Chatbot Service Quality (CSQ) and Customer Loyalty (CL) in Banks.*

III. Conceptual Model

Figure 2 presents the research model used in this study, showing the relationships among constructs. Customer Loyalty (CL) is the Dependent Variable, with Customer Value (CV) as the Moderator and Customer Satisfaction (CSAT) as the Mediating Variable. The Independent Variable of interest is Chatbot Service Quality, comprising seven dimensions: Human-Collaboration (HC), Cultural Adaptation (CA), Continuous Improvement (CI), Human-Like (HL), Personalization (PERS), Semantic Understanding (SEM), and Efficiency (EFFY). This model provides a comprehensive framework for understanding how Chatbot Service Quality influences CL, considering CSAT and CV.

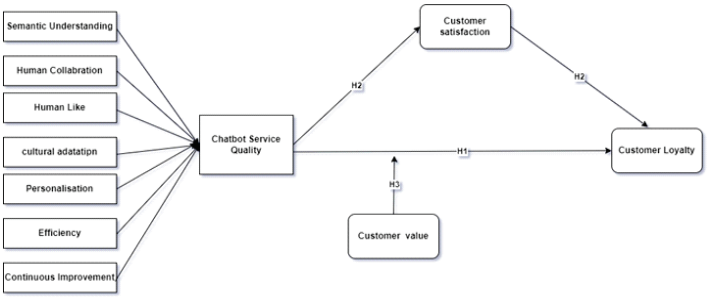

Figure ii: Conceptual Model

IV. Methodology

A quantitative research approach was employed to accomplish this goal, explicitly utilizing a descriptive and causal-effect research method. The participants for this research consisted of students, working professionals, and business owners of Indian banking. The target population for data collection comprised individuals above 18 with chatbot-using experience in banking. A total of 586 samples participated in the survey. The purposive sampling technique was employed to ensure the inclusion of diverse respondents. The AISQC scale, developed by (Chen *et al.*, 2022), was employed to measure CSQ.CSAT was measured using the American CSAT scale introduced by (Fornell *et al.*, 1996). The measurement scale for CV was adapted from a study by (Shamdasani *et al.*, 2011). Participants were asked to rate their level of agreement or disagreement with each statement on a five-point Likert scale based on their personal experiences and perspectives.

V. Data Analysis

The gathered data underwent analysis using statistical software such as SPSS and AMOS. The analysis involved employing Structural Equation Modelling (SEM) to test the hypotheses proposed. The study incorporates second-order factors, namely Semantic Understanding (SEM), Cultural Adaptation (CA), Human-Like (HL), Continuous Improvement (CI), Human-Collaboration (HC), Efficiency (EFFY), and Personalization (PERS) which act as , as dimensions CSQ. These factors are integrated with CL's endogenous variable, with CSAT acting as the mediating variable and CV as the moderator.

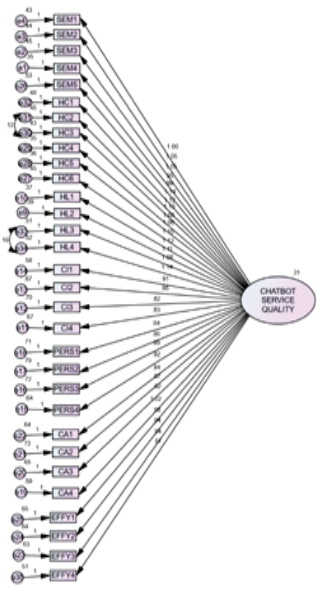

Figure iii: Chatbot service quality one order factor

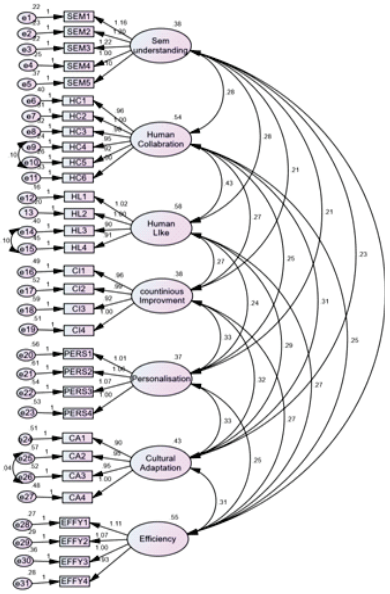

Figure iv: Chatbot service quality seven correlated with the first-order factor

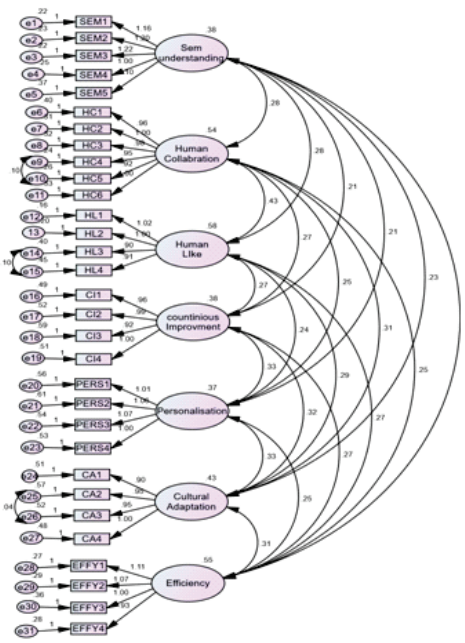

Figure v: Second order factor for CSQ

Table 1. Summary of model fit indices of CSQ

Fit -Indices	One first - order factor for CSQ (1)	Seven correlated first-order factors for CSQ (2)	Second-order factor for CSQ (3)
CMIN	3980.411	991.038	1125.131
DF	432	410	423
CMIN/DF	9.214	2.417	2.660
CFI	0.658	0.944	0.932
SRMR	0.091	0.040	0.055
RMSEA	0.118	0.049	0.053
PCLOSE	0.000	0.637	0.081

The result of model fit indices of (1) for CSQ is shown in Table 1. Goodness-of-fit and incremental indices are required for integrating CSQ second-order SQ factors into dependent variables (Nunkoo et al., 2017). The model fit for the first-order factor for CSQ has the weakest model fit while (1) correlated for CSQ and the (2) for CSQ had an acceptable model. The model fit measures for the first order factor correlated for CSQ are CFI =0.94; RMSEA =0.049; SRMR =0.040; CMIN/DF =2.417. The model fit measurement for the second order factor for CSQ is CFI =0.932; RMSEA= 0.053; SRMR = 0.055; CMIN/DF= 2.660. Thus the model can be integrated with the dependent variable.

Figure vi: Overall Measurement Model

Figure 6 represents the overall or comprehensive measurement model of the second-order factor of the CSQ model integrated with CSAT, CL, trust, and CV was further tested for its validity and composite reliability.

Variables	Standardized Loading	CR.	A.VE
Service Quality (SQ.)		**0.921**	**.628**
SEM	.722		
HC.	.754		
HL.	.723		
CI	.856		
PERS	.894		
CA.	.696		
EFFY	.875		
Customer satisfaction (*CS represent customer satisfaction)*		**0.792**	**.591**
CS1	.661		
CS2	.745		
CS3	.636		
CS4	.643		
CS5	.601		
Customer Value		**0.756**	**.437**
CV1	.650		
CV2	.637		
CV3	.730		
CV4	.622		
Customer Loyalty		**.797**	**.440**
CL1	.686		
CL2	.676		
CL3	.685		
CL4	.659		
CL5	.609		

Table 2 presents the comprehensive measurement model's composite reliability and convergent validity. Firstly, the Confirmatory Factor Analysis (CFA) demonstrates no negative loadings. Secondly, a significant proportion of the items exhibit loadings exceeding 0.6, indicating strong convergent validity.". According to (Chen *et al*., 2005), the standardized path should be at least 0.20 and ideally above o.30 to be considered meaningful for discussion. Hence, all the items are considered more significant than 0.30. The Composite Reliability (CR) of the overall model is more than 0.7 (Hair *et al*., 2006), and the Average Variance Extracted(AVE) is less than 0.5.If the AVE is below 0.5 and the Composite Reliability (CR) exceeds 0.7, it is considered acceptable for the constructs to converge (Fornell and Larcker, 1981).

Table 3. Discriminant Validity: Heterotrait-Monotraits (HTMT) criterion

Heterotrait-Monotraits Ratio of Correlation				
	SQ	CL	CV	CSAT
SQ	1			
CL	0.583	1		
CV	0.798	0.627	1	
CSAT	0.744	0.733	0.786	1

Heterotrait-Monotraits Ratio of Correlation was used to determine the discriminant validity of the entire model (HTMT). Table 3 illustrates HTMT in which the requirement for discriminant validity was met. HTMT. In a study by (Henseler et.al, 2015), they utilized a Monte Carlo simulation analysis to showcase enhanced performance of the method. The findings revealed significantly higher specificity and sensitivity rates (97% to 99%) compared to the cross-loadings criterion (0.00%).

Table 4. Model fitness of the overall model

CMIN	**DF**	**CMIN/DF**	**CFI**	**SRMR**	**RMSEA**	**P CLOSE**
2146.080	923	2.325	0.912	0.053	0.048	0.940

Table 4 represents The model fit indices for the overall model in which the exogenous variable (CSQ - CSQ) integrates the endogenous variable (CL), moderating variable (CV) and mediating variable (trust) (CFI =0.912; RMSEA =00.048; SRMR =0.053; CMIN/DF=2.325) which is the acceptable model fit measure.

Table 5. Summary of the effect of CSQ on CL

Constructs	**Standardized Estimates**	**SE.**	**CR.**	**P Value**
CSQ CL	.553	0.84	8.86	0.000

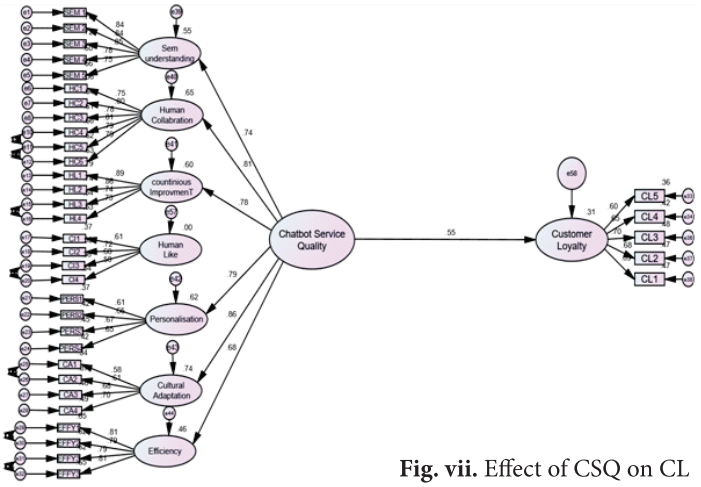

Fig. vii. Effect of CSQ on CL

As predicted the hypotheses H1 of this study were supported and accepted. Table 5 shows the summary of hypothesis testing. The result of structural equation modeling provides a statistically significant relationship between CSQ and CL and indicates that the SQ of Chatbots services significantly influences CL (β =.553; SE = 0.84; p = 0.000). The result shows that there is a positive influence on CL. The squared multiple correlation value 0.306 depicts that the model explains 30.6% of the variance in CL.

Table 6. Summary of Mediating Analysis

Relationship	**Total effect**	**Direct effect**	**Indirect effect**	**Confidence interval**	
				Lower Bond	**Upper Bond**
CSQ - CS - CL	0.888	0.202	0.686	0.482	0.926
P value	0.002	0.63	0.003		

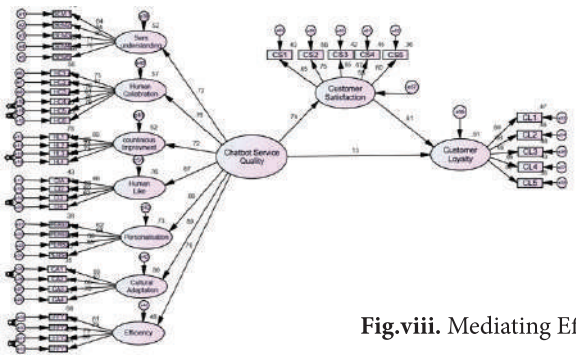

Fig.viii. Mediating Effect

This study identifies the mediating role of CSAT in the relationship between CSQ (IV) and CL (DV) (Baron, R. M., & Kenny, 1986) the method was followed for mediation analysis.It can be observed from the table that the result indicates that there is a positive and significant indirect effect of CSQ on CL (β =0.686 p=0.003). In the indirect test of CSQ to CL through CSAT, the lower bound confident interval is 0.482, and the upper bound is 0.926. This shows a significant indirect effect since there is no zero between the upper and lower bound confidence intervals.The direct influence of Chatbot Service Quality (CSQ) on Customer Loyalty (CL) is statistically insignificant in the presence of a mediator (β = .202, p = 0.063). Therefore, Customer Satisfaction (CSAT) is a complete mediator, enhancing and mediating the relationship between CSQ and CL.

Table 7. Moderation analysis summary

Relationship	Beta	CR.	P value
CSQ -- CV	-0.239	-1.827	0.000
CL -- SQ_CV	0.159	7.041	0.000

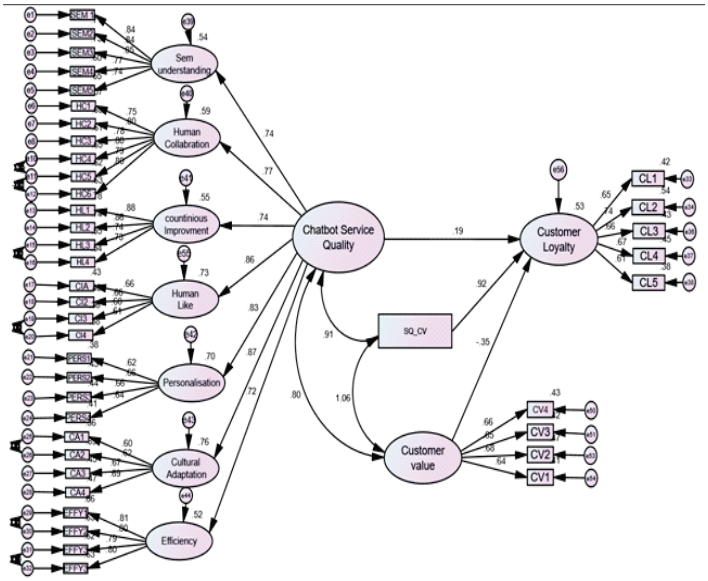

Fig. ix: Moderation effect

This study aims to recognize CV as a moderator in the relationship between SQ and CL. The results demonstrate a meaningful and favorable moderating effect of CV on the relationship between CSQ and CL. Thus, H3 is accepted. The moderation summary analysis is presented in Table 7. According to research, a firm can attain higher levels of CSAT, CL, and performance results if they provide standard perceived SQ and value (Pisnik, 2010).

Fig. x : Advanced Chatbot Interfaces Framework

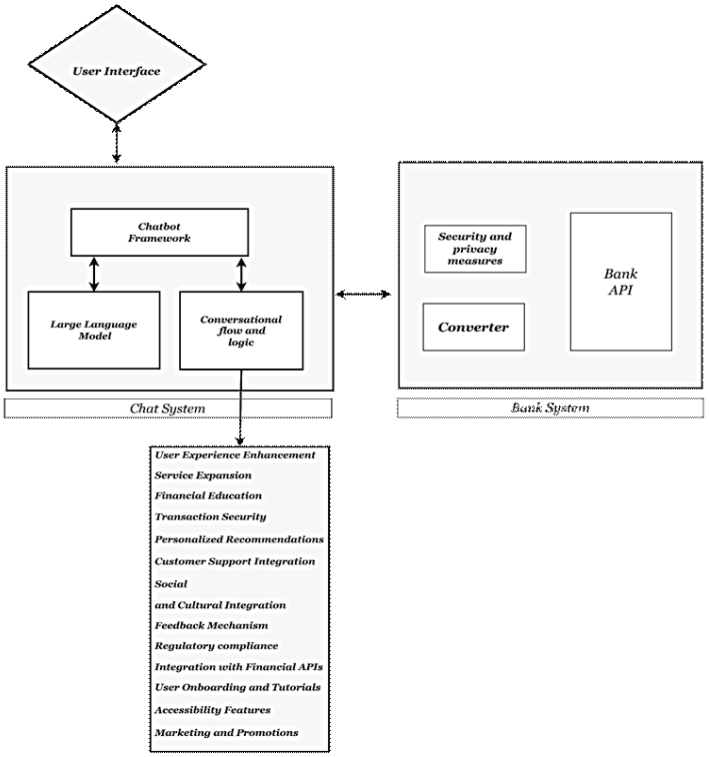

Figure x represents the advanced chatbot framework. The chatbot will feature a user-friendly interface, granting customers easy access to a wide array of banking services. Within the chat system, the chatbot framework receives and interprets user responses, while also managing subsequent interactions. Once a message is received from the customer, it is forwarded to an advanced large language model, equipped with human-like understanding capabilities. This model carefully analyzes the message's content and interaction patterns to accurately discern the customer's needs. Subsequently, the large language model contextualizes the message, making it compatible with the conversational flow and logic stored within the system. Upon reaching this stage, the chat system utilizes its advanced features to match the customer's request. If a match is found, the response is transmitted to the bank system, where stringent security measures safeguard user data and ensure compliance with banking regulations. Intermediary converters play a crucial role here, translating chat inputs into API requests and relaying the bank system's responses back to the user. Once the bank system processes the request, the response is routed back to the chat system. Here, the large language model converts the message into human-readable language, which is then released through the chatbot framework.

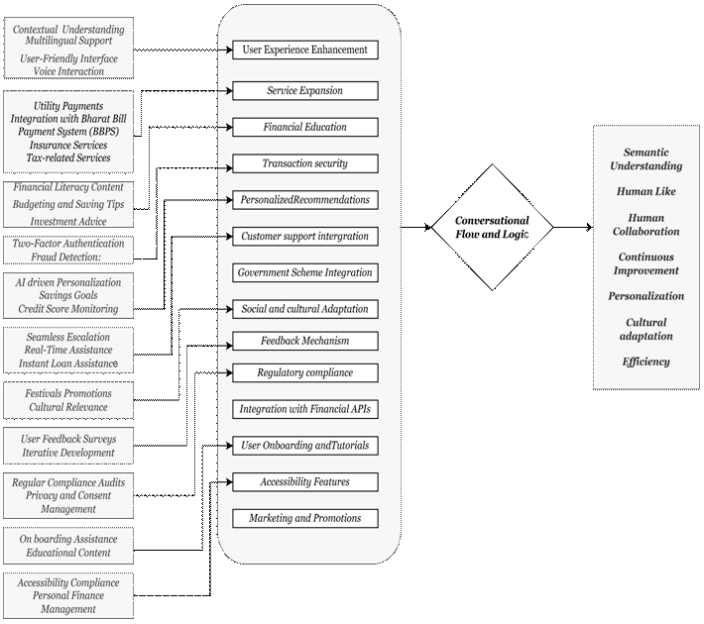

Fig xi . Conversational flow and Logic flowchart

After implementation of large Language Model into chatbot interface, the following advanced features can be inculcated. **Figure xi** will represent the diagram which shows all the advanced features of chatbot services in banking in the form of diagram for better understanding of readers. The suggestion for the advanced features are as follows:

Service Expansion:

Expanding the chatbot's services involves integrating with the Bharat Bill Payment System (BBPS) for comprehensive utility bill payments. Additionally, including insurance-related information and tax assistance broadens its utility. This multifaceted approach not only facilitates seamless bill payments but also offers valuable insights in insurance and tax domains, enhancing overall user experience.

Financial Education:

Providing educational content on financial literacy, investment strategies, and budgeting empowers users to make informed financial decisions. Integration with mutual fund APIs broadens investment options, making the chatbot a comprehensive resource for financial education and guidance.

Transaction Security: Implementing Two-Factor Authentication (2FA) and robust fraud detection mechanisms enhances data protection and user trust. These security features safeguard user transactions, ensuring a secure and reliable experience.

Personalised Recommendation: Leveraging artificial intelligence for personalized recommendations and integrating features for setting savings goals empowers users in financial planning. Including a credit score monitoring feature further enhances users' financial well-being.

Customer Support Integration: Seamless integration with customer support systems and real-time assistance features ensure prompt issue resolution and enhance user experience. Instant loan assistance simplifies the loan application process for users.

Government Schemes Integration: Regular updates on government-sponsored financial schemes and assistance in the application process promote financial inclusion and empowerment among users.

Social and Cultural Integration: Incorporating festive promotions and ensuring cultural understanding in responses fosters user engagement and relevance.

Regulatory Compliance: Adhering to regulatory standards and ensuring data protection through regular audits and privacy management features establishes a secure environment for users.

Integration with Financial APIs: Exploring integration with third-party financial APIs enhances functionality and expands user offerings, aligning with India's transaction methods like UPI

User On boarding and Tutorials: Facilitating user on boarding with tutorials and educational content on financial literacy ensures a smooth introduction and enhances user confidence.

Personal Finance Management: Incorporating features for personal finance management, such as expense tracking and savings goals, supports users' financial well-being.

Marketing and Promotions: Integrating promotional campaigns informs users about new features and services, enhancing communication and engagement.

VI. Discussion and conclusion

The banking industry is undergoing a significant transformation with the rise of Chatbot services, yet it is crucial for banks to understand how customers perceive these services within their unique contexts. Recognizing the

pivotal role of Chatbots in the value-creation process and their impact on Customer Satisfaction (CSAT) levels is imperative as Chatbot technology continues to evolve as a dominant trend in service delivery. Despite the increasing digitalization efforts by banks, there's often a gap in fully comprehending customers' activities, preferences, and everyday habits in the digital realm. This study adopts a customer-centered approach, focusing on Chatbots in Indian banking, aiming to gain insights into CSAT with regards to service quality and how customer value is achieved through Chatbot interactions. Taking a customer-centric perspective allows banks to grasp customers' attitudes and satisfaction levels with Chatbots, enabling them to tailor strategies and operations to enhance Chatbot service quality and align with customer expectations. Identifying key factors such as Human-Collaboration, Cultural Adaptation, Continuous Improvement, Human-Like interaction, Personalization, Semantic Understanding, and Efficiency contributing to CSAT with Chatbots helps prioritize areas for improvement and guides investments in enhancing these dimensions of Chatbot Service Quality (CSQ).

Moreover, the study underscores the importance of delivering value to customers through Chatbot services. Banks can leverage insights to identify aspects of Chatbot services that create value, such as personalized interactions and efficient problem-solving. Furthermore, aligning strategies and operations with customer preferences and behaviors is crucial. Understanding customer needs, habits, and lifestyles empowers banks to design user-friendly Chatbot services that seamlessly integrate into customers' everyday routines. By aligning with customer preferences, banks can enhance user experience and strengthen their position in the competitive banking landscape.

VII . Future Scope of the Study

Future research in AI-enabled customer services in the banking industry should focus on several key areas. This article acknowledges Customer Value (CV) as a moderating factor and Customer Satisfaction (CSAT) as a mediating factor in the relationship between Chatbot Service Quality (CSQ) and Customer Loyalty (CL). Subsequent research could delve deeper into the specific dimensions of CV and CSAT influenced by CSQ and their impacts on CL and long-term relationships with banks.

Firstly, future research can explore how customers perceive and interact with AI-enabled services, particularly Chatbots. This could involve studying factors like trust, acceptance, and ease of use of AI-based customer services, providing insights for banks to enhance service quality. Secondly, comparative analyses across different banking industries and regions can offer insights into diverse contexts. Comparing customer perceptions, service quality, and outcomes across countries can broaden understanding of the effectiveness of AI-enabled customer services in varied cultural and economic settings.

Long-term effects on CL and integration of AI-enabled services with other channels should be investigated, tracking customer behaviors and satisfaction levels over time and analyzing the sustained impact of Chatbot services on customer relationships. Additionally, ethical considerations in AI-enabled customer services, such as privacy, data security, and responsible AI algorithm use, must be explored to foster trust and confidence in these services.

Reference

Akbar, M.M. and Parvez, N. (2009) 'Impact Of Service Quality, Trust , And Customer Mohammad Muzahid Akbar and Noorjahan Parvez', 29(1), pp. 24–38.

Baron, R. M., & Kenny, D.A. (1986) 'The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations', *Journal of Personality and Social Psychology*, 15((6)), pp. 1173–1182. Available at: https://doi.org/https://doi.org/10.1037/0022-3514.51.6.1173.

Bolton, R.N. and Drew, J.H. (1991) 'A multistage model of customers' assessments of service quality and value.', *Journal of Consumer Research*, 17(4), pp. 375–384.

Boulding, W. *et al.* (1993) 'A Dynamic Process Model of Service Quality : From Expectations to Behavioral Intentions Author (s): William Boulding , Ajay Kalra , Richard Staelin and Valarie A . Zeithaml Stable URL : https://www.jstor.org/stable/3172510', *Journal of Marketing Research*, 30(1), pp. 7–27.

Bruhin, O., Hausch, M. and Söllner, M. (2020) 'Towards Developing Trust-Supporting Design Features for AI-Based Chatbots in Customer Service', (Coniam 2014), pp. 1–9. Available at: https://www.alexandria.unisg.ch/publications/261540.

Chen, F.F., Sousa, K.H. and West, S.G. (2005) 'Teacher's Corner: Testing Measurement Invariance of Second-

Order', *Structural Equation Modeling*, 12(3), p. 471492. Available at: https://doi.org/10.1207/s15328007sem1203.

Chen, Q. *et al.* (2022) 'Classifying and measuring the service quality of AI chatbot in frontline service', *Journal of Business Research*, 145(February), pp. 552–568. Available at: https://doi.org/10.1016/j.jbusres.2022.02.088.

Chenet, P., Tynan, C., & Money, A. (1999). (1999) 'Service performance gap: re-evaluation and redevelopment.', *Journal of Business Research*, 46(2), pp. 133–147.

Chodzaza, G.E. and Gombachika, H.S.H. (2013) 'Service quality, customer satisfaction and loyalty among industrial customers of a public electricity utility in Malawi', *International Journal of Energy Sector Management*, 7(2), pp. 269–282. Available at: https://doi.org/10.1108/IJESM-02-2013-0003.

Chung, M. *et al.* (2020) 'Chatbot e-service and customer satisfaction regarding luxury brands', *Journal of Business Research*, 117(September), pp. 587–595. Available at: https://doi.org/10.1016/j.jbusres.2018.10.004.

Fida, B.A. *et al.* (2020) 'Impact of Service Quality on Customer Loyalty and Customer Satisfaction in Islamic Banks in the Sultanate of Oman', *SAGE Open*, 10(2). Available at: https://doi.org/10.1177/2158244020919517.

Fornell, C. *et al.* (1996) 'The American Customer Satisfaction Index: Nature, purpose, and findings', *Journal of Marketing*, 60(4), pp. 7–18. Available at: https://doi.org/10.2307/1251898.

Fornell, C. and Larcker, D.F. (1981) 'Evaluating Structural Equation Models with Unobservable Variables and Measurement Error', *Journal of Marketing Research*, 18(1), p. 39. Available at: https://doi.org/10.2307/3151312.

Gartner (2019) *Market guide for virtual customer assistants.*

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L. (2006) 'Multivariate data analysis', 6.

Hapsari, R., Clemes, M. and Dean, D. (2016) 'The Mediating Role of Perceived Value on the Relationship between Service Quality and Customer Satisfaction : Evidence from Indonesian Airline Passengers', *Procedia Economics and Finance*, 35(October 2015), pp. 388–395. Available at: https://doi.org/10.1016/S2212-5671(16)00048-4.

Hardi, R.T., Naim Che Pee, A. and Suryana Herman, N. (2020) 'Enhanced Security Framework On Chatbot Using Mac Address Authentication To Customer Service Quality', *International Journal of Scientific & Technology Research*, 9(10).

Henseler, J., Ringle, C.M. and Sarstedt, M. (2015) 'A new criterion for assessing discriminant validity in variance-based structural equation modeling', *Journal of the Academy of Marketing Science*, 43(1), pp. 115–135. Available at: https://doi.org/10.1007/s11747-014-0403-8.

Iqbal, M.S., Hassan, M.U. and Habibah, U. (2018) 'Impact of self-service technology (SST) service quality on customer loyalty and behavioral intention : The mediating role of customer satisfaction Impact of self-service technology (SST) service quality on customer loyalty and behavioral intention : T', *Cogent Business & Management*, 50(1). Available at: https://doi.org/10.1080/23311975.2018.1423770.

Jun, M. and Cai, S. (2001) 'The key determinants of Internet banking service quality: A content analysis', *International Journal of Bank Marketing*, 19(7), pp. 276–291. Available at: https://doi.org/10.1108/02652320110409825.

Kuo, N.T. *et al.* (2011) 'The Impact of Service Quality , Customer Satisfaction and Loyalty in the Restaurant Industry : Moderating Effect of Perceived Value', in *IEEE ICQR made*, pp. 551–555.

Kuzniecova, T.E., Lebedev, N.A. and Nikiforov, L. V. (2013) 'Conditions and prospects of development of modern russia', *World Applied Sciences Journal*, 24(8), pp. 1059–1064. Available at: https://doi.org/10.5829/idosi.wasj.2013.24.08.13254.

Le, O.V. und Q. (2015) *ANeural ConversationalModel*, *Online Information Review*.

Leninkumar, V. (2017) 'The Relationship between Customer Satisfaction and Customer Trust on Customer Loyalty', *International Journal of Academic Research in Business and Social Sciences*, 7(4), pp. 450–465. Available at: https://doi.org/10.6007/ijarbss/v7-i4/2821.

Malik, S.U. (2012) 'Customer Satisfaction , Perceived Service Quality and Mediating Role of Perceived Value', 4(1), pp. 68–76. Available at: https://doi.org/10.5539/ijms.v4n1p68.

Meyer-Waarden, L. *et al.* (2020) 'How Service Quality Influences Customer Acceptance and Usage of Chatbots?', *Journal of Service Management Research*, 4(1), pp. 35–51. Available at: https://doi.org/10.15358/2511-

8676-2020-1-35.

Min Kyu, L. and Heejun, P. (2019) 'Exploring Factors Influencing Usage Intention of Chatbot – Chatbot in Financial Service', *The Korean Society for Quality Management*, 47(4), pp. 755–765.

Munari, L., Ielasi, F. and Bajetta, L. (2013) 'Customer satisfaction management in Italian banks', *Qualitative Research in Financial Markets*, 5(2), pp. 139–160. Available at: https://doi.org/10.1108/QRFM-11-2011-0028.

Nguyen, D.M., Chiu, Y.T.H. and Le, H.D. (2021) 'Determinants of continuance intention towards banks' chatbot services in vietnam: A necessity for sustainable development', *Sustainability (Switzerland)*, 13(14), pp. 1–24. Available at: https://doi.org/10.3390/su13147625.

Nunkoo, R. *et al.* (2017) 'Integrating service quality as a second-order factor in a customer satisfaction and loyalty model', *International Journal of Contemporary Hospitality Management*, 29(12), pp. 2978–3005. Available at: https://doi.org/10.1108/IJCHM-11-2016-0610.

Omoregie, O.K. *et al.* (2019) 'Factors influencing consumer loyalty: evidence from the Ghanaian retail banking industry', *International Journal of Bank Marketing*, 37(3), pp. 798–820. Available at: https://doi.org/10.1108/IJBM-04-2018-0099.

Otaibi, N.M. Al and Yasmeen, K. (2014) 'An Overview of Customer Loyalty, Perceived Service Quality and Customer Satisfaction: Brief on Saudi Grocery Stores', *Journal of Entrepreneurship and Business Innovation*, 1(1), p. 79. Available at: https://doi.org/10.5296/jebi.v1i1.6657.

Pandey, C, K. (2012) 'Banks for customer care', in *Banking 2020*. 2012th edn. Dominat Publishers and Distributors Pvt Ltd, pp. 374–381.

Parasuraman, A., Zeithaml, V. a and Berry, L.L. (1988) 'SERQUAL: A Multiple-Item scale for Measuring Consumer Perceptions of Service Quality', *Journal of Retailing*, 64(January), p. 28. Available at: https://doi.org/10.1016/S0148-2963(99)00084-3.

Park, J.G. *et al.* (2012) 'Client Relationship Proneness, Trust, Commitment and Reuse Intention in IT Services', *Journal of Digital Convergence*, 10(9), pp. 137–149.

Pisnik, A. (2010) 'Development , Validity and Reliability of Perceived Service Quality in Retail Banking and its Relationship With Perceived Value and Customer Satisfaction', (June).

Sanny, L. *et al.* (2020) 'The analysis of customer satisfaction factors which influence chatbot acceptance in Indonesia', *Management Science Letters*, 10(6), pp. 1225–1232. Available at: https://doi.org/10.5267/j.msl.2019.11.036.

Shamdasani, P., Mukherjee, A. and Malhotra, N. (2011) 'Antecedents and consequences of service quality in consumer evaluation of self-service internet technologies', 2069. Available at: https://doi.org/10.1080/02642060701725669.

Shawar, B.A. and Atwell, E. (2007) 'Different measurements metrics to evaluate a chatbot system', (April), pp. 89–96. Available at: https://doi.org/10.3115/1556328.1556341.

Sweeney, J.C., Soutar, G.N. and Johnson, L.W. (1999) 'The role of perceived risk in the quality-value relationship: A study in a retail environment', *Journal of Retailing*, 75(1), pp. 77–105. Available at: https://doi.org/10.1016/S0022-4359(99)80005-0.

Trivedi, J. (2019) 'Examining the Customer Experience of Using Banking Chatbots and Its Impact on Brand Love: The Moderating Role of Perceived Risk', *Journal of Internet Commerce*, 18(1), pp. 91–111. Available at: https://doi.org/10.1080/15332861.2019.1567188.

Wang, I.-M. and Shieh, C.-J. (2006) 'The relationship between service quality and customer satisfaction: the example of CJCU library', *Journal of Information and Optimization Sciences*, 27(1), pp. 193–209. Available at: https://doi.org/10.1080/02522667.2006.10699686.

Yee, R.W.Y., Yeung, A.C.L. and Cheng, T.C.E. (2011) 'The service-profit chain: An empirical analysis in high-contact service industries', *International Journal of Production Economics*, 130(2), pp. 236–245. Available at: https://doi.org/10.1016/j.ijpe.2011.01.001.

Zaibaf, M., Taherikia, F. and Fakharian, M. (2013) 'Effect of Perceived Service Quality on Customer Satisfaction in Hospitality Industry: Gronroos' Service Quality Model Development', *Journal of Hospitality Marketing and Management*, 22(5), pp. 490–504. Available at: https://doi.org/10.1080/19368623.2012.670893.

Zameer, H. *et al.* (2014) 'Impact of service quality , corporate image and customer satisfaction towards customers '

A REVIEW OF BLOCKCHAIN APPLICATION IN BANKING: A BIBLIOMETRIC APPROACH

Akshay Kumar Mishra*, Bhaskar Basu**

Purpose: *The increasing popularity of blockchain technology has garnered considerable attention within the banking sector, leading to a surge in research and implementation efforts. This study explores the current academic literature on blockchain implementation within the banking domain.*

Design/Methodology/Approach: *This study conducts a comprehensive bibliometric analysis to scrutinize the existing literature concerning the integration of blockchain technology in banking.*

Findings: *The thematic analysis reveals nine distinct clusters around the four quadrants, the central focus of which revolves around cryptocurrencies, payment services, operational efficiency enhancement, and reduction of transaction costs and intermediaries.*

Originality/Value: *The study uncovers several future research avenues, including investigating regulatory intervention, challenges in blockchain implementation, knowledge sharing impact, privacy, and ethical concerns, trust in monetary transactions, cost reduction's relationship with investment decisions, competitive advantages, and operating performance concerning blockchain technology in banking.*

Keywords : *Blockchain technology, Banking, Literature Review, Bibliometric Analysis, Thematic Analysis*
JEL Code: *G21*

I. Introduction

Technology plays a crucial and indispensable part in the contemporary business landscape. Internet banking, financial technology (Fintech), and prepaid payment instruments (PPI) have emerged as significant solutions to address the prevailing business dynamics within the banking and financial sectors. With the advent of Internet banking, many issues, such as high transaction fees, double spending, fraud and account hacking, economic crises, and crashes, have also been experienced by the industry. Blockchain technology (BCT) has been gaining popularity over the years, and many banks are particularly interested in adopting this technology. Blockchain is an open digital ledger with a chain of decentralized transactions; it is a distributed ledger controlled by all the participants, enabling them to form a trustworthy ledger. The origin of the blockchain idea was given by Nakamoto in 2008 (Thakur & Kilkarni, 2017). Blockchain technology uses an open digital ledger with a chain of decentralized transactions. It is a distributed public ledger controlled by all the participants, which enables them to form a trustworthy ledger (Lemieux, 2016).

Scholars have assessed the advantages and difficulties associated with BCT and its implementation across several scholarly fields, encompassing quantitative and qualitative finance contributions. Nevertheless, a notable gap exists in the extant academic literature regarding the synthesis of literature pertaining to the implementation of this concept, particularly within the domain of the banking sector. Considering this background, the present study endeavored to fill this gap by undertaking a comprehensive review and conducting a thematic analysis. Moreover, this study distinguishes itself from previous studies in two distinct ways. The study employs a comprehensive methodology to discern emerging prevailing themes in blockchain technology and banking. Additionally, it analyses the current research trends and advancements concerning the applications of blockchain in the selected domain of the research. Furthermore, this study provides a thorough framework for future research that researchers could utilize in their subsequent research pursuits.

II. Literature Review

The banking industry has witnessed a transformation of its historical phases to the different banking models (Mishra, 2019, 2023) in the era of globalization. Banks have demonstrated a proactive approach to leveraging technology to improve client satisfaction and operational efficiency, and they are currently exploring blockchain technology that could revolutionize the financial sector (Garg et al., 2023). During the early development of Blockchain, it was treated as

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a record-keeping technology with high integrity and security (Lemieux, 2016). Subsequently, it is proven as a technology for storing transactions in a decentralized manner, with high transparency and monitoring logistics to intelligent contracts (Kim et al., 2018; Wang et al., 2018). The trend of this technology is beyond cryptocurrency payments; it could enable decentralized applications without intermediaries (Taylor et al., 2020). Although BCT has numerous advantages, it has challenges, including storage capacity, scalability, security, anonymity, data privacy, smart contracts, legal issues, consensus, widespread adoption, and energy consumption (Reyna et al., 2018).

There appears to be many research publications on blockchain applications in various domains. Nevertheless, the focus of the study centers around cryptocurrencies, with a predominant emphasis on bitcoin analysis (Corbet et al., 2019) within the broader realm of BCT. While cryptocurrencies brought blockchain technology to the public's notice, it has many additional applications (Treleaven *et al.,* 2017). BCT can potentially enable large-scale applications in banking and associated industries; the comprehensive integration of blockchain and fintech will remain an intriguing study area (Xu *et al.,* 2019). Significantly, financial innovations have ushered in a new era in the field of finance, with BCT playing a crucial role in these transitions (Osmani et al., 2020). BCT will help reduce the number of intermediaries, improve transaction speed, and reduce the time spent processing transactions (Ramchandra et al., 2022; Cheng et al. 2021), thus improving efficiency.

In the studies above, scholars have examined blockchain technology's potential and anticipated advantages in the banking sector. Furthermore, the researchers have undertaken literature reviews of blockchain technology in several domains, such as cyber security (Taylor et al., 2020), management (Tandon et al., 2021), accounting (Lardo et al., 2022), including in the area of finance (Pal et al., 2021). However, the scholarly exploration of blockchain in banking has been limited to the best of the author's knowledge. Hence, given the significance of applying blockchain technology in the banking sector, this study aims to undertake a novel synthesis of scholarly literature to offer a comprehensive summary of existing research, identify key themes, and suggest potential areas for future research. This study thus presents the subsequent research questions (RQs) to fulfill the study's objective.

RQ1: What are the publication trends in the blockchain and banking area?

RQ2: What are the most prominent themes that have become apparent in blockchain technology and banking?

RQ3: What are the potential future directions for research into blockchain applications in banking?

III. Research Methodology

This study uses bibliometric analysis to review and evaluate the existing literature on blockchain applications in the banking sector. This technique is gaining significant influence due to its capacity to anticipate trends within specific domains (Li & Hasnah Hassan, 2023). Furthermore, this approach facilitates a comprehensive comprehension of the discipline by discerning the key areas that have received considerable focus and assessing their attributes and influence (Monteiro et al., 2021). For the intended review, the Scopus database was selected due to its usefulness in conducting the review, as highlighted by several studies (Sardana & Singhania, 2022; Roy & Banerjee, 2022; Kamath et al., 2022). The literature search was conducted using an appropriate mix of keywords to gather the appropriate data. The subsequent stage involves the application of inclusion and exclusion criteria to identify publications that are pertinent to the field of Blockchain and banking. Figure 1 shows the approach utilized to implement the data-collecting procedure on August 17, 2023. Moreover, this research employs a bibliometric approach to unveil trends, progress, and thematic domains of interest in blockchain and banking literature. We utilized the "Bibliometrix package" (Aria & Cuccurullo, 2017) and VOS Viewer in this investigation.

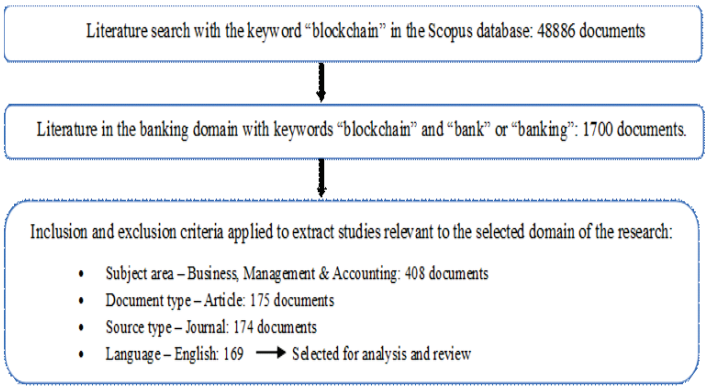

Figure 1 Data collection procedure of blockchain and banking literature

IV. Data Findings & Discussion

1.1. Evolution of Blockchain and Banking Literature Over the Years

The concept of Blockchain was initially introduced in 2007, and research about its practical implementation gained popularity at a later stage. For instance, we have used the default selection for the publication period, indicating that publications in the banking domain have experienced a surge in popularity since 2017. Based on the selected scholarly literature, Figure 2 displays the publication trends in Blockchain and banking, specifically regarding the annual count of published studies. The analysis of publishing patterns demonstrates a steady increase in publications from 2017 onwards. The year 2023 exhibits the most substantial volume of scientific output; however, this figure may be understated due to the data-gathering process conducted on September 9, 2023. Moreover, the analysis reveals that the utilization of blockchain technology in the banking sector is experiencing an upward trend.

Figure 2 Research articles annually published over the years

1.2. Influential sources and documents analysis

The scholarly evaluation of the evolution of BCT and its use in the banking industry has shown that this area has advanced consistently over time. To illustrate the significance of publication sources, we analyzed the data to present the most prominent sources, sorted based on the number of documents published within the designated study period. The use of BCT in the banking sector has been covered in studies published in many academic journals. Figure 3 displays the top 10 most prominent publication outlets (journals), including the number of scientific publications and the total count of citations, to demonstrate their significance within the chosen field of investigation. The journal "Transactions on Engineering Management" has demonstrated high productivity, publishing 8 papers. The journal "Technological Forecasting and Social Change" has been identified as the most significant source based on its substantial number of citations (479).

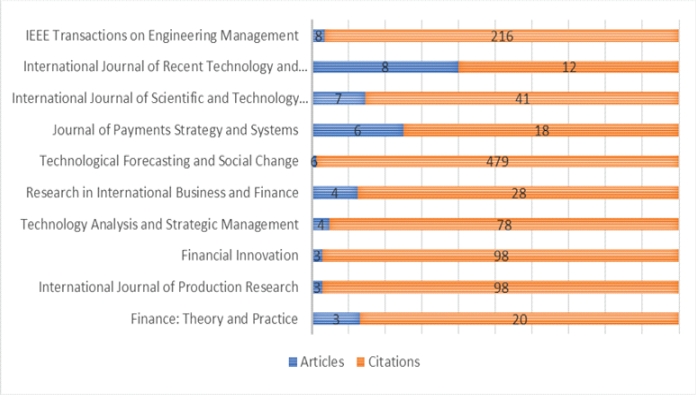

Figure 3 Most Influential Publication Sources

We augment our analysis by examining publications with the maximum number of citations to visualize the influence within the selected domains. Table 1 compiles the most often cited documents with their respective publication sources. Numerous scholarly authors have extensively examined various crucial facets of using BCT within the banking sector; for instance, intermediaries such as banks stand to gain advantages in terms of trust and security benefits through implementing blockchain technology (Min, 2019). Also, the capabilities of BCT have undergone significant development, resulting in a wide range of domains, including those in banking (Dai & Vasarhelyi, 2017; Du et al., 2020). According to Chang et al. (2020), although BCT can transform financial and commercial infrastructure, financial services should utilize it in the long run to grow their operations. Similarly, Mehar et al. (2019) highlighted that financial service businesses are driven to implement blockchain technology due to several significant factors, including cost reduction, security, convenience, and efficiency.

Table 1 Most influential documents in blockchain and banking literature

Title and Authors	Sources	Citations
"Blockchain technology for enhancing supply chain resilience" (Min, 2019)	Business Horizons	416

Title and Authors	Sources	Citations
"Toward Blockchain-Based Accounting and Assurance" (Dai & Vasarhelyi, 2017)	Journal of Information Systems	343
"How Blockchain can impact financial services – The overview, challenges and recommendations from expert interviewees" (Chang et al., 2020)	Technological Forecasting and Social Change	199
"Supply Chain Finance Innovation Using Blockchain" (Du et al., 2020)	IEEE Transactions on Engineering Management	143
"Understanding a Revolutionary and Flawed Grand Experiment in Blockchain: The DAO Attack" (Mehar et al., 2019)	Journal of Cases on Information Technology	141
"Cryptocurrencies and Business Ethics", (Dierksmeier & Seele, 2016)	Journal of Business Ethics	118
"Blockchain entrepreneurship opportunity in the practices of the unbanked" (Larios-Hernández, 2017)	Business Horizons	115
"Blockchain technology and startup financing: A transaction cost economics perspective", (Ahluwalia et al., 2020)	Technological Forecasting and Social Change	110
"The transition from traditional banking to mobile internet finance: an organisational innovation perspective - a comparative study of Citibank and ICBC" (Chen et al., 2017)	Financial Innovation	89
"Measuring the perceived benefits of implementing blockchain technology in the banking sector", (Garg et al., 2021)	Technological Forecasting and Social Change	84

Source: Authors compilation

Cryptocurrencies, known for their decentralized nature, are frequently seen as a possible challenge or alternative to the traditional centralized banking system (Dierksmeier & Seele, 2016). Notably, utilizing blockchain technology could offer various advantages, such as improving transparency, security, and accountability, and facilitating reduced transaction costs (Larios-Hernández, 2017). Moreover, according to Ahluwalia et al. (2020), BCT in banks enables the expeditious transfer of funds without intermediaries, which helps reduce transactional costs and mitigate uncertainty by reducing the time to execute the transaction. Technological advancements, including BCT and other financial technologies, have significantly transformed conventional commercial banks. Moreover, using BCT can potentially reshape the structural framework of commercial banks (Chen et al., 2017). Garg et al. (2021) assert that implementing BCT in banking can improve the quality of customer services, lower costs, eliminate intermediaries, and foster operational efficiency. These studies have examined the possible advantages of using blockchain technology in banking. These benefits encompass enhanced security measures, improved operational efficiency, reduced costs, increased accountability, eliminating intermediaries, and quality customer service.

1.3. Country's citations and scientific production

To enhance the scope of our study, we analyzed the countries with the highest levels of scientific productivity and influence based on the number of scientific documents and total citation counts, respectively. Table 2 presents a comprehensive overview of countries with high productivity levels and influence in blockchain and banking literature. The analysis reveals that the body of knowledge attracted authors from developing and developed countries. India tops the list regarding the number of scientific productions with 90 articles, whereas the United Kingdom tops the list regarding the highest citations (427).

Table 2 Most productive and most cited countries in blockchain and banking literature

Country	Article	Country	Citations
India	90	United Kingdom	427
China	61	China	398
USA	42	Germany	186
United Kingdom	33	Mexico	110
Ukraine	24	USA	76
Italy	17	France	67
Germany	14	India	60
France	12	Italy	57
Malaysia	12	Qatar	54
Nigeria	10	Hong Kong	41

Source: Authors compilation

1.4. Conceptual structure based on blockchain and banking literature

We employed keyword co-occurrence and thematic analysis to identify conceptual structures based on the blockchain and banking literature. Figure 4, generated using the VOS Viewer, illustrates the frequently used keywords in the literature on Blockchain and banking. The most frequently used keywords in scholarly literature encompass Blockchain, cryptocurrency, fintech, bitcoin, and banking, each appearing in over ten occurrences. The analysis was conducted by choosing co-occurrences of all the keywords and using the complete counting method. The threshold for visualization, as determined by the minimum number of occurrences of keywords, is set at 5. Of 860 keywords, 29 satisfy this criterion and are therefore eligible for visualization, as depicted in Figure 4.

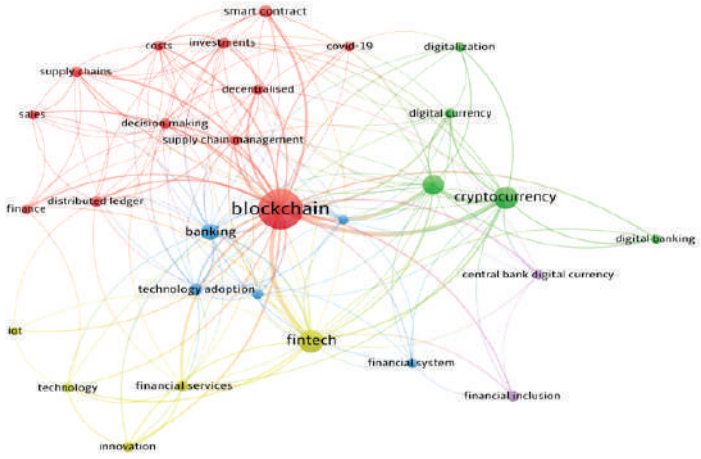

Figure 4 Conceptual structure based on blockchain and banking literature.

Five distinct clusters were discovered through the analysis. The initial cluster with 10 items, distinguished by the prominent keyword "blockchain", having the highest frequency (126) and the strongest link strength (217) within the body of literature, has been discovered. Based on the frequency of the keyword occurrences 5 different clusters have been identified (figure 3) "blockchain (12 keywords)", "cryptocurrency (5 keywords)", "banking (5 keywords)", and "fintech (5 keywords)" and "financial inclusion (2 keywords).

The thematic map (figure 5) has been constructed employing the "bibliometrics" tool, with consideration given to the relevance and progression of themes (Kamath et al., 2022) as indicated by the authors' keywords. The themes in the top right quadrant (Figure 5) are identified as motor themes exhibiting both high centrality and high density, indicating their significance and extensive development in blockchain and banking literature. Nine clusters have emerged in the different quadrants of the thematic map, enabling us to review the related literature to comprehend the responses to the proposed second and third research questions (RQ2 & RQ3). The central focus of these driving themes revolved around applying blockchain technology in the banking sector to enhance operational efficiency. For example, BCT can assist banks in identifying instances where the agreed-upon covenant is breached by actively looking into the smart contract execution to ensure adherence to regulations (Dai & Vasarhelyi, 2017).

Moreover, it can also facilitate improved decision-making within the banking sector by utilizing transparent, tamper-proof, and legitimate data (Tian et al., 2020). Tokenization, facilitated by blockchain technology, can significantly disrupt numerous operations across various disciplines, including banking and digital transactions (Ahluwalia et al., 2020). Significantly, (Raddatz et al., 2021) found that consumers' acceptance of conventional banking presents an important obstacle to fully harnessing the advantages of implementing blockchain technology in the banking sector.

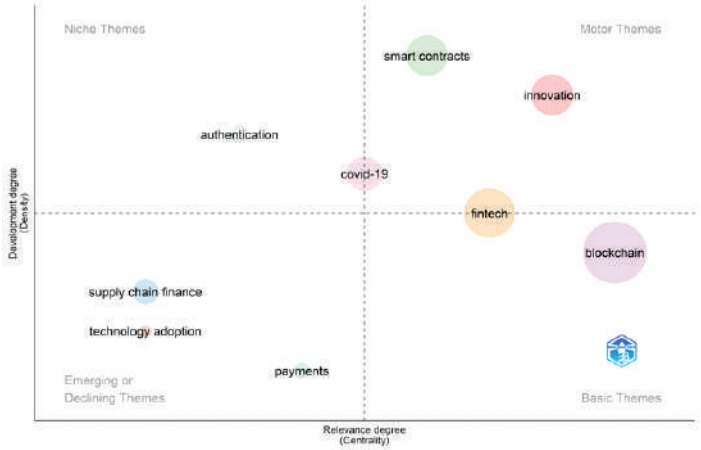

Figure 5 Key themes based on the author's keywords

Implementing BCT has positively impacted the banking sector's cost reduction and operational efficiency (Dozier & Montgomery, 2020). The potential benefits of BCT include enhanced data protection, expedited resolution, and streamlined automation leading to cost reduction. Also, open banking should consider utilizing payment mechanisms facilitated by Blockchain (Rjoub et al., 2023).

The literature delves into several facets under the core theme, such as trust and security (Min, 2019), cost reduction,

security, and efficiency (Mehar et al., 2019; Mishra & Kaushik, 2021; Kumar & Devi, 2022). Furthermore, the themes that exhibit lower levels of density and centrality encompass the themes of "payments", "technology adoption", and "supply chain finance". Significantly, utilizing blockchain technology effectively mitigates trust-related concerns within the domain of supply chain financing (Du et al., 2020; Liu et al., 2021). Using Blockchain, integrating real-time data between banks and the agriculture industry can improve credit ratings, risk profiling, and financing (Rijanto, 2020). In the niche theme, authors explored the security and safety aspects in relation to the literature; for example, implementing blockchain technology can provide significant benefits to both financial and non-financial industries, including enhanced security (Kumar et al., 2019).

V. Conclusion

The present study contributes to the existing body of literature by conducting a comprehensive review incorporating a bibliometric analysis of the scientific literature on implementing blockchain technology in the banking sector. Moreover, this study adds the following conclusions: First, the bank can utilize this technology to remove/lower the number of intermediaries, expedite transaction speed and quality, and bring transparency and convenience. Second, by leveraging this technology, which is widely regarded as the optimal approach for eliminating intermediaries and improving efficiency while reducing costs, it becomes feasible to promptly and seamlessly tackle banks' inefficiency challenges. Third, blockchain technology in the banking sector can contribute to risk management through several mechanisms, such as risk profiling, credit rating, and data protection, facilitating improved decision-making processes. In response to the proposed research questions (RQs), the study's findings presented the trend based on the growth of annual publication, country citations and scientific productions, and analysis of influential publication outlets and documents. Based on keyword analysis, the key areas that attracted scholars in this field include fintech, technology adoption, decision-making, financial services, digital banking, financial inclusion, investment, and smart contact. The thematic analysis allowed us to go deeply into the review, where the literature covered various pertaining issues, including cost reduction, efficiency, security, credit rating, financing, and integrating real-time data across the sectors to enhance banking operations. Furthermore, this study proposes potential avenues for future thematic and content analysis research. The areas within this domain that require further investigation encompass the following.

- Role of regulatory intervention using blockchain in the banking area.
- Challenges towards implementation of Blockchain in banks and other disciplines.
- The significance of knowledge sharing in the mitigation of perceived risk.
- The impact of blockchain implementation on privacy concerns.
- The association between the implementation of blockchain technology and ethical concerns.
- The significance of trust in monetary transactions using blockchain technology.
- The linkage between cost reduction and investment decision-making in entrepreneurial activity through blockchain technology.
- The relationship between using blockchain technology and attaining competitive advantages in the banking sector.
- The association between implementing blockchain technology and the operating performance in the banking sector.

Reference

Ahluwalia, S., Mahto, R. V., & Guerrero, M. (2020). Blockchain technology and startup financing: A transaction cost economics perspective. *Technological Forecasting and Social Change*, *151*, 119854. https://doi.org/10.1016/j.techfore.2019.119854

Aria, M., & Cuccurullo, C. (2017). bibliometrix : An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, 11(4), 959–975. https://doi.org/10.1016/j.joi.2017.08.007

Chang, V., Baudier, P., Zhang, H., Xu, Q., Zhang, J., & Arami, M. (2020). How Blockchain can impact financial services – The overview, challenges and recommendations from expert interviewees. *Technological Forecasting and Social Change*, *158*, 120166. https://doi.org/10.1016/j.techfore.2020.120166

Chen, Z., Li, Y., Wu, Y., & Luo, J. (2017). The transition from traditional banking to mobile internet finance: an organisational innovation perspective - a comparative

study of Citibank and ICBC. *Financial Innovation*, *3*(1). https://doi.org/10.1186/s40854-017-0062-0

Cheng, H. K., Hu, D., Puschmann, T., & Zhao, J. L. (2021). The landscape of Blockchain research: impacts and opportunities. *Information Systems and E-Business Management*, *19*(3), 749–755. https://doi.org/10.1007/s10257-021-00544-1

Corbet, S., Lucey, B., Urquhart, A., & Yarovaya, L. (2019). Cryptocurrencies as a financial asset: A systematic analysis. *International Review of Financial Analysis*, *62*, 182–199. https://doi.org/10.1016/j.irfa.2018.09.003

Dai, J., & Vasarhelyi, M. A. (2017). Toward Blockchain-Based Accounting and Assurance. *Journal of Information Systems*, *31*(3), 5–21. https://doi.org/10.2308/isys-51804

Dierksmeier, C., & Seele, P. (2016). Cryptocurrencies and Business Ethics. *Journal of Business Ethics*, *152*(1), 1–14. https://doi.org/10.1007/s10551-016-3298-0

Dozier, P. D., & Montgomery, T. A. (2020). Banking on Blockchain: An Evaluation of Innovation Decision Making. *IEEE Transactions on Engineering Management*, *67*(4), 1129–1141. https://doi.org/10.1109/tem.2019.2948142

Du, M., Chen, Q., Xiao, J., Yang, H., & Ma, X. (2020). Supply Chain Finance Innovation Using Blockchain. *IEEE Transactions on Engineering Management*, *67*(4), 1045–1058. https://doi.org/10.1109/tem.2020.2971858

Garg, P., Gupta, B., Chauhan, A. K., Sivarajah, U., Gupta, S., & Modgil, S. (2021). Measuring the perceived benefits of implementing blockchain technology in the banking sector. *Technological Forecasting and Social Change*, *163*, 120407. https://doi.org/10.1016/j.techfore.2020.120407

Garg, P., Gupta, B., Kapil, K. N., Sivarajah, U., & Gupta, S. (2023). Examining the relationship between blockchain capabilities and organisational performance in the Indian banking sector. *Annals of Operations Research*. https://doi.org/10.1007/s10479-023-05254-0

Kamath, N. A., S. Shenoy, S., & Kumar N., S. (2022). An overview of investor sentiment: Identifying themes, trends, and future direction through bibliometric analysis. *Investment Management and Financial Innovations*, *19*(3), 229–242. https://doi.org/10.21511/imfi.19(3).2022.19

Kim, H. M., & Laskowski, M. (2018). Toward an ontology-driven blockchain design for supply-chain provenance. *Intelligent Systems in Accounting, Finance and Management*, *25*(1), 18–27. https://doi.org/10.1002/isaf.1424

Kumar, A. N., Jegadeesan, R., Ravi, C., & Greeda, J. (2019). A secure transaction authentication scheme using Blockchain based on IOT. *International Journal of Scientific & Technology Research, 8(10),* 2217-2221.

Lardo, A., Corsi, K., Varma, A., & Mancini, D. (2022). Exploring Blockchain in the accounting domain: a bibliometric analysis. *Accounting, Auditing & Accountability Journal*, *35*(9), 204–233. https://doi.org/10.1108/aaaj-10-2020-4995

Larios-Hernández, G. J. (2017). Blockchain entrepreneurship opportunity in the practices of the unbanked. *Business Horizons*, *60*(6), 865–874. https://doi.org/10.1016/j.bushor.2017.07.012

Lemieux, V. L. (2016, July 18). Trusting records: is Blockchain technology the answer? *Records Management Journal*, *26*(2), 110–139. https://doi.org/10.1108/rmj-12-2015-0042

Li, P., & Hasnah Hassan, S. (2023). Mapping the literature on Gen Z purchasing behavior: A bibliometric analysis using VOSviewer. *Innovative Marketing*, *19*(3), 62–73. https://doi.org/10.21511/im.19(3).2023.06

Liu, L., Li, Y., & Jiang, T. (2021). Optimal strategies for financing a three-level supply chain through blockchain platform finance. *International Journal of Production Research*, *61*(11), 3564–3581. https://doi.org/10.1080/00207543.2021.2001601

Mehar, M. I., Shier, C. L., Giambattista, A., Gong, E., Fletcher, G., Sanayhie, R., Kim, H. M., & Laskowski, M. (2019). Understanding a Revolutionary and Flawed Grand Experiment in Blockchain. *Journal of Cases on Information Technology*, *21*(1), 19–32. https://doi.org/10.4018/jcit.2019010102

Min, H. (2019). Blockchain technology for enhancing supply chain resilience. *Business Horizons*, *62*(1), 35–45. https://doi.org/10.1016/j.bushor.2018.08.012

Mishra, A. K. (2019). Differentiated Banking in India: The Road Ahead. *Management Dynamics, 19(1).* https://doi.org/10.57198/2583-4932.1291

Mishra, A. K. (2023). Payment Banks in India: Review and Research Agenda. *Management Dynamics, 23(2)*. https://doi.org/10.57198/2583-4932.1326

Mishra, L., & Kaushik, V. (2021). Application of Blockchain in dealing with sustainability issues and challenges of financial sector. *Journal of Sustainable Finance & Investment*, *13*(3), 1318–1333. https://doi.org/10.1080/20430795.2021.1940805

Osmani, M., El-Haddadeh, R., Hindi, N., Janssen, M., & Weerakkody, V. (2020). Blockchain for next generation services in banking and finance: cost, benefit, risk and opportunity analysis. *Journal of Enterprise Information Management, 34(3),* 884–899. https://doi.org/10.1108/jeim-02-2020-0044

Pal, A., Tiwari, C. K., & Behl, A. (2021). Blockchain technology in financial services: a comprehensive review of the literature. *Journal of Global Operations and Strategic Sourcing*, *14*(1), 61–80. https://doi.org/10.1108/jgoss-07-2020-0039

Raddatz, N., Coyne, J., Menard, P., & Crossler, R. E. (2021). Becoming a blockchain user: understanding consumers' benefits realisation to use blockchain-based applications. *European Journal of Information Systems, 32(2),* 287–314. https://doi.org/10.1080/0960085x.2021.1944823

Ramchandra, V. M., Kumar, K., Sarkar, A., Kr. Mukherjee, S., & Agarwal, K. (2022). Assessment of the impact of blockchain technology in the banking industry. *Materials Today: Proceedings*, *56*, 2221–2226. https://doi.org/10.1016/j.matpr.2021.11.554

Reyna, A., Martín, C., Chen, J., Soler, E., & Díaz, M. (2018). On Blockchain and its integration with IoT. Challenges and opportunities. *Future Generation Computer Systems*, *88*, 173–190. https://doi.org/10.1016/j.future.2018.05.046

Rijanto, A. (2020). Business financing and blockchain technology adoption in agroindustry. *Journal of Science and Technology Policy Management*, *12*(2), 215–235. https://doi.org/10.1108/jstpm-03-2020-0065

Rjoub, H., Adebayo, T. S., & Kirikkaleli, D. (2023). Blockchain technology-based FinTech banking sector involvement using adaptive neuro-fuzzy-based K-nearest neighbors algorithm. *Financial Innovation*, *9*(1). https://doi.org/10.1186/s40854-023-00469-3

Roy, S., & Banerjee, S. (2022). Trajectories of Brand Personality Research since the New Millennium: A Bibliometric Analysis. *FIIB Business Review*, https://doi.org/10.1177/23197145221105942

Sardana, V., & Singhania, S. (2022). Fifty Years of Research in Deposit Insurance: A Bibliometric Analysis and Review. *FIIB Business Review*, https://doi.org/10.1177/23197145221116455

Tandon, A., Kaur, P., Mäntymäki, M., & Dhir, A. (2021). Blockchain applications in management: A bibliometric analysis and literature review. *Technological Forecasting and Social Change*, *166*, 120649. https://doi.org/10.1016/j.techfore.2021.120649

Taylor, P. J., Dargahi, T., Dehghantanha, A., Parizi, R. M., & Choo, K. K. R. (2020, May). A systematic literature review of Blockchain cyber security. *Digital Communications and Networks*, *6*(2), 147–156. https://doi.org/10.1016/j.dcan.2019.01.005

Thakur, S., & Kulkarni, V. (2017, December 15). Blockchain and Its Applications – A Detailed Survey. *International Journal of Computer Applications*, *180*(3), 29–35. https://doi.org/10.5120/ijca2017915994

Tian, Z., Zhong, R. Y., Vatankhah Barenji, A., Wang, Y. T., Li, Z., & Rong, Y. (2020). A blockchain-based evaluation approach for customer delivery satisfaction in sustainable urban logistics. *International Journal of Production Research, 59(7),* 2229–2249. https://doi.org/10.1080/00207543.2020.1809733

Treleaven, P., Gendal Brown, R., & Yang, D. (2017). Blockchain Technology in Finance. *Computer*, *50*(9), 14–17. https://doi.org/10.1109/mc.2017.3571047

Xu, M., Chen, X., & Kou, G. (2019). A systematic review of Blockchain. *Financial Innovation*, *5*(1). https://doi.org/10.1186/s40854-019-0147-z

AN EXPLORATORY STUDY EXAMINING THE INTERRELATIONSHIP BETWEEN FRAUDS AND STAFF ATTRIBUTES: PRIVATE VS. PUBLIC SECTOR BANKS IN INDIA.

Tirumalaraju Naveen*, Dr. G.V. Satya Sekhar**

Purpose: *For the past decade, our Indian Banking industry has been facing multiple issues with balance sheet figures and one of the major issues is non-performing assets caused by fraud. Therefore, to eliminate financial fraud conditions, it is necessary to introduce measures and identify the challenges that banks face when dealing with such fraudulent activities. This paper examines the interrelationship between frauds and the staff attributes, viz., designation, delegation, and doing business vis-à-vis private and public sector banks in India.*

Design/Methodology/Approach: *We have analyzed RBI data on frauds during the last ten-year period i.e. from 2013 to 2023 and a sample of 362 employees from various banks have been taken for analyzing the study. We have used regression analysis and content analysis to test the hypothesis of our study. Further, an extensive literature review helped us to fulfill the objectives of our study.*

Findings: *TOur study revealed that various factors i.e. business targets and staff shortage lead to fraud in the Indian banking sector. Particularly, work pressure caused by staff shortage leads to an increase in frauds in public sector banks and work pressure caused by business targets leads to an increase in fraud cases in private sector banks. This study's findings revealed the major obstacles faced by bankers in their daily operations.*

Originality/Value: *The previous researchers have not discussed the individual factors or staff attributes that are responsible for fraud in the Indian Banking sector and especially, sector-wise (public/private) problems were not discussed to curtail the fraud and the current paper tries to fill this gap.*

Keywords : *Fraud, Staff Attributes, Public Sector, Private Sector, Banking Sector.*
JEL Code: *C00,C12,E44,E50.*

I. Introduction

Almost every bank has been reporting fraud to regulatory authorities yearly, and some big-ticket loans have hit the headlines. Vijay Mallya fraud case (2016), Nirav Modi scam (2018), Rotomac Pen Scam (2015), Winsome Diamond scam (2016), Kanishk Gold Bank Fraud (2017), Videocon Case (2019), Sterling Biotech Limited Fraud (2017), ABG Shipyard Fraud Case (2022), etc. For example, the Central Bureau of Investigation (CBI) reported a financial fraud case on 10 January 2021 in Hyderabad against Coastal Projects Limited for defrauding the State Bank of India (SBI) with INR 4736.57 crores. The company misappropriated the assets by falsifying account books and financial statements, showing high investments in the form of unrealizable bank guarantees during 2013-2018.

As per the figures of 2022-23 released by the Reserve Bank of India 69,791 fraud cases amounting to Rs.29,990 crores were reported by commercial banks including certain financial institutions, out of which, Rs.21,137 crores from public sector banks, and the remaining Rs.8,853 crores from private sector banks. Private sector banks dominate public sector banks in the number of fraud cases and vice versa in case of amount wise. The said fraud cases in the last FY 2022-23 were reported as on current date and it may increase if any bank reports in future date. During the past decade, the highest fraud cases reported by a banks in a single financial year is 2019-20 i.e. Rs.1,82,468 crores.

Statement of the Problem:

Fraud doesn't affect the balance sheet of banks alone, it impacts the entire country's economy in every aspect and the burden falls on every individual's head directly or indirectly. The banking industry is considered the heart of the economy as it supplies money to all other sectors of the economy, the health of the nation ultimately depends on the banking sector. Further, if the banking sector is affected by financial fraud, it adversely impacts the bank's growth and efficiency (Khanna & Arora, 2009). The increase in fraudulent cases

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creates questions about the bank's workings' accountability, fairness, and transparency. It creates mistrust among the people, and the goodwill of the banks gets hampered negatively. Therefore, banks must conduct their banking operations carefully to prevent fraud and enhance their productivity & performance.

Over the last few years, fraud cases have been increasing enormously in public and private sector banks as per the RBI data on frauds reported by the banks. From the below tables, it can be observed that figures are doubling every year compared to the preceding year in both the public and private sector banks. The number of fraud cases and amounts are high in Public sector banks compared to private sector banks; nevertheless, private sector banks have also reported high-value frauds in recent years. As there is no downtrend in fraud figures despite various guidelines and preventive measures on frauds issued by Reserve Bank of India, Central vigilance Commission and respective banks. In this regard, my study is to find out the actual challenges faced by the bankers in their daily operations and factors that leads to frauds in Indian public and private sector banks.

Staff Attributes & their Impact on Fraud:

In any organization, every staff member has to work for their corporate objective, for which their attributes play a vital role in meeting corporate goals. In the banking sector, little more importance is given to individual attributes since it deals with public money. As per recent statistics, fraud cases have been increasing in a multifold manner, in this regard, extra care is to be given to the following attributes for the good conduct of business in banks.

Delegation: Delegation is the most important part of any business as it determines the authority among the employees in an organization. Everyone in the organization has their role and responsibility to do, however, if any staff shortage exists at any juncture, the role & responsibility will be fallen on another staff and which leads to overburdening them. These problems lead to an increase in the chances of perpetrating fraud by fraudsters.

Designation: Every designation of an employee in the banking sector has separate key responsible areas, depending on their position they face multiple challenges in their daily operations. As per the modus operandi of some of the fraud cases, these problems are the root causes of many fraud incidents.

Doing Business with people: Banks mainly deal with the public and over the past few years, the competition is very high among its peers as branches of various banks are opening in every corner of the area. Thereby, total business figures are mounting up every year and which leads to an increase in fraud cases too.

II. Literature Review

Internal Management and Control:

Bologna, (1993) discussed frauds committed by insiders like managerial staff, directors, and managers and outsiders like customers, and vendors. He cites certain factors that increase the probability of embezzlement by fraudsters i.e., inadequate rewards, inadequate internal controls, no proper role assignment & duties, no proper accountability procedure, no proper training methods to educate employees, no proper periodical inspections, unable to check the compliance with company procedure and policies by the employees. He discussed specific methods for corporate fraud prevention and detection techniques.

Albrecht, (1996) has mentioned that negligence on the part of a bank's internal control will increase the occurrence of fraud. This may include a lack of proper work allocation among its staff, lack of delegation of powers, lack of scrutiny, lack of proper documentation, and poor accounting system.

Sharma &Brahma, (2000) revealed that the causes of many frauds are due to the negligence of the bank's supervisory staff. Further, it was stated in the study that supervisory staff at the branch level need to control the above types of fraud.

Madan, (2015) found in his study that security control measures were not complied with under the following heads i.e. internal checks, DD section, chequebook issue department, loans & advances, deposit account & internal branch accounts. He discussed that banks should concentrate on fraud prevention techniques and enable an effective mechanism to investigate all fraud cases. The primary reason behind the high incidence of Fraud in Indian public and private sector banks was a failure in the regulatory supervision system. Auditors have failed to perform their duties effectively and therefore many of the frauds are not made known. He further discussed that all banks should share the methods and procedures adopted by the fraudsters in different reported scams so that they can arrest in the future course. It is suggested that the regulatory members work collaboratively by sharing databases and inputs to prevent Fraud.

Swain & Swain and Pani, (2016) mentioned that the leading causes of bank fraud are due to the laxity of bank officials, lack of knowledge about the bank's guidelines, and noncompliance with KYC guidelines.

Neha&Dhiraj, (2017) studied employee awareness's impact on reducing financial fraud. The study discussed that various banks have adopted different internal control measures and which are not sufficient as the same was not met with the RBI requirements. Their study has discussed the importance of training employees for the prevention of bank fraud. They have suggested that the employees should be properly trained to act against fraud.

Technology frauds:

According to Goyal (2012), cybercrime is defined as unauthorized access to a computer system, data modification, and steal the data of one's confidential information, i.e., financial transaction data and office data.

Apart from the individual's data, cybercrime causes the nation's security may be in threat if one steals the data, also conventional spying, and other associated activities. Recently fake emails, sexual harassment, and phishing are prominently taken place and registered numerous complaints.

Soni&soni, (2013) have analyzed cyber frauds in the banking industry and they have made a comparative analysis between public and private sector banks. The analysis was mainly based on the data obtained from Reserve bank of India. The study found that private sector banks including foreign banks have more share in cyber frauds than public sector banks and the cyber frauds include card-related transactions, digital banking (mobile and internet banking), and other online activities. Their study mentioned that the value of cyber fraud was still higher despite cases had been decreasing. This study explains that the introduction of ATMs and digital banking is the result of cyber frauds in the country and RBI also gets stronger from the above-said experience and issued regulatory & reporting guidelines to banks with regard to cyber fraud cases.

Bamrara, A., Singh, G. & Bhatt, M. (2013) have discussed the importance of networks i.e. communication between different organizations via the internet and at the same time it was informed that the above type of networks is more prone to cyber-attacks. The study explains the different methods adopted by cyber fraudsters to concentrate on particular banks to gain an advantage and also they have assessed different cyber defense techniques and their correlation with cyber attacks. Their study found that 60% of banks' top management informed that their banks identified online identity theft. They have suggested that customer awareness should bring into the picture to encounter the above type of fraud and with the help of governments & private agencies, the task would be made easier.

Kumar, V. &Sriganga, B.K., (2014) have discussed that bank frauds had been rising alarmingly and they have suggested that implementing data analysis tools to arrest the said type of fraud and impact can be reduced at a higher level. They have mentioned that fraudsters are coming with advanced technologies to defraud the banks and their customers and implanting data analysis tools type methods is the best possible way to stop fraudsters from counterattacks.

Raghavan&Parthiban, (2014) studied numerous frauds in digital banking relating to card frauds, i.e., debit and credit cards, phishing attacks, hacking, malware attacks, and stealing personal data, which leads to substantial financial loss to the individual and sovereign.

More, Jadhav&Nalawade, (2015) have stated that in the current period of globalization, digital banking has occupied a prominent place in the current century. Online crimes are also increasing along with technology. To arrest the same to a certain extent, specific preventive measures must be adopted, i.e., to find out the source of the crime, recruit skilled employees, adopting precautionary measures, i.e., educate the customers.

Fraud prevention measures:

Suh&Han, (2002) states that banks must implement sophisticated fraud preventive measures to build trust among the customers, in absence of the above checks it is difficult to build customer trust and increase business.

Wilhelm (2004) states that the fraud management lifecycle will summarize the entire prevention cycle. The cycle contains eight stages: prevention, identification, mitigation, scrutiny, guidelines, investigation, and trial. On the other hand, a prevention activity identifies and arrests fraudsters from committing fraudulent activities.

Bierstaker, Brody&Pacini, (2006) have discussed different fraud protection and identification strategies. These include fraud guidelines, staff profile checks, frequent reviews of vulnerable areas, statistical reviews, password policies,

firewalls, and other discovery methods like software code design.

Willson, (2006) has stated that lack of proper management control and inattention towards early warning signals leads to financial fraud in organizations. Other factors, such as weak operational control, lack of risk management, and segregation of tasks between front and back-office, lead to high risks of financial fraud within a banking organization.

Kingsley, (2012) has explained the multiple reasons for fraud in the Nigerian banking sector. He stated that fraud had been increasing to a greater extent and losing trust and confidence among the public. The author has stated certain factors that cause fraud and which include low salary structure of the employees, weak information technology, deviating bank's laid down guidelines and procedures, heavy competition among its peers. The author has concluded his study by stating that banks should bring effective fraud detective mechanisms and curtail the motives of the fraudsters for doing fraud.

Hoffman &Birnbrich, (2012) have established the relationship between customer awareness of fraud prevention policy and customer loyalty. They have mentioned that many of the customers have been affected by fraud earlier and it influenced them to gain knowledge about the prevention mechanism of fraud policy in banks. The study revealed that there is a positive relationship between customer knowledge about prevention methods and their satisfaction with bank products.

Vigneshwaran&Yokesh, (2018) identified that the banking sector is normally well-regulated and supervised. However, the sector has its own set of problems and challenges regarding ethical practices.

OBJECTIVES:

- To identify the intensity of factors that lead to fraud in Indian public and private sector banks.
- To examine the staff attributes (viz., designation, delegation, and doing business) impact on fraud in the banking sector in India.

RESEARCH HYPOTHESIS:

H1: Attribute- Delegation: There is no significant relationship between overburdened staff and fraud.

H2: Attribute- Designation: There is no significant relationship between the cadre of staff and factors influencing Fraud.

H3: Attribute- Doing Business with People: There is no relationship between the turnover of the business and the amount of Fraud in public vs. private sector banks.

METHODOLOGY:

By analyzing the literature review, RBI data on frauds for the period of 10 years (2013-23), practical experiences, and interviews with random bank employees, an outline can be made and it would clear the considerable factors of fraud in the banking industry and its actual output, which damages the industry as a whole. A sample size of 362 bank employees (Scale II:64, Scale I:232, Clerk:66) was taken from Union bank of India, Canara Bank (Public Sector Banks) &KarurVysya Bank, Axis Bank (Private Sector Banks) in Vijayawada, Visakhapatnam & Kakinada, Andhra Pradesh state for interviews with random bank employees.

H1: There is no significant relationship between overburdened staff and fraud.

III. Data Findings and Discussion

From Tables 1 and 2, it can be observed that the p-value is less than the specified α of 0.05. Hence, the null hypothesis is rejected, and it is made clear that there is a significant relationship between overburdened staff and fraud in public sector branches. From the below analysis, it is evident that staff shortage exists in public sector banks.

Table- 1: Staff Position & Fraud in Public Sector Banks (Amount in cr.)

YEAR	PSB staff	PSB branches	No. of frauds	Amount involved in fraud
2013-14	8,42,813	85,004	2,495	6,840
2014-15	8,59,692	90,774	3,061	16,246
2015-16	8,27,283	94,054	2,657	16,647
2016-17	8,26,840	96,593	2,608	18,396
2017-18	8,07,448	95,223	3,908	36,921
2018-19	8,08,400	92,523	6,520	63,290
2019-20	7,70,409	92,816	12,457	1,48,175
2020-21	7,70,800	92,481	9,920	77,900
2021-22	7,60,029	86,311	7,937	40,029
2022-23	7,56,644	84,258	6,090	21,137

Source: compilation from RTI act data from RBI

Table- 2: Result of regression statistics

Regression Statistics	
Multiple R	0.801009207
R Square	0.64161575
Adjusted R Square	0.53922025
Standard Error	2357.106091
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	69627756	34813878	6.266054	0.027556
Residual	7	38891644	5555949		
Total	9	1.09E+08			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	56586.80615	21132.25	2.677746	0.031642	6616.968	106556.6	6616.968	106556.6
PSB staff	-0.078636369	0.022269	- 3.5312	0.009582	-0.13129	-0.02598	-0.13129	-0.02598
PSB branches	0.135448488	0.188046	0.720295	0.494687	-0.30921	0.580107	-0.30921	0.580107

From Tables 3 and 4, it can be observed that the p-value is more than the specified α of 0.05. Hence, the null hypothesis is accepted, and it is clear that there is no significant relationship between staff burden and fraud in private sector branches. Hence, we may conclude that there is no staff shortage exists in private-sector banks.

Table- 3: Staff Position & Fraud in Private Sector Banks (Amount in cr.)

YEAR	PVB staff	PVB branches	No. of frauds	Amount involved in fraud
2013-14	3,03,856	18,716	1240	2354.75
2014-15	3,19,050	20,657	1167	2686.35
2015-16	3,63,048	25,516	1545	1528.89
2016-17	4,13,989	27,816	1732	5120.04
2017-18	4,20,285	29,443	22371	3853.45
2018-19	4,76,390	33,186	35507	6750.81
2019-20	5,54,950	34,794	58858	34293.46
2020-21	5,72,586	35,686	64933	45602.83
2021-22	6,47,094	36,680	59138	17476.24
2022-23	7,45,612	37,872	63701	8853.52

Source: compilation from RTI act data from RBI

Table- 4: Result of regression statistics

Regression Statistics	
Multiple R	0.934774
R Square	0.873802
Adjusted R Square	0.837746
Standard Error	11537.21
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	6.45E+09	3.23E+09	24.23426	0.000714
Residual	7	9.32E+08	1.33E+08		
Total	9	7.38E+09			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-74268	19594.63	-3.79022	0.006801	-120602	-27934.1	-120602	-27934.1
PVB staff	0.094608	0.073032	1.29543	0.236253	-0.07809	0.267303	-0.07809	0.267303
PVB branches	1.988097	1.573494	1.263491	0.246864	-1.73263	5.70882	-1.73263	5.70882

H2: There is no significant relationship between the cadre of staff and factors influencing Fraud.

As per Table -5, it can be observed that most of the employees in public sector banks (various positions) quoted that overburden causes more bank frauds. Further, almost the same score was given to business pressures that cause fraud. Minor weightage is given to personal financial issues. As per table-6, it can be observed that most of the employees in private sector banks (various positions) quoted that business pressures cause more bank frauds. The least weightage is given to personal financial issues.

Table 5: Scores given by public sector bank staff to the certain reasons for the occurrence of frauds in Banks.

	Reasons for Frauds in Public Sector Banks (for maximum 10-point rating)				
Rank	Lack of awareness of bank guidelines	Overburden due to Staff shortage	Business pressures	personal financial issues	corrupted higher officials
Scale II	5	9	8	2	4
Scale I	7	9	9	3	6
Clerk	7	7	5	2	5

Source: Author's compilation

Table 6: Scores given by private sector bank staff to the certain reasons for the occurrence of frauds in Banks.

	Reasons for Frauds in private sector banks (for maximum 10-point rating)				
Rank	Lack of awareness of bank guidelines	Overburden due to Staff shortage	Business pressures	personal financial issues	corrupted higher officials
Scale II	3	2	9	4	4
Scale I	5	3	8	4	5
Clerk	3	3	8	2	3

Source: Author's compilation

H3: There is no relationship between the turnover of the business and the amount of Fraud in public vs private sector banks

Tables 7 and 8 depict regression analysis; business turnover is considered the independent variable, and fraud amount is the dependent variable. R Square is 0.32, which implies that 32% of variations in business turnover are explained by the amount involved in Fraud. Further, from the above table, it can be observed that the p-value is greater than the specified α of 0.05. So, the null hypothesis is accepted, and it is made clear that there is no significant relationship between business turnover and the amount of fraud in public sector branches.

Table 7: Branch position & business statistics of Public sector banks

YEAR	PSB branches	Business	No. of frauds	Amount involved in fraud
2013-14	85,004	1,04,56,349	2495	6839.72
2014-15	90,774	1,12,51,809	3061	16246.11
2015-16	94,054	1,19,91,793	2657	16646.93
2016-17	96,593	1,30,15,062	2608	18396.43
2017-18	95,223	1,35,50,106	3908	36920.8
2018-19	92,523	1,40,77,232	6520	63289.72
2019-20	92,816	1,47,92,676	12457	148175.32
2020-21	92,481	1,58,65,472	9920	77900.36
2021-22	86,311	1,77,61,303	7937	40029.03
2022-23	84,258	1,99,93,344	6090	21136.57

Source: compilation from RTI act data from RBI

Table 8: Regression Results

Regression Statistics	
Multiple R	0.567259
R Square	0.321782
Adjusted R Square	0.237005
Standard Error	3033.146
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	34919623	34919623	3.795623	0.08723
Residual	8	73599777	9199972		
Total	9	1.09E+08			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-3741.49	4973.065	-0.75235	0.473393	-15209.4	7726.421	-15209.4	7726.421
Business	0.000666	0.000342	1.948236	0.08723	-0.00012	0.001454	-0.00012	0.001454

Tables 9 and 10 represent regression analysis; business turnover is the independent variable, and fraud amount is the dependent variable. R Square is 0.87, which implies that 87% of variations in business turnover are explained by the amount involved in Fraud. Further, from the above table, it can be observed that the p-value is less than the specified α of 0.05. So, the null hypothesis is rejected, and it is made clear that there is a significant relationship between business turnover and the number of frauds in private sector branches.

Table 9: Branch position & business statistics of Private sector banks

YEAR	PVB branches	Business	No. of frauds	Amount involved in fraud
2013-14	18,716	28,06,898	1240	2354.75
2014-15	20,657	32,72,888	1167	2686.35
2015-16	25,516	40,09,689	1545	1528.89
2016-17	27,816	49,07,590	1732	5120.04
2017-18	29,443	58,14,951	22371	3853.45
2018-19	33,186	73,32,726	35507	6750.81
2019-20	34,794	79,30,222	58858	34293.46
2020-21	35,686	87,87,927	64933	45602.83
2021-22	36,680	1,00,17,783	59138	17476.24
2022-23	37,872	1,16,66,005	63701	8853.52

Source: compilation from RTI act data from RBI

Table 10: Regression Results

Regression Statistics	
Multiple R	0.938026
R Square	0.879893
Adjusted R Square	0.86488
Standard Error	10528.42
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	6.5E+09	6.5E+09	58.6074	5.99E-05
Residual	8	8.87E+08	1.11E+08		
Total	9	7.38E+09			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-28927.7	8508.923	-3.39969	0.009365	-48549.3	-9306.09	-48549.3	-9306.09
Business	0.009008	0.001177	7.655547	5.99E-05	0.006295	0.011722	0.006295	0.011722

Our findings revealed that public sector bank branches are working with limited staff (staff shortage), leading to overburdening for the existing staff, thereby deviating from the guidelines in executing the daily operations. Hence, it allows fraudsters to take advantage of this issue. With regard to private sector banks, bank managements have been framing high business targets for achieving their business in recent years because competition is very high in the market. To reach the higher targets, bank staff failed to pay attention to the policy guidelines, which led to fraud in the banking industry. Hence, fraud number has been increasing enormously along with its business in private sector banks. It is disclosed that there is no significant relationship between staff burden and fraud in public sector branches. It is found that there is a significant relationship between business turnover and the amount of fraud in private sector branches as fraud number increases along with its business.

IV. Conclusion

The research is estimated to provide a brief overview of the factors influencing fraud in private and public banks in India. By analyzing the above literature, the details related to financial fraud within the Indian banking sector have been inadequate and did not provide much information about the obstacles they face, especially sector-wise. The current research is expected to provide valuable information about the occurrence of financial fraud in the Indian banking sector (sector-wise). The research also contributes to enhancing banks' functioning by directing policymakers' attention toward revamping staffing patterns in the Indian banking sector and making stringent rules against fraudsters.

References

Raghavan, A.R., &Latha P (2014). The Growing Case Of Cybercrime And Types Of Cybercrime On A Global Scale. *Journal of Computer Science Engineering and Information Technology Research (JCSEITR),* 4(2), 1-6.

Albrecht, W.S. (1996). Employee fraud. *Internal Auditor*, 26.

Bamrara, A., Singh, G., & Bhatt, M. (2013). "Cyber attacks and defense strategies in India- An Empirical assessment of Banking Sector," *International Journal of Cyber Criminology,* 7(1) 49-61. http://dx.doi.org/10.2139/ssrn.2488413.

Goyal, M. (2012). Ethics and Cyber Crime in India. *International Journal of Engineering and Management Research,* 2(1), 1–3.

Hoffmann Arvid, O.I., &Birnbrich, C. (2012). The impact of fraud prevention on bank-customer relationships: An empirical investigation in retail banking. International *Journal of Bank Marketing*. 30(5), 390- 407.

Bierstaker, J., Brody, R.G., &Pacini, C. (2006). Accountants" perception regarding fraud detection and prevention methods. *Managerial Auditing Journal*, 21(5), 520–535.

Khanna, A & Arora, B. (2009). A study to investigate the reasons for bank frauds and the implementation of preventive security controls in Indian banking industry. *International Journal of Business Science and Applied Management*. 4.

Kingsley, A. Adeyemo. (2012). Frauds in Nigerian Banks: Nature, Deep-Seated Causes, Aftermaths, and Probable Remedies. *Mediterranean Journal of Social Sciences*. 3(2), 279- 289.

Kumar, V., &Sriganga, B.K. (2014). A Review on Data Mining Techniques to Detect Insider Fraud in Banks. *International Journal of Advanced Research in Computer Science and Software Engineering*, 4(12), 370-380.

Bhasin, M.L. (2015). An Empirical Study of Frauds in the Banks, *European Journal of Business and Social Sciences,* 4(7), 1-12.

More, D. M. M., &Nalawade, M. P. J. D. K. (2015). Online banking and cyber-attacks: the current scenario. *International Journal of Advanced Research in Computer Science and Software Engineering*, 5(12),743-749.

Sharma, N., & Sharma, D. (2017). An Empirical Study on Banking Frauds in India with a particular reference to the role of Employee Awareness in Banking Fraud, *International Journal of Business Management*, 3(1).

RBI RTI Data dated 26.05.2023.

Sharma, S., & Brahma (2000). "A Role of Insider in banking Fraud," available at https;// manuputra .com

Soni R.R. &Soni, N. (2013). "An Investigative Study of Banking Cyber Frauds with Special Reference to Private and Public Sector Banks," *Research Journal of Management Sciences*. 2(7), 22-27.

Suh, Bomil& Han, I. (2002). Effect of trust on customer acceptance of Internet banking. *Electronic Commerce Research and Applications*. 1, 247-263. 10.1016/S1567-4223(02)00017-0.

Sukhamaya Swain and Lalata K Pani (2016). Frauds in Indian Banking: Aspects, Reasons, Trend-Analysis and Suggestive Measures. *International Journal of Business and Management Invention,* 5(7).

Vigneshwaran, T.S. &Yokesh, M. (2018). A Study on Causes and Prevention of Fraud in Banking Industry. *International Journal of Pure and Applied Mathematics*, 120(5), 311–321.

Wilhelm, W.K. (2004). "The fraud management lifecycle theory: A holistic approach to fraud management," *Journal of Economic Crime Management*, 2 (2), 1-38.

Willson, R. (2006). Understanding the offender/ environment dynamics for computer crimes. *Information Technology and People*, 19 (2), 170–186.

FINANCIAL PERFORMANCES OF SELECT PHARMA COMPANIES IN INDIA DURING THE COVID PERIOD: A COMPARATIVE STUDY

Prosenjit Bhattacharya*, Dr. Anirban Ghosh**

Purpose: *The study is aimed to assess the state of business of Pharma Companies during the pandemic due to COVID-19. Though most corporate sectors were completely locked down during the 1st phase of the pandemic, the Pharma sector remained open as an emergency service to serve the people. The financial parameters of some selected companies in the pharma sector were analyzed to get an idea of their financial performances during the challenging time.*

Design/Methodology/Approach: *20 companies were selected from sectoral indices of NSE from its official website. Out of these 20 companies, only 7 companies were chosen randomly for this study. Secondary source of data were extracted from published annual reports of the companies. Ratios that were used to assess the state of financial performance were DebtorsTurnover Ratio (DTR), Inventory Turnover Ratio (ITR), Current Ratio (CR), Debt Equity Ratio (DER), Operating Profit Ratio (OPR), Net Profit Ratio (NPR), Return on Net Worth (RoNW) Ratio and Earning per Share (EPS). The financial results of the companies under study were compared over the period of four years i.e. for the pre-and during the pandemic period. Statistical tools like simple mean, Hypotheses testing using ANOVA and Rank analysis were performed to arrive the conclusion.*

Findings: *Alternative hypotheses were accepted for Current Ratio, Net Profit Ratio, Operating Profit Ratio, Debtors Turnover ratio, Inventory Turnover ratio, Debt to Equity ratio and EPS, thus it is evident that during the study period significant changes took place to this ratios. But on the contrary Return on Net Worth Ratio, do not changed significantly during the period of study thus alternative hypotheses was accepted. From the rank analysis it may be concluded that Abbott, Pfizer and Torrent were the top three performers during the study period among the selected companies.*

Originality/Value: *The paper is original in nature which was notbeen publishedelsewhere.*

Keywords : *COVID, EPS, ANOVA. Financial statement, financial performances,ratio analysis.*
JEL Code: *G30*

I. Introduction

The years 2019-2021 were terrible years. World faced a great pandemic called the novel coronavirus disease 2019 (COVID-19). Severe Acute Respiratory Syndrome coronavirus 2 (SARS2) was the scientific name of the virus which was responsible for the pandemic. The human race was not prepared at all for such an airborne contagious viral disease. Thus, huge numbers of people lost their lives. During the initial phase of COVID-19 people observed possibly first time in their life – lockdown. During this time everything was closed except some essential services. And among them, most important service was to maintain the continuous flow of medicines in the market. Though all the industries were closed, pharma companies were working 24x7 to save lives as an emergency service. The present paper is aimed to find out the profitability of some of the selected pharma companies during this period. It will give us an insight into the business condition of these companies during, pre and post COVID conditions.

II. Literature Review

Aravind M & Manoj krishnan (2020) The study dealt with stocks of pharma companies and their impact on it during the covid period. The selection of companies was made based on market capitalization. Daily price observation data for 10 companies were taken into consideration. Other than two, all companies behaved in accordance with a benchmark index. Bigger companies were capable to withstand the turmoil situation. Huge disruption in daily life was taken place due to the pandemic. Even pharma companies were also faced several challenges. They had to manage separate supplier vendors as Chinese companies refused to supply active pharmaceutical ingredients. Hamed Almurisi Samah et al. (2020) the review article gives insight.

Ayati et al. (2020) assessed in the instant article about the crisis developed during the COVID-19 and short-term and long-term impact created by the pandemic. The effect of the

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pandemic leads to changes in demand, amendment in the regulations, more emphasis on R & D etc. Telemedicine and Tele medical consultancy was evolved as major help during this pandemic. During the study, it suggested significant abnormal returns and cumulative abnormal returns. Though no significant statistical result was found with the behaviour of pharma companies and other industries. In Tušek et al.(2021), it has been discussed that pharma companies may be seen from two different sides, firstly they supply necessary medicine for covid and at the same time developed new drugs to cure it. The study was conducted on a global scale and both pharma and Biotechnology companies were considered under this study. The author concluded that the financial results during this COVID-19 had surpassed all previous years. Khan & Basak, (2021) had observed a shift in pharma marketing trend in post-Covid era. A qualitative study was conducted among 100 people belonging to health services which include Doctors, health workers, medical representatives, etc. Due to COVID-19, many of the earlier practices now has been converted into digital marketing, e-sampling, telemedicine, e-pharmacy etc. which are found to be encouraging for all who belong to this fraternity.

Vijay Karthigeyan (2022) here the author tried to determine the profitability by taking five pharma companies on the basis of its market capitalization. As during the Covid period, all the pharma companies had increased its production, therefore their profitability would have also increased. The regression model was used to identify the factors influencing profitability. The assertive correlation was observed between Firm Size, Firm Growth, Working Capital and Financial Leverage.

III. Research Methodology

Twenty companies were selected from sectoral indices (NIFTY Pharma Index) of NSE from its official websites. All the selected companies were valued above 3 lakh crores. Out of this list, seven companies were selected randomly. Period of study was 2018-19 to 2021-2022. Secondary data were mainly collected from the official websites of the respective companies and their published annual report.

Ratios are among the best-known and most widely used tools of financial analysis to measure the inter-firm and intra-firm comparison of financial performances for a particular period. The period of the present study is four years (2018-19 to 2021-22). Hence the data has been collected for this period only i.e. pre-pandemic (2018-19, 2019-20), pandemic (2020-2021), and post-pandemic (2021-22). Financial ratios become meaningful to judge the financial condition and profitability of a company only when there is a comparison. When financial ratios for several preceding years are computed, we can determine the composition of change and determine whether there has been an improvement or deterioration in the financial position of the company over the period. The other comparison involves comparing the ratios of the companies with those similar types of companies or with industry averages at the same point of time. The comparison through ratio analysis provides considerable insight into the relative financial condition and performance of the company.

Key financial ratios those were used to illustrate the state of business during the study period were Debtors Turnover Ratio (DTR), Inventory Turnover Ratio (ITR), Current Ratio (CR), Debt Equity Ratio (DER), Operating Profit Ratio (OPR), Net Profit Ratio (NPR), Return on Net Worth (RoNW) Ratio and Earning per Share (EPS).

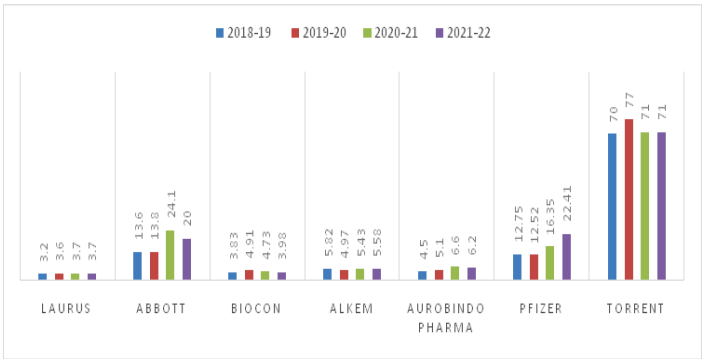
Indicators of profitability were Operating Profit Ratio, Net Profit Ratio and Return on Net Worth. To assess the status of working capital, Debtors turnover and Inventory turnover were taken into consideration. As a measure of gearing ratio, the Debt/Equity Ratio had been calculated, and to check the liquidity of the companies, the Current Ratio had been used during the study.

IV. Data Findings and Discussion

Debtors Turnover Ratio (DTR):

Below is the graphical comparison of DTR of the all 7 companies were presented. Though most of the companies were quite consistent in all throughthe years, a surge for Abbott, Pfizer, and Aurobindo were observed.

Figure 1: Debtors Turnover



HypothesisTesting:

H_0= Debtorsturnover of selected companies does not vary significantly along the years.

H_1= Debtorsturnover ofselected companies varies significantly along the years.

ANOVA: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Laurus	4	14.2	3.55	0.056667
Abbott	4	71.5	17.875	26.04917
Biocon	4	17.45	4.3625	0.288225
Alkem	4	21.8	5.45	0.1282
Aurobindo Pharma	4	22.4	5.6	0.94
Pfizer	4	64.03	16.0075	21.29443
Torrent	4	289	72.25	10.25

ANOVA

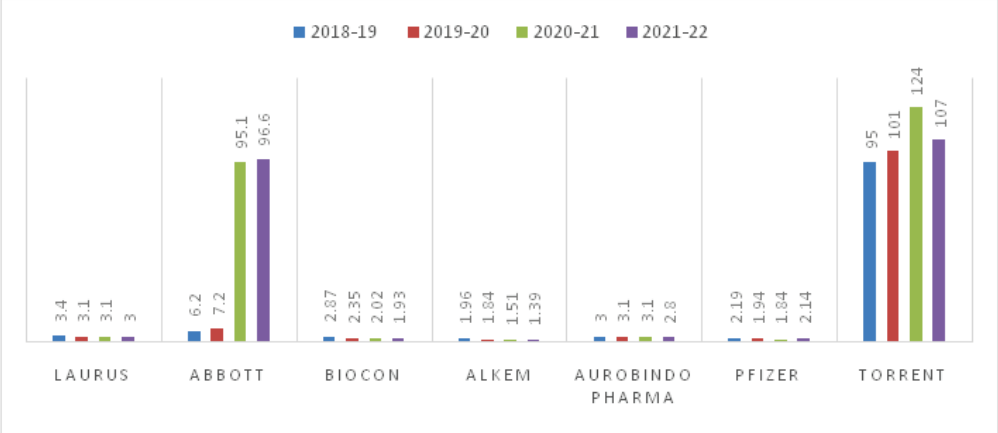
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	14611.91	6	2435.318	288.9034	4.64E-19	2.572712
Within Groups	177.0201	21	8.429526			
Total	14788.93	27				

Interpretation:Fcal=288.90 and Fcrit=2.57. ThusFcal>Fcrit and at the same time p value of different years is 4.64E-19 which is lesser than 0.05. So, alternative hypothesis is accepted at 95% level of significance. Hence, it transpires that Debtorsturnover of selected Indian pharma companies differ significantly during the years.

Inventory Turnover Ratio (ITR):

Inventory Turnover Ratio is the number of times a company sale and replaces its inventory during a period. It is calculated by dividing Cost of goods sold by average inventory. it is very evident from bar diagram that two companies had really done great during covid years that is Abbott and Torrent.

Figure 2: Inventory Turnover



Hypothesis Testing :

H0= Inventory turnover of selected companies does not vary significantly over the years.

H1= Inventory turnover of selected companies varies significantly over the years.

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Laurus	4	12.6	3.15	0.03
Abbott	4	205.1	51.275	2649.783
Biocon	4	9.17	2.2925	0.180825
Alkem	4	6.7	1.675	0.0723
Aurobindo Pharma	4	12	3	0.02
Pfizer	4	8.11	2.0275	0.027292
Torrent	4	427	106.75	156.25

ANOVA

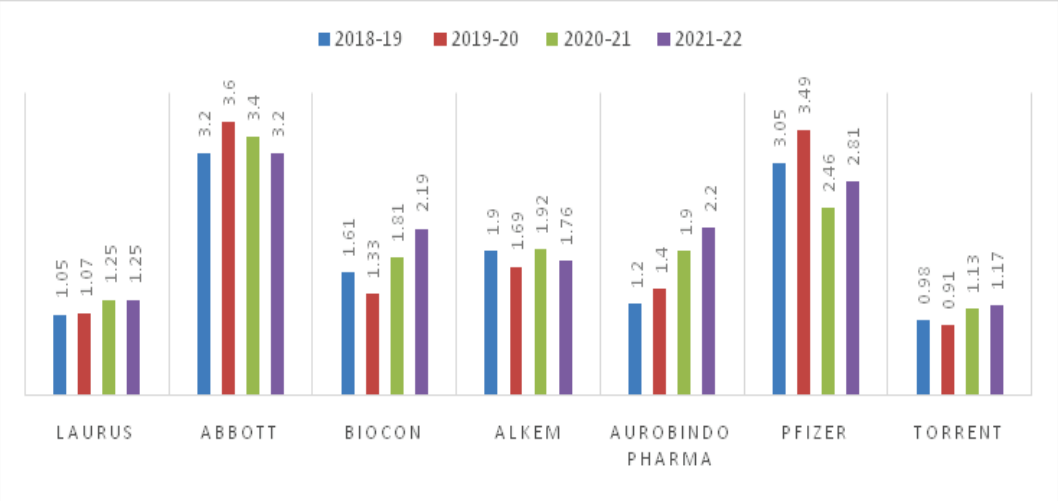
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	39675.8	6	6612.633	16.4941	5.74E-07	2.572712
Within Groups	8419.089	21	400.909			
Total	48094.89	27				

Interpretation:Fcal=16.49 and Fcrit=2.57. ThusFcal>Fcrit and at the same time p value of different years is 5.74E-07 which is lesser than 0.05. So, alternative hypothesis is accepted at 95% level of significance. Hence, it transpires that Inventoryturnover of selected Indian pharma companies differ significantly among the years.

Current Ratio (CR):

Current Ratio is though very common but a really useful ratio to determine the company's capacity to pay its current liability. Here, in this study a sharp increase is being seen in case of Abbott, Pfizer, Biocon. Quite a significant increase is seen for Aurobindo, Alkem and Laurus.

Figure 3: Current Ratio



Hypothesis Testing :

H_0= Current ratio of selected companiesdoes not vary significantly over the years.

H_1= Current ratio of selected companies varies significantly over the years

ANOVA: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Laurus	4	4.62	1.155	0.0121
Abbott	4	13.4	3.35	0.036667
Biocon	4	6.94	1.735	0.130767
Alkem	4	7.27	1.8175	0.012292
Aurobindo Pharma	4	6.7	1.675	0.209167
Pfizer	4	11.81	2.9525	0.187092
Torrent	4	4.19	1.0475	0.015092

ANOVA

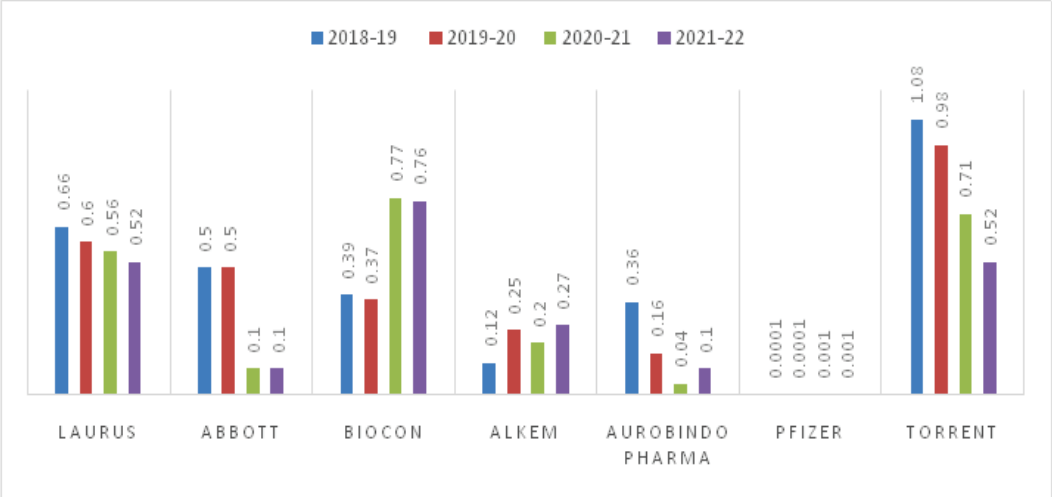
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	18.19989	6	3.033314	35.20239	6.66E-10	2.572712
Within Groups	1.809525	21	0.086168			
Total	20.00941	27				

Interpretation :Fcal=35.2 and Fcrit=2.57. Thus Fcal>Fcrit and at the same time p value of different years is 6.66E-10 which is lesser than 0.05. So, alternative hypothesis is accepted at 95% level of significance. Hence, it transpires that the Current ratio of selected Indian pharma companies differ significantly over the years.

Debt Equity Ratio(DER):

The Debt Equity Ratio is used to evaluate a company's financial leverage. It is a measure of the degree to which a Company is financing its operations through debt versus wholly owned funds. It is calculated by dividing a company's total liabilities by its Shareholder's equity. Now, it is being observed that the stated ratio for three companies like Laurus, Biocon and Torrent is on the higher side.

Figure 4: Debt Equity Ratio



Hypothesis Testing :

H_0= Debt equity ratio of selected companies does not vary significantly over the years.

H_1= Debt equity ratio of selected companies varies significantly over the years.

ANOVA: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Laurus	4	2.34	0.585	0.003567
Abbott	4	1.2	0.3	0.053333
Biocon	4	2.29	0.5725	0.049492
Alkem	4	0.84	0.21	0.004467
Aurobindo Pharma	4	0.66	0.165	0.0193
Pfizer	4	0.0022	0.00055	2.7E-07
Torrent	4	3.29	0.8225	0.065092

ANOVA

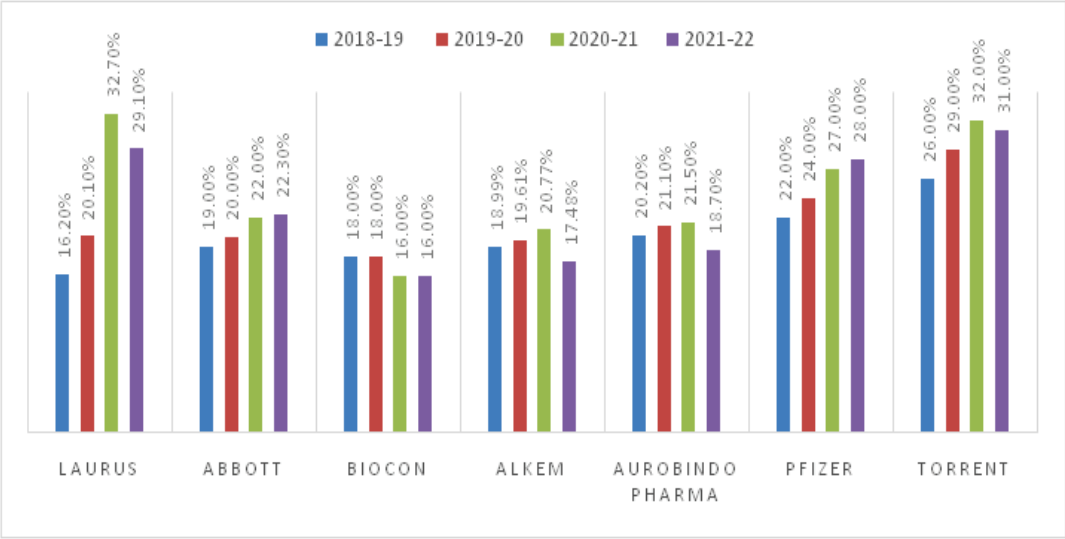
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2.001568	6	0.333595	11.95984	7.62E-06	2.572712
Within Groups	0.585751	21	0.027893			
Total	2.587319	27				

Interpretation :Fcal=11.96 and Fcrit=2.57. Thus Fcal>Fcrit and at the same time p value of different years is 7.62E-06 which is lesser than 0.05. So, alternative hypothesis is accepted at 95% level of significance. Hence, it transpires that Debt equity ratio of selected Indian pharma companies differ significantly among the years.

Operating Profit Margin (OP):

Operating Profit Margin is a profitability or performance ratio used to calculate the percentage of profit a company produces from its operations. It is calculated by dividing the Earnings Before Interest and Taxes by Revenue from Operations. Sharp height is being shown in Abbott. However, each of the companies are quite steadily has increased and reached their peak 2020-21. Highest profit margin recorded by Laurus during 2020-21. The data for Pfizer is showing NIL as there is no debt at all.

Figure 5: Operating Profit Margin



Hypothesis Testing :

H_0= Debt equity ratio of selected companies does not vary significantly over the years.

H_1= Debt equity ratio of selected companies varies significantly over the years.

ANOVA: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Laurus	4	0.981	0.24525	0.005888
Abbott	4	0.833	0.20825	0.000252
Biocon	4	0.68	0.17	0.000133
Alkem	4	0.7685	0.192125	0.000188
Aurobindo Pharma	4	0.815	0.20375	0.000154
Pfizer	4	1.01	0.2525	0.000758
Torrent	4	1.18	0.295	0.0007

ANOVA

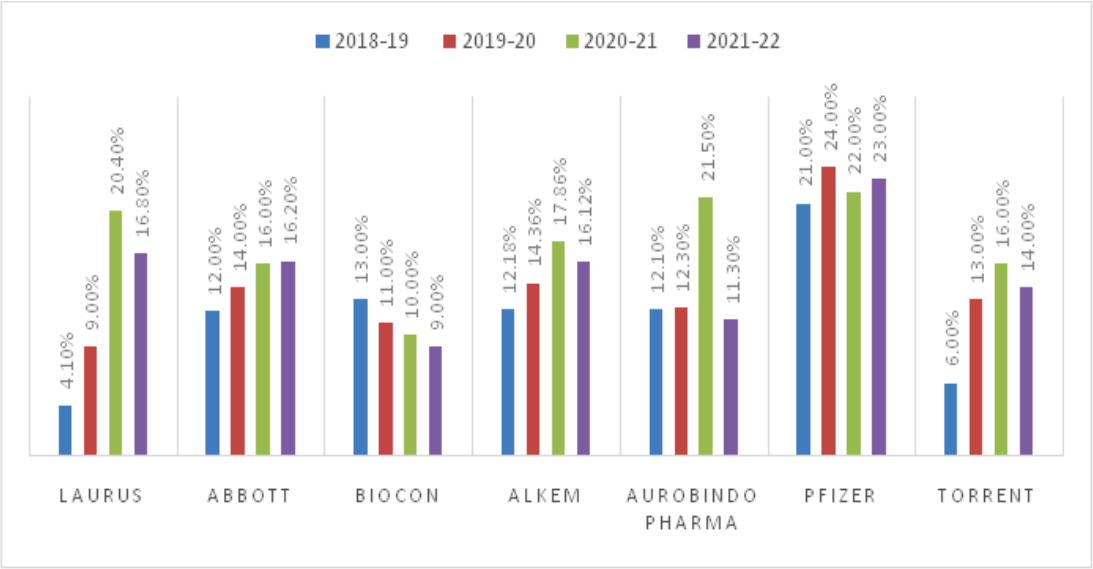
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.043579	6	0.007263	6.296845	0.000662	2.572712
Within Groups	0.024223	21	0.001153			
Total	0.067802	27				

Interpretation: Fcal=6.29 and Fcrit=2.57. Thus Fcal>Fcrit and at the same time p value of different years is 0.0007 which is lesser than 0.05. So, alternative hypothesis is accepted at 95% level of significance. Hence, it transpires that Operating profit margin ratio of selected Indian pharma companies differ significantly over the years.

Net Profit Ratio(NPR) :

The Net Profit Margin is equal to how much net income or profit is generated as a percentage of revenue. It is calculated by dividing the profit for the year by Revenue from Operations. It was very evident that in the year 2020-21, the profit margin reached its peak and it was true for all the companies.

Figure 6: Net Profit Ratio



Hypothesis Testing:

H_0= Net profit margin of selected companies does not vary significantly along the years.

H_1= Net profit margin of selected companies varies significantly along the years.

ANOVA: Single Facto r

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Laurus	4	0.503	0.12575	0.005456
Abbott	4	0.582	0.1455	0.000388
Biocon	4	0.43	0.1075	0.000292
Alkem	4	0.6052	0.1513	0.000591
Aurobindo Pharma	4	0.572	0.143	0.002323
Pfizer	4	0.9	0.225	0.000167
Torrent	4	0.49	0.1225	0.001892

ANOVA

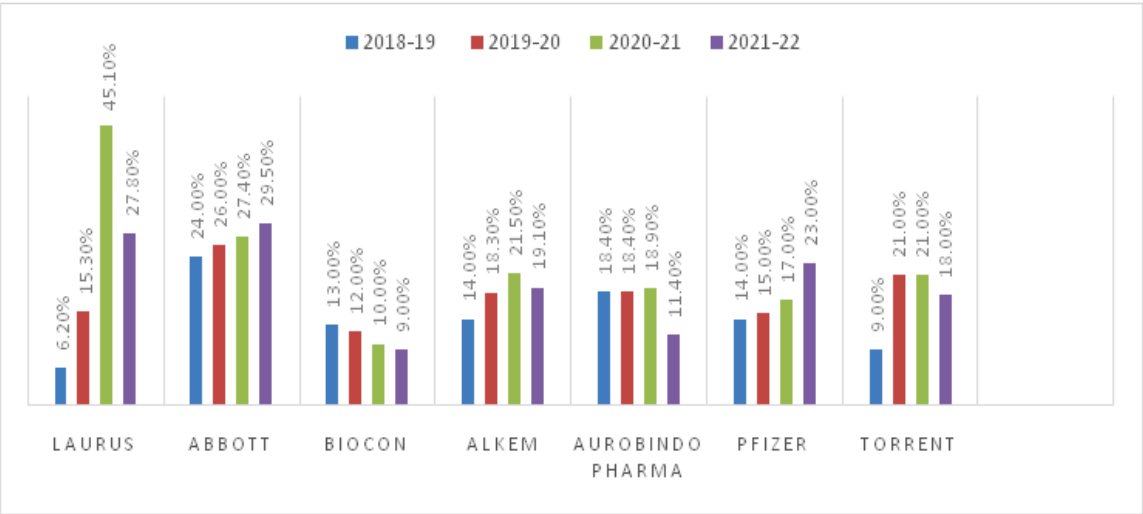
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.03489	6	0.005815	3.664674	0.011991	2.572712
Within Groups	0.033323	21	0.001587			
Total	0.068213	27				

Interpretation:Fcal=3.66 and Fcrit=2.57.Thus Fcal>Fcrit and at the same time p value of different years is 0.01 which is lesser than 0.05. So, alternative hypothesis is accepted at 95% level of significance. Hence, it transpires that Net profit margin of selected Indian pharma companies differ significantly among the years.

Return on Net Worth(RoNW) Ratio:

Return on Net Worth is a measure of the profitability of a company expressed in percentage. It is calculated by dividing profit after tax for the year by the average capital employed during the year. It was clear that out of all the companies, Larus was far ahead in the financial year 2021-22 than that of its counterparts.

Figure 7: Return on Net Worth



Hypothesis Testing :
H_0= Return on Net Worth of selected companies do not vary significantly along the years.
H_1= Return on Net Worthof selected companiesvaries significantly along the years.

ANOVA: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Laurus	4	0.944	0.236	0.028385
Abbott	4	1.069	0.26725	0.000537
Biocon	4	0.44	0.11	0.000333
Alkem	4	0.729	0.18225	0.000978
Aurobindo Pharma	4	0.671	0.16775	0.00129
Pfizer	4	0.69	0.1725	0.001625
Torrent	4	0.69	0.1725	0.003225

ANOVA

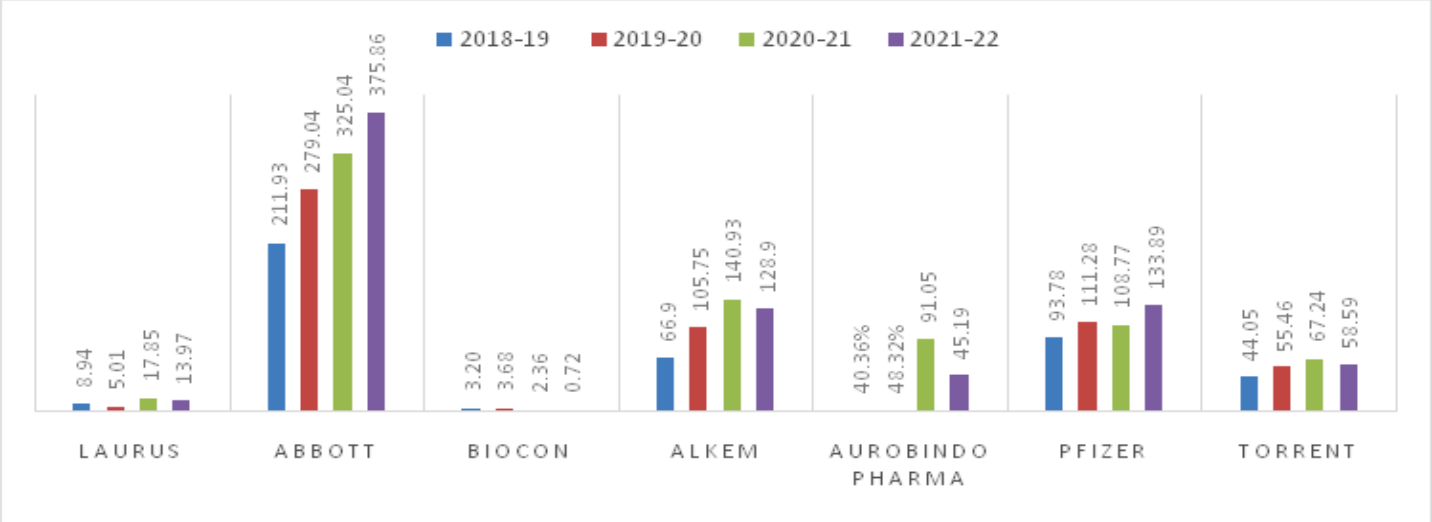
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.062334	6	0.010389	1.999395	0.111313	2.572712
Within Groups	0.109118	21	0.005196			
Total	0.171453	27				

Interpretation :Fcal=1.99 and Fcrit=2.57. Thus Fcal<Fcrit and at the same time p value of different years 0.11 which is greater than 0.05. So, the null hypothesis is accepted at 95% level of significance. Hence, it transpires that the Return on Net Worth of selected Indian pharma companies do not differ significantly over the years.

Earning per Share (EPS):

The Basic EPS is computed by dividing the net profit after tax for the year attributable to the equity shareholders of the Company by weighted average number of equity.

Figure 8: EPS



Hypothesis Testing :

H_0= EPS of selected companies do not varies significantly along the years.

H_1= EPS of selected companies variessignificantly along the years.

ANOVA: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Laurus	4	45.77	11.4425	31.69463
Abbott	4	1191.87	297.9675	4853.621
Biocon	4	9.96	2.49	1.69
Alkem	4	442.48	110.62	1062.67
Aurobindo Pharma	4	224.92	56.23	549.5797
Pfizer	4	447.72	111.93	274.0241
Torrent	4	225.34	56.335	91.89697

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	240873	6	40145.51	40.93391	1.6E-10	2.572712
Within Groups	20595.53	21	980.7395			
Total	261468.6	27				

Interpretation:Fcal=40.9 and Fcrit=2.57. Thus Fcal>Fcrit and at the same time p value of different years 1.6E-10 which is lesser than 0.05. So, the alternative hypothesis is accepted at 95% level of significance. Hence, it transpires that EPS of selected Indian pharma companies differ significantly over the years.

Table 1: Analysis of financial performance of Pharma companies using selected financial performance indicators (based on Average).

Company	Financial Performance Indicators									Ranks of Financial Performance Indicators									Sum of ranks	Ultimate Financial Performance Rank
	DTR Av	EPS Av	RoNW Av	NP_{Av}	OP_{Av}	DER Av	CR Av	ITR Av	ICR Av	DTR R	EPS R	RoNW R	NP R	OP R	DER R	CR R	ITR R	ICR R		
Laurus	3.55	11.44	0.236	0.13	0.245	0.585	1.16	3.15	13.8	7	6	2	5	3	2	6	3	7	41	5
Abbott	17.88	298	0.267	0.15	0.208	0.3	3.35	51.3	129	2	1	1	3	4	4	1	2	2	20	1
Biocon	4.36	2.49	0.11	0.11	0.17	0.573	1.74	2.29	18.2	6	7	7	7	7	3	4	5	5	51	7
Alkem	5.45	110.6	0.182	0.15	0.192	0.21	1.82	1.68	18.2	5	3	3	2	6	5	3	7	5	39	4
Aurobindo Pharma	5.6	34.28	0.168	0.14	0.204	0.165	1.68	3	24.3	4	5	6	4	5	6	5	4	4	43	6
Pfizer	16.01	111.9	0.173	0.23	0.253	6E-04	2.95	2.03	193	3	2	4	1	2	7	2	6	1	28	2
Torrent	72.25	56.34	0.173	0.12	0.295	0.823	1.05	107	45.2	1	4	5	6	1	1	7	1	3	29	3

Source: Computed and compiled from Published Annual Reports of the selected Pharmaceutical companies

V. Conclusion

Indicators of profitability ratios such as Operating Profit Margin and Net Profit margin whose P values were 0.0006 and 0.01 respectively. In case of these ratios, alternative hypotheses have been accepted. Therefore, it was evident that over the period of study, these ratios changed significantly. But on the contrary the third one in the same group i.e. Return on Net Worth, P value was 0.11, which was slightly higher than 0.05. Thus statistically Null hypotheses had been accepted. The asset management indicators like the Debtors Turnover Ratio and Inventory Turnover Ratio's, P value was far less than 0.05. In both the cases alternative hypotheses were accepted. The liquidity status of the companies over the study period differs significantly. The Debt to Equity Ratio was also accepted the alternative hypotheses thus signifies there was significant difference over the span of the study period. EPS changed significantly during the period of study as it accepts the alternative hypotheses.

From the rank analysis it may be concluded that Abbott, Pfizer and Torrent were the top three performers during the time frame. More or less all companies remained steady during COVID-19 period and performed well during the challenging time especially when other sectors remained closed for a long period.

References

Ayati, N., Saiyarsarai, P., &Nikfar, S. (2020). *Short and long term impacts of COVID-19 on the pharmaceutical sector*.

Mittal, S., & Sharma, D. (2021.). The Impact of COVID-19 on Stock Returns of the Indian Healthcare and Pharmaceutical Sector. In *AABFJ* (Vol. 15, Issue 1).

Tušek, B., Ježovita, A., & Halar, P. (2021). The Profitability Determinants of the Global Pharmaceutical & Biotechnology Companies During the COVID-19 Pandemic. *DIEM: Dubrovnik International Economic Meeting*, *6*(1), 43–54. https://doi.org/10.17818/DIEM/2021/1.5

Khan, Md. M. R., & Basak, K. (2021). Shifts in Pharma-Marketing Trends in Post COVID-19 Era. *International Journal of Multidisciplinary: Applied Business and Education Research*, *2*(2), 108–114.

Chandra SINHA Rabindra Mahavidyalaya, P., Chandra Sinha, P., & Agarwal, P. (n.d.). *COVID-19 and CAPM: a tale of reference dependence with the pharma stocks' returns*.

Phuong, L. C. M. (2021). How Covid19 affects the stock return of the Vietnamese pharmaceutical industry: event study method. *Entrepreneurship and Sustainability Issues*, *8*(4), 250–261.

RELATION BETWEEN HDI INDICATORS AND ECONOMIC GROWTH: AN EVIDENCE FROM INDIA'S PERFORMANCE

Dr. Anjusha Srivastava*, Dr. Suman Taneja, Dharmveer Singh*****

Purpose: *The present paper aims to investigate the connection between human development indicators (HDI) and the economic performance of India.*

Design/Methodology/Approach: *This study examines the impact of economic advancement on various human resource development indicators, such as education, life expectancy (LE), and per capita income, in India. It employs the neo-classical Solow production function and multiple linear regression models on time-series data from 2000 to 2019 to analyze and examine the connection between HDI indicators and economic growth. Life expectancy is used as a proxy for human capital.*

Findings: *The findings indicate a significant positive correlation between indicators of human resource development and economic growth in India. Higher levels of education, life expectancy, and per-capita GDP growth rates are all positively linked. There is a strong positive correlation between India's economic growth and life expectancy. Additionally, factors like secondary enrollment and per capita income have a favorable effect on economic growth. The study's key finding is that life expectancy has the most influence on India's GDP growth.*

Originality/Value: *To achieve long-term and sustained economic growth in India, the paper concludes with policy implications for promoting human resource development. It suggests that policymakers should concentrate on enhancing India's human capital through increased healthcare spending and more funding for education. With the right policies, India's enormous population can be leveraged to boost economic progress rather than being viewed as a barrier.*

Keywords : *Economic Growth, Secondary School Enrollment, Life Expectancy, Per Capita Income*
JEL Code: *I15, J24, O15*

I. Introduction

India stands as one of the most rapidly advancing major economies worldwide, boasting a staggering population of over 1.45 billion individuals. The country's remarkable economic growth, observed throughout the past few decades, has been fueled by a multifaceted blend of elements, including abundant natural resources, substantial physical capital, technological advancements, and influential social and political factors. Nonetheless, the crucial role played by human development in fostering India's economic progress has often been overlooked in academic discourse.

Human development status, encompassing the knowledge, skills, and abilities that individuals possess, is increasingly recognized as a pivotal catalyst for both economic growth and overall development. In the Indian context, nurturing human capital becomes paramount, given the nation's vast and expanding population, which notably encompasses a significant proportion of young individuals poised to join the workforce in the near future.

This research endeavor aims to delve into the impact of indicators pertaining to human resource development on India's economic growth, focusing specifically on the period from 2000 to 2019. In this study, life expectancy will serve as a surrogate variable for gauging human capital, complemented by other factors such as per capita income and secondary school enrollment. Utilizing multiple regression models, the investigation will meticulously analyze the intricate relationships between these variables and India's GDP growth rate.

The findings stemming from this study will hold profound implications for policymakers not only within India but also in other developing nations. By contributing to the existing literature, this research initiative will provide essential insights by adding to the body of literature on the intricate interplay between human development indicators and economic growth, particularly in the context of emerging economies, this research endeavor will offer invaluable insights. Ultimately, this comprehensive study will help deepen our comprehension of the multifaceted drivers

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underpinning economic growth & development in burgeoning nations like India.

Objectives:

1. To explore the relationship between human development indicators (HDI) and India's economic growth of over the period 2000-2019.
2. To investigate the impact of Life expectancy as a proxy variable for human development on India's GDP growth.
3. To analyze the contribution of other variables, such as Per capita income and secondary school enrollment, on India's economic growth.
4. To identify the key elements of economic growth in India and their relative importance.
5. To provide policy recommendations for policymakers to enhance human development in India and achieve sustained economic growth.

Need and Importance of the Study:

The significance and necessity of this study lie in recognizing the pivotal role of human development indicators as drivers of economic growth and progress. Therefore, it becomes imperative to investigate how these indicators impact India's economic growth, especially considering the nation's vast and burgeoning population and its potential to emerge as a major economic powerhouse in the future. Focusing on the period from 2000 to 2019, encompassing a time of significant economic reforms in India, this research employs life expectancy as a surrogate measure for human development, while also considering alternative variables such as per capita income and enrollment in secondary education. Utilizing multiple regression models, the study aims to dissect the intricate relationship between these factors and India's GDP growth rate, thus offering valuable insights into the role of human development in propelling economic advancement in the country. The implications of these findings hold substantial value for policymakers within India and other developing nations alike. Moreover, the research will contribute significantly to the current body of literature on interplay between Human Development indicators (HDI) and Economic-Growth, particularly concerning developing nations. Ultimately, this comprehensive study seeks to deepen our comprehension of the multifaceted determinants that fuel economic growth and development in emerging economies,

II. Literature Review

Discover the captivating link between human development and economic expansion. For years; researchers worldwide have been entranced by the intriguing correlation between these indicators. Countless investigations have delved deep into the profound effect of human capital on the economy's progress. The findings are compelling, showcasing the pivotal role human capital plays in fostering remarkable economic growth. Prepare to be fascinated as we unravel the intricate relationship between human potential and thriving economies.

Such research was carried out by "Mankiw, Romer, and Weil" in 1992.The Solow growth model is compared to the global variation in level of life to see if it makes sense. It demonstrates how effectively the cross-country data can be described by an expanded Solow model that takes the buildup of both human and physical capital into account. The Solow model's implications for convergence in living standards, or whether impoverished nations typically experience quicker growth than affluent ones, are also covered in this essay. The data suggests that nations converge at about the rate predicted by the enhanced Solow model, keeping constant population growth and capital accumulation.

In a study conducted by "Barro and Sala-i-Martin" in (1995), the relation between human-capital and economic expansion was examined across a panel of 100 countries spanning the years 1960 to 1990. The findings of this research indicated that human capital exerted a significant and positive influence on economic growth, with a stronger effect observed in countries with lower income levels. Several factual studies have explored the effect of human resource development (HRD) on economic growth, employing diverse methodologies and indicators. Among the commonly utilized indicators is education attainment, which can be measured through enrollment rates, years of schooling, or educational quality. Additionally, health-related indicators such as health expenditure, life expectancy, or disease prevalence have been employed to gauge the impact of health and willingness on economic growth.

In the quest to understand the link in human resource development and economic growth, a collection of compelling empirical studies emerges. Enter the work of Islam (1995), where a cross-country panel data set was

harnessed to unravel the impact of education on economic growth. Unveiling a strong positive effect, particularly pronounced in low-income countries, the study revealed that education's influence on growth primarily stems from its remarkable impact on productivity.

Meanwhile, De Gregorio and Lee (2002) embarked on a captivating exploration, enlisting a diverse sample of 98 countries to scrutinize the relationship between economic growth and health. Their findings painted a picture of health's constructive influence on economic growth, resonating more profoundly within low-income nations. Crucially, the study illuminated that health's effect on growth manifests primarily through its empowering impact on labor productivity.

Not to be outdone, Romer (1990) embarked on a captivating journey, wielding a cross-country panel data set to examine the entwined fates of human-capital and economic-growth. The study danced with a revelation: human capital possesses an inherent ability to foster economic growth, primarily by igniting the flames of technological progress. Fascinatingly, the study unveiled that the effect of human capital on growth blazes with greater intensity w Delving into the Indian landscape, Kumar and Rangarajan (2006), embarked on a study delving into the impact of education on economic growth within the nation's borders. Their findings resonated with hope, revealing a significant positive correlation in education and economic growth in India. Moreover, their research illuminated a promising prospect: by enhancing educational attainment levels, India could potentially unlock higher economic growth rates, breathing vitality into the nation's progress.

Meanwhile, Chakraborty and Mukherjee (2008), embarked on their own expedition, attempting to understand the relation-ship between India's economic-growth and its human-capital. Armed with a comprehensive panel data set spanning the years 1980 to 2004, their findings painted a vivid portrait of the symbiotic connection among human capital and economic growth. Their study unearthed a significant and productive impact of human capital on India's economic growth, revealing the transformative power that lies within human potential.

Embarking on a journey into contemporary research, Ahmad and Ramzan (2017) directed their focus towards Pakistan, unraveling the fascinating link between human capital and economic growth. Their study yielded an unequivocal affirmation: human capital wields a remarkable positive influence on the country's economic progress. Among the key constituents of this influential capital, education and health emerged as pivotal factors. These groundbreaking findings shed light on the paramount significance of nurturing robust educational and healthcare systems. By doing so, Pakistan can harness the full potential of its human resources, setting the stage for a dynamic surge in economic growth and prosperity.

Collectively, these studies present a mosaic of evidence, affirming the vital role played by human capital in steering economic growth across nations. They illuminate the pathway to progress, emphasizing that policies centered on bolstering human resource development hold the potential to propel nations towards higher economic growth rates. Within the specific context of India, education and healthcare have been identified as pivotal components of human capital, capable of propelling the nation towards a prosperous future.

III. Research Methodology

The study will use secondary data, collected from the World Bank database, for the time duration from (2000 – 2019). To validate the hypotheses and determine the strength and significance of the relationships among the different variables and economic growth in India, Multiple regression analysis will be used. The model will include HDI indicators i.e. Life expectancy, secondary school enrollment ratio, and per capita income, independent variables, and GDP growth rate as the dependent variable. Additionally, we also check the correlation between the variables, all data will be analyzed using statistical software like E-View, Excel etc. and the results will be presented through descriptive statistics, correlation matrices, and regression tables.

Variable Description:

The study uses four variables, including the GDP Growth Rate as the dependent variable, and three independent variables, namely Life Expectancy (LE), representing the country's investment on the health of its population, Secondary Enrollment Ratio (SER) as a measure of access to education, and GDP Per Capita. All these variables are the indicators of the Human development.

Variables Definition

Below is the definition of the entire variable used in the study according to the World Bank.

GDP (current US$) - India	Find out India's economic pulse using GDP (current US dollars). This crucial figure encapsulates the complete value of goods & services produced by all the skilled people and companies in the nation. In addition to the earnings made, it also includes product taxes but excludes subsidies. The numbers, which are given in current U.S. dollars, provide a thorough overview of India's economic health. Domestic currencies are converted using annualized official exchange rates to enable realistic comparisons.
Per capita GDP (US dollar) 2015 (at constant)	Discover the Per capita GDP (US Dollar) 2015 at constant inin India to determine the economic well-being of people. This metric indicates the average gross domestic product per person, taking into account both the population and economic output for a particular year. It takes into account inflation by using constant 2015 U.S. dollars and enables accurate comparisons throughout time. It demonstrates how India's economic success results in concrete advantages for its people.
Life expectancy (LE) at birth, (in years) - India	Embark on a journey to unlock the enigmatic secret of longevity in India, where life expectancy at birth holds the key. This pivotal metric unveils a captivating portrait of the average lifespan that waits new-borns, should the prevailing patterns of mortality persist throughout their journey. It serves as a powerful lens, allowing us to peer into the nation's health and well-being, painting a vibrant tapestry of vitality and endurance. Delve into this essential measure, and unravel the mysteries that lie within, as we navigate the fascinating realm of life and its boundless possibilities in India.
School Enrolment Secondary (% Gross)	Embark on a journey into the vibrant world of education in India, where the Gross Enrolment Ratio (GER) for secondary school takes center stage. This remarkable ratio unveils the percentage enrolment (total), irrespective of age, in relation to the corresponding population set. Secondary education, acting as a vital cornerstone for life-long learning and human development, holds the key to unlocking specialized knowledge and empowering students with valuable skills. Delving into the depths of the GER allows us to unravel India's unwavering dedication towards offering its citizens a pathway to quality education.

The Hypothesis:

This research aims to evaluate both the hypothesis i.e. null (**H0**) and alternative hypotheses (**H1**), which are presented as follows:

- **H0:** There is no significant relation between the HDI indicators and India's economic growth.
- **H1:** There is a significant relation between HDI indicators and India's economic growth.

The Model:

A well-known macroeconomic model recognized as the Solow model focuses on how capital accumulation, population expansion, and technological advancement relate to long-term economic development. We can modify the Solow model to incorporate life expectancy, school enrollment, and per capita income as additional independent variables that can potentially impact GDP. Here's is an econometric model using the modified Solow model:

The modified Solow growth model for this study can be framed as follows:

$$GDP = \beta 0 + \beta 1 * \text{Life Expectancy} + \beta 2 * \text{School Enrollment} + \beta 3 * \text{Per Capita Income} + \varepsilon \quad (1)$$

Where:

GDP: Gross Domestic Product, the dependent variable, represents the output of an economy and is a measure of its overall economic performance.

Life Expectancy: Represents the average number of expected newborns is to live in year, which can reflect the health and well-being of a population.

School Enrollment: Represents the percentage of the population enrolled in educational institutions, which can reflect the human capital and education level of a population.

Per Capita Income: Represents the average income per person in the economy, which can reflect the standard of living and economic development.

β0: When all independent variables are 0, the GDP baseline level, or intercept, is represented.

β1, β2, β3: Coefficients, under the assumption that all other variables remain constant, provide the predicted change in GDP for a unit change in each individual independent variable.

ε: The model's random error or unexplained variance is represented by the error term.

The reduced equation for the above will be as:

$$\mathbf{GDP = \beta 0 + \beta 1 * log\ (Life\ Expectancy) + \beta 2 * log\ (School\ Enrollment) + \beta 3 * log\ (Per\ Capita\ Income) + \varepsilon} \quad \mathbf{(2)}$$

Based on the equations (2), the above model can be re-written as following:

$$\mathbf{LGDP = \beta 0 + \beta 1 LLE + \beta 2 LSE + \beta 3 LGDPC.} \quad \mathbf{(3)}$$

The modified Solow model assumes that the level of GDP is determined by the level of capital, labor force, technological progress, as well as the additional factors of life expectancy, school enrollment, and per capita income. The coefficients (β1, β2, β3) in the model represent the estimated effects of life expectancy, school enrollment, and per capita income on GDP, respectively. The econometric techniques such as ordinary least square (OLS) regression to estimate the coefficients and assess the statistical significance and economic interpretation of the results.

Equation (3) shall be estimated during this study.

IV. Data Findings and Discussion

Table 1: Correlation Table

	LGDP	*LLE*	*LSE*	*LGDPPC*
LGDP	1			
LLE	0.980356625	1		
LSE	0.963461775	0.973454971	1	
LGDPPC	0.991086366	0.985309633	0.950419298	1

Source: Calculated by using E-view 12

The table presented displays the outcomes of a correlation analysis conducted on all variables used in the research. The findings support the hypothesis that a robust positive correlation exists between GDP and three other factors: Life expectancy (0.98), Secondary School enrollment (0.96), and GDP per capita (0.99). This implies that as these three factors increase, India's GDP will also increase.

In this correlation table, we explore the positive impact of three key factors on Gross Domestic Product (GDP).

Life Expectancy (LLE) and GDP: Both Life expectancy and GDP shows a significant positive relationship in India. As life expectancy increases, it suggests that the population is healthier and more productive, which, in turn, contributes to economic growth. Improved healthcare systems, access to medical services, and overall well-being positively impact GDP.

School Enrollment Ratio (LSE) and GDP: The correlation between school enrollment ratio and GDP is also positive. As more children and young adults enroll in educational institutions, it enhances human capital development and equips individuals with the necessary skills for economic productivity. This positive relationship between education and GDP underscores the importance of investing in the education system to drive economic growth.

GDP per Capita (GDPpc) and GDP: There is a strong positive correlation between Per Capita GDP and GDP in India. As the average income per person (GDP per Capita) increases, it indicates higher purchasing power and economic prosperity at the individual level. This, in turn, contributes to overall GDP growth, reflecting a positive impact of individual prosperity on the economy.

Taken together, these positive relationships emphasize the significance of life expectancy, education, and individual prosperity as drivers of economic growth and development. By investing in healthcare, improving education opportunities, and fostering economic well-being at the individual level, India can further enhance its GDP and create a more prosperous future for its citizens.

Table 2: Regression Statistics

Multiple-R	0.991409569
R-Square	0.982892933
Adj.- R Square	0.979685358
Standard Error (SE)	0.03750688
Observations	20

Source: Calculated by using E-view 12

Our regression statistics table reveals some fascinating insights about the relationship between variables. Here's a breakdown of the key statistics:

Multiple R: The multiple R value, displayed as 0.991409569, represents the correlation coefficient. "It measures the strength and direction of the linear relationship between the dependent variable and the independent variables in the regression model". In simpler terms, it tells us how well the independent variables predict the dependent variable. A value close to 1 indicates a strong positive relationship.

R-Square: The model goodness of fit is indicated by the R-Square value that depicted as 0.982892933, displays the proportion of the variance in the dependent variable that can be explained by the independent variables in the regression model. A value close to 1 implies that the independent variables describe a large portion of the variability in the dependent variable.

Adj.-R Square: The Value of adjusted Square is 0.979685358, adjusts the R Square value to account for the number of independent variables in the model and the sample size. It gives a better aimed measure of the goodness-of-fit, considering the complexity of the model and potential over fitting. A higher Adjusted R Square indicates a better fit, suggesting that the independent variables have a strong explanatory power.

Standard Error: The Standard Error, represented as 0.03750688, gives an estimate of the average distance between the perceive values of the dependent variable and the forecasted values from the regression model. It computes the accuracy of the regression model's predictions. A smaller Standard Error suggests that the model's predictions are more precise and closer to the actual values.

Observations: The number of Observations, indicated as 20, represents the sample size used in the regression analysis. It signifies the number of data points or cases that were included in the analysis. A larger sample size normally intensifies the reliability and accuracy of the regression model's results.

In summary, this regression statistics table showcases the strength and quality of the regression model. The high Multiple R and R Square values indicate a well-built relationship between the dependent and independent variables. The Adjusted R Square accounts for model complexity, and the Standard Error provides an estimate of prediction accuracy. Overall, these statistics provide valuable insights into the predictive power and goodness-of-fit of the regression model.

Table 3: ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	1.29322028	0.431073427	306.4286612	2.4301E-14
Residual	16	0.022508256	0.001406766		
Total	19	1.315728536			

Source: Calculated by using E-view 12

In this table, we have a wealth of statistical insights that uncover the relationships between variables and reveal the significance of our findings.

First, let's break down the table step by step:

Degrees of Freedom (df):

ANOVA assesses the variability in our data and the Degree of freedom (df) represent the number of independent cases of information available for analysis. We have 3 degrees of freedom for regression, 16 for the residual (unexplained) variability, and a total of 19 degrees of freedom.

Sum of Squares (SS):

The Sum of squares quantifies the total variability in our data. For regression, we find a sum of squares of 1.29322028, and for the residual (unexplained) variability, it is 0.022508256. The total sum of squares is the combined variation, which is 1.315728536.

Mean Square (MS):

To better understand the variance, we calculate the mean square by dividing the Total of squares by the degrees of freedom. For regression, the mean-square is 0.431073427, and for the residual variability, it is 0.001406766.

F-statistic (F):

This powerful statistic measures the ratio of variability between groups (regression) and within groups (residual). In our case, the F-value is an impressive 306.4286612, indicating a significant relationship between the variables being studied.

Significance F:

The significance F-value, represented here as 2.4301E-14 (a very small number in scientific notation), reveals the probability of obtaining an F-value as extreme as what we

have observed, assuming there is no real relationship between the variables. A tiny significance F-value indicates strong evidence for a meaningful connection in our data.

In conclusion, this ANOVA table showcases the statistical prowess of our analysis, demonstrating significant relationships between the variables under study. The insights gained here open the door to further exploration and understanding of the underlying patterns and dynamics in the data.

Table 4: Regression Coefficients

	(Coefficients)	*Standard Error**	*t-Stat.*	*T-value*
Intercept	4.298050351	5.78489942	0.742977542	0.468264759
LLE	-7.090340196	4.020063449	-1.76373838	0.096858413
LSE	2.130849986	0.478519141	4.453008881	0.000400676
LGDPPC	1.609360246	0.536459239	2.99996743	0.008480076

Source: Calculated by using E-view 12

Behold the treasure trove of regression coefficients! In this captivating table, we delve into the mystical realm of statistical relationships, unveiling the mystical powers of our variables.

Intercept: The mystical Intercept is like the heart of our regression, representing the value of the dependent variable when all other factors are zero. Here, it stands at 4.298050351, with a standard error (SE) of 5.78489942. The t-statistic value is 0.742977542 and the p-value is 0.468264759 which reveal that its significance might be not as strong as we hoped, yet its presence adds an enchanting element to our model.

LLE (Life Expectancy at Birth): Gaze upon the enigmatic LLE coefficient, which stands at -7.090340196. This captivating number suggests a negative relationship with our dependent variable, but its standard error of 4.020063449 and a t-statistic of -1.76373838 tell us that its significance dances on the edge. With a p-value of 0.096858413, we cannot dismiss its potential impact, for it might hold secrets to the mysteries of life expectancy.

LSE (School Enrollment Secondary): Marvel at the mesmerizing LSE coefficient, gracing us with a value of 2.130849986. A t-statistic of 4.453008881 and an astonishingly low p-value of 0.000400676 bestow great significance upon LSE. Its power to positively influence the dependent variable shines through the tight standard error of 0.478519141, leaving us in awe of its impact on educational enchantment.

LGDPPC (GDP per Capita): Witness the captivating LGDPPC coefficient, standing tall at 1.609360246. It has a significant t-statistic of 2.99996743 and a p-value of 0.008480076. The accuracy of its impacts on our dependent variable, as seen by the standard error of 0.536459239, compels us to investigate the puzzling connection between wealth and growth.

In this mystical journey through the regression coefficients, we uncover the hidden forces that shape our dependent variable. Each coefficient plays a unique role, and their significance and precision leave us captivated and eager to explore the deeper mysteries that lie within the data.

Several econometric tests were conducted to establish the model's importance, and all showed a very statistically significant relation in the variables i.e. Dependent and Independent. As a result, the $\mathbf{H_0}$i.e. the null Hypothesis is rejected, and the $\mathbf{H_1}$(Alternative hypothesis) is accepted, stating that shows there is a statistical relationship between HDI Indicators and India's economic growth.

V. Conclusion

This paper explores the correlation between indicators of human development and economic growth in India from 2000 to 2019, specifically the HDI. To measure human development, the study used life expectancy, secondary school enrollment, and GDP per capita as proxy variables. The study employed neo-classical Solow production functions and multiple linear regression models. The Findings shows a positive correlation among economic growth and HDI indicators. Notably, both life expectancy (LE) and secondary school enrollment (SSE) has positively impacted economic growth of India's. Secondary school enrollment had the most significant impact on India's GDP growth. Therefore, to achieve sustained economic growth,

policymakers should focus on improving these indicators by increasing funding for education and healthcare. Additionally, future studies could explore the connection in human capital, healthcare expenditure, and growth of economy in both rural and urban areas of India.

References

Ahmad, I., &Ramzan, M. (2017). The impact of human capital on economic growth: A comparative study of Pakistan and selected South Asian countries. Journal of Economic Cooperation and Development, 38(3), 89-108.

Arora, S., & Mittal, S. (2019). Impact of human capital on economic growth: Evidence from India. International Journal of Innovation and Learning, 25(2), 161-180.

Barro, R. J., &Sala-i-Martin, X. (1995). Economic growth. New York: McGraw-Hill.

Bowman, Mary Jean. (1980). Education and economic growth: An overview. (1-71).

Chakraborty, C., & Mukherjee, J. (2008). Human capital and economic growth in India: Cointegration and causality analysis. The ICFAI Journal of Applied Economics, 7(3), 7-28.

De Gregorio, J., & Lee, J. W. (2002). Education and health: Evidence on productivity and growth from cross-country regressions. World Bank Policy Research Working Paper, (2795).

Garg, D., & Singh, A. K. (2021). Digital literacy and economic growth in India: A state-level analysis. Technological Forecasting and Social Change, 167, 120701.

Gokarn, S. G., Singh, S. K., &Sinha, A. (2018). Health and economic growth in Indian states: Evidence from panel data analysis. Social Indicators Research, 138(2), 501-526.

Gupta, Honey. (2014). Public expenditure and economic growth.

Hanushek, Eric A. (2013). Economic growth in developing countries: The role of human capital. Economics of Education Review, 37, 204-212.

Hanushek, Eric A., &LudgerWößmann. (2007). The role of education quality for economic growth. The World Bank.

Haldar, Sushil Kumar, &Mallik, Girijasankar. (2010). Does human capital cause economic growth? A case study of India. International Journal of Economic Sciences & Applied Research, 3(1).

Islam, N. (1995). Growth empirics: A panel data approach. The Quarterly Journal of Economics, 110(4), 1127-1170.

Kaur, A., &Dhawan, S. (2018). Entrepreneurship and economic growth in India: Evidence from time series analysis. Vision: The Journal of Business Perspective, 22(1), 68-76.

Kumar, A., &Rangarajan, C. (2006). Education and economic growth in India. Economic and Political Weekly, 41(4), 339-347.

Kumar, S., & Jain, S. (2018). Health expenditure and economic growth in India: Evidence from causality and cointegration analysis. International Journal of Health Economics and Management, 18(4), 377-391.

Lau, Lawrence J., et al. (1993). Education and economic growth Some cross-sectional evidence from Brazil. Journal of Development Economics, 41(1), 45-70.

Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. The quarterly journal of economics, 107(2), 407-437.

Mathur, Vijay K. (1999). Human capital-based strategy for regional economic development. Economic Development Quarterly, 13(3), 203-216.

Mitra, S. K., & Pal, S. (2018). Education and economic growth in India: A state-level analysis. International Journal of Social Economics, 45(1), 39-51.

Romer, P. M. (1990). Endogenous technological change. Journal of Political Economy, 98(5), S71-S102.

Siddiqui, R., & Ahmed, Q. M. (2006). Education and economic growth: A time series analysis of Pakistan. The Pakistan Development Review, 45(4), 1185-1197.

Tamura, Robert. (2006). Human capital and economic development. Journal of Development Economics, 79(1), 26-72.

Blundell, Richard, et al. (1999). Human capital investment: The returns from education and training to the individual, the firm and the economy. Fiscal studies, 20(1), 1-23.

Zemed Degu Mengesha & Lakhwinder Singh (2023) Human capital accumulation and economic growth of Ethiopian economy, African Journal of Science, Technology, Innovation and Development, 15:2, 211-226, DOI: 10.1080/20421338.2022.2062652

IMPACT OF STUDENT ATTITUDE, TEACHER'S E-READINESS, AND QUALITY OF E-LEARNING PLATFORMS ON STUDENT-SATISFACTION

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Purpose: *The increasing adoption of e-learning requires examining how students view and embrace this method of education. To enhance the e-learning environment, the present paper depicts three pillars of e-learning: student attitude, teacher e-readiness, and the quality of e-learning delivered and its impact on student satisfaction. This study aims to analyze educational institutes in India engaged in various e-platforms regarding their delivery of various online courses and their students' satisfaction with e-learning.*

Design/Methodology/Approach: *The research framework is grounded in the Technology Acceptance Model (TAM) and End User Computing Satisfaction models (EUCS). This is a pilot study; students enrolled in e-learning institutes were studied. The collected data of 124 students is subject to multiple linear regression analysis using SPSS.*

Findings: *All the components of student satisfaction from e-learning, such as student attitude, teacher e-readiness, and the quality of e-learning, have a significant relationship with students 'satisfaction. Among the three components of student satisfaction, the quality of e-learning has a major impact. The pilot study results conclude that this study can also be conducted in the future by incorporating some minor changes in the questionnaire.*

Originality/Value: *This research contributes theoretically to factors influencing e-learning adoption and acceptance among students. The findings hold practical implications for e-learning providers in the education industry for effective and efficient implementation of e-learning that enhances student satisfaction.*

Keywords : *Students' satisfaction, student attitude, teacher e-readiness, quality of e-learning, e-learning platforms*
JEL Code: *O330*

I. Introduction

Education is the fundamental and powerful beam behind the success of any nation (Baiyere & Li, 2016). The process of education is essentially the expression of the innate potential and excellence that is already present within an individual. In the last three decades, India has witnessed an unprecedented expansion in the higher education sector (Mittal & Pani, 2020). However, the sudden suspension or closing of schools and higher education institutes by the end of April 2020 was due to COVID-19, a novel coronavirus disease that spread across the globe. One hundred eighty-six countries implemented nationwide closures, affecting almost 73.8% of the total enrolled students globally. The pandemic had left no choice for the education sector, be it a school, college, university, or stand-alone institution, to shift to educational innovation using digital interventions (Farhat, 2023). In this situation, information and communication technology (Das et al., 2022) offered an edge over the talk-and-chalk model of teaching and learning with e-learning (Alsoud & Harasis, 2021).

E-learning is a system of learning and teaching through electronic media, especially the Internet, as per the Oxford Dictionary, 2023. Alonso et al. (2005) defines e-learning as utilizing information and communication technologies to enhance learning quality by facilitating access to resources and services and supporting distant collaboration and exchange. E-learning has enabled learners to access educational materials and made them interactive and useful, irrespective of geographical and time constraints (Liu &Yu, 2023). E-learning ensures many benefits, irrespective of distance; it communicates between the parties through a dialogue room, digital classroom, and emails. Moreover, the 24-hour availability of the resources leads to any time and every time learning as per convenience (Abed, 2019). E-learning systems provide knowledge that is not easy to access but provides flexibility, too (Kapo et al., 2023); they can now attend sessions without physical boundaries and with the help of the Internet.

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E-learning platforms assist in organizing, managing, and disseminating educational content. These platforms are primarily categorized into Massive Open Online Courses (MOOCs) and Learning Management Systems (LMSs) (Liu & Yu, 2023), chosen based on their cost and the intended user base. The surge in the e-learning market in India is partly due to favourable macroeconomic trends. The Indian Government has initiated several programs to enhance digital education and skill acquisition, increasing the demand for e-learning services (Srideviponmalar, 2023).

Moreover, the growing emphasis on continuous learning and professional development in today's workforce has further propelled the expansion of the e-Learning Platforms market. As e-learning is becoming popular, the number of students on different e-learning platforms is increasing (Cowie & Sakui, 2013). Hence, exploring student satisfaction with the acceptance of e-learning becomes increasingly crucial, as does examining factors that contribute positively to its acceptance. Limited literature exists on this subject, particularly concerning research that considers variables such as student attitude, teacher e-readiness, and the quality of e-learning. These factors are pivotal in influencing user satisfaction, ultimately contributing to the acceptance of e-learning in higher education. Therefore, there is a need to identify the significant factors that affect the acceptance of e-learning systems and consequentially prioritize their effectiveness to improve the overall e-learning outcomes. There are few research papers in India on similar topics, especially on e-learning carried out by universities. However, increasing the scope to include other learners not part of the regular university system is necessary. This study evaluates factors affecting student satisfaction from e-learning in the Indian scenario.

II. Review of Literature

Student Attitude: In designing effective e-learning environments, it is necessary to 'understand the target group' and consider the learner's attitude as an essential indicator of an effective LMS, further linked to user satisfaction. Student Attitude referring to his/her positive/negative/mixed evaluation of online learning system as managing study time, being self-disciplined, and believing that ELS is an effective educational tool (intention to use), amongst others, was proposed by (Koseler, 2009). A few positive items include time management, schedule flexibility, and reducing costs, and negative items include e-learning teaching efficiency and the need for advanced technical abilities.

Teacher E-Readiness: Online teacher's attitudes towards e-learning systems have focused on opinions and perceptions of its performance; their level of e-readiness can influence their use, technical know-how, and use of technology tools (Garg & Chander, 2023) needed to assist online learners; and is reflected in successful course outcomes and user satisfaction suggested (Hung et al., 2014). Technology skills, lifestyle, and pedagogical training in e-learning determine online teacher e-readiness in higher education (Keramati et al., 2011). Ozkan and Koseler (2009) introduced the concept of teacher e-readiness as a measure of a teacher's preparedness for online environments. They defined this readiness through three key areas: technology readiness, lifestyle readiness, and pedagogical readiness. Technology readiness encompasses having the necessary tools, such as dedicated internet service, access to the correct software and browsers, and knowing how to utilize online support services. Lifestyle readiness involves being comfortable with digital communication methods like emailing, texting, and messaging, as well as having sufficient uninterrupted time to dedicate to online courses. Pedagogical readiness refers to the teacher's ability to learn independently, willingness to experiment with new technologies, and capability to provide constructive written feedback. (Akaslan & Law's 2011) measured Teacher's Readiness for E-Learning, teacher e-readiness was studied regarding E-Readiness, E-Acceptance, and E-Training.

E-Learning Quality: 'Online learning quality is evaluated by the hassle-free integration of hardware and software that facilitates the e-teacher's interaction in the virtual learning environment (VLE). It provides stability, security, speed, and responsiveness of the VLE, which are critical for e-teachers (Keramati et al., 2011). e-learning quality through ease-of-use, user-friendly, stable, secure, fast, accessible, and responsive was also measured.

Student-satisfaction: Student satisfaction measures the degree to which a user is satisfied with his or her overall use of the E-learning system (ELS). Familiarity with the usage of ELS, the e-learners gain more technology experience through its interaction, thus influencing their acceptance of and satisfaction with the ELS. In a study by Chakraborty, 2019, user satisfaction with a learning app is based on the responsiveness of the app and content as imperative factors that influence satisfaction with portable learning Applications. User satisfaction is based on, and user satisfaction among e-learners categorized as learner, course, technology, design, and environment direction (Asoodar et al., 2016).

The objectives of the study focus on measuring user satisfaction among e-learners as follows:

1. To identify student user satisfaction in e-learning across various e-learning platforms in Edtech.
2. To explore the relationships between user satisfaction towards e-learning, student attitude, teacher e-readiness, and quality of e-learning.

In today's educational landscape, there is often a blend of traditional and e-learning methods, known as blended learning or hybrid learning, combining the strengths of both approaches to cater to diverse learning preferences and needs. Though both traditional learning and e-learning aim to achieve specific learning objectives and outcomes, traditional learning and e-learning represent two distinct educational approaches, each with its characteristics, advantages, and limitations. With its global reach, flexibility, student-centric approach, and adaptability quotient, e-learning is gradually gaining acceptance and validity in the global education scenario for entry-level students in school, higher, and professional education.

Learner attitudes towards e-learning and e-learning quality, including systems, information, and service, significantly impact students' acceptance of e-learning (Anthony, 2024). Yang and Xu (2023) recommend instructors' e-readiness for promoting e-learning success. User satisfaction positively influences user acceptance, loyalty, and promotion (Rahayu et al., 2023) of e-learning.

A framework for assessing End-user computing satisfaction (EUCS) has been established through research (Doll & Torkzadeh, 1988), encompassing five key components: i.e., content, accuracy, format, ease of use, and timeliness. This framework is a foundational structure for numerous studies exploring user satisfaction and acceptance, including those related to e-learning. After reviewing the existing literature, the following hypotheses have been framed:

H1: Student Attitude has a positive relationship with student satisfaction in E-learning.

H2: A significant and positive relationship exists between teachers' e-readiness and student satisfaction in E-learning.

H3: E-learning quality has a significant and positive impact on student satisfaction.

III. Research Methodology

To ensure that a comprehensive list of e-learning variables was included, previous researchers' works (Asoodar et al., 2016; Akaslan and Law, 2011) were reviewed. The research instrument of the present study has four independent factors: students' attitude, teacher e-readiness, quality of e-learning, and dependent factors, i.e., student satisfaction. These four factors have 86 statements (Venkatesh et al., 2012) using a five-point Likert scale ranging from 1 to 5. The scale designates 5 as "strongly agree" and 1 as “strongly disagree.” Eligible participants included individuals who were enrolled and completed e-learning courses. These courses may be short-term or ongoing programs on e-learning platforms. The questionnaire was shared with students, and data collected online through Google Forms was used for further analysis.

In this study, which aims to explore the impact of student attitude, teacher e-readiness, and the quality of e-learning on user Satisfaction in higher education, regression analysis can be a valuable tool for assessing the strength and nature of these relationships. Statistical software SPSS was used to perform the multiple linear regression analysis. The output includes coefficients, significance levels, and other statistics that help interpret the relationships effectively.

This paper is based on a pilot study of 150 respondents; 124 responses were received after refinement, and an 82% response rate was used for the final analysis. This study is conducted to understand the impact of student's attitudes towards online courses, teacher readiness, and quality of online courses on e-learners' satisfaction. The research design is based on the correlation of independent and dependent constructs. The analysis shows more males (53.2 %) enrolled in online courses than females (46.8%). The prominent age group (37.1%) in this data falls in 22-26 years, possibly because this group is more computer savvy. A large number of the respondents (48.4%) are postgraduates pursuing short-term (46.8%) online courses from mostly either private institutes (48%) or e-learning platforms (46.8%). This could be because private institutes and EdTech platforms have customized courses to cater to the needs of e-learners. 66.1% of respondents belong to Delhi and NCR. Regarding internet proficiency, an equal number of respondents were experts (48.4%) or intermediate (48.4%); only 3.2% claimed to be beginners. A summarized view of the demographic profile of the respondents is given in Table 1.

Table 1: Demographic Profile of Respondents

Demographics	Percentage
Gender	
Male	53.2
Female	46.8

Age	
17-21yrs	29.0
22-26yrs	37.1
27-31yrs	3.2
32yrs and above	30.6
Educational Status	
Professional Certificate	11.3
Undergraduate	32.3
Post-Graduate	48.4
Others	8.1
Duration of the online course	
Short term course	46.8
Long term course	25.8
Continuous Online Learning	6.5
All	21.0
Type of Institute	
Government LMS	3.2
Private-LMS like blackboard classroom	48.4
Autonomous-Self-created workshops through Google Meet/Zoom, etc.	1.6
EdTech Platform (like Coursera)	46.8
Location of Institute	
Delhi NCR	66.1
Northern India	1.6
Western India	3.2
Southern India	3.2
Online	25.8
Internet Proficiency	
Expert	48.4
Intermediate	48.4
Beginner	3.2
Desk used for E-learning	
On a laptop or desktop	56.5
On both laptop-desktop & and mobile	43.5

IV. Data Findings and Discussion

4.1 Common Method Variance

Common method variance (CMV) is a major challenge these days. To check and rectify CMV, Podsakoff (2003) and others, Saxena M et al. (2022) suggested many remedies. In the present study, data was collected from different parts of India with students pursuing online courses from Government, private, and autonomous institutes providing online courses as well as from EdTech platforms with different levels of education, age groups, and gender, which reduce some of the effects of Common method variance (CMV) in the data. Finally, Harman's single-factor analysis was administered to investigate CMV. All statements were put together to conduct factor analysis. The eighteen factors that were extracted had a total variance of 84 percent. Moreover, the first factor explained 33.8% of the variance, which is less than 50% of the threshold value as suggested by previous researchers (Harman, 1960; Babin et al., 2016; Gupta S et al., 2020), which means CMV is not an issue in this data.

Considering all responses for each item of a construct, the mean and the standard deviation for all respondents were calculated collectively. The mean of the constructs ranged from 2.83 e-learner attitude towards the course to 4.13, which belongs to e-learners' internet self-efficacy (LISE). The lowest standard deviation is for the technology quality (.365) of the online course, and perceived usefulness (PU) has the highest standard deviation (.942), as explained in Table 2, Descriptive Statistics and Reliability.

Table 2: Descriptive Statistics and Reliability

Constructs	N(No. of participants)	Sum	Mean	Std. Deviation	N(no. of statements)	Reliability
T_LATC	124	351	2.83	.608	7	.735
T_LAC	124	369	2.97	.552	7	.716
T_LISE	124	513	4.13	.933	7	.946
T_IPG	124	433	3.49	.859	8	.872
T_IAIC	124	441	3.55	.790	10	.914
T_ECF	124	462	3.73	.853	7	.881
T_ECQ	124	430	3.47	.893	7	.895
T_TQ	124	479	3.87	.791	7	.919
T_IQ	124	394	3.17	.365	4	.690
T_PU	124	479	3.86	.942	4	.891
T_PE	124	499	4.02	.923	4	.936
T_LPIO	124	395	3.18	.532	7	.846
T_USS	124	457	3.68	.775	7	.888
Overall_Stu_Sat	124	436	3.52	.487	86	.952

Cronbach's alpha measures the internal consistencies of each construct. Table 2 describes all the constructs with values above 0.7, which prove good to excellent data reliability.

4.2 Regression Analysis

To analyze how factors can predict student satisfaction in the

e-learning era, an Enter method of regression analysis was conducted to test and explain the impact of different independent variables, such as student attitude, teacher e-readiness, and quality of e-learning, on the dependent variable of user satisfaction.

According to the central limit theorem, data is normal if it is more than 30 observations (Field A, 2009; Ghasemi A & Zahediasl S, 2012); the data has 124 respondents, so it tends to be normally distributed, assumption for regression analysis. For examination, the independence of observations checks the independence of residuals using the Durbin-Watson test (Pedhazur,1997). Table 3 represents the results of R; the value for the Durbin-Watson test in the case of student attitude (SA) is 1.988, teacher e-readiness (TER) is 1.863, and quality of e-learning (QEL) is 2.224. All the values of this test are above the threshold value (>1); we assume that in this study, the residuals are independent; hence, observations are independent. Further, Variance Inflation Factor (VIF) table values were calculated to check the multicollinearity among the different constructs, as all VIF values are less than 5, Table 3 reveals that the study has no multicollinearity issue (Hair et al., 2020; Schuberth, F, 2021).

Table 3: Result of R

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
SA	.921[a]	.848	.840	.195	1.988
TER	.800[a]	.640	.634	.295	1.863
QEL	.938[a]	.881	.876	.172	2.224

a. Predictors: (Constant), (SA=T_LPIO, T_LISE, T_LATC, T_LAC, T_PU, T_PE), (TER=T_IAIC, T_IPG), (QEL= T_USS, T_IQ, T_ECF, T_ECQ, T_TQ)

b. Dependent Variable: Overall_Stu_Sat

4.2.1 Impact of Student Attitude Towards e-learning on Overall Students Satisfaction

It is evident from the Table above that 84% of the variance of user satisfaction in e-learning can be predicted by the six independent constructs of student attitude towards e-learning (SA) i.e. E-Learner internet self-efficacy (LISE), E-Learner attitude towards the course (LATC), E-Learner computer anxiety (LCA), E-Learning course flexibility (ECF), Perceived ease of use in e-learning (PE), E-Learner perceived interaction with others in online courses (LPIO), Perceived Usefulness(PU). However, two constructs, LATC and LCA, do not significantly correlate with overall user satisfaction. Moreover, they have a very small and partial correlation with the dependent construct of user satisfaction in e-learning. Table 4 shows that items in PE had the largest and most significant effect on overall user satisfaction, with β= .385 and a p-value less than 0.01. Followed by Items in PU, which had the second largest explanation power with β=.377and P-value is less than 0.000. LPIO and LISE significantly and positively affect overall user satisfaction in e-courses. Based on the results of the regression analysis, the researchers acknowledge a revelation of the key constructs of SA's impact on user satisfaction in E-learning.

Table 4: Students Attitude

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta (β)			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.986	.201		4.899	.000					
	T_LATC	-.016	.030	-.020	-.544	.588	.196	-.050	-.020	.938	1.066
	T_LAC	.029	.035	.033	.829	.409	.018	.076	.030	.832	1.201
	T_LISE	.091	.026	.173	3.446	.001	.677	.304	.124	.515	1.943
	T_PU	.195	.033	.377	5.859	.000	.848	.476	.211	.315	3.176
	T_PE	.203	.037	.385	5.508	.000	.856	.454	.199	.266	3.757
	T_LPIO	.173	.036	.189	4.856	.000	.412	.410	.175	.864	1.158

a. Dependent Variable: Overall_Stu_Sat

4.2.2 Impact of Teacher e-readiness on Overall student's Satisfaction

Table 4 shows a 64% variance in user satisfaction in e-learning. The regression analysis results gave insight into the main construct of teacher e-readiness (TER) that impacts user satisfaction in E-learning. Teacher e-readiness comprises two independent constructs: Teacher presence and guidance (IPG) and ability in the internet-based course (IAIC). Table 4 shows that items IAIC had the largest and most significant effect on overall student satisfaction, with β= .529 and a p-value less than 0.01. On the other hand, teacher presence and guidance (IPG) has less than IAIC impact but is positive and significant with β=.296, and a P-value is less than 0.05.

Table 4: Teachers e-readiness(TER)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta (β)			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	1.774	.123		14.459	.000					
	T_IPG	.168	.062	.296	2.693	.008	.756	.238	.147	.246	4.067
	T_IAIC	.326	.068	.529	4.812	.000	.787	.401	.262	.246	4.067

a. Dependent Variable: Overall_Stu_Sat

4.2.3 Impact of Quality of e-learning on Overall student's Satisfaction

According to Table 3, 88% of the variance of user satisfaction in e-learning can be predicted by the five independent constructs of Quality of e-learning (QEL). All the components of QEL have a positive and significant relationship with overall User's Satisfaction. Table 5 reveals that items in the Technology quality in online courses (TQ) had the largest and most significant effect on overall user satisfaction, with β= .367 and a p-value less than 0.01. Items in University support and services in online courses (USS) had the second largest explanation power with β=.259 and a P-value of less than 0.000. Based on regression analysis results, the researchers acknowledge a revelation of the key constructs of QEL impact on user satisfaction in E-learning.

Table 5: Quality of e-learning

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta (β)			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.730	.150		4.869	.000					
	T_ECF	.101	.028	.177	3.593	.000	.764	.314	.114	.416	2.404
	T_ECQ	.128	.027	.234	4.712	.000	.788	.398	.150	.409	2.447
	T_TQ	**.226**	**.035**	**.367**	6.389	.000	.866	.507	.203	.307	3.258
	T_IQ	.157	.046	.117	3.419	.001	.289	.300	.109	.857	1.166
	T_USS	.163	.032	.259	5.065	.000	.809	.423	.161	.387	2.581

a. Dependent Variable: Overall_Stu_Sat

E-learning continues to reshape the educational landscape, and understanding student satisfaction becomes paramount, particularly when considering the interplay of factors such as students' attitude, teacher e-readiness, and quality of e-learning. The research deals with four factors and 86 statements. The present paper is a pilot study of a sample of 124 students. In the present study, among the three independent constructs, the quality of e-learning has the highest R^2 of 0.876, followed by students' attitude (R^2=0.840) and teachers' e-readiness construct (R^2=0.643). However, teachers' e-readiness has a minimum R^2 value.

All e-learning (QEL) quality components positively and significantly correlate with students' satisfaction. The quality of e-learning has a clear and organized structure based on the learning progress, facilitates the easy and fast exchange of information and knowledge via the internet among students, enables instant teacher feedback on learning progress, and e-learning keeps me up-to-date with the outside world.

In the case of Teachers' e-readiness, the construct- teachers' ability for the e-learning course (IAIC) has a higher beta value, which indicates the teacher is comfortable, integrates the right tools in using the e-platforms, and encourages the students to participate by provoking questions and engaging the students in a discussion to generate interest. The teacher also clears the course requirements and expectations from the course and communicates important due dates and time frames for the completion of assignments to the students. However, teachers' e-readiness construct has less impact than the other two.

In the case of students, attitude is a combination of 6 factors: LATC, LISE, LCA, PU, PE, and E-Learner perceived interaction with others in online courses (LPIO). Four constructs have a significant relationship with student satisfaction in e-learning and have the highest impact on the perceived usefulness of e-learning. However, two constructs, LATC and LCA do not significantly correlate with student satisfaction. Moreover, LATC and LCA in student attitude have very little Part and partial correlation, which implies that these two constructs have a lower impact on students' attitudes, leading to less impact on student satisfaction, hence less predictive power to predict student satisfaction of e-learners. The study was done after CORONA when students transitioned to technology adoption. In the adopted standardized questionnaire, the scale had all statements of students' attitudes reflecting negative attitudes such as "our online course is challenging," "complicated," "creates psychological stress," "needs patience," "nervous," and "is for young people" hold insignificance in the present scenario of technology adoption.

V. Conclusion

This research study delves into the intricate dynamics of student satisfaction within the realm of e-learning, shedding light on the crucial influences that stem from students' perspectives, the preparedness of teachers, and the overall quality of the e-learning experience. The study aims to contribute valuable insights to the ongoing discourse on enhancing student satisfaction in e-learning environments by exploring identified factors. The exploratory factor analysis conducted in the survey derived the 4-factor model. This model is instrumental in elucidating and describing user satisfaction within an e-learning environment. It also offers valuable insights for designing and developing syllabi and course curricula. Additionally, a subsequent regression

analysis highlighted that learner interaction with peers significantly and positively influences user satisfaction in e-learning contexts.

The study further revealed that several factors contribute positively and significantly to student satisfaction. These include the presence and guidance of teachers, the flexibility of e-learning courses, the quality of technology used, its perceived usefulness, the variety in assessment methods, the competence of teachers in conducting internet-based courses, and the support and services provided by the university for student satisfaction. As the study is a working paper, it has been found that teachers' e-readiness has a positive role, meaning that teachers are ready and comfortable with the e-course delivery. The teachers establish a course keeping in mind different levels of users. Their assessments, i.e., assignment submissions, interactive tasks, chat rooms, quizzes, etc., are also planned at the user level. Eligible participants included individuals who were enrolled and completed e-learning courses. Regardless of how efficient or effective the course may be, the expansion depends upon the students and their attitude towards using these e-learning courses for self-development.

References

Abed, E.K. (2019). "Electronic learning and its benefits in education," EURASIA Journal of Mathematics, Science, and Technology Education, Vol. 15 No. 3, 1672.

Akaslan, D., Law, E.L.C. (2011). Measuring Student E-Learning Readiness: A Case about the Subject of Electricity in Higher Education Institutions in Turkey. In: Leung, H., Popescu, E., Cao, Y., Lau, R.W.H., Nejdl, W. (eds) Advances in Web-Based Learning - ICWL 2011. ICWL 2011. Lecture Notes in Computer Science, vol 7048. Springer, Berlin, Heidelberg.

Alonso, F., Lopez, G., Manrique, D., & Vi ´ nes, J. M. (2005). An instructional model for web-based ˜ e-learning education with a blended learning process approach. British Journal of Educational Technology, 36(2), 217–235.

Alsoud, A.R. and Harasis, A.A. (2021). "The impact of COVID-19 pandemic on student's e-learning experience in Jordan", Journal of Theoretical and Applied Electronic Commerce Research, Vol. 16 No. 5, pp. 1404–1414.

Anthony Jnr, B. (2024). Examining Blended Learning Adoption Towards Improving Learning Performance in Institutions of Higher Education. Technology, Knowledge and Learning, 1-35

Asoodar, M., Vaezi, S., & Izanloo, B. (2016). Framework to improve e-learner satisfaction and further strengthen e-learning implementation. *Computers in Human Behavior, 63,* 704–716.

Babin, B. J., Griffin, M., & Hair Jr, J. F. (2016). Heresies and sacred cows in scholarly marketing publications.

Baiyere, A. and Li, H. (2016). "Application of a virtual collaborative environment in a teaching case," in AMCIS 2016: Surfing the IT Innovation Wave - 22nd Americas Conference on Information Systems.

Chakraborty, D. (2019). Factors Influencing Satisfaction of Learning App Consumers in India: A Study on Smart Phone Users. *MANTHAN: Journal of Commerce and Management, 6*(1), 26–37.

Das, S., Nayak, J., & Naik, B. (2022). Impact of COVID-19 on Indian Education System: Practice and Applications of Intelligent Technologies. In *Future of Work and Business in Covid-19 Era: Proceedings of IMC-2021* (pp. 265-283). Singapore: Springer Nature Singapore.

Davis, F.D., Bagozzi, R.P. & Warshaw, P.R. (1989). "User acceptance of computer technology: a comparison of two theoretical models", Management Science, Vol. 35 No. 8, pp. 982–1003.

Doll, W. J., & Torkzadeh, G. (1988). The measurement of end-user computing satisfaction. *MIS Quarterly*, 259-274.

Farhat, L. (2023). From E-learning to Ed-tech; A Case Study of India's Road to Education 4.0. *Focus*.

Field A. (2009). Discovering statistics using SPSS. 3 ed. London: SAGE Publications Ltd. p. 822.

Fishbein, M. and Ajzen, I. (1975). Belief, Attitude, Intention, and Behaviour: An Introduction to Theory and Research, Addison-Wesley Publishing Company, Reading, MA.

Garg, B., & Chander, V. (2023). A Study of School Teachers' Awareness and Experience towards Online Teaching Learning Process during Covid 19 Lockdown. *GBS Impact: Journal of Multi-Disciplinary Research, 9* (2), 146-161.

Ghasemi A, Zahediasl S. (2012). Normality tests for statistical analysis: a guide for non-statisticians. Int J Endocrinol Metab. Spring;10(2):486-9.

Govindasamy, T. (2001). "Successful implementation of e-learning: pedagogical considerations," The Internet and Higher Education, Vol. 4 Nos 3-4, pp. 287-299.

Gupta S et al. (2020). Factors impacting innovation performance for entrepreneurs in India. International Journal of Entrepreneurial Behaviour & Research. Vol. 27 No. 2, 2020. pp. 356-377

Hair J F, Howard MC, Nitzl C (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. J Bus Res 109(1): pp. 101–110.

Harasim, L., Hiltz, S.R., Teles, L. and Turoff, M. (1995), Learning Networks: A Field Guide to Teaching and Learning Online, The MIT Press, Cambridge, MA.

Liu, M., Yu, D. (2023), Towards intelligent E-learning systems. Educ Inf Technol 28, 7845–7876.

Kapo, A., Milutinovic, L.D., Rakovic, L. et al. (2023). Enhancing e-learning effectiveness: Analyzing extrinsic and intrinsic factors influencing students' use, learning, and performance in higher education. *Educ Inf Technol*. https://doi.org/10.1007/s10639-023-12224-3

Keramati Abbas, Masoud Afshari-Mo Frad, and Kamrani Ali (2011). The role of readiness factors in E-learning outcomes: An empirical study Computers & Education, 57, 1919-1929**.**

Mittal P. & Pani A. (2020). Measuring Access to Higher Education through Eligible Enrolment Ratio (EER), AIU Research Report, 1.

Neil Cowie, Keiko Sakui (2013). It's never too late: An overview of e-learning, *ELT Journal*, Volume 67(4), Pages 459–467

Ozkan S. and Koseler R. (2009). Multi-dimensional evaluation of E-learning systems in the higher education context: An empirical investigation of a computer literacy course, Proceedings - Frontiers in Education Conference, FIE, 10.1109/FIE.2009.5350590

Pedhazur, E. J. (1997). Multiple regression in behavioural research: Explanation and prediction. Holt, Rinehart & Winston, New York.

Podsakoff, P. M., Mac Kenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioural research: A critical literature review and recommended remedies. Journal of Applied Psychology, 88(5), 879-903.

Rahayu, N., Dhiaullah, M., & Marsha, A. (2023). Utilizing e-learning and user loyalty with user satisfaction as mediating variable in a public sector context. International Journal of Data and Network Science, 7(3), 1341-1348.

Saxena, M., Bagga, T., Gupta, S., & Kaushik, N. (2022). Exploring Common Method Variance in Analytics Research in the Indian Context: A Comparative Study with Known Techniques. FIIB Business Review, 0(0).

Schuberth, F. (2021). Confirmatory composite analysis using partial least squares: setting the record straight. Review of Managerial Sciences 15, 1311–1345.

Srideviponmalar, P., Wagle, S.A., Harikrishnan, R., Sawant, R. (2023). Digital-Based Learning in Indian Government's Higher Education: Initiatives and Insights. In: Tanwar, S., Wierzchon, S.T., Singh, P.K., Ganzha, M., Epiphaniou, G. (eds) Proceedings of Fourth International Conference on Computing, Communications, and Cyber-Security. CCCS 2022., vol 664. Springer, Singapore. https://doi.org/10.1007/978-981-99-1479-1_25

Venkatesh, V., Thong, J.Y.L. and Xu, X. (2012). "Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology", MIS Quarterly, Vol. 36 No. 1, pp. 157–178.

Yang, C., & Xu, D. (2023). Predicting student and instructor e-readiness and promoting e-learning success in online EFL class during the COVID-19 pandemic: A case from China. Plos one, 18(5), e0284334.

QUANTIFYING THE ASSOCIATION OF INDIA VIX WITH NIFTY IT AND HEALTHCARE SECTOR: AN EMPIRICAL STUDY

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Purpose: *The current study aims to empirically explore the relationship of India VIX with Nifty IT and Nifty Healthcare indices.*

Design/Methodology/Approach: *To achieve the study's objective, historical data of the indices have been gathered from the official website of the National Stock Exchange (NSE). The study has employed daily data of these indices from April 2009 to March 2023.*

Findings: *The study's empirical findings reveal the negative relationship of India VIX with the returns of both Nifty IT and Nifty Healthcare indices. Incorporating Vector Autoregressive (VAR) model results and Variance Decomposition Analysis (VDA), the study has found that the shocks in India VIX have a significant ability to explain Nifty IT and Nifty Healthcare returns. The lead-lag relationship has also been tested using the Block Exogeneity Wald test and its results show a unidirectional relationship following from India VIX to returns of both the sectoral indices.*

Originality/Value: *Prior research has mostly concentrated on establishing the connection between the volatility index and its underlying index. Therefore, there is a need to study the impact of the volatility index on sectoral indices. This study is the first to examine India VIX's relationship with information technology and healthcare sector indices. The inverse relationship between India VIX and stock indices' results makes India VIX a valuable hedging tool for diversifying portfolios and managing investment risk.*

Keywords : *India VIX, Volatility, Nifty IT, Nifty Healthcare, Vector Autoregressive Model*
JEL Code: *C58, G10, G12, G19*

I. Introduction

Volatility estimation and forecasting are important not just in academia but are also required and employed by practitioners in the financial and other sectors of the economy (Pandey, 2005). Researchers and investors alike have been interested in the Indian financial market as a result of the country's recent significant volatility. Since volatility can be defined as the "rate and magnitude of changes in prices", there is a great deal of interest in examining its relationship to price movement empirically (Narwal et al., 2016). Fluctuations are common in financial markets due to various happenings (good or bad news) in the economy, which gives birth to risks and uncertainties. Fluctuating volatility has a substantial influence on the financial market fluctuations of an economy (Schwert, 1989).

While predicting how volatile the financial markets will be in the near future, implied volatility is crucial. An index called the volatility index, more commonly abbreviated as VIX, has been developed to implement an implied volatility measure. The Chicago Board Options Exchange (CBOE), presently known as CBOE Global Markets was the initiator to launch the volatility index (VIX) in 1993. CBOE did this on the lines of the seminal work of .This was an innovative instrument for predicting market volatility in the US market using market-based methods. The volatility index anticipated future volatility. S&P 500 Index (SPX) serves as the basis for CBOE VIX. It captures the market sentiments, whether the market is causing excitement or fear (Pati et al., 2019). VIX has become one of the most well-liked indicators among the different scales used to assess market volatility. The VIX is popularly known as the “investor fear gauge” as it depicts anticipated future stock market swings. As the VIX starts to rise, the fear increases (Whaley, 2000).

The National Stock Exchange of India (NSE) introduced India VIX (IVIX), the nation's first volatility index, in April 2008. The calculation of the India VIX closely resembles the CBOE's new VIX computation as it was established based on the methodology of the CBOE VIX. The India VIX, popularly known as the "investor fear gauge," quantifies the anticipated volatility of the Nifty 50 index in real-time. It gives information about market sentiment and risk aversion and is determined based on Nifty 50 options prices (Kumar, 2010). Using the best bid-ask prices for NIFTY options

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contracts, India VIX talks about the volatility of the next 30 calendar days. The India VIX is a valuable tool for gauging market participants' levels of comfort or fear for the near term.

There has been little research on the linkage of India VIX with specific sectoral indices, even though it has been significantly examined in the context of the broader market indices. This study aims to examine the relationship of the India VIX with two prominent sectors of the Indian stock market, namely Nifty IT and Nifty Healthcare. The Nifty Healthcare index comprises of top companies of India operating in the healthcare sector and the Nifty IT index includes leading equities of Indian companies active in the IT industry. These two sectors have shown significant growth in recent years and are expected to maintain a more noteworthy position in the economy of India. Past literature has intended to investigate the connection between the India VIX and various market indices. For example, Srinivasan and Vasudevan, (2017) investigated the India volatility index in relation to the Nifty 50 returns and found asymmetric relations between them. Moreover, concurrent index returns emerged as a significant element in figuring out the changes in the India VIX. Fousekis and Grigoriadis, (2018) intended to examine the causal relationship between the Volatility Index and the major stock indices and found that the causality was flowing from the volatility index to the returns of the stock indices. However, there is a very limited study on checking the relation of the India VIX with specific sectoral indices. The current paper aims to extend this research by exploring the association of India VIX with two important sectors of the Indian stock market, namely Nifty IT and Nifty Healthcare. The research findings will help the investors and traders better understand the alliance of India VIX with the returns of these specific sectors so that they can make their investment decisions appropriately.

The rest of the study has been structured as follows: Section I of the study deals with the past literature reviewed along with the research gaps identified. Section II discusses the research objective, hypotheses, data and research methodology used to conduct the study. Section III displays the results and discussion part of the research. Section IV comes up with the conclusion and policy implications of the study.

II. Review of Literature

India VIX captures the anticipated volatility of the market for the next 30 calendar days. Investors of ten see the India Volatility Index (India VIX) as a fear gauge to estimate the extent of anxiety, stress, and ambiguity in the stock market. The India VIX has gained significance in recent years as an evaluation tool for market risk and forecasting of future market volatility (Kumar, 2012).Dhanaiah et al., (2012)and Acharya et al., (2022) assessed the asymmetric relation of the India VIX with market returns, expressing how the high levels of VIX have a negative impact on the returns of the stock market. Alike findings were attained by, Shaikh and Padhi, (2013), Mall et al., (2014)and Shaikh and Padhi, (2015)who evidenced the India VIX as a useful forward-looking indicator of market sentiments that can be used to predict the Nifty returns.

In his findings, Ozair, (2014) found that the VIX is a gauge of market volatility and helps in forecasting the stock market returns. Toanalyze the association between implied volatility and stock market returns, Lee and Ryu (2013) proposed a new VAR approach and came to the conclusion that high implied volatility causes low returns. Thakolsri et al., (2017) in their study found an asymmetric relation between the changes in VIX levels and the return of the underlying index of the Thai stock exchange. Moreover, the size effect of index returns was also found to impact the VIX. Chang et al., (2016)examined the correlation between the VIX and the stock index ETF and found a very strong correlation between both of them. The predicting power of the volatility index was examined by G.C. and Kothari, (2016), who discovered the VIX a significant tool in forecasting the market volatility. Singh, (2016) analyzed the correlation between the US Financial Stress Index and the VIX and concluded that the VIX is an accurate indicator of market volatility. The study also discovered the causality flowing from the US Financial Stress Index to the India VIX which is found to be increasing with time. Mishra and Debasish, (2021) found volatility clustering while assessing the connection of India VIX with Nifty and Sensex. Moreover, the spillover effect of Nifty and Sensex was also discovered on the India VIX along with asymmetries.

A study has particularly analyzed the connection between the India VIX and sectoral indices like Nifty IT, Nifty Finance, Nifty Energy, Nifty Healthcare, etc. Nifty IT and Nifty Healthcare were found to have a significant negative correlation with the India VIX, according to the research by Joo and Bhat, (2016) that investigated the linkage between the volatility index and NSE sectoral indices. Due to their potential for growth and increasing profitability, investing in these sectors can be fortunate. According to Wang et al., (2020), the healthcare and IT sectors are significantly affected

by the volatility index's effects on the returns of the CSI300 index because they are more sensitized to the market fluctuations. Chandra and Thenmozhi, (2015) examined the relationship of India VIX with the stock market returns and found that IVIX has a negative impact on the returns of the stock market. Moreover, they discovered India VIX as the best modern tool for capturing the volatility present in the market. Erdoğdu and Baykut, (2016) did not find any long-term relationship among the BIST Banka Endeksi, VIX, and MOVE indices. Also, granger causality was observed from VIX to BIST Banka Endeksi. By examining the asymmetric relationship between the VIX and its underlying asset, Narwal and Chhabra, (2017) discovered that VIX is a reliable indicator of market volatility. They found investors and traders to respond more quickly to the negative or inverse situation in the market in comparison to the market generating positive returns. Vergili and Çelik, (2023) assessed the cointegration between the DJSEMUP index and the Volatility Index (VIX) using the ARDL method. They discovered a long-term correlation between the two indices and a causal relationship between VIX and DJSEMUP. They advised to analyze VIX thoroughly while investing in the companies listed in DJSEMUP. In line with the above literature, Öztürket al., (2021) also examined the relation of the volatility index with two sub-indices of the Istanbul Stock Exchange including the sustainability index and corporate governance index. Long-term, as well as causal relationships resulting from their study, suggested using the volatility index as a valuable tool to invest in the companies of respective sectors.

Most studies have been conducted to check the association between the volatility index and its underlying index. Moreover, some studies discuss the relationship between sectoral indices and the base index of the stock exchange. However rare studies have been observed checking any linkage between volatility index and sector-specific indices. Therefore, this study has used this gap to explore the association of the volatility index with the IT sector and the healthcare sector of India.

Research Objective & Hypothesis Formulation

The primary aim of the study is to investigate the relationship of IVIX with information technology and healthcare indices of NSE. The objective of the study has been segregated into the following sub-objectives:

I) To investigate the relationship between India VIX and Nifty IT index; and

ii) To investigate the relationship between India VIX and Nifty Healthcare index.

To fulfill above research objectives, the following hypotheses are formulated:

H_{01}: There is no relationship between India VIX and Nifty IT index.

H_{02}: There is no relationship between India VIX and Nifty Healthcare index.

III. Research Methodology

The present study has investigated the association of India VIX with two major sectors of the Indian stock market which are Nifty IT and Nifty Healthcare. The dataset being used in the study is time series in nature and consists of daily logarithmic compounding returns of all the respective indices. The data has been obtained from the NSE official website. The data has been collected for the period 1 April, 2009 to 31 March, 2023. The data of India VIX is available from 2009. Therefore, the data has been taken from the financial year 2009-10 to 2022-23. The daily price series of all the indices has been transformed into logarithmic compounding returns and calculated as below in eq. (1), (2) and (3):

$$R(IVIX)_t = \ln\left(\frac{IVIX_t}{IVIX_{t-1}}\right) \times 100 \quad (1)$$

$$R(NiftyIT)_t = \ln(\frac{NiftyIT_t}{NiftyIT_{t-1}}) \times 100 \quad (2)$$

$$R(NiftyHC)_t = \ln(\frac{NiftyHC_t}{NiftyHC_{t-1}}) \times 100 \quad (3)$$

Where, R represents the return of each variable, IVIX represents the India Volatility Index, IT represents the information technology sector and HC represents the healthcare sector.

Unit Root Test for Stationarity

The study employed both the ADF test and the PP test to check the stationarity of the variables. The ADF and PP test statistics have been equated as below in eq. (4) and (5):

$$\Delta X_t = \alpha + \beta_t + \gamma X_{t-1} + \sum_{i=1}^{k} \varphi_i \Delta X_{t-1} + \varepsilon_t \quad (4)$$

$$\Delta X_t = \alpha + \rho X_{t-1} + \varepsilon_t \quad (5)$$

Where, X_t= X variable at time t, ΔX_t = first difference of series X_t, α= constant, β =coefficient of a time trend, γ = coefficient to be estimated, φ_i = parameter of lagged first, k = number of lagged terms, ε= error term or white noise and if ρ=1, means there is a unit root.

Model Specification

The thrice of return series were found stationary at level. According to the nature of the data, the Vector Auto regressive Model (VAR) has been found appropriate to employ in this study (Shrestha and Bhatta, 2018). VAR is a widely used model to be applicable on multi variate time series to check the impact on a variable of its own and other variables' past lags (G.C. and Kothari, 2016). The VAR model with lag 1 is represented below in eq. (6):

$$Y_t = \alpha + \delta X_{t-1} + \delta Y_{t-1} + \varepsilon_t \quad (6)$$

Where, X and Y denote stationary variables, δ = Coefficient to be estimated and ε = white noise disturbance.

Two separate VAR models have been computed to check the individual impact of IVIX on both sectors. The number of lags has been selected on the basis ofAIC, HQ, FPE and LR criterion to be regressed in the VAR models. The equations computed for both the VAR models are as follows:

$$lnIVIX_t = lnIVIX_{t-1} + lnIVIX_{t-2} + lnNiftyIT_{t-1} + lnNiftyIT_{t-2} + c \quad (7)$$

$$lnNiftyIT_t = lnIVIX_{t-1} + lnIVIX_{t-2} + lnNiftyIT_{t-1} + lnNiftyIT_{t-2} + c \quad (8)$$

$$lnIVIX_t = lnIVIX_{t-1} + lnIVIX_{t-2} + lnNiftyHC_{t-1} + lnNiftyHC_{t-2} + c \quad (9)$$

$$lnNiftyHC_t = lnIVIX_{t-1} + lnIVIX_{t-2} + lnNiftyHC_{t-1} + lnNiftyHC_{t-2} + c \quad (10)$$

Where, IVIX represents the India Volatility Index, IT represents the information technology sector, HC represents the healthcare sector and c is used for constant.

Inverse Roots of Computed VAR Model

This study also employs the inverse roots of the AR characteristic polynomial to check the firmness of the framed VAR models.

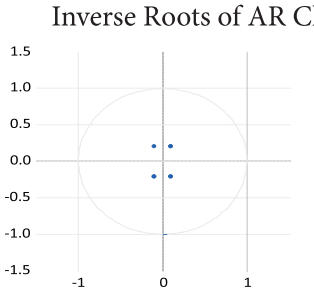

Fig 1. Inverse Roots of VAR I

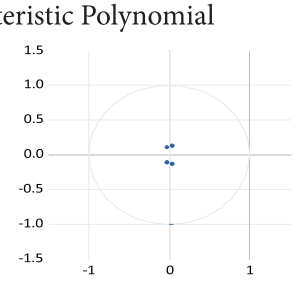

Fig 2. Inverse roots of VAR II

Both Figure 1 and Figure 2 demonstrate that there is no unit root outside the circle which ensures the stability of the computed VAR Models. Hence, the study has been carried out using the VAR approach.

IV. Data Findings and Discussion

Unit Root Test

Table 1reports the results of unit root testing for both the ADF and PP tests. The results of both tests demonstrate that the return series of all three variables are found statistically significant at level i.e. I(0). So, the null hypothesis (H_{01}) of having a unit root in the level series is rejected for all the variables.

Table 1: Results of Unit Root Tests

Variable Name	ADF Test t-stat	PP Test Adj. t-stat	Integration Order
lnIVIX	-59.61752 (0.0000)*	-59.76582 (0.0000)*	I(0)
lnNiftyIT	-59.17838 (0.0000)*	-59.17792 (0.0000)*	I(0)
lnNiftyHC	-56.43609 (0.0000)*	-56.48402 (0.0000)*	I(0)
Notes: * indicates significant P-values at 1% levels.			

Source: Author's Computation

Due to the variables' homogeneous nature of integration which is I(0), the unit root test findings support the adoption of the Vector Auto-Regressive (VAR) model (Shrestha and Bhatta, 2018).

Results of VAR Models

This study exerts bivariate VAR models to examine the association of India VIX with the Nifty IT sector and the Nifty Healthcare sector. Table 2 illustrates the results of both VAR models. In VAR I results, IVIX doesn't get impacted by its own lags while it is getting significantly affected by the second lag of Nifty IT. But IVIX strongly helps in predicting Nifty IT returns as the latter is seen getting affected highly significant with second lag of the former. Moreover, Nifty IT is also affected negatively with its own past lag.

Table 2: Results of VAR Models

VAR I			VAR II		
	lnIVIX	lnNiftyIT		lnIVIX	lnNiftyHC
lnIVIX(-1)	-0.010919	-0.000412	lnIVIX(-1)	-0.008777	-0.007196
	(0.01794)	(0.00486)		(0.01817)	(0.00394)
	[-0.60857]	[-0.08481]		[-0.48311]	[-1.82539]
	0.5428	0.9324		0.6290	0.0680***
lnIVIX(-2)	-0.028100	-0.012970	lnIVIX(-2)	-0.032765	-0.008807
	(0.01794)	(0.00486)		(0.01817)	(0.00394)
	[-1.56612]	[-2.66684]		[-1.80329]	[-2.23381]
	0.1174	0.0077*		0.0714***	0.0255**
lnNiftyIT(-1)	0.030213	-0.004247	lnNiftyHC(-1)	0.061083	0.030226
	(0.06624)	(0.01795)		(0.08374)	(0.01817)
	[0.45608]	[-0.23654]		[0.72943]	[1.66336]
	0.6483	0.8130		0.4658	0.0963***
lnNiftyIT(-2)	0.117831	-0.035696	lnNiftyHC(-2)	0.066089	0.004417
	(0.06612)	(0.01792)		(0.08361)	(0.01814)
	[1.78211]	[-1.99184]		[0.79044]	[0.24347]
	0.0748***	0.0464**		0.4293	0.8076
C	-0.000447	0.000728	C	-0.000412	0.000514
	(0.00088)	(0.00024)		(0.00088)	(0.00019)
	[-0.50880]	[3.05432]		[-0.46854]	[2.69484]
	0.6109	0.0023*		0.6394	0.0071*
Notes: * and ** indicate significant P-values at 1% and 5% levels.					

Source: Author's Computation

The results of VAR II illustrate that IVIX is negatively impacted by its own past second lag, but Nifty HC does not create any significant impact on IVIX. Nifty HC is getting negatively affected by the past lags of IVIX as represented by significant p-values. Moreover, Nifty HC itself is getting interpreted by its own lagged value.

Variance Decomposition Analysis

Table 3 reports the results of VDA considering VAR I. The results reflect that when a shock hits Nifty IT, it doesn't affect the forecast error variations in the IVIX in one day. However, the contribution of Nifty IT increases to 0.10% approximately over 5 days. On the other hand, when a shock hits IVIX, then that contributes approximately 10.8% (average) in forecasting error variations of Nifty IT returns.

Table 3: VAR I Variance Decompositions

VAR I						
Period Lags	**lnIVIX**			**lnNiftyIT**		
	S.E.	**lnIVIX**	**lnNiftyIT**	**S.E.**	**lnIVIX**	**lnNiftyIT**
1	0.051659	100.0000	0.000000	0.014002	10.71180	89.28820
2	0.051666	99.99401	0.005986	0.014002	10.71163	89.28837
3	0.051727	99.90390	0.096100	0.014019	10.81585	89.18415
4	0.051727	99.90381	0.096190	0.014019	10.81592	89.18408
5	0.051727	99.90345	0.096555	0.014019	10.81678	89.18322

Source: Author's Computation

Overall, it also means that although IVIX is helpful in predicting Nifty IT returns but it is strongly predicted by itself too.

Table 4 illustrates the results of VDA considering VAR II. Similar to VAR I, in the lag of one day, the shocks subjected to Nifty HC don't affect the forecast error variations of IVIX. Later on, the contribution of Nifty HC increases to 0.03% approximately over 5 days. On the other side, a shock subjected to IVIX contributed 12.9% approximately in forecasting error variations of Nifty HC returns. Moreover, the contribution of IVIX increases to 13.2% approximately over 5 lagged days.

Table 4: VAR II Variance Decompositions

VAR II						
Period Lags	**lnIVIX**			**lnNiftyHC**		
	S.E.	**lnIVIX**	**lnNiftyHC**	**S.E.**	**lnIVIX**	**lnNiftyHC**
1	0.051676	100.0000	0.000000	0.011213	12.90563	87.09437
2	0.051684	99.98470	0.015296	0.011229	13.06371	86.93629
3	0.051727	99.96614	0.033863	0.011239	13.22387	86.77613
4	0.051727	99.96614	0.033864	0.011239	13.22387	86.77613
5	0.051727	99.96612	0.033879	0.011239	13.22403	86.77597

Source: Author's Computation

In the line of VAR I results, despite IVIX being helpful in predicting Nifty HC returns; it is strongly predicted by itself too.

Block Exogeneity Wald Test (VAR Granger Causality Test)

Based on specified VAR models, Table 5 reports the Block Exogeneity Wald Test results. The unidirectional relationships following from IVIX to NiftyIT and IVIX to Nifty HC are found in the results.

Table 5: Results of Block Exogeneity Wald Test

VAR I			
Dependent variable: lnIVIX			
Excluded	**Chi-sq**	**dof**	**Probability**
lnNiftyIT	3.383201	2	0.1842
All	3.383201	2	0.1842
Dependent variable: lnNiftyIT			
Excluded	**Chi-sq**	**dof**	**Probability**
lnIVIX	6.816093	2	0.0285**
All	6.816093	2	0.0285**
VAR II			
Dependent variable: lnIVIX			
Excluded	**Chi-sq**	**dof**	**Probability**
lnNiftyHC	1.203383	2	0.5479
All	1.203383	2	0.5479
Dependent variable: lnNiftyHC			
Excluded	**Chi-sq**	**dof**	**Probability**
lnIVIX	8.174365	2	0.0168**
All	8.174365	2	0.0168**
Notes: * and ** indicate significant P-values at 1% and 5% levels.			

Source: Author's Computation

As indicated by the significant p-values, the returns of India volatility index i.e. IVIX granger cause the returns of Nifty IT and Nifty HC. On the other hand, the returns of IVIX don't get granger caused by the returns of the sectors i.e. Nifty IT and Nifty HC. In other words, the returns of Nifty IT and Nifty HC don't granger cause the returns of IVIX. These results are in line with similar studies that checked the relationship between the VIX and the returns of its underlying asset conducted by G.C. and Kothari, (2016) andİskenderoglu and Akdag, (2020).

V. Conclusion

The current study aims to investigate the linkage of India VIX with Nifty IT and Nifty Healthcare indices. The results of the study report a statistically significant impact of India VIX on the returns of Nifty IT and Nifty Healthcare sectors. The study has been conducted using the VAR approach. The findings show that IVIX is very helpful in predicting the returns of both Nifty IT and Nifty Healthcare. Further, the lead-lag relationship has been tested usingBlock Exogeneity Wald Tests. The results of this test display the usefulness of IVIX in forecasting Nifty IT and Nifty Healthcare returns. A unidirectional causal relationship has been observed following from IVIX to Nifty IT and IVIX to NiftyHC.Thus, both the null hypotheses of the study are rejected as significant relations have been found between the said variables. The research study unveils the India VIX as a source of opportunity to earn good returns from Nifty IT and Nifty Healthcare stocks. In conclusion, India VIX has emerged as a hedging tool to invest or trade in stocks of IT and healthcare sectors.The literature suggests that the India VIX is a significant tool for risk management and hedging for portfolio managers, policymakers and traders in the stock market. The present study is helpful in making sector-specificinvestments as well as trading strategies, particularly for the IT and healthcare sectors. Portfolio managers can hedge their portfolio by including the above sector stocks selected on the basis of India VIX. Moreover, the study can be extended by including some macroeconomic indicators to check their impact on sectoral indices in comparison to India VIX.

References

Acharya, A., Seet, S. K. & Salvi, P. A. (2022). *Implied Volatility Index (VIX) a Forward-Looking Indicator of Stock Market Movements in India?* RBI Working Paper Series 13.

Chandra, A., & Thenmozhi, M. (2015). On asymmetric relationship of India volatility index (India VIX) with stock market return and risk management. *Decision*, *42*(1), 33-55.

Chang, C. L., Hsieh, T. L., & McAleer, M. (2016). *How are VIX and Stock Index ETF related?* Tinbergen Institute Discussion Paper, (16-010/III).

Dhanaiah, G., Reddy, D. R. & Prasad, T. N. L. (2012). INDIA VIX: Examining the negative and asymmetric volatility index – Market return relationship. *Indian Journal of Finance, 6*(5), 4-10

Erdoğdu, H., & Baykut, E. (2016). BİST Banka Endeksi'nin (XBANK) VIX ve MOVE Endeksleri ile İlişkisinin Analizi. *Bankacılar Dergisi*, 98, 57-72.

Fousekis, P., & Grigoriadis, V. (2018). Causality betweenstock market and "fear gauge" indices: an empirical analysis with e-statistics. *Applied Finance Letters*, *7*(1), 13-21.

G.C., S. B., & Kothari, R. (2016). Analyzing Relationship between India VIX and Stock Market Volatility. *International Journal of Exclusive Management Research*, *6*(2). https://ijemr.in/wp-content/uploads/2018/01/Analyzing-Relationship-between-India-VIX-and-Stock-Market-Volatility.pdf

G.C., S. B., & Kothari, R. (2016). The forecasting power of the volatility index: Evidence from the Indian stock market. *International Journal of Management and Social Sciences*, *4*(1), 230-243.

İskenderoglu, Ö., & Akdag, S. (2020). Comparison of the effect of VIX fear index on stock exchange indices of developed and developing countries: The G20 case. *South East European Journal of Economics and Business*, *15*(1), 105-121.

Joo, B. A., & Bhat, I. A. (2016). Examining the Linkage between Sectoral Indices of NSE and Volatility Index: An Empirical Study. *Global Journal of Research in Management*, *6*(2), 28-37.

Kumar, S. S. S. (2010). The behaviour of India's volatility index. *Indore Management Journal*, *2*(2), 27-33.

Kumar, S. S. S. (2012). A first look at the properties of India's volatility index. *International Journal of Emerging Markets, 7*(2), 160-176.

Lee, B. S., & Ryu, D. (2013). Stock returns and implied volatility: A new VAR approach. *Economics*, *7*(1), 1-20.

Mall, M., Mishra, S., Mishra, P. K., & Pradhan, B. B. (2014). A study on relation between India VIX and nifty returns. *Intercontinental Journal of Banking, Insurance and Finance*, *1*(3), 1-7.

Mishra, P., & Debasish, S. S. (2021). Exploring Relationship Between Stock Market Indices And India Volatility Index Using Econometric Analysis. *International Journal of Management*, *11*(12), 919-930.

Narwal, K. P., & Chhabra, P. (2017). An examination of asymmetric relation between implied volatility index and its underlying asset. *International Journal of Financial Management*, *7*(4), 10-22.

Narwal, K. P., Sheera, V. P., & Mittal, R. (2016). Implied volatility vs. realized volatility: A forecasting dimension for Indian markets. *Delhi Business Review*, *17*(2), 75-85.

Ozair, M. (2014). What does the VIX actually measure? An analysis of the causation of SPX and VIX. *ACRN Journal of Finance and Risk Perspectives*, *3*(2), 83-132.

Öztürk, M. B., Çelik, M. S., & Artantaş, E. (2021). Can the VIX Index Be Used As An Indicator for the Borsa Istanbul Sustainability Index and Corporate Governance Index? *Turkish Online Journal of Qualitative Inquiry*, *12*(3), 1329-1352.

Pandey, A. (2005). Volatility Models and Their Performance in Indian Capital Markets. *Vikalpa*, *30*(2), 27-46.

Pati, P. C., Rajib, P., & Barai, P. (2019). The Role of the Volatility Index in Asset Pricing: The Case of the Indian Stock Market. *The Quarterly Review of Economics and Finance*, *74*(C), 336-346.

Schwert, G. W. (1989). Why does stock market volatility change over time? *The Journal of Finance*, *44*(5), 1115-1153.

Shaikh, I., & Padhi, P. (2013). The information content of implied volatility index (India VIX). *Global Business Perspectives*, *1*, 359-378. http://10.1007/s40196-013-0025-4.

Shaikh, I., & Padhi, P. (2015). The implied volatility index: Is 'investor fear gauge' or 'forward-looking'? *Borsa Istanbul Review*, *15*(1), 44-52.

Shrestha, M. B., & Bhatta, G. R. (2018). Selecting appropriate methodological framework for time series data analysis. *The Journal of Finance and Data Science*, *4*(2), 71-89.

Singh, A. (2016). On the linkages between India VIX and US financial stress index. *Theoretical Economics Letters*, *6*(01), 68-74.

Srinivasan, P., & Vasudevan, R. D. (2017). Linkage between India Implied Volatility Index and Stock Index Returns. *Theoretical Economics Letters*, *7*(4), 929-938.

Thakolsri, S., Sethapramote, Y., & Jiranyakul, K. (2017). Relationship of the change in implied volatility with the underlying equity index return in Thailand. *Economic Research Guardian*, *6*(2), 74-86.

Vergili, G., & Çelik, M. S. (2023). The Relationship Between the Indices of Volatility (VIX) and Sustainability (DJSEMUP): An ARDL Approach. *Business and Economics Research Journal*, *14*(1), 19-29.

Wang, Y. C., Tsai, J. J., & Lu, W. (2020). The Impact of Volatility Index on China's Stock Market. *Journal of Business & Economics*, *6*(1), 24-46.

Whaley, R. E. (1993). Derivatives on market volatility: Hedging tools long overdue. *The Journal of Derivatives*, *1*(1), 71-84.

Whaley, R. E. (2000). The investor fear gauge. *The Journal of Portfolio Management*, *26*(3), 12-17.

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