ISSN:2347-2839

International Journal of Applied Management Research

(A Double Blind Peer Reviewed Journal)

Vol. 8-9 , No. 1-4, 2022-23

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Tura Campus, Tura-794002, Meghalaya, India

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Published by :
Department of Management, North-Eastern Hill University,
Tura Campus (India), 2025

Editorial

Editor-in-Chief

I am pleased to announce the release of Volume 8-9, Issues 1-4 for the years 2022-2023 of the International Journal of Applied Management Research (IJAMR). This Volume comprises a total of ten (10) manuscripts. A temporary hiatus in the release of issues occurred during 2020-21, attributable to the Covid-19. However, the Editorial staff promptly organized its responsibilities and began receiving contributions from eminent scholars and academicians, enabling the expedited facilitation of the past issues.

I express my profound gratitude to all the authors for their valuable submissions from both India and abroad. I am very grateful to all the reviewers who assisted in the timely blind examination of the articles; their ongoing assistance enabled the successful publication of this journal issue.

I express my gratitude to the Managing Editor of IJAMR, who, upon assuming the particular role has dedicated himself to the publication of the current issue. I express my gratitude to the Advisory Board and Editorial Board Members for their diligent contributions, which have facilitated the effective publication of this Volume.

I express my profound gratitude to the Vice Chancellor of NEHU, Shillong, and the Campus Director of NEHU, Tura Campus, for their unwavering support to our department and for advancing this institution towards greater academic success. I extend my sincere gratitude to all the writers who submitted high-quality pieces for this issue. I anticipate that high-quality research papers will persist in being submitted to IJAMR in the future.

(Prof. Abhigyan Bhattacharjee)
Editor-in-Chief, IJAMR

Editorial

Managing Editor

I take great delight in presenting the consolidated issues (Issues 1-4) of Volume 8-9 for the years 2022-2023 of the International Journal of Applied Management Research.

To form an objective perspective on the subject of inquiry, scholars must gather facts, concepts, viewpoints, and other pertinent matters.The backlog of issues from 2020 has been a testament and a significant editorial commitment to include papers as combined issues in the current Journal Volume.

We are dedicated in elevating the quality of publications with IJAMR and standard among academics. The International Journal of Applied Management Research (IJAMR) has demonstrated a robust commitment to ethical publication processes, marking a significant advancement in the domain of publishing ethics.

The research papers in the current volume were meticulously picked through a blind review process and have been appropriately included in the current editions of our journal. The reviewers' competent evaluation of the manuscripts, together with their objective and equitable peer-review method, contributed to the journal's outstanding quality of research. The editorial board has undertaken proactive and constructive initiatives in the publication process, driven by a dedicated objective to advance management research while adhering to business research standards.

Due to the meticulous efforts of our Editor-in-Chief and editorial board members, along with the steadfast support of our advisory board members, the issues could be published in the current volume.

I wish to convey my appreciation to all the scholars and researchers who have submitted their research papers and have agreed to serve as our esteemed reviewers. The editorial board acknowledges the significant responsibility of ongoing commitment to the academic mission and anticipates valuable and pragmatic ideas to advance our efforts.

Amit Kundu

(Dr Amit Kundu)
Managing Editor, IJAMR

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Vol. 8-9 **No. 1-4** **2022-23**

CONTENTS

Nexus between Earning per Share, Dividend per Shareand Stock Price: Evidence from Indian Stock Market

Mahesh Dahal[1], Joy Das[2], Akivi H Sumi[3]

ABSTRACT

The Present study proposes to examine the relationship between Earning per Share, Dividend per Share and Stock Price of firms listed in BSE 100 index.The researcher has used a quantitative approach in order to examine the impact of market valuation measures on stock price. The present study has used panel data analysis, as the methodology provides a better understanding and information by combining the time series and cross-sectional dimensions.The study has compiled the data of companies consisting in BSE 100 index to examine the relationship of their Earnings per share (EPS) and Dividend per share (DPS) with the share price by employing appropriate statistical analysis through panel data.The creation of shareholders' value is the prime objective of a firm's manager and the same prominently depends on the market value of the shares (Sharma,2011). However, the stock prices keep changing over time and often depend on the market expectations with regard to firm performance as well as the earnings (Menaje, 2012). Therefore, a firm, to mitigate volatility in share price, predominantly focuses on the firm's earnings per share and dividend sharing to shareholders (Erasmus, 2010).The dividend is viewed as a signal of management's confidence in sustainable earning potential of the firm and symbolizes economic well-being of a firm (Correia et al., 2015), while EPS is a carefully scrutinized metric that is often used as a barometer to gauge a company's profitability per unit of shareholder ownership.Empirical studies conducted over the globe have also shown that the share price of a firm predominantly depends on the earnings of a firms and its dividend distribution, but is not conclusive in the context of Indian market. And majority of the studies are conducted in countries other than India. Therefore, the present study has been initiated, where an attempt has been made to quantify the relationship between the variables in the context of Indian firms listed on the stock exchange of India. The present study shall be limited to Indian stock market.

Key Words: *Indian Stock Market, EPS, DPS, COVID 19,Panel Data Analysis*

Manuscript Received: August 13, 2024; Revised Manuscript Received: November 25, 2024, Accepted: April 5 2025

1.INTRODUCTION

A company's stock price is affected by a variety of factors, including both internal and external factors. Therefore, it's crucial for investors to consider all these factors when they are making investment decisions.Investors use a variety of informational sources when assessing a company for investment, including the annual financial statements. While these statements are widely recognized as valuable resources, they do suffer from certain limitations(Correia et al., 2015).While investors often recognize

the value of thoroughly analyzing the various factors, many tend to concentrate primarily on the company's earnings, cash flow, and dividendpayout when making investment decisions(Erasmus, 2010).The creation of shareholders' value is the prime objective of a firm's manager and the same prominently depends on the market value of the shares (Sharma,2011). However, the stock prices are never stable and keep changing over time. The changes in stock prices often depend on the market expectations with regard to firm performance as well as the earnings (Menaje, 2012). Therefore, a firm, to mitigate volatility in share price, predominantly focuses on the firm's earnings per share and dividend sharing to shareholders (Erasmus, 2010). The dividend is viewed as a signal of management's confidence in sustainable earning potential of the firm and symbolizes economic well-being of a firm (Correia et al., 2015).Theterm earning per share (EPS) represents the portion of a company's earnings, net of taxes and preferred stock dividends that is allocated to each share of common stock.EPS is a carefully scrutinized metric that is often used as a barometer to gauge a company's profitability per unit of shareholder ownership.As such, earning per share is a key driver of share prices.Dividend per share is the portion of the profit after tax, which is distributed to the shareholders for their investment bearing risk in the company (Geetha and Swaaminathan, 2015).DPS is vital because the major goal of a company is to return value to its shareholders. Investors receive value through dividends as well the price paid for the stock of the firm.

Empirical studies conducted over the globe have also shown that the share price of a firm predominantly depends on the earnings of a firms and its dividend distribution. Om Prakash Agarwal, et al. (2020); Menike, et al. (2012); Angela &Masjud. (2016); Hikmah, et al. (2020); Idawati& Wahyudi (2015) are among the researcher who found a positive relationship between EPS, DPS and stock price. However, there are some exceptions, like Chang & Chang (2008); Utami &Absari (2019); Jasman &Kasram (2017) who found no significant relation between EPS, DPS and stock price.

The outcome of empirical studies reveals that although the relationship between EPS, DPS and share price is widely studied but is not conclusive. And majority of the studies are conducted in countries other than India. Therefore, the present study has been initiated, where an attempt has been made to quantify the relationship between the variables in the context of Indian firms listed on the stock exchange of India.

Therefore, to address this complication of results, this area has been subjected to further examination to enhance the knowledge of policy makers in formulating a better framework and to also give clearer idea to the stakeholders and investorsto foster a more informed decision making.

2. REVIEW OF LITERATURE

Reviewing of previous literature gives an overview of the research work done on the topic under study. It also provides the knowledge regarding the gap in the existing literature, which forms the base for future research work. With the said object, the present study has also reviewed the prominent literature and the same are presented below:

Om Prakash Agarwal, et al. (2020) have critically examined the relationship between EPS and stock price for the Indian stock market from2002 to 2021 and found that there exists a positive significant relation between the two and further noted that stock price is influenced by the earning per share (EPS). Similarly, Menike, et al.(2012)examined the impact of accounting variables on stock price of selected 100 companies listed on the Colombo stock exchange and founda significant and positive impact of EPS on the stock price. However, Chang & Chang (2008) in the study conducted during 1997 to 2006 on the Singapore stock market observed that in firm with a high level of growth, EPS has less power in explaining the stock prices.

Angela &Masjud (2016) using panel data regression analysis found that in the Indonesian stock market, PBV has a positive and significant impact on the stock price. Similarly, the study by Abdallah etal.(2018) observed that the ratio of assets turnover, long–term debt to total assets, inventory to total current assets ratio, and total current assets to total assets significantly affect the market stock price of Jordanian industrial companies, while the equity to total assets ratio and working capital ratio have no significant effect.Utami &Absari(2019) examined the relationship between EPS and stock price for the Indonesia stock exchange using panel data regression analysis and found that the liquidity, asset size,debt-equity ratio (DER), and return on equity (ROE) does not affect stock prices, however, Hikmah, et al. (2020) found that EPS has a positive and significant effect on DPR of transportation and logistics sector companies listed on the Indonesia stock exchange. Similarly, Ebrahimi &Chadegani (2010) for the Indian stock market found that there exists significant relationship between the effect of earning, dividend and stock price.AL Shubiri (2010)finds a highly positive significant relationship between market price of stock and net asset value per share for Amman stock exchange in Jordan. Idawati& Wahyudi (2015) also found positive relationship of EPS and ROA with stock prices in Indonesia stock exchange. Velankar, et al. (2017) have critically examined the relationship between EPS and stock price for the Indian stock market and found that there exists significant relationship between the two. Similarly, Jasman &Kasram (2017) found that profitability had no effect on stock return and EPS. While, Chebii and Wasike (2004) on examining the relationship between EPS and stock price using panel data techniques and found a positive significant relationship between capital structure and dividend payouts for company listed at the NSE.

From the literature reviewed above, it is clear that the relationship between EPS and stock price is a much-explored topic with varying result. However, majority of the studies have indicated a positive relation between the variables. Concentrating on the literature reviewed, another important aspect that can be pointed out is that the majority of studies have explored the stock markets other than Indian stock market. A few studies have explored the Indian market, but the outcomes are inconclusive and do not form a common notion so far, the relation between EPS and stock prices are concerned. Therefore, the present study has been initiated to explore the relationship between the two and also to bridge the existing gap in literature. The present study is an improvement on the earlier studies. Firstly, it employs a large sample for the purpose of investigation.

Secondly, it examines a greater number of variables than those included in earlier studies. Thirdly, it considers a large period of ten years of investigation.

3. RESEARCH GAP

From the above review of literature following research gap has been identified.

Table 1: Research Gap

Variables	Research Gap identified
EPS	· Results are inconclusive. Variations were observed in terms of its relationship with stock prices.
DPS	· Fewer studies were observed. Results are inconclusive. Variations were observed in terms of its relevance.
COVID-19	· Results are inconclusive. Variations were observed in terms of its relevance with the stock price.

4. STATEMENT OF THE PROBLEM

Accounting information acts as a basis for decision making for stakeholders and investors (Azar *et al.,* 2019). EPS has a significant association with the stock price (Elshandidy, 2014). Similarly,Irsath et al. (2015) have also claimed that EPS and DPS have a significant effect on stock price. Kasim & Muhammad (2021) also proved that EPS and DPS to have strong association with the stock price. However not every study conducted in this field have supported this argument. Rather, their studies have proven otherwise. For example,Putri et al., (2023) in their study of 45 consumer cyclical Indonesian Stock Exchange (ISE) listed firms from 2020-2022 found EPS to be irrelevant. Bankole & Ukolobi, (2020) did an analysis of 20 financial NSE-listed firms from 2012-2018 found EPS and DPS to be of no significance. Similarly, Jasman & Kasram (2017) found that profitability had no effect on stock return and EPS.

While there have been contributions in this field through numerous studies,some areas are studied more so than others while being contradictory with one another. While, EPS appear to be of greater interest to the researchers. While some research suggests that they are positively related to stock price (Om Prakash Agarwal, et al., 2020; Menike, et al., 2012; Hikmah, et al., 2020; Idawati & Wahyudi 2015; Velankar, et al., 2017; Chebii and Wasike 2004), others argue that they are negative (Putri et al., 2023; Bankole & Ukolobi, 2020; Jasman & Kasram 2017). Out of the two, DPS has been the lower subject of interest. And the studies that are done are also in contradiction. Hence, there needs to be more studies to substantiate the actual proof of its relationship with the stock price. The study has also speculated that there may be some extraordinary effects of COVID-19 on stock prices. So, to enhance the proof of relationship further and provide concrete evidence of its relationship with the stock price, the pandemic, the study will examine the effect of COVID-19 through appropriate statistical measures.

5. OBJECTIVES OF THE STUDY:

1. To examine the effects of EPS and DPS with the stock price.
2. To identify if there is an extraordinary effect of COVID-19 on stock price valuation.

6. DATA AND METHODOLOGY

6.1. Sample and Study Period

The study considered the stock of all the listed firms forming BSE 100 Index. The stock price data of the same has been collected from the official website of BSE India for the period from 2012 to 2022.

6.2. Variables under Study

In the present study to now the effect of earnings on the stock prices of a company, Earning Per Share (EPS) and Dividend Per Share (DPS) are considered independent variables whereas Stock Price isthedependent variable. The data relating to independent variables has been collected from Prowess IQ Data base. Since the period of the study falls during COVID period, therefore to tackle the impact of the COVID-19 pandemic, a dummy variable has been assigned for the years 2020 and 2022.The list of variables and their operational definitions have been shown in Table 2.

Table No. 2: List of Variables

	Variable	Definition	Symbo	Data Source
Dependent Variable	Market Price of Equity Shares	Market prices of equity shares as on 31st March each year of the study period.	Share Price	BSE Website
Independent Variable	Earnings per Share	It is computed as the firm's profit divided by the outstanding shares of its common stock	EPS	BSE Website
	Dividend per Share	It is calculated as the sum of declareddividends (including interim dividends) over the period of a year divided by number of outstanding shares.	DPS	BSE Website
	COVID-19		COVID	

Source: *Author's Calculation*

6.3. Tools and Technique

The researcher has used a quantitative approach in order to examine the impact of market valuation measures on stock price. The present study has used panel data analysis, as the methodology provides a better understanding and information by combining the time series and cross-sectional dimensions. It also provides the advantage of loss collinearity among variables, more degrees of freedom and enhanced analytical efficiency (Alexakis et al., 2010).

Further, the study employed the VCE to examine the impact of EPS, DPS and COVID Dummy on Stock Prices. It is used when heteroskedasticity is present in the variances of the observations or when there is a certain degree of autocorrelation in the observations, or both are present. It allows estimations in the heteroskedasticity across panels and first- order autocorrelation within panels.

$$\text{Model 1: } Y_{it} = a_0 + a_1 \text{EPS} + a_2 \text{DPS} + a_3 \text{COVID-Dummy} + u_{it}$$

In the model 1: Y_{it} is the firm's performance proxied by Stock Price study.

$u_{i} = a_j + a_{jt}$

7. DATA ANALYSIS AND INTERPRETATION

7.1. Descriptive Statistics

Descriptive statistics of all the independent and dependent variables have been shown in Table 3. It portrays the descriptive statistics of the entire variable: independent variable-, EPS, DPS; dependent variable- Share Price of the firms constituting the BSE 100 Index for the period from 2012 to 2022. The table shows that the minimum value of Share price at 99.3 while the maximum value goes up to 19708.55 with a standard deviation of 2690.934 and a mean of 1893.793. Similarly, the min value of the EPS remains at -47.7 with an upswing of 250.79 and the standard deviation and mean stand at 52.45 and 49.846, respectively. The min value of DPS at 0 while, the max value goes up to 342 with a std. Dev. of 30.724 and a mean of 16.807. From this, it can be inferred that the variable, Share Price have higher standard deviations implying high variables, whereas EPS has the higher mean and DPS has the lowest mean.

Table No. 3: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Share Price	1893.793	2690.934	99.3	19708.55
EPS	49.846	52.45	-47.7	250.79
DPS	16.807	30.724	0.00	342

Source: Author's Calculation

Table 4 portrays the Pearson's pair-wise correlation of all variables under study. The Share Price displays a positively significant correlation with EPS and DPS. Similarly, EPS and DPS also displayed positive relationship.

Table No. 4: Pair wise Correlations

Variables	(1)	(2)	(3)
(1) Share Price	1.000		
(2) EPS	0.655*	1.000	
	(0.000)		
(3) DPS	0.708*	0.604*	1.000
	(0.000)	(0.000)	

Source: Author's Calculation

**** p<0.01, ** p<0.05, * p<0.1*

Table 5 presents the Breusch-Pagan / Cook-Weisberg test for heteroskedasticityto detect the presence of heteroskedasticity in the longitudinal data as these biases the standard errors and thus lead to ambiguous results. The Breush -Pagan test is applied for the variables to test the panel level heteroskedasticity and the outcome of the test validates the existence of heteroskedasticity.

Table No. 5: Heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of SharePrice
chi2(1) = 67.28
Prob > chi2 = 0.0000

Source: *Author's Calculation*
**** p<0.01, ** p<0.05, * p<0.1*

Testing for serial correlation has been done using the Wooldridge test in longitudinal data. The null hypothesis of the first-order autocorrelation is rejected for Share price as shown in the Table 6.

Table No. 6: Autocorrelation

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelationF(1, 29) = 8.205
Prob > F = 0.0077

Source: *Author's Calculation*
**** p<0.01, ** p<0.05, * p<0.1*

The Hausman test is employed to find the suitable model from the two longitudinal data models. In the table 7, it suggested to invoke the random effect model. The results of the Housman test are shown in Table No. 7.

Table No. 7: Hausman (1978) specification test

	Coef.
Chi-square test value	4.44
P-value	.218

Source: *Author's Calculation*
**** p<0.01, ** p<0.05, * p<0.1*

Table No. 8: Regression results (Random Effect VCE)

SharePrice Sig	Coef.	St.Err.	t-value	p-value
EPS ***	15.219	4.561	3.34	.001
DPS ***	35.422	3.835	9.24	0.00
COVID ***	1099.971	346.901	3.17	.002
Constant	295.407	191.232	1.54	.122

Source: *Author's Calculation*
**** p<0.01, ** p<0.05, * p<0.1*

RESULTS AND DISCUSSION

The main purpose of this study is to identify if EPS and DPS of a company is a statistically significant factor in interpreting changes in the stock prices. Where it is found that EPS and DPS do have an impact on the stock prices of a firm implying the importance of these values among the stakeholders in making investment decision.The results corresponding to Random effect model presents that the Coefficient of EPS is positive and statistically significant at 1 per cent level. The significant coefficient of EPS shows that the information of EPS does cause movement in stock prices. In other words, investors do rely on the EPS information while selecting the stocks from BSE 100 Index. Further, the coefficients of DPS are positive and statistically significant at 1 per cent level. The positive coefficient of DPS confirms the positive Influence of dividend payments on the stock price of firms constituting the BSE 100 index.Further, the COVID dummy is found to be significantly positive implying a positive impact of COVID on the stock prices of firms constituting BSE 100 index. The positive co-efficient can be associated with the timing of data collection, since the data is collected as on 31st March of each year, and dummy is included from the year 2019, but at the time of data collection the impact of the COVID was not felt for year 2019, similarly for 2020 and 2022 the stock market was at its peak in the month of march for both the years. Therefore, the study found a positive impact of the COVID on the stock market. In other word it can said that the impact of the COVID was short term and the market continue to grow despite pandemic in long run.

CONCLUSION

This paper focuses on a critical study of the relationship between earning per share (EPS), Dividend per Share (DPS) and stock Price. The study initially considered

the entire firm under BSE 100 Index, but due to the non-availability of data, the final sample has come down to 27 firms. In the present study, Dummy COVID have been created for the period falling during COVID era i.e., from 2020 onward. The independent variables which are used in the study are EPS, DPS and COVID Dummy and the dependent variable is Share Price.

From the descriptive statisticsin Table no. 7.1, it can be inferred that the variable Share Price have higher standard deviation implying high variations, whereas EPS has the higher mean and DPS has the lowest mean. Further, pair-wisecorrelation in Table no.7.2reveals that there is a positive relationship of Share Price with EPS, DPS and COVID.The Breusch-Pagan test for testing the panel level heteroskedasticity is employed and the results indicated that the null hypothesis of the first-order autocorrelation is rejected for Share price. The Hausman testas shown in Table no. 7.5 is employed to find the suitable model from the two longitudinal data models, and it suggested the random model(cannot justify the use of random effect model). Considering the presence of heteroskedasticity and correlation, the study has employed panel data regression in Table no. 7.6with the VCE model by using the state command and found that the coefficient of EPS, DPS and COVID Dummy are positive and significant, indicating the positive impact of the same on Share Pricewhich is consistent with the studies of (Om Prakash Agarwal, et al., 2020;Menike, et al., 2012; Hikmah, et al., 2020;Idawati& Wahyudi 2015; Velankar, et al., 2017; Chebii and Wasike2004).The positive relationship of DPS and stock price could suggest that shareholders do value dividend payouts as they should.

The present study considered only two variables, EPS and DPS to find their impact on stock prices but there are many other variables also which an investor may consider before making their investment decisions,which the present study have not considered and this may be considered a limitation of the study.

LIMITATIONS

The study is limited to only companies listed in BSE 100 companies as such the results of other or larger set of companies may not correspond with the findings of this study.Also, the time period of the study is limited to 10 years from 2012-2022, as such studies conducted across different time periods may produce different results.

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Unraveling the Impact of Public Expenditures on Entrepreneurship and its Consequential Effects on Economic Growth in Meghalaya

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ABSTRACT

This research aims to investigate the complex interaction between entrepreneurship, public expenditures and economic growth in the context of Meghalaya, India. The study seeks to unravel the mechanics of sustainable development by examining the impact of public expenditures on entrepreneurship and assessing how this entrepreneurial activity, in turn, influences economic growth. Employing empirical analysis on the data set varying from 2004-05 to 2021-22, VECM models under STATA, the study aims to contribute valuable insights for policymakers and stakeholders interested in encouraging sustainable economic development. The findings showed there was long-run causality and short-run significant relationship running from Economic Growth (GSDP) to the PE (Public Expenditure) and Entrepreneurship (EA). The statistical output also found that the public expenditure (â -0.28; p-value > 0.001) does have a significant positive relationship and that the Entrepreneurship (â 65.4; p-value > 0.001) does have a significant but negative relationship with the Economic growth in Meghalaya.

Keywords: Entrepreneurship, Public Expenditures, Economic Growth, Sustainable Development Goals, Meghalaya, Vector Error Correction Model.

Manuscript Received: September 2, 2024; Revised Manuscript Received: November 20, 2024, Accepted: April 11 2025

1. INTRODUCTION

In the dynamic landscape of regional development, the role of public expenditures in fostering entrepreneurship has emerged as a critical factor influencing economic growth. Meghalaya, with its unique socio-economic environment, provides a captivating setting to unravel the complex relationship between entrepreneurship, public expenditures and economic growth. This research aims to explore the impact of public expenditures on entrepreneurship in Meghalaya and determine its consequential effects on economic growth.

The symbiotic relationship between entrepreneurship, public expenditures and economic growth is a crucial dimension in the pursuit of sustainable development goals. This study aims to unravel the complicated web of these relationships, focusing on the unique context

of Meghalaya. By exploring the impact of public expenditures on entrepreneurship and its consequential effects on economic growth, this research endeavors to contribute to the overarching framework of sustainable development.

2. CONTEXTUAL BACKGROUND

Meghalaya, with its rich cultural tapestry and diverse economic activities, faces the challenge of achieving sustainable development amidst evolving global dynamics. The nexus between public expenditures, entrepreneurship, and economic growth remains understudied, posing a critical knowledge gap that hinders informed policy decisions.

1. **Public Expenditures and Entrepreneurship:** The patterns and effectiveness of public expenditures in fostering entrepreneurship in Meghalaya are not well-understood. This knowledge deficit impedes the formulation of targeted policies to harness entrepreneurial potential for sustainable development.

2. **Entrepreneurial Contribution to Economic Growth:** While entrepreneurship is recognized as a catalyst for economic growth, the specific sectors and mechanisms through which public expenditures influence entrepreneurial contributions to the economy are not clearly delineated.

3. **Alignment with Sustainable Development Goals:** Understanding how public expenditures align with and contribute to the achievement of sustainable development goals in Meghalaya is imperative. This includes exploring the potential of entrepreneurship as a vehicle for advancing socio-economic and environmental sustainability.

3. RATIONALE OF THE STUDY

Meghalaya has a unique socioeconomic background, making it an excellent case study for understanding regional dynamics of entrepreneurship and economic progress. The findings of this study can provide significant insights for Meghalaya officials in devising strategies to optimize public expenditures for stimulating entrepreneurship and supporting sustainable economic growth. The study adds to the scholarly conversation by deepened understanding of the complicated interplay between entrepreneurship, public expenditure, and economic growth, particularly in the context of a region like Meghalaya. This research aims to not only improve our understanding of regional development dynamics, but also to provide actionable insights for directing Meghalaya towards a path of equitable and sustainable prosperity.

4. REVIEW OF LITERATURE

Relationship between Entrepreneurship and Public expenditure.

Public expenditure increases economic growth (Al-Yousif, 2000; Ranjan and Sharma, 2008), and Bernard (2009) demonstrated that insufficient funding has a negative impact on economic growth. According to Danladi et al., (2015), capital and recurring expenditure have a considerable positive link with economic growth. Bygrave (2006) and Koellinger and Minniti (2009) discovered that national level social expenditure limits

entrepreneurial activity, but Islam (2015) discovered a negative influence on entrepreneurial activity, which was later validated by Solomon et al., (2022) in 31 developed nations between 2004 and 2011. Prasetyo (2020) discovered that between 2009 and 2019 Q3, public expenditure has a favourable and significant link with small and medium-sized firms in Indonesia. Woldemichael et al., (2024) further added to the literature by discovering a mixed relationship between the functional level of the public expenditure and the motivation of the Entrepreneurship and concluded that there was a significant and positive relationship between the public expenditure and the entrepreneurial activities.

Relationship between Entrepreneurship and Economic growth.

Hartog et al., (2010) undertook a systematic examination of the relationship between entrepreneurship and economic performance, concentrating on 21 OECD nations from 1981 to 2006. Their findings revealed convincing evidence for a long-run equilibrium relationship, leading them to conclude that increased firm ownership is causally related to economic growth.

Begum et al., (2022) added to this discussion by finding a positive and significant relationship between entrepreneurial growth, as measured by SME output, and overall economic growth. Their research found that entrepreneurship growth contributed 30.4% to the overall economic growth trajectory.

Zaki and Rashid (2016), on the other hand, found a substantial negative association in Emerging Countries. This emphasizes the complex function of institutional structures and strategic investments.

Relationship between Entrepreneurship and Human development.

Recent empirical studies highlight the critical significance of entrepreneurial activity in determining regional well-being and economic development. Scholars such as Thurik and Wennekers (2004), Wennekers et al., (2005, 2010), and Hafer (2013) have highlighted the importance of delving into the complex relationship between entrepreneurship and regional economic development. Renowned researchers such as Van Stel et al., (2005), Carree and Thurik (2010), and Pinillos and Reyes (2011) have shed light on the various consequences of entrepreneurship on regional economic dynamics. Recognising the temporal and regional heterogeneity of findings, researchers such as Bjornskov and Foss (2016, 2013), Hartog et al., (2010), and Vivarelli (2013) argue that the nature of the relationship—whether positive or negative—is an empirical matter that needs to be investigated. Ballesta et al., (2020) presented solid evidence in support of a link.

Relationship between Public Expenditure and Economic growth.

Increased government spending promotes economic growth (Al-Yousif, 2000; Ranjan and Sharma, 2008 and Nhemhafuki, 2023), but Hajamini and Falahi (2018) suggest that increased government spending may stifle economic growth if taxes and borrowing are increased. Although the relationship between government spending and economic growth is still debated, it varies greatly by country, methodology, proxy for government spending, and study period (Nyasha and Odhiambo, 2019). Inadequate finance, according to Bernard (2009), has a negative influence on economic growth. Capital and recurring

expenditure have a considerable positive link with economic growth, according to Danladi et al., (2015).

5. RESEARCH OBJECTIVES

1. To analyze the significance of public expenditures in Meghalaya, with a focus on sectors conducive to entrepreneurship.
2. To examine the current entrepreneurial landscape in Meghalaya, identifying key sectors and their responsiveness to public expenditures.
3. To measure the impact of entrepreneurial activities, influenced by public expenditures, on the economic growth of Meghalaya.
4. To illuminate through findings for policymakers to optimize public expenditures for fostering entrepreneurship and driving sustainable economic development.

6. HYPOTHESIS

H_{01}: There is no significant relationship between Entrepreneurship and Economic growth.

H_{02}: There is no significant relationship between Entrepreneurship and Public expenditure.

H_{03}: There is no significant relationship between Economic growth and Entrepreneurship

H_{04}: There is no significant relationship between Economic growth and Public Expenditure.

7. RESEARCH METHODOLOGY

Data: The annual time series data and the figures are in crores are obtained from a secondary source i.e. the Meghalaya Budget, Finance Department, Government of Meghalaya and the All-India Survey on Higher Education, Ministry of Education, Government of India, ranging from 2004-05 to 2021-22.

Public Expenditure: Public Expenditure is measured in respect to the Economic services and the Social and Community services as reported in the Meghalaya budget.

Entrepreneurial activity: In terms of enhancing more revenue, there is a strategic requirement to increase production and sales, which necessitates higher acquisition of inputs such as raw materials. This increase in operational activities invariably results in increased tax responsibilities, including but not limited to sales/trades taxes, excise charges, and vehicle-related taxes such as transportation levies for both products and passengers. This discernible upward trend in tax payments acts as a solid indicator of increased entrepreneurial activity, indicating prospective profit increases and thus, encouraging the growth of entrepreneurship. The aggregated outlays, which include sales/ trade taxes, state excise taxes, vehicle taxes (transport), and taxes on goods and

passengers, represent the state's dynamic engagement of entrepreneurs. This comprehensive viewpoint sheds light on one aspect of their work.

Economic Growth: It is measured by Gross State Domestic product.

Research Desi7gn: Purposive sampling was used to analyse an annual time series data set. The reported variables are computed in crores for the analysis in the current study.

The following pair of Equation for the VECM has been considered as follows:

$$EP_t = o + \text{“}_{i=}^{k} 1\ a_j EP_{t-i} + \text{“}_{j=1}^{k} O_j\ PE_{t-i} + \text{“}_{j=1}^{k} Y_j\ EG_{t-ij} + e_1 ECT_{t-i} + \}_{it} \text{.....(1)}$$

$$EG_t = o + \text{“}_{i=}^{k} 1\ a_j EG_{t-i} + \text{“}_{j=1}^{k} O_j\ PE_{t-i} + \text{“}_{j=1}^{k} Y_j\ EP_{t-ij} + e_1 ECT_{t-i} + \}_{it} \text{.....(2)}$$

Where,

EP (dependent variable) is the function of its (EP, PE & EG) lagged values in an enquiry to derive its intricate relationship i.e. equation (1), on the other equation (2); EG (dependent variable) is the function of its (EG, PE & EP) lagged values for its consequential effects.

t – i = the lag length is reduced by 1

a_j, $O_{j,}$ Y_j= short run dynamic coefficients of the model's adjustment long run equilibrium

$ë_1$= speed of adjustment parameter with a negative sign

ECT_{t-1}= the error correction term is the lagged value of the residuals obtained from the cointegrating regression of the dependent variable on the regressors. Contains long run information derived from the long run cointegrating relationship

$\}_{it}$ = residuals (*error terms*)

EP = Entrepreneurship

PE = Public expenditure in Economic services and Social and Community Services

EG = Economic growth measured by increased in Gross State Domestic Product.

Statistical Tools:

The VECM was used, along with lag order selection statistics and the Cointegration test. These criteria are widely used in the literature due to their effectiveness in balancing model fit and complexity (Hansen, 2001). For unit root tests, the Augmented Dickey-Fuller method was also used. The ADF test is a robust method for assessing the stationarity of a series and is frequently referenced in econometric analyses (Dickey & Fuller, 1981). The results from these tests guide the subsequent cointegration analysis, ensuring that our model adheres to the necessary assumptions of stationarity. The integration preconditions were also met by using the ADF method for unit root testing, after which the variables were converted to First Differences and tested again to confirm the unit roots. This transformation is a common practice in time series analysis, as differencing helps eliminate trends and allows for the application of conventional statistical techniques (Box & Jenkins, 1976). The variables were finally used to meet the desired objective and questions.

8. ANALYSIS: RESULTS & DISCUSSIONS

UNIT ROOT TEST :

To fulfil the required criteria, the variables were first checked for unit root test using ADF method. The variables were converted into First difference and further tested for unit roots and the results are as follows.

Table 1: Augmented Dickey Fuller Test for Unit Root Test (no-constant)

Variable	Test Statistics	5% Critical Value
EP	3.020	-3.000
PE	2.916	-1.950
EG	4.762	-1.950

The test results in Table No.1 above revealed that the Test Statistics Value of EP, PE and EG are greater than its 5% Critical Value, indicating that they are stationary. It means that the variables do not have a unit root after being transformed into first difference.

The preceding tests have met the prerequisites for the co-integration test. As a result, for the Lag Order Selection in the VEC Model, the VARSOC technique was used and suggested for lag 4 as the maximum lag selection, but due to technicalities, the lags are reduced and computed at lag 1 in the system.

Table 2: Johansen Cointegration Test

```
. vecrank GSDP EA PE, trend(constant) lags(1) max

                     Johansen tests for cointegration
Trend: constant                                      Number of obs =      17
Sample:  2006 - 2022                                       Lags =       1
```

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	3	-462.77482	.	39.1092	29.68
1	8	-451.76672	0.72612	17.0930	15.41
2	11	-445.66294	0.51232	4.8854	3.76
3	12	-443.22022	0.24977		

maximum rank	parms	LL	eigenvalue	max statistic	5% critical value
0	3	-462.77482	.	22.0162	20.97
1	8	-451.76672	0.72612	12.2076	14.07
2	11	-445.66294	0.51232	4.8854	3.76
3	12	-443.22022	0.24977		

The results of the Johansen Cointegration tests (Table 2) revealed that the Max Statistics at rank 0 is 22.0162, which is greater than the 5% critical value. This means that there were multiple Cointegrations connecting EP to the PE and EG. This means that the EP, PE and EG are cointegrated and have a long run association, or that they move in the same direction in the long run.

Since the variables are found to be cointegrated, the VEC model was computed. Under the VEC Model, all the variables are automated and the data are converted into first difference.

From Table 3 mentioned below, it can be seen that the probability z value of ce1 (viz. Error Correction term which is a speed of adjustment towards equilibrium) was -3.47 (less than 0.01), it was found significant and the Coefficients of ce1 value was negative, which was a good sign of cointegration, as shown above (Table 4). This means that there was long-run causality running from Entrepreneurship (EA) to the PE (Public Expenditure) and Economic Growth (GSDP).

Table 3: vector Error Correction Model

```
. vec GSDP EA PE, trend(constant) lags(1)

Vector error-correction model

Sample:  2006 - 2022                            Number of obs     =         17
                                                AIC               =    54.0902
Log likelihood = -451.7667                      HQIC              =   54.12918
Det(Sigma_ml)  =  2.43e+19                      SBIC              =    54.4823

Equation           Parms      RMSE     R-sq      chi2     P>chi2
------------------------------------------------------------------
D_GSDP                 2    1521.2   0.6702   30.4794   0.0000
D_EA                   2   70.6786   0.8079   63.0697   0.0000
D_PE                   2   72472.8   0.3376  7.644829   0.0219
------------------------------------------------------------------
```

Table 4: Long-run causality Test (EA - PE - GSDP)

D_EA						
_ce1						
L1.	-.0035875	.0010342	-3.47	0.001	-.0056144	-.0015606
_cons	377.8139	75.57925	5.00	0.000	229.6813	525.9465

The probability z value of ce1 (viz. Error Correction term which is a speed of adjustment towards equilibrium) was -3.47 (p-value < 0.01), it was found significant and the Coefficients of ce1 value was negative, which was a good sign of Cointegration, as shown above (Table 4). This means that there was long-run causality running from Entrepreneurship (EA) to the PE (Public Expenditure) and Economic Growth (GSDP).

The probability z value of ce1 (viz. Error Correction term which is a speed of adjustment towards equilibrium) was -2.75 (less than 0.01), it was found significant and the Coefficients of ce1 value was negative, which was a good sign of Cointegration and effective consequential effects, as shown below (Table 5). This means that there was long-run causality running from Economic Growth (GSDP) to the PE (Public Expenditure) and Entrepreneurship (EA).

Table 5: Long-run causality test (GSDP –PE –EA)

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_GSDP						
_ce1						
L1.	-.061149	.0222578	-2.75	0.006	-.1047735	-.0175244
_cons	6119.279	1626.677	3.76	0.000	2931.051	9307.507

Table 6: Short-run causality Test (GSDP - PE - EA)

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
GSDP	1	.	.	.	.	.
EA	65.39539	19.32577	3.38	0.001	27.51758	103.2732
PE	-.2831428	.0557376	-5.08	0.000	-.3923866	-.1738991
_cons	98289.52	.	.	.	.	.

The VECM results shown above (Table 6), clearly demonstrated that there was a short-run significant relationship running from GSDP to PE and EA. The coefficient of PE was -0.28 which was significant at the 0.001 level (p-value < 0.001), suggests a highly significant relationship between the Economic growth and public expenditure. Thus, the null hypothesis that “There is no significant relationship between the Economic growth and Public expenditure” may be rejected. This means that every increase of the public expenditure by Rs. 1 crore, the GSDP on average expected to be increasing by Rs. 28 lakh, ceteris paribus. Therefore, statistically, it may be said that the public expenditure does have a significant positive relationship with the Economic growth in Meghalaya.

It can also be seen that coefficient of EA was 65.39 which was significant at the 0.001 level (p-value < 0.001), suggests a highly significant relationship between the Economic growth and Entrepreneurship. Thus, the null hypothesis that “There is no significant relationship between the Economic growth and Public expenditure” may be rejected. This means that every increase of the Entrepreneurship by Rs. 1 crore, the

GSDP on average expected to be decreasing by Rs. 65 crores, ceteris paribus. Therefore, statistically, it may be said that the Entrepreneurship does have a significant but negative relationship with the Economic growth in Meghalaya.

Table 7: Short-run causality Test (EA - PE - GSDP)

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
EA	1	.	.	.	.	.
PE	-.0043297	.0007596	-5.70	0.000	-.0058185	-.0028409
GSDP	.0152916	.0205158	0.75	0.456	-.0249186	.0555018
_cons	1503.004	.	.	.	.	.

The VECM results shown above (Table 7), subsequently demonstrated that there was a short-run significant relationship running from EA to PE and GSDP. The coefficient of PE was -0.04 which was significant at the 0.001 level (p-value < 0.001), suggests a highly significant relationship between the Economic growth and Public expenditure. Thus, the null hypothesis that "There is no significant relationship between the Entrepreneurship and Public expenditure" may be rejected. This means that every increase of the public expenditure by Rs. 1 crore, the GSDP on average expected to be increasing by Rs. 43 thousand, ceteris paribus. Therefore, statistically, it may be said that the public expenditure does have a significant positive relationship with the Entrepreneurship in Meghalaya.

However, it can also be seen that coefficient of GSDP was 0.015 which was not significant at the 0.001 level (p-value > 0.001) and suggested not significant relationship between the Economic growth and Entrepreneurship. Thus, the null hypothesis that "There is no significant relationship between the Entrepreneurship and Economic growth" may not be rejected. Therefore, statistically, it may be said that the Economic growth does not have a significant relationship with the Entrepreneurship in Meghalaya.

Further, the following diagnostics and post estimation tests were computed to to assess the validity of assumptions, check the model's fit, and evaluate the reliability of the estimated parameters.

Table 8: Auto-correlation Test

```
. veclmar

  Lagrange-multiplier test

+-------+--------------+----+-----------+
| lag   |         chi2 | df | Prob > chi2 |
+-------+--------------+----+-----------+
|   1   |       7.8073 |  9 |   0.55367 |
|   2   |      16.3573 |  9 |   0.05978 |
+-------+--------------+----+-----------+

  H0: no autocorrelation at lag order
```

The output clearly showed that the estimated parameters with Chi2 value of 7.807 at lag 1 and the Chi2 value of 16.36 at lag2 has no autocorrelation at its lag order and hence it is evident for the validity of the no autocorrelation assumption.

Table 9: Jarque-Bera Test

```
. vecnorm, jbera skewness kurtosis

  Jarque-Bera test

+-------------+--------------+----+-----------+
|    Equation |         chi2 | df | Prob > chi2 |
+-------------+--------------+----+-----------+
|      D_GSDP |        1.150 |  2 |   0.56262 |
|        D_EA |        0.869 |  2 |   0.64745 |
|        D_PE |        1.945 |  2 |   0.37812 |
|         ALL |        3.965 |  6 |   0.68144 |
+-------------+--------------+----+-----------+
```

The Jarque-Bera test was used to assess the normality of the residuals; the p-values are 0.562, 0.647and 0.378, respectively. These are relatively high p-values, indicating that there was no strong evidence to reject the null hypothesis of normality for the residuals in these equations and hence it supports the validity of the normality assumption.

The overall combination of a unit modulus eigenvalue as shown in Table 10 below suggests a well-behaved system with stable long-term relationships and an ability to adjust to short-term disturbances.

Table 10: Eigenvalue Test

```
. vecstable

   Eigenvalue stability condition

+-------------------------------+
|        Eigenvalue |   Modulus |
|-------------------+-----------|
|                 1 |         1 |
|                 1 |         1 |
|         .5181152 |   .518115 |
+-------------------------------+

   The VECM specification imposes 2 unit moduli.
```

Hence, it can also be said that the computed model statistically indicated that changes in public expenditure overtime have a lasting impact on entrepreneurship activities and economic growth and whenever there are short-term disruptions or changes in expenditure, the entrepreneurship activities and economic growth adjusts quickly overtime and move back to its stable relationship in the long-run.

9. LIMITATIONS

The study confronts many difficulties, largely due to time restrictions, while investigating the impact of public expenditures on entrepreneurship and its subsequent implications on economic growth in Meghalaya. The duration available for data collection may limit the data sets' comprehensiveness and the public expenditures in other services are also not covered, potentially resulting to an imperfect picture of long-term trends and fluctuations in economic and entrepreneurial dynamics. The findings of the study may be limited to a single time period, limiting its generalizability and application to broader temporal settings or various regions. Furthermore, the study's short timeline may not fully capture the changing policy environment and the breadth of entrepreneurial indicators. Despite these constraints, the research seeks to convey its findings in a transparent manner, making meaningful contributions while acknowledging the contextual and temporal constraints. Future research projects could these limitations for a more comprehensive understanding of the interplay between public expenditures, entrepreneurship, and economic growth in Meghalaya.

10. FINDINGS & CONCLUSION

The statistical analysis revealed significant long-term relationships among Entrepreneurship, Public Expenditure, and Economic Growth in Meghalaya, with p-values less than 0.05. The Vector Error Correction Model (VECM) indicated that changes in public expenditure have a notable and stable short-term impact on Entrepreneurship, while Entrepreneurship also significantly influences Economic Growth. This suggests that short-term fluctuations in these variables are temporary, with a tendency to return to a stable equilibrium over time. These findings highlight that a sustained increase in public expenditure, particularly focused on economic activities and social services, is essential for fostering Entrepreneurship and enhancing Economic Growth in Meghalaya. Overall, the results underscore the importance of strategic public investment to stimulate growth and improve entrepreneurial outcomes.

This study contributes to the existing literature by confirming the interconnectedness of Entrepreneurship, Public Expenditure, and Economic Growth and advocate for government intervention and investment in public goods as a catalyst for economic development. The findings reinforce the idea that effective public expenditure can enhance entrepreneurial activity, which in turn drives economic growth. The results suggest that policymakers should prioritize increasing public expenditure in sectors that directly support Entrepreneurship, such as education, infrastructure, and community services. This strategic investment can create an environment conducive to business growth and innovation. The implications are significant: increased public spending aimed at fostering Entrepreneurship can lead to job creation, improved living standards, and greater overall economic resilience in Meghalaya. By recognizing the vital role of public expenditure, stakeholders can work towards a more sustainable and inclusive economic future for the state.

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Impact of Selected Macroeconomic Factors on Growth: Some Facts and Fictions in India

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ABSTRACT

The pace and trajectory of a country's growth of economy are influenced by various aspects that fall under the umbrella of macroeconomic determinants. A comprehensive analysis of various macroeconomic determinants is required to assess an economy's strength. These determinants have been tested empirically and can determine the degree of a nation's economic performance. The present researchintends to assess the effect of selected macroeconomic determinants on India's economic growth, including inflation,FDI, exports, interest rates,imports, exchange rates, development assistance, and capital formation. The analysis utilized a comprehensive set of time-series data covering 1990 to 2021, which better understands different aspects of an economy's growth and identifies the key drivers of development. Theresearchoffers valuable insight into the factors that contribute to India's economic growth, which can be useful for policymakers, investors, and researchers alike.

Keywords: India; ARDL;Economic Growth;Exchange Rate; FDI; Inflation
Manuscript Received: September 12, 2024; Revised Manuscript Received: December 16 , 2024,
Accepted: January 7 2025

1. INTRODUCTION

Economic growth has been a central focus of human civilization for centuries. A nation's GDP growth rate has a substantialimpression on its overall development and progress. Assessing the strength of an economy requires a comprehensive analysis of various macroeconomic determinants, which have been empirically tested and can be used to assessa nation's economic performance. By examining factors such as foreign direct investment, inflation, rate of interest, exports, imports, exchange rates, development assistance, and capital formation, the study can gain a better understanding of how an economy is functioning and identify areas that need improvement.

In emerging countries like India, FDI is essential for fostering the economy's growth. A study by Gregorio and Lee in 1998 found that, when it comes to boosting economic growth, foreign direct investment packs a stronger punch than domestic investment. Its influence can reshape economies and drive progress in ways that local investments often cannot match.It serves as a primary conduit for technology transfer. It is vital to understand that the benefits of foreign investments can only be fully achieved if the country receiving the investment has a basic level of skilled workers and education. In other words, a host economy's capacity to adopt new technologies is a crucial factor in

the effectiveness of FDIin fostering the economy's growth. FDI can be a strong driver of economic development. However, it must be managed carefully to ensure that the host economy possesses the necessary skills and infrastructure to fully benefit from the new technologies being introduced.

Macroeconomics studies how inflation affectsgrowth of economy, productivity, and output. The money and growth literature has developed models that analyze this topic. These models focus on the steady-state equilibrium of capital per capita and output. Inflation influences output and capital per capita, as explored by Orphanides and Solow (1990). They disclosed that inflation significantly affects the macroeconomic landscape. Furthermore, cutting budget deficits and controlling inflation have led to economic growth in Latin America, especially in Chile and Mexico as observed by Fischer (1993).

There are two main ideas about how inflation and economic growth are related. Mundell in 1963 and Tobin in 1965 argued that high inflation surges the cost of holding money, leading to shifting capital from money to investment portfolios, ultimately improving economic growth. However, a rise in inflation can also slow economic growth. High inflation increases the cost of capital, which reduces investment rates and the rate of capital accumulation. This fall in capital accumulation leads to a fall in the real growth rate. High inflation also reassures inflation tax to rise, reducing workincentives and ultimately increasing unemployment. As a result, high unemployment not only reduces real output but also declines growth in the economy.

International trade is a decisive aspect of growth in the economy. When countries buy and sell things to each other, it helps them grow and improve, which leads to greater development and progress for everyone involved. Policymakers and scholars have shown a strong interest in investigating the potential connection between international trade and economic growth. Piana (2001) notes that when a country intensifies its exports, the levels of production, GDP, and employment also increase. However, imports significantly contribute to establishing a "virtuous" link between trade and output growth.By importing necessary inputs and technology, a country can improve its production capabilities, which can lead to increased economic outputcontended by Thangavelu and Rajaguru (2004).

Capital formation and economic growth are closely connected processes that reinforce each other. Investments in both physical and human capital drive economic growth. In turn, sustained growth fosters conditions that promote further capital accumulation. Policymakers often focus on creating an environment that encourages both capital formation and economic growth to achieve long-term development objectives. Both the growth of physical resources, like buildings and machinery and the development of people's skills and knowledge play important roles in helping the economy grow, according to studies conducted by (Maria & Stryszowski, 2009; Sahoo, 2012).

This study examines the effect of macroeconomic factors such as FDI, inflation, rate of interest, exports, and imports on the Indian economy. The paper continues with

the section following the Review of Literature. This next section presents the data, study variables, econometric analysis, and methodology used in the research. The study concludes with a summary of the whole work. The goal is to explore how different large-scale economic factors affect India's economy. The study looks into how various factors influence India's financial performance, whether helpful or harmful. By rigorously examining key economic indicators such as GDP, FDI, inflation, interest rates, exports, imports, exchange rates, development assistance, and capital formation, this study seeks to deliver a complete understanding of the complex connectionamong macroeconomic variables and economic growth in India.

2. LITERATURE REVIEW

In recent decades, many studies have looked at how macroeconomic factors influence growth in the economy. One study by Das and Das (2020) shows that trade openness affects GDP. Another study by Gupta et al. (2022) found that factors like financial development, trade openness, technological skills, and institutional quality significantly influence the bond between FDI and economy's growth, even if their effect is indirect. Verma and Saluja (2018) conducted a research study that explored how foreign investment stimulates technology inflow, enhances sector competitiveness, and creates economic activity and employment opportunities. According to the Planning Commission, foreign direct investment (FDI) is preferred over other forms of external funding because it does not create debt, is stable, and its performance is tied to the projects it supports, as emphasized by Singh (2019).

Aresearch work by Sultana et al. (2019) investigated the influence of FDI on key factors in India's economy, including population, the HDI, and the Sensex index. Their findings revealed that FDI significantly influenced HDI, population dynamics, and the Sensex, with a moderate impact on imports and exports. In a follow-up study in 2020, Fonseka and Singh analyzed the relationship between FDI and India's Gross Domestic Product (GDP). Using a regression model, they found that changes in FDI accounted for about 90% of the variations in GDP, highlighting its critical role in the economy. Their research also showed a strong positive correlation between increased FDI and growth of economy, suggesting that boosting foreign investment can enhance India's overall prosperity.

According to the study conducted by Mishra & Kumar in 2016, Foreign direct investment significantly contributes to the economic development of evolving nations by facilitating knowledge transfer and providing financing. Multinational corporations view foreign direct investment as an essential tool in restructuring cross-border manufacturing activities to meet their corporate goals and leverage the competitive advantages of the host country. Moreover, FDI positively impacts products, especially in high-income countries.However, this effect is neither uniform nor significant in upper-middle-income countries as per theresearch conducted by Alvara et al. (2017).

In a study conducted by Gupta & Shastri (2020), the relationshipbetween public expenditure and India's growth of the economyfrom 1980-2015 was examined using several statistical models such as ADF, PP unit root test, and vector autoregression. The study found that government expenditures positively impactedIndia's economic progress. Similarly, trade openness and human capital development significantly positively influence economic progress in Asian nations. However, the study also showed that the labor force'sparticipation negativelyaffected economic progress in these countries, Amna Intisar et al. (2020).

In 2017, Simionescu et.al conducted a study to detectthe key influencers that influenced the evolution of the economy of the V4 nations between 2003 and 2016. Using the Bayesian regression model, the research found that foreign direct investment and spending on research and development are vital for growth in all the countries studied. In a similar context,the result of FDI on the economy's growth from 1990 to 2015, utilizing the vector error correction model examined by Reza et al. (2018).

3. ECONOMETRIC MODEL METHODOLOGY

Data description and sources

This study evaluates how certain macroeconomic factors affect growth in the economy. It uses the ARDL bounds testing method and analyzes a complete set of time series data covering 1990 to 2021.The model looks at the overall economic output of a country i.e., GDP, measured in constant 2015 US dollars, to see how it is affected by other factors. In this case, the economic output is the focus, while all the other factors are considered to help explain how it changes. This means that GDP is used as a sign of a developed country, while the other variables are used to explain the factors that influence this development. The explanatory variable FDI refers to the total amount of foreign direct investments flowing into India, measured in US dollars. Additionally, this variable highlights the potential trade opportunities available in the country. The exports and imports are calculated at constant 2015 US$, Chirwa & Odhiambo, 2017.Do not forget to consider how inflation can shape GDP growth. It is an important factor that can significantly influence the overall economic landscape! The use of WPI to denote theWholesale Price Index (2010 = 100), which is used as a proxy for inflation. Burnside and Dollar (2000) have suggested in their study that the inflation rate represents a country's monetary policy. EXCH stands for the exchange rate, which is a way to measure how much one country's money is worth compared to another's. This rate can help us understand how stable or unpredictable trade between countries might be, Ilhan, 2006(LCU per US$, period average). ODA stands for official development assistance, which refers to the financial help that countries receive to support their development goals. This assistance is measured in a way that keeps its value consistent over time, using the purchasing power of money in the year 2020 as a standard. Finally, GCF represents the gross capital formation measured at constant 2015 US$.

4. ECONOMETRIC MODEL SPECIFICATION

This study looks at how various factors influence economic growth in India. It seeks to understand these relationships by building on previous research to provide a clearer picture of the economy.The analysis references extensive research conducted by scholars such as Fischer in 1993,Anyanwu in 2014, Bal, Dash, and Subhashish in 2016, Chirwa and Odhiambo in 2017, Kryeziu in 2016, and Mbulawa in 2015. The resulting equation, which investigates the factors influencing GDP growth, is presented below in its functional form.

$$GDP_t = f(FDI_t, WPI_t, EXP_t, IMP_t, EXCH_t, ODA_t, GCF_t) \quad (1)$$

Equation (1) combines several important economic factors. These include: Real Growth of Domestic Product (GDP);Foreign Direct Investment (FDI);Exchange Rate (EXCH); Wholesale Price Index (WPI);Export (EXP); Import (IMP);Official Development Assistance (ODA); and Gross Capital Formation (GCF).

To make the variables more easily interpretable, they have been transformed into their natural logarithm form. Hence, the model is formulated in the following log-linear form with intercept $\beta_0$and all other a coefficients $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6 and\ \beta_7$ corresponding to their respective explanatory variables, bearing their specific interpretations.

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$$lnGDP_t = \beta_0 + \beta_1 lnFDI_t + \beta_2 lnWPI_t + \beta_3 lnEXP_t + \beta_4 lnIMP_t + \beta_5 lnEXCH_t + \beta_6 lnODA_t + \beta_7 lnGCF_t + \varepsilon_t \quad (2)$$

The log-linear ARDL model based on Equation (2) can be stated as follows,

$$lnGDP_t = \emptyset_0 + \sum_{i=1}^{p} \emptyset_{1i} lnGDP_{t-i} + \sum_{i=0}^{p} \emptyset_{2i} lnFDI_{t-i} + \sum_{i=0}^{p} \emptyset_{3i} lnWPI_{t-i} + \sum_{i=0}^{p} \emptyset_{4i} lnEXP_{t-i} + \sum_{i=0}^{p} \emptyset_{5i} lnIMP_{t-i} + \sum_{i=0}^{p} \emptyset_{6i} lnEXCH_{t-i} + \sum_{i=0}^{p} \emptyset_{7i} lnODA_{t-i} + \sum_{i=0}^{p} \emptyset_{8i} lnGCF_{t-i} + \varepsilon_t \quad (3)$$

The article explores how different factors are related to each other over both short and long periods. It uses a method known as the ARDL approach to help explain these connections between the main ideas, allowing for a clearer understanding of their relationships.The ARDL bounds test method offers some benefits compared to more traditional ways of analyzing co-integration. M. Pesaran & B. Pesaran, in 1997 stated that it can be used even when the variables have different orders of integration. Then the model uses past data points to create a step-by-step approach that startswith a broad perspective and becomes more focused, according to Laurenceson & Chai (2003). The ARDL model stands out from other methods because it can identify long-term relationships between variables using one simple equation. This approach makes it easier to understand how different factors influence each other over time, as noted by Shrestha and Chowdhury in 2007. The error correction model (ECM) effectively combines short-run dynamics with long-run relationships without losing sight of long-term evidence. In this study, we examine a combination of variables that exhibit both I(0) and I(1) orders.ADF testconducted to check if there is a repeated pattern in the data over time.Additionally, the PP unit root test has been conducted to examine the overall movement and trends in the data series.Hence,the ARDL bound estimation model can be represented mathematically with notational specifications.

$$\begin{aligned}\Delta lnGDP_t = {} & \emptyset_0 + \sum_{i=1}^{p} \emptyset_{1i} \Delta lnGDP_{t-i} + \sum_{i=0}^{p} \emptyset_{2i} \Delta lnFDI_{t-i} + \sum_{i=0}^{p} \emptyset_{3i} \Delta lnWPI_{t-i} \\ & + \sum_{i=0}^{p} \emptyset_{4i} \Delta lnEXP_{t-i} + \sum_{i=0}^{p} \emptyset_{5i} \Delta lnIMP_{t-i} + \sum_{i=0}^{p} \emptyset_{6i} \Delta lnEXCH_{t-i} \\ & + \sum_{i=0}^{p} \emptyset_{7i} \Delta lnODA_{t-i} + \sum_{i=0}^{p} \emptyset_{8i} \Delta lnGCF_{t-i} + \varphi_1 lnGDP_{t-1} + \varphi_2 lnFDI_{t-1} \\ & + \varphi_3 lnWPI_{t-1} + \varphi_4 lnEXP_{t-1} + \varphi_5 lnIMP_{t-1} + \varphi_6 lnEXCII_{t-1} \\ & + \varphi_7 lnODA_{t-1} + \varphi_8 lnGCF_{t-1} + \varepsilon_t \end{aligned} \quad (4)$$

The symbol Ä is typically used to represent the first difference in statistical analysis. The parameters that correspond to differenced lagged variables are known as short-run parameters, while those associated with lagged variables at levels are referred to as long-run parameters. The selection of an optimal lag order is often determined using information criteria such as the Akaike and Schwartz criteria. The studyrelied on the Akaike Information Criteria as a suitable criterion for selecting the appropriate lag order.

The Wald F statistic is used to evaluate the null hypothesis, suggesting that there is no cointegration between the regressors and the regressand. This assessment is made in comparison to the alternative hypothesis, which argues that these variables do indeed exhibit cointegration.

The hypothesis can be expressed in the following manner,

$$H_0: \varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = \varphi_6 = \varphi_7 = \varphi_8 = 0 \quad (5)$$

$$H_1: \varphi_1 \neq \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq \varphi_5 \neq \varphi_6 \neq \varphi_7 \neq \varphi_8 \neq 0 \quad (6)$$

To assess the Wald F statistic, it must be compared against two critical bound values: the lower bound critical value I(0) and the upper bound critical value I(1).These values categorize the predictor variables into three distinct groups: purely I(0), purely I(1), or those that are mutually cointegrated. If the F statistic exceeds the upper bound value, the null hypothesis cannot be accepted, suggesting the presence of a long-run relationship. On the other hand, if the F statistic falls below the lower bound, it indicates that no such long-run relationship exists.

Upon confirming the existence of a long-term cointegration relationship, the subsequent step is to analyze the short-run dynamics of that relationship. This can be accomplished through the application of ECM, which necessitates the incorporation of a first-order lagged error correction term. The regression equation can consequently be articulated as follows:

$$\begin{aligned}\Delta lnGDP_t = \emptyset_0 &+ \sum_{i=1}^{p} \emptyset_{1i} \Delta lnGDP_{t-i} + \sum_{i=0}^{p} \emptyset_{2i} \Delta lnFDI_{t-i} + \sum_{i=0}^{p} \emptyset_{3i} \Delta lnWPI_{t-i} \\ &+ \sum_{i=0}^{p} \emptyset_{4i} \Delta lnEXP_{t-i} + \sum_{i=0}^{p} \emptyset_{5i} \Delta lnIMP_{t-i} + \sum_{i=0}^{p} \emptyset_{6i} \Delta lnEXCH_{t-i} \\ &+ \sum_{i=0}^{p} \emptyset_{7i} \Delta lnODA_{t-i} + \sum_{i=0}^{p} \emptyset_{8i} \Delta lnGCF_{t-i} + \vartheta ECT_{t-1} + \varepsilon_t\end{aligned} \quad (7)$$

Where, ϑ is the coefficient associated with lagged ECT reflects the speed at which short-run shocks adjust back towards long-run equilibrium.

Empirics

Visual representations presented below provide a detailed analysis of the trends observed in all the variables that were subjected to scrutiny in the study. It is evident from the graphs that each variable has shown a consistent upward trend over the years. However, a noticeable dip was observed in the year 2020, which can be attributed to the unprecedented effect of the COVID-19 pandemic on the global economy. Despite this temporary setback, the overall pattern suggests a positive long-term outlook for the variables analysed.

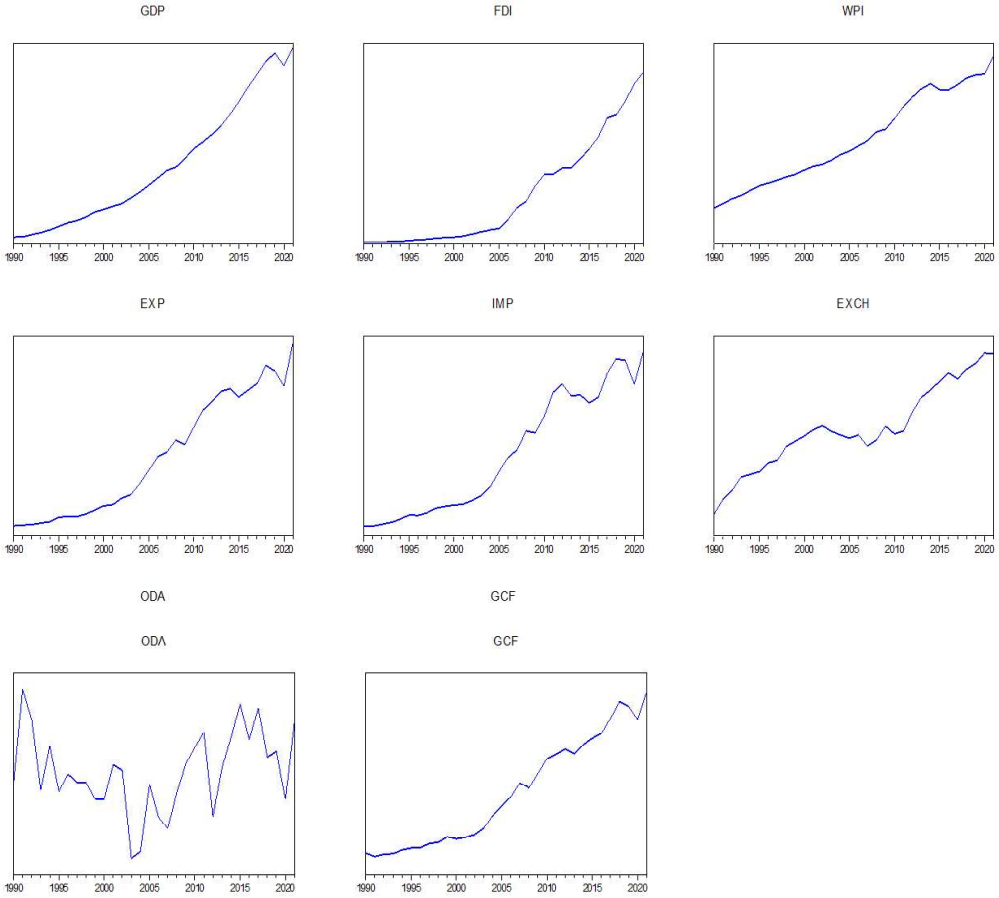

Figure 1: Graphical Analysis of Trends of the Variables

Unit Root and ARDL Bound Cointegration Test

Non-stationarity of variables is a common problem when dealing with time series data that have unit root(s). This can lead to biased inferences, which can be avoided by conducting ADF and PP unit root tests to determine the variables' stationarity. The null hypotheses of these tests check for the occurrence of unit root, while the alternatives recommend others. If the t statistic exceeds the corresponding critical t value, the null hypothesis is rejected, and the alternative hypothesis is accepted. This outcome indicates the presence of a unit root in the data. The findings of both the ADF and PP unit root tests, as presented in Table 1, demonstrate the results for both level and first difference unit root assessments.

Table 1: Unit Roots Tests©

Variables	Augmented Dickey-Fuller		Phillips–Perron	
	Level		Level	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
lnGDP	-0.2202	-2.6881	-0.2191	2.8209
lnFDI	-2.4626	-0.0188	-2.1688	-0.3123
lnWPI	-3.4010**	-2.5685	-3.0190**	-2.5316
lnEXP	-1.6711	-0.6492	-1.7636	-0.6339
lnIMP	-2.0344	-0.6616	-1.9960	-0.7542
lnEXCH	-3.7762***	-2.2901	-3.2390**	-3.9828**
lnODA	-3.3523**	-3.3644*	-3.3721**	-3.3644*
lnGCF	-0.3854	-1.8695	-0.3782	-2.0760
Variables	**At First Difference**		**At First Difference**	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
lnGDP	-5.3831***	-5.3588***	-5.4377***	-5.4230***
lnFDI	-3.1192**	-3.9853**	-3.1975**	-3.9853**
lnWPI	-3.5522**	-3.4938*	-3.5053**	-3.4432*
lnEXP	-4.5976***	-4.9389***	-4.5976***	-4.8457***
lnIMP	-4.2200***	-4.8862***	-4.2477***	-4.8744***
lnEXCH	-4.9823***	-4.9473***	-5.0817***	-4.9834***
lnODA	-6.4634***	-6.5025***	-11.0790***	-14.9619***
lnGCF	-6.3909***	-6.4810***	-6.3596***	-6.4810***

Note: *p<0.1; **p<0.05; ***p<0.01

©Author's calculation

Table 1 presents the results of tests used to check whether certain economic indicators show consistent patterns over time. The indicators examined include GDP, FDI, EXP, IMP, and GCF. Initially, these indicators do not show stable behaviour, meaning they can fluctuate widely. However, after adjusting the data either by looking at their original values or making small changes, these indicators show more stability. This finding suggests that it is possible to explore how these variables might be connected over the long term using specific testing methods.

Once you have verified that there isn't a long-term trend affecting the data, the next step is to check whether the variables have a stable long-term relationship with each other. The process involves selecting the best lag model and using equation (4) to find the Wald F statistics. The regression analysis indicates that there is long-run cointegration among the variables. The results of the cointegration bound test are presented in Table 2, which shows the Wald F statistic alongside the critical values at the 1%, 5%, and 10% significance levels. This information is crucial in determining the long-term associationsamong the variables and can aid in making informed decisions.

Table 2: ***F***-Bounds Cointegration Test©

Model: $lnGDP_t = f(lnFDI_t, lnWPI_t, lnEXP_t, lnIMP_t, lnEXCH_t, lnODA_t, lnGCF_t)$

Test Statistic	Value	Significance	I (0)	(1)
F-Statistic	4.8423***	10 %	2.03	3.13
		5 %	2.32	3.50
		1 %	2.96	4.26

‘‘***’’ shows the significance level at 1 %

©Author's own calculation

Looking at the data in Table 2, we find that a specific measure, known as the Wald F statistic, is higher than the critical values we look for at three key significance levels: 1%, 5%, and 10%. This means the null hypothesis cannot be accepted and instead support the alternative assumption. In simpler terms, this indicates that there is a long-term relationship between the variables involved. Specifically, the variables tied to lnFDI, lnWPI, lnEXP, lnIMP, lnEXCH, lnODA, and lnGCF all show a lasting connection with lnGDP.

ARDL Long Run Coefficient Elasticities

After establishing that there is a stable long-term relationship between the variables, we can calculate how changes in each variable affect the others over time using an estimable equation (4). Here, only present the estimated long-run coefficient elasticities to avoid the gratuitous clumsiness of the result. The results shown in the table suggest a strong manifest long-run cointegration of most of the predictors with the regressand. The variablesFDI, WPI, and ODA have a positive impact on the gross domestic product but the result is statistically insignificant. Whereas, other variables such as EXP, EXCH, and GCF havea positive and significant effect on GDP. Furthermore, IMP has a negative

and significant effect on GDP, such that a 1% fall in imports can increase the GDP by 0.66%.

It was discovered through the analysis presented in Table 3 that theGDP is positively influenced by FDI and development assistance. However, the impact was found to be insignificant. This suggests that bringing in more resources and tools for production in anemerging country like India could lead to lasting growth of the economy over time (Chakraborty & Mukherjee, 2012).

Table 3: Long-run Coefficient Elasticities©

Variable	Coefficient	Std. Error	t-Statistic
Constant	11.6290***	3.8508	3.0198
lnFDI	0.07627	0.0459	1.6599
lnWPI	0.1345	0.1539	0.8742
lnEXP	0.1391*	0.0642	2.1662
lnIMP	-0.6612***	0.1072	-6.1639
lnEXCH	0.7758***	0.1214	6.3879
lnODA	0.0433	0.0257	1.6869
lnGCF	0.9244***	0.0651	14.2006

©Author's own calculation

Note: *p<0.1; **p<0.05; ***p<0.01

According to the analysis, the data indicates that inflation has a favourable influence on economic growth. As highlighted by influential economists Mundell and Tobin, high inflation makes holding onto cash more burdensome. This situation prompts a shift, as individuals and businesses reallocate their funds from mere savings to investments. Such a transition fuels economic growth and creates opportunities for innovation and expansion, benefiting everyone in the long run.

Trade among countries, exports, and imports, is very important for a nation's economy. This trade can greatly influence the overall wealth and growth of the country. However, their impact is not the same. While export has a positive impact on GDP, import has a negative impact. A study by Ghoshal in 2015 highlighted that when looking at how open trade affects economic growth, it is important to look at exports and imports separately. This helps us understand their roles in the economy better. Therefore, it is crucial to understand the dynamics of exports and imports to better evaluate their influence on the GDP of a country.

The interdependence between the exchange rate and GDP in India reveals that fluctuations in exchange rates lead to a positive impact on the growth of the country's GDP. The long-term positive correlation between these two variables indicates that exchange rate fluctuations play a crucial role in influencing the overall economic growth

of India. It is an economic shock that can be made stable by the influence of other macroeconomic variables.

Investments in physical and human capital have a significant influence on economic growth. Gross capital formation (GCF) is a measure of these investments, and it has been found that a 1% increase in GCF can increase GDP by 0.92%. This means that sustained economic growth is dependent on the accumulation of capital, which in turn creates the conditions for further investment. Therefore, it is essential to prioritize investments in physical and human capital to drive economic growth and achieve long-term prosperity.

ARDL Short Run Dynamic Effect & ECM

Based on the AIC, an Autoregressive Distributed Lag (ARDL) model has been constructed utilizing a leg setup of 2, 2, 2, 2, 1, 2, 2, and 2. The process of examining the long-term relationship between variables, known as cointegration, is crucial in econometric analysis. Once this has been established, the short-run dynamic effects and ECT can be determined. In this regard, the estimation results obtained by regressing equation (7) have been provided in the appendix section. To better understand the results, a portion of the data has been presented in Table 4, focusing solely on the short-run coefficients and coefficients corresponding to lagged ECT. The table shows that both foreign direct investment (FDI) from this year and last year have a strong positive effect on the country's GDP, with results that are very reliable. Similarly, inflation rates from this year and last year also positively influence GDP, again at a reliable level.

Table 4: Short-run Dynamic Effect & Error Correction©

Selected Model: ARDL(2, 2, 2, 2, 1, 2, 2, 1)

Variable	Coefficient	Std.	Errort-S	tatistic
$\triangle lnGDP_t$	0.5213***	0.1044	4.9898	
$\triangle lnFDI_t$	0.1202***	0.0257	4.6726	
$\triangle lnFDI_{t-1}$	0.2183***	0.0320	6.8214	
$\triangle lnWPI_t$	0.7940***	0.1499	5.2955	
$\triangle lnWPI_{t-1}$	0.5079***	0.1441	3.5239	
$\triangle lnEXP_t$	-0.1250**	0.0438	-2.8509	
$\triangle lnEXP_{t-1}$	0.1704***	0.0345	4.9384	
$\triangle lnIMP_t$	-0.0535	0.0390	-1.3699	
$\triangle lnEXCH_t$	1.1057***	0.1232	8.9707	
$\triangle lnEXCH_{t-1}$	0.2684***	0.0433	6.1983	
$\triangle lnODA_t$	0.0170**	0.0055	3.0710	
$\triangle lnODA_{t-1}$	-0.0127*	0.0063	-1.9994	
$\triangle lnGCF_t$	0.5030***	0.0487	10.3206	
ECT_{t-1}	-1.0196***	0.1196	-8.5226	

R^2	0.925	
Adjusted R^2	0.855	
F-Statistic	13.306***	
Durbin-Watson Statistic		2.24
Note: *p<0.1; **p<0.05;		

***p<0.01©Author's own calculation

However, it has been seen that current export hurts GDP at a 5% level, whereas the previous year's exports hada positive impact at a 1% level. The current imports do not seem to affect the overall economy, or GDP, in a meaningful way. However, both the current exchange rate and the exchange rate from the previous year appear to positively influence GDP, with strong evidence indicating this happens at a high level of reliability. Additionally, investments in capital (like buildings, machinery, etc.) also significantly boost GDP. On the other hand, while current foreign aid helps the economy grow, aid received in the previous year seems to have a negative effect.Additionally, ECT a measure of the convergence speed to equilibrium is calculated to be -1.019, which is statistically significant. This means that 101.96% of the short-term disequilibrium in GDP is corrected in the long run by the independent variables. These findings offer important information about how exports, imports, and the overall economy (GDP) are related. This information can help guide decisions that aim to boost economic growth.

After completing the regression analysis, did some follow-up tests to check for two potential issues: uneven variances and correlation. Table 5 displays the statistical values of the BPG, BG LM, and JB Normality tests, which are 0.269, 0.101, and 0.645, respectively. The results indicate that there are no significant problems present in the model that could impact the accuracy of the estimations. Therefore, concluding that the model is reliable and produces valid results.

Table 5 : Diagnostic Tests ©

Test	Statistic	Probability
Breusch-Pagan-Godfrey for Heteroskedasticity	1.5451	0.2699
Breusch- Godfrey LM Test for Serial Correlation	3.4288	0.1016
Jarque-Bera for Normality	0.8745	0.6457
CUSUM	Stable	
©Author's own calculation		

Figure 2: CUSUM Plot

On the basis of CUSUM Plot analysis, conclusion can be made that there is no significant change observed in the dataset observations during the entire time span that

has been considered in the study. This indicates that the coefficients of independent variables remain consistent in the long term, despite the short-term variations.

4. RESULTS

This research employed the Dynamic Ordinary Least Squares (DOLS) and Fully Modified Ordinary Least Squares (FMOLS) methods to confirm the reliability of the ARDL findings. The results from the DOLS analysis are presented in Table 6.In analysing cointegration, the DOLS method is used to address potential endogeneity by incorporating leads and lags of the differenced independent variables. The findings reveal that FDI and EXP have positive effects on GDP, but these effects are not statistically significant. Meanwhile, WPI demonstrates a positive impact on GDP, although it is not statistically significant. On the flip side, IMP has a notable negative impact on the economy's overall growth, represented by GDP. In contrast, EXCH shows a significant positive effect, suggesting that it helps boost the economy, while ODA is marginally significant, suggesting a positive but relatively weaker impact. GCF emerges as the most significant positive factor. Furthermore, the model's R-squared value has increased to 0.996144, indicating a very good fit.

Table 6:DOLS Results for Robustness©

Variables	DOLS		
	Coefficient	Std. Error	t - Statistic
FDI	0.027835	0.049592	0.561278
WPI	0.325495	0.222283	1.464328
EXP	0.028148	0.100092	0.281217
IMP	-0.456092***	0.106731	-4.273297
EXCH	0.351215***	0.107508	3.266883
ODA	0.045611*	0.023811	1.915567
GCF	0.868140***	0.092875	9.347386
C	11.89107***	2.704736	4.396388
R2	0.996144		

Source: ©Author's own calculation
Adjusted R2 0.995019
Note: *p<0.1; **p<0.05; ***p<0.01

The Fully Modified OLS (FMOLS) method is a robust approach used to estimate cointegrating relationships while taking into account issues such as serial correlation and endogeneity. Upon analysing the results, it is observed that the Wholesale Price Index (WPI) exhibits near significance with a positive effect, hinting at a potential impact on Gross Domestic Product (GDP). In contrast, Imports (IMP) display a statistically significant negative effect on GDP. Additionally, both the Exchange Rate (EXCH) and Official Development Assistance (ODA) demonstrate statistically significant positive effects on GDP. Gross Capital Formation (GCF) emerges as the most significant positive factor, characterized by a substantial coefficient. Notably, the model yields a remarkably high R-squared value of 0.995478, signifying that the model explains approximately 99.55% of the variance observed in GDP.

Table 7 : FMOLS Results for Robustness ©

Variables	DOLS		
	Coefficient	Std. Error	t - Statistic
FDI	0.026681	0.042266	0.631265
WPI	0.327454*	0.185347	1.766704
EXP	0.026333	0.083493	0.315393
IMP	-0.517280***	0.096096	-5.382947
EXCH	0.387454***	0.093533	4.142444
ODA	0.048895**	0.020203	2.420190
GCF	0.942977***	0.087086	10.82807
C	11.34624***		2.256054
5.029243			

Source: ©Author's own calculation

Note: *p<0.1; **p<0.05; ***p<0.01

Table 8:Johansen Cointegration©

	T-value	5% critical value	Prob.
Trace Statistics			
r d” 0	327.9617	159.5297	0.0000***
r d” 1	221.1929	125.6154	0.0000***
r d” 2	153.5974	95.75366	0.0000***
r d” 3	111.7467	69.81889	0.0000***
r d” 4	72.16997	47.85613	0.0001***
r d” 5	38.05504	29.79707	0.0045***
r d” 6	18.83988	15.49471	0.0151**
r d” 7	5.967114	3.841466	0.0146**
Maximum Eigen			
r d” 0	106.7688	52.36261	0.0000***
r d” 1	67.59553	46.23142	0.0001***
r d” 2	41.85068	40.07757	0.0312**
r d” 3	39.57674	33.87687	0.0094***
r d” 4	34.11493	27.58434	0.0063***
r d” 5	19.21516	21.13162	0.0908*
r d” 6	12.87277	14.26460	0.0820*
r d” 7	5.967114	3.841466	0.0146**

Note: *p<0.1; **p<0.05; ***p<0.01

Source: ©Author’s own calculation

To confirm that there is a long-term connection between the variables, apply the Johansen cointegration test.The unrestricted cointegration rank test comprises the Trace and Maximum Eigenvalue tests, which are used to assess the presence of cointegration relationships among variables, indicating a long-run equilibrium relationship. Both the Trace test and the Maximum Eigenvalue test indicate the presence of multiple cointegration equations, as their respective test statistics significantly exceed the critical values at the 0.05 level. To be specific, the Trace test suggests the existence of 8 cointegrating equations, while the Maximum Eigenvalue test suggests 5. These results suggest that the variables are connected in the long run, meaning they tend to change in the same direction over time, even though they may not do so perfectly at all moments.

5. DISCUSSION

The results of our studies show that imports can hurt the economy. Specifically, when a country brings in more goods from other countries, it tends to lower the overall economic output. On the other hand, factors such as exchange rates, official development assistance, and gross capital formation have been identified as having significant positive effects on GDP. This implies that changes in these factors are associated with noticeable boosts in the country's economic output. Furthermore, the results suggest the existence of long-term relationships among the variables. That is why these variables are likely to move in conjunction with each other over extended periods, reflecting a certain level of interdependence. Moreover, it is significant to note that the variables are connected in a way that shows they share a stable, long-term relationship. This means that changes in one variable are linked to changes in another over time, indicating a consistent pattern between them. Additionally, it is important to highlight how strong and reliable the connection is between capital investment—like buildings, machinery, and infrastructure—and a country's overall economic growth. This consistent pattern across different studies shows that when a country invests more in these areas, it usually leads to a significant boost in its economy.

6. CONCLUSION

The pursuit of economic growth has been a driving force for human civilization since the dawn of time. A country's GDP is a vital indicator of its overall development and progress. To gain deeper insights into the factors that influence GDP growth, this study employed theARDL framework for conducting an empirical analysis. It examined the impact of several economic variables, including FDI, inflation, rate of interest, exports, and imports on GDP. The study utilized a comprehensive set of time series data spanning three decades, from 1990 to 2021. By analyzing these variables, the study has better understood the dynamics of economic growth and identified the key drivers of development.

In the conducted study, an analysis has been presented on the prevalence of long-run cointegration among the independent variables concerning the dependent variable GDP. The research findings have indicated that some of the variables such asFDI, WPI, and ODA have a positive effect on the GDP but the result is statistically insignificant. Whereas, other variables such as EX, EXCH, and GCF havea positive and significant outcome on GDP. Furthermore, IMP has a negative and significant effect on GDP. Additionally, a brief study was carried out that showed a relationship between the variables in the short term. This study also provided insights into how these variables are related over the long term. The research has also demonstrated that the lagged differences have had a positive effect on the GDP. Additionally, the study has incorporated an error correction term signifying the convergence speed to equilibrium, which is evident to be high. This explanation suggests that the economy is poised to shift from a temporary imbalance to a more stable long-term state soon.

7. POLICY IMPLICATION

The outcomes of the study provide valuable insights for policymakers. The long-term India's growth of economy is supported by several key factors such as exports, imports, exchange rates, and gross capital formation. Exports play a critical role in generating revenue and fostering international trade relationships, while imports help meet domestic demands for goods and services that may not be produced locally. Additionally, exchange rates influence the competitiveness of Indian products on the global market, affecting both export and import dynamics. To enhance economic resilience and reduce over-reliance on specific regions or countries, Indian exporters must diversify their market presence. By exploring and entering new markets, businesses can mitigate risks associated with economic fluctuations in any single region and potentially tap into new sources of revenue. This strategic diversification allows for a broader customer base, which can contribute to sustained growth and stability in India's economy. Encouraging exporters to seek opportunities in emerging markets and strengthening trade partnerships can further support this initiative. Additionally, the Government should invest in infrastructure and capacity building to meet global quality standards and certifications, thereby bolstering the reputation of Indian products in international markets. The study also recommends the adoption of strategic import substitution policies to promote the development of domestic industries and decrease dependence on imported goods. Encouraging the production of critical goods domestically would enhance self-sufficiency. Finally, a technology-driven and professional environment should be fostered to ensure capital formation in economic growth.

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User Acceptance of eLearning: A Conceptualized Hybrid Model Integrating Technology Acceptance Model and Expectancy Confirmation Model

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ABSTRACT

The rapid expansion of eLearning has significantly transformed the educational landscape, offering flexibility and access to a wider learner base. Understanding user acceptance is important for the sustainability and success of eLearning systems. The Expectancy Confirmation Model (ECM) and Technology Acceptance Model (TAM) provide frameworks to study these dynamics. TAM emphasizes two key factors: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), which influence the acceptance of technology by users. ECM focuses on user satisfaction by examining initial expectations and their confirmation through actual usage, which directly influences continued usage intentions. Sustainability in eLearning encompasses not only environmental and economic factors but also the preservation of long-term engagement and efficacy. The purpose of this study is to propose a conceptual hybrid model of eLearning using the extended Technology Acceptance Model and Expectancy Confirmation Model for measuring sustainability based on the exhaustive review of the past literature and their critical analysis. Owing towardsdiversity of problems prevalent in the literature, it is evident that the variables affecting sustainability of eLearning are multifarious. This prototype maps out the key variables involved in the study of e-learning effectiveness and the communicationsamong these variables.It is expected that this conceptual model will support researchers in developing upcoming evaluative studies which are both sufficiently robust and holistic in design.

Key words: eLearning, User Acceptance, Sustainability, Success Factor, Technology Acceptance Model, Expectancy Confirmation model.

Manuscript Received: September 17, 2024; Revised Manuscript Received: December 14 , 2024, Accepted: January 7 2025

INTRODUCTION

The revolution of digital transformation in the education field (such as the introduction of LMS, MOOCs, etc. platforms) at all levels has allowed to adopting a newly teaching–learning ecosystem called eLearning. Without anydoubt, the Web and all of its ancillaries have opened up previously unimaginable possibilities and opportunities (Lee and Jeon (2020)). Thus, an eLearning ecosystem contains aneducator and apprentice group, substance and component (text, audiovisual), principles and techniques (adaptive, effective), systems and procedures (internet,multimedia, semantic web), and managing of learning properties (obtain, elicit, unify, recover, reuse)(Atukunda, P et. Al (2024)).

eLearning is more than transferring traditional lecture materials The eLearning trend in India has been on the rise for the last decades, with cost-effectiveness and learning flexibility being key factors. Success depends on content quality, representation, and infrastructural support. A standard set of quality parameters could reduce variation and improve overall eLearning quality. Professionals believe identifying these parameters is essential for improving eLearning outcomes in India. Incorporating these parameters can address uncertainties, provide an integrated approach, address information security, and ensure compliance with statutory, legal, and regulatory requirements (Bhattacharya, S., & Das, P. (2020)). However, maintaining improved results requires integration with regular practices and a quality framework. India is embracing online learning, with structured, proper elearning frameworks. However, concerns about e-learning effectiveness proposed by Roy, S. et. al. (2020).Chahal, J., and Rani, N. (2022) explores the factors influencing e-learning adoption among Indian higher education apprentices, focusing on COVID-19's impact on instructional methods. It uses the Technology Acceptance Model to analyse perceived ease of use, usefulness, behavioural intention, and attitude. The findings suggest that institutions should improve training programs, develop intuitive interfaces, and promote e-learning awareness. A thematic review by Chelawat, A., and Sant, S. (2023) discusses how eLearning can accelerate education for sustainable development in Indian higher education. This study emphasizes the integration of sustainability concepts into the curriculum and teaching methods, creating a foundation for education that is both impactful and durable. Additionally, it identifies infrastructure challenges and the necessity for robust government support to maintain digital platforms in rural and semi-urban areas. The research underscores the need for policies that support digital literacy and training to ensure that educational institutions and students can fully leverage eLearning for sustainable growth.

Principles and methods are a significant part of pedagogical approaches in teaching and learning methods. Popular strategies include active, explorative, adaptive, collaborative, blended, and concept mapping. However, without appropriate supporting technologies, these instructional techniques are limited in their effectiveness in an eLearning system. Studies have shown the usefulness of these principles in eLearning(Dicheva and Dichev, 2006; Alonso et al., 2005).

Research on the sustainability of eLearning emphasizes the effectiveness of systems and processes in adopting pedagogical strategies. Technologies like adaptive, blended, active, concept mapping, information retrieval, and computer-supported collaborative studying are proposed for enriching the eLearning environment. Effective resource management is crucial for expanding sustainable eLearning Keramati et al. (2011).The management of substance involves addressing learner benefits from pedagogical strategies and associates. It involves systematic activities like forming, capturing, validating, recovering, and reusing eLearning contents. Corbitt et al. (2010) found authentication ontology and learner profile. Selim, H. M. (2007) surveyed CSF.

The Expectation-Confirmation Model is commonly used by researchers for evaluating the adoption of technologies. Sumi, R.S. (2024) introduced an integrated model to measure students' intention to continue using eLearningservices, utilizing ECM constructs like confirmation, ease of use, perceived usefulness, and self-efficacy to evaluate satisfaction. This study explores the effect of quality traits on satisfaction and persistence intention, service quality, including information efficiency and system quality. The PLS-SEM findings show that the PEOU has a significant impact on the PU, after the perceived self-efficacy.The study highlights the unique challenges faced by learners in developing countries and the need for widespread research regarding holistic growth in the education market of Bangladesh. System quality significantly influences satisfaction, but service and information quality have negligible influence. The study suggests that proper attention to the development of content and continuous up-gradation can enhance the level of involvement and satisfaction among e-learners.Prasetya et. al,(2022) explored the adoption of eLearning system and its correlation with service quality, system quality, performance expectancy, and satisfaction.The hypothesis indicates that there exists a positive correlation between satisfaction and CI, and that confirmation is also correlated with satisfaction. Chow, W.S., and Shi, S. (2014)explored the satisfaction and purpose to continue using eLearning among students by applying the Expectation-Confirmation Model.The study expanded four (learning procedure, collaboration with peers,communication with tutor, and curriculum design) quality assurance factors to quantify post-adoption expectation in eLearning. Results showed confirmation positively influences PAE factors and satisfaction, with learning procedure and course layout significantly influencing satisfaction and continuance intention. The study suggests that eLearning practitioners should enhance students' confirmation of expectations and PAE.

After reviewing the comprehensive literature, the study identified many variables that affect the effectiveness of eLearning, which were grouped in three success factors as: 1) User Satisfaction 2) Service Quality and 3) Benefits. Each Success Factor is explained in previous research papers as follows:

User satisfaction

User satisfaction wasdescribed by Almarashdeh (2016) as the accuracy of the information obtained through an eLearning system. User satisfaction is crucial for eLearning system performance, affecting user experience, functionality, utility benefits, and information quality. It depends on perceived self-efficiency and learning environment and can be improved by improving skills. Successful systems incorporate learners' collaborative interests and consider service quality and infrastructure dependability. Research has been conducted to determine these factors.

Service quality

Learning involves inputs, transformation, and outputs. Service quality in eLearning systems influences learner satisfaction. Quality is measured by functionality and technicality. User engagement and prior expectations impact service evaluation. Proper explanations and support improve service delivery. Service quality is the ability ineLearning

to provide services to users with suitable navigation features, organized content, and a dependable and responsive system.

Learner-friendly systems are likely to outperform competitors due to their focus on differentiating service products and enhancing learner satisfaction(Wang et al., 2007).The benefits of providing safety in education through eLearning have been analysed, and three dimensions have been identified to assess the level of User Satisfaction, that is, cost reduction, time reduction, and performance improvement (Ho and Dzeng, 2010).

Net benefits

Net benefits could be defined as the degree to achieve knowledge and skills gained by the learner and proper implementation of that acquired knowledge.Ferguson and DeFelice (2010) analysed that net benefit is avital factor to the success ofan eLearning system. DeLone and McLean (2003) define net benefits as the impact of management and individual users on achieving their goals in an eLearning environment. These benefits can include improved test results and better employability. Kettinger and Smith (2009) and Isaac et al. (2017) measure net benefits to learners, focusing on academic performance, satisfaction, personal growth, and career progression.

In the proposedmodel, a combination of three constructs – satisfaction of the user, net benefits,and service quality will bemeasured forthe overalleffectiveness of theeLearningsystem.Sustainability is described as continuing innovation processes which benefit society, economy, and environment (Foo, 2013). Technological, organizational, and societal reforms are necessary for sustainable development (Sahid et al., 2011). Sustainable eLearning refers to Learner's satisfaction of the pedagogical system, service quality of infrastructure, and benefits of the system's impact.

Technology Acceptance Model (TAM)

One of the most recognized techniques for assessing users' acceptability of innovations is the Technology Acceptance Model, which has been extensively used in many research. The TAM identifies four variables affecting the adoption of new technologies: perceived utility, ease of use, attitude towards use, and net benefits of behavioural purpose. It suggests that external variables can influence users' perceptions of ease of use and usefulness. However, not all TAM indicators predict sustainability. Recent changes focus on enhancing net benefits for user happiness and system reusability, as success only considers positive effects (Binyamin et al., 2017). Many studies have examined the usage and acquiescence of technology in education. Davis et al. introduced a TAM in 1989, predicting ICT acceptance using PU and PEOU. The model considers perceived usefulness and ease of use, with the Need for Cognition (NFC) being a moderated variable.

Expectation Confirmation Model (ECM)

The Expectation Confirmation Model represents a theory that enlightens how users' expectations and their confirmation of those expectations shape their continued

use of a product or service. The ECM is based on the idea that satisfaction is achieved when expectations are confirmed. The ECM was constructed based on the ECT hypothesis by Oliver (2001), which evaluates people's desire to repurchase and behavior by inspecting the relationsamong expectation, usefulness, confirmation, satisfaction, and repurchase intention. Alshammari et. al. (2024) studied repurchase intention and behavior in virtual classrooms by analyzing the relationships among expectation, satisfaction, usefulness, confirmation, and intention to repurchase. It suggests that intention to use virtual classrooms could be like repurchasing behavior in ECT, with perceived usefulness, confirmation, satisfaction, and continuous intention being key factors.

RESEARCH GAP

Existing studies focus on short-term adoption factors or success indicators, neglecting the intersection of user situational acceptance and long-term sustainability. The integration of TAM and ECM models is underexplored in Indian educational frameworks, where challenges like digital literacy and varying pedagogical needs significantly impact perceived ease of use and usefulness. A conceptual model tailored to Indian learners is needed, integrating TAM's adoption factors with ECM's focus on user satisfaction and continuance intention. This hybrid approach could predict the sustainable success of eLearning systems in India and help adapt educational technology to better serve diverse learner populations.

RESEARCH OBJECTIVE

The objectiveof this study is to expand the theoretical understanding of the variables affecting eLearning effectiveness, the method in which these variables have been studied to date, and to suggestanappropriate conceptual model of eLearning effectiveness to assist its assessment.

Design of the Study

The paper reconsiders and critically reviews most important contributions tothe eLearning effectivenessliterature.

Discussion and conceptual model

The aim of this research is to improve understanding of the Technology Acceptance Model (TAM) for evaluating eLearning adoption and factors influencing it. It provides an extended TAM model for assessing sustainability, derived from 60 papers published between 2010 and 2024. The model is improved to account for eLearning adoption in emerging countries like India, including external factors like learner happiness and service quality.

The Expectation Confirmation Model (ECM) is a tool used to analyse how students' expectations about online learning experiences align with their actual experiences. It involves pre-course expectations (Expectations Formation, Influencing Factors), perceived performance (Experience Evaluation- Content Quality, Platform Usability, Instructor

Interaction, Engagement), and post-course evaluation (Confirmation or Disconfirmation). Aligning expectations can enhance satisfaction, engagement, and learning outcomes. To apply ECM in eLearning, course design, UX design, instructor interaction, feedback mechanisms, and expectation management should be implemented. This approach helps educational institutions better understand and meet students' needs, leading to improved satisfaction and learning outcomes.

Another reason for this article was to better explore the parameter or variable associated with the construct of the parameter's success factor of influencing eLearning effectiveness. And to propose a hybrid conceptual model of eLearning using extended TAM and ECM models for measuring sustainability. The research study reveals that eLearning success is influenced by various factors, and different studies may have different classifications of success elements.Here, eLearning success factors has been categorized into three dimensions. These are learner's satisfaction, service quality, and benefit. The summary of the variables is presented in Table 2, 3,and4.

Stakeholders and perceived beneficiaries of an eLearning system are learners or students. Learners are recognizing the benefits of using eLearning platforms, but proper usage is crucial as education awareness increases and students become more engaged and advanced.

This paper introduced a theoretical framework for evaluating the sustainability of an eLearning ecosystem, considering three elements: Pedagogical/Learning Perspective, Technological and Other Infrastructure Perspective, and Management Perspective. The framework considers learner satisfaction, service quality, and benefits to measure its effectiveness. Our vision is to measure a sustainable eLearning system to ensure quality education in the future. The support of learner satisfaction and overall benefits is one of sustainable e-traits.

In this hybrid model, TAM could be used to understand initial adoption behaviour, while ECM could focus on continued use and sustainability. Here's how these might be integrated the eLearning system's initial adoption is affected by perceived usefulness and ease of use, which in turn affects satisfaction and continued use intention. Sustainability factors like system quality, content quality, and user training are also considered.

When focusing on students in an eLearning environment, the external variables that influence Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are tailored to their educational needs and experiences. These factors can greatly impact how students perceive the effectiveness and accessibility of an eLearning platform.For students, these external variables directly affect their willingness to adopt and continue using eLearning platforms. For instance, PU apprentices are more likely to find the platform useful if it directly contributes to their academic success through relevant content, interactive learning tools, and personalized learning paths.PEOU a platform that is easy to navigate, accessible

on multiple devices, and supported by clear instructions and tutorials will be perceived as easier to use, encouraging sustained engagement.

The optimisation of these factors enables eLearning systems to more effectively cater to the requirements of students, resulting in increased satisfaction, enhanced learning results, and higher rates of adoption.

The framework (Fig 1) provides a deeper understanding of the eLearning ecosystem. Here, we are focusing on a learner-centered eLearning environment that incorporates user perception and behavioral intention as critical factors in achieving the net benefits of eLearning. Here variables (e.g., Service Quality and Benefits) are intermediaries that influence both Perceived Usefulness and Perceived Ease of use, and they are connected, which measures the sustainability of the system. This framework incorporates user perception and behavioral intention as critical factors in achieving the net benefits of eLearning.

To carry out the research, a structured questionnaire will be created for the collection of data. The study will be conducted in select colleges and universities in eastern India using a structured questionnaire to capture students' perceptions of technology-mediated teaching throughout the COVID-19 period. The first version of the questionnaire shall be circulated to the limited participants who had prior experience with eLearning. Those collected data from the pilot study will be used to test the reliability and validity of the questionnaire. The final questionnaire will then be sent to students at higher education institutes who have undertaken an eLearning course at the time of COVID-19 and post-pandemic era.

THEORITICAL FRAMEWORK

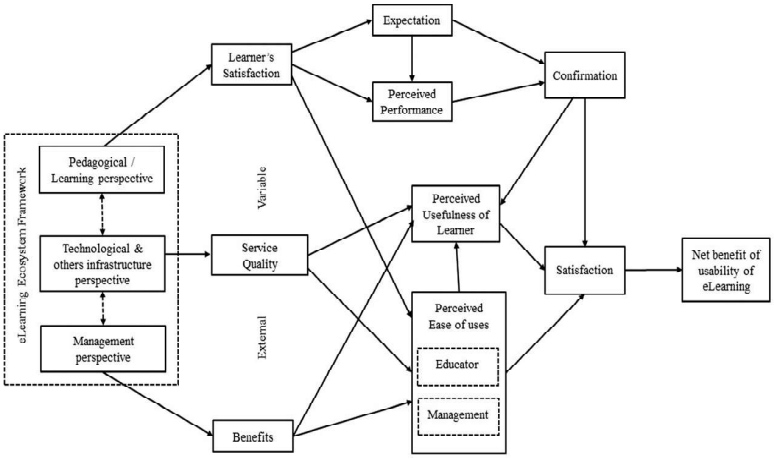

Fig 1: Conceptualized Hybrid Model using TAM and ECM for measuring sustainability of eLearning

Table 1: IdentifyingConstructs

Constructs List	Reference
Confirmation	Bhattacherjee, (2001)
Continuance Usage Intention	Al-amin et al. (2022)
Satisfaction	DeLone andMcLean (2003), Lee et al. (2009)
Perceived Ease of use (PEOU)	DeLone and McLean (2003), Wang and Liao (2008)
Perceived Usefulness (PU)	DeLone and McLean (2003), Hassanzadeh et al. (2012)
Perceived Performance	Hsu et al. (2018), Luo and Du (2022)
Service Quality	Wang and Liao (2008), Au et al. (2008)
System Quality	DeLone and McLean (2003)
Net benefit	Isaac et al. (2017), El-Gohary (2012)

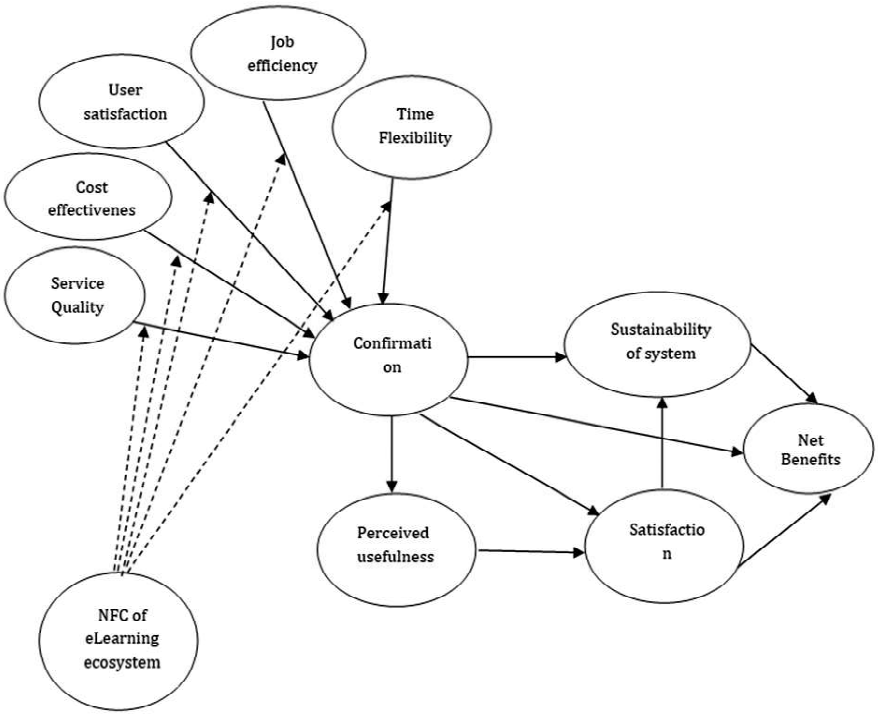

Fig 2: Conceptualized acceptance model for measuring sustainability of eLearning

In Fig 2, the Necessary Factors and Conditions (NFC) of the eLearning Ecosystem drives quality aspects like User Satisfaction, Cost-Effectiveness, and Service Quality, which together influence Confirmation. Confirmation then impacts the system's Perceived Usefulness, Sustainability, and Satisfaction, leading to Net Benefits. This flow shows how a well-designed eLearning ecosystem can lead to positive outcomes, as long as key factors align with user expectations and provide functional advantages like efficiency and flexibility.

This section summarized external variables of the success factors that affect the effectiveness of eLearning in following table from previous studies.

Table 2: Variables of**User satisfaction**

Authors	Variables
Duggal (2022)	Learner's collaboration interests
Shuja et al. (2019)	Infrastructure dependability
Kang et al. (2018)	Satisfaction, helpfulness, Reference to others, overall contentment
Pham and Huynh (2017)	computer self-efficacy, frontalcommunication, email interaction, simplicity of use and social occurrence
Almarashdeh (2016)	System functionality, information accurateness, significance of quality service
Ramayah and Lee (2012)	Quality of Service, quality of system, quality of information
Reynolds (2012)	Learner's readiness
Teo (2011)	Delivery of the course, instructor attributes, learning atmosphere, favourable circumstances

Table 3: Variables measured in **Quality of Service**

Authors	Variables
Uppal et al. (2017)	Content of learning, empathy, responsiveness, tangibility assurance, reliability
Raspopovic et al. (2014)	Stimuli interest factor, accessibility,assessment grade for facilitatorsassumed by learner, promptness, usefulness, demonstrated knowledge, receiving response from facilitators

Kritikos et al. (2013)	Significance of service performance, significance of qualityinformation, significance ofquality experience,
Benlian et al. (2011)	Completion, system accessibility, security, flexibility, efficiency, confidentiality

Table 4: Variables of **Benefits**

Authors	**Variables**
Isaac et al. (2017)	Efficiency at work, possession of knowledge, communication skills, ability to make decisions
Gay (2016)	Empowerment, saving time, improvement of skills, academic excellence
Raspopovic et al. (2014)	Time saving, learning enhancement, achievements, knowledge and idea acquisition in academic
Oye et al. (2012)	Academic excellence
El-Gohary (2012)	Cost-Effectiveness

CONCLUSION

In this article, we have reconsidered significant instances of the eLearning effectiveness research literature.According to our critical analysis and synthesis of the literature,a conceptual model has been proposed to evaluate the sustainability of the eLearning ecosystem in India. It identifies constructs and items for eLearning adoption, focusing on learner perception and accrued benefits. The study emphasizes the need to prioritize success factors affecting eLearning system effectiveness to improve overall outcomes and ensure learning continuity and national lifelong learning programs. It is nevertheless anticipated that such a conceptual model will assist comprehension of the significant variables affecting eLearning efficacy and the way in which they interact.

FUTURE SCOPE OF THE STUDY

The proposed model under this work is a part of the research, in the next stage the proposed model will be validated using different methods including expert opinion and survey questionnaires. Future study should therefore seek to deploy the model in an experimental context to evaluate its provenance and it is the intention of the current authors to do so.

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Remittances and Socioeconomic Impacts on LMICs Amid COVID-19: A Case Study of India.

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ABSTRACT

Remittances refer to the transfer of money made by migrants abroad to support their families back in their home countries. These transfers from migrants working abroad are a lifeline for economies of low- and middle-income countries. Remittance flows have grown significantly over the past two decades and now rank second among all outside funding sources for developing nations, behind only foreign direct investment (FDI) (Ebeke, 2012). Workers' or migrant remittances are the transfers made by immigrants sending home part of their wages as either cash or goods to help their families. (World Bank). However, when the COVID-19 epidemic struck globally in 2020, this international pecunious flow of resources was disrupted, severely harming the world economy and posing existential risks to millions of employment-generating companies throughout the world. The pandemic has had an adverse effect on the economy and its impact is heterogeneous throughout countries of the world, particularly developing economies, across households and individuals. In the beginning of March 2020, the World Bank projected the steepest drop in international fund transfers in all world regions. India in particular, saw a decline of 9 percent in international remittance receipt (World Bank, 2020).This review paper aims to examine the socioeconomic effects of the 2020 COVID-19 pandemic on global remittance flows to low- and middle-income countries (LMICs), with a focus on the varied challenges these economies faced during their recovery. It incorporates insights from extensive research and scholarly studies to provide a thorough analysis of the pandemic's impact on this vital financial resource.

Keywords: Remittance, Migrant remittances, Low- and Middle-IncomeCountries (LMICs), Covid-19 Pandemic.

Manuscript Received: October 25 , 2024; Revised Manuscript Received: February 18 , 2025, Accepted: May 3 2025

I. INTRODUCTION

I.1 International Remittances:

International emittances are money transfers that form part of the earnings sent by migrants working abroad to support their families in their country of origin. These overseas money transfers are also known as *workers*' or *migrant remittances*. International remittances have become one of the largest sources of foreign funding, next to Foreign Direct Investment (FDI) for many developing economies in the last two decades (*Ebeke, 2012*).

According to the World Bank," when migrants send home part of their earnings in the form of either cash or goods to support their families, these transfers are known as workers' or migrant remittances."

The International Organization for Migration (IOM) broadly defined migrant remittances "as monetary Atransfers that a migrant makes to the country of origin". In other words, that is to say, the financial flows associated with migration. Often, remittances are personal cash transfers by an expatriate to individuals particularly relatives in the country of origin. They can also include funds invested, deposited, or donated by the migrant to the country of origin.

1.2.Low and middle-income countries (LMICs)

The economies of the world have been classified by the World Bank into four income groups (Serajjudin& Hamadeh, 2020), namely :

- Low-income group
- Lower-middle income group
- Upper-middle income group
- Upper income group

These classifications are updated by the World Bank every year on the 1st of July based on the Gross National Income (GNI) per capita. The World Bank classifies countries into four income categories for the fiscal year 2024 based on their Gross National Income (GNI) per capita, calculated using the Atlas method. The classifications are as follows:

- Low-Income Countries: GNI per capita of $1,145 or less.
- Lower-Middle-Income Countries: GNI per capita between $1,146 and $4,515.
- Upper-Middle-Income Countries: GNI per capita between $4,516 and $14,005.
- High-Income Countries: GNI per capita above $14,005.(World Bank, 2024).

The study is focused on LMICs for the following reasons:

· LMICs depend highly on remittances for economic performance and to support public services. For most LMICs, the rate of inward remittances is higher than foreign direct investments (FDIs) and official development assistance (ODAs) (World Bank, 2020).

- For most LMICs, remittances have helped alleviate poverty, provide food security, and better access to education and healthcare. (International Fund for Agricultural Development (IFAD), 2021)
- According to the World Bank Report in 2020, the COVID-19 pandemic greatly disrupted remittance inflows, causing substantial challenges for LMICs. The World Bank estimated a 7.2% drop in remittance flows to most LMICs, further deepening their economic vulnerabilities. (World Bank, 2021)
- Despite the disruptions caused by the pandemic, remittances demonstrated remarkable resilience compared to other financial flows, highlighting their critical importance for LMICs during times of crisis (Ratha & Giugale, 2021).
- The impact of disrupted remittance flows varies significantly across LMICs, with rural and low-income households being especially vulnerable.(Kumar & Mistral, 2022)

. I.3. SIGNIFICANCE OF REMITTANCESIN LOW AND MIDDLE-INCOME COUNTRIES (LMICS)

Remittances, or private financial transfers, are important in linking migration and development. These funds improve living conditions in low- and middle-income countries by expanding access to housing, education, healthcare, and investment opportunities, thereby reducing poverty. Furthermore, remittances contribute to recipient countries' positive balance of payments (BoP). Remittances from diaspora communities contribute significantly to development efforts, benefiting migrant households and their home countries(Carling, 2004).

I.3.i. Macro Level

Remittances sent home by international migrants are a major source of income for low- and middle-income countries (LMICs), often surpassing both foreign direct investment (FDI) and official development assistance (ODA). In 2023, remittances contributed to $669 billion in inflows to LMICs, a 3.8% increase, according to the World Bank (2019, 2023). Adam and Page (2005) found that every 1% increase in remittances increased a country's GDP by 0.07%. According to Alberto et al. (2014), these transfers boost household financial stability and economic growth by increasing investments, savings, and consumption. Remittances also provide foreign exchange and alleviate credit constraints, both of which contribute to economic growth.

1.3. ii.Micro Level

At the organization, household, and individual level, the best part of remitted funds is mainly utilised in their current consumption, and having a positive multiplier effect on the same, it helps in raising the living standard and in poverty alleviation (Adam and Page; 2005). Studies have revealed that in most LMICs, migrants' remittances are being utilised to meet the necessities of the beneficiary. These include:

- Expenditures on essential needs and consumption to improve living standards.
- Education and health expenses
- Consumer durables
- Land purchase and housing (these include construction, repairs, renovations, and improvement)
- Purchase of livestock
- Socio-cultural expenditures which include ceremonial expenses on birth, marriage, pilgrimage, death, etc.
- Loan repayments
- Savings
- Investments, self-employment, entrepreneurial activities.

In addition tofinancial remittances, recent years have seen the emergence of social remittances, where migrants transfer not just money but also skills, knowledge, ideas, and values back to their home countries.The impact of social remittances is popularly perceived in areas such as education, health, employment, business, and aspects of governance, as reflected in a study by the International Organisation for Migration in Tanzania in 2015.(Sekei, Altvater, Mrema, & Kisinda, 2014)

I.3.iii. Household Level

Remittances play an important role in breaking families out of poverty cycles by improving household consumption, health, education, and investment (Chami, Fullenkamp, &Jahjah 2003). They positively influence local economies and living standards, particularly in South Asia and Latin America. Remittances demonstrated resilience during economic shocks such as COVID-19 when other foreign income sources declined (World Bank, 2024). However, without structural reforms, remittances cannot drive comprehensive economic development on their own (Haas, 2007). Furthermore, studies show that low-income families use their remittances for necessities, whereas middle-class families spend them on luxury goods (Eversole & Johnson, 2014).

Another key aspect of the importance of remittances to individuals is that remittances provide capital to small entrepreneurs (Ratha, 2007). It is speculated that if remittances are being used for investing or savings rather than consumption, it would yield a future flow of income for reinvestment and consumption.

Carling (2004) justifies this statement in his Remittance-development linkage model as shown in the following Figure 1.

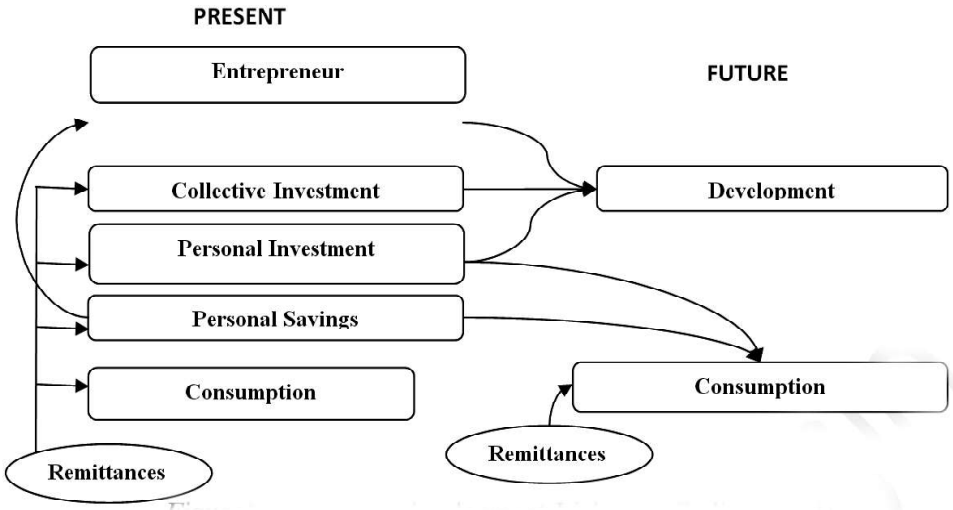

Figure1*:* Remittance-development Linkages (Carling, 2004)

As per this model, the investment portfolios can be summed up into five categories:

i. Savings plans

ii. Location-specific capital investments

iii. Human capital resource investments

iv. Diversified microeconomic investments and ventures

v. Community support, maintenance, and sustenance.

I. LITERATURE REVIEW:

The review of scholarly literature is categorized based on the impact of remittances to the various economic and social aspects of remittances and, pertinently, the effects of the novel Coronavirus (COVID-19) on the flow of international remittances to the recipient low and middle-income countries (LMICs).

II.1. Remittances and Economic Growth:

II.1.i.*Macroeconomics- impact of Remittances*

The numerous macroeconomic effects of remittances are the main focus of the study. They significantly impact both GDP and long-term inflation, claim Narayan et al.

(2011). Remittances have the potential to reduce productivity while simultaneously raising consumption and lowering interest rates (Vacaflores, 2011). Bahadir et al. (2018) argue that remittances are one of the primarysources of credit for entrepreneurs. Beaton et al. (2017) argued that this preserves economic stability while also reducing "Dutch disease." Hassan and Holmes (2015) argue that remittances help to sustain the current account; however, Lueth and Ruiz-Arranz (2007) and Cáceres and Saca (2006) found that they are ineffective during recessions.

Some of the primary macroeconomic impacts of remittances are the following:

a. GDP: In a good number ofeconomies in the world, remittances can account for more than 20% of GDP, indicating a significant contribution.

b. Inflation: According to Jansen et al. (2012), remittances can increase long-term prices by stimulating demand.

c. Consumption: They increase household consumption despite being ineffective (SSRC, 2009).

d. Investment: Remittances can be directed to land and other non-productive assets (SSRC, 2009).

e. The balance of payments compensates for trade deficits (Lartey, 2018).

f. Labour Supply: According to Orozco and Ellis (2014), remittances may harm labour supply and cause "Dutch Disease."

II.1. ii. *Microeconomics- impact of Remittances*

Remittances affect recipient households economically by boosting consumption, income, education, and healthcare, while socially improving children's education and lowering infant mortality rates (Arif, 2009).

Economic impact of Remittances

Remittances not only provide significant financial benefits, but they also help recipient households build human and social capital. To support small businesses and promote economic growth, these funds prioritise investment, consumption, and education. Remittances are commonly used to buy homes and real estate, as well as to pay for necessities such as food, healthcare, and education (Lipton, 1980; Arru and Ramella, 2000). Studies show that remittances have a noteworthybearing on savings and investments, particularly in healthcare and education.

Remittances contribute significantly to household financial stability. According to Combes and Ebeke (2010), remittances help to stabilise less developed economies, manage risk, and smooth consumption; however, this stabilising effect is reduced when inflows exceed 6% of GDP. According to the World Bank (2006), remittances stimulate demand for entrepreneurship, healthcare, and education while also alleviating poverty

and providing capital to farmers and business owners. Furthermore, remittances benefit households and the national economy by reducing consumption shocks such as agricultural and economic crises. (World Bank 2006; Combes &Ebeke 2010).

1. Remittances provide a consistent source of income, allowing families to allocate more resources to food, healthcare, education, and local investments.
2. Remittances offer a variety of investment and savings opportunities, including bonds, bank accounts, real estate, land, and small businesses.
1. Economic stability and risk management benefit developing economies by lowering the probability of economic shocks and natural disasters (Combes and Ebeke, 2011).
2. According to the World Bank (2006), remittances have no impact on inequality but little on poverty.
3. Entrepreneurship and small businesses: They support farmers and entrepreneurs by providing working capital.

II.1. iii. S*ocialImpact of Remittance*

From the sociological point of view, remittance is said to have improved the living standards of the beneficiary families and individuals. Remittances improve living conditions for families back home by increasing their options, opportunities, and social standing (Gamburd, 2000; Siddiqui, 2001; Asis, 2002).Migration and remittances can have a positive or negative impact on recipient families' social standing, health, and overall well-being.Remittances help to promote social development by improving healthcare, education, and infrastructure (Adam Jr. &Cuecuecha, 2010).Diaspora remittances support community projects such as health clinics and schools (Page 2009).Remittances help small businesses expand, leading to more jobs and higher household incomes (Dustmann&Kirchamp, 2001; Page, 2020).Migrants return social and human capital—skills, values, and ideas—to their home countries, which Peggy Levitt refers to as "Social Remittances" (Lacroix et al., 2016).Technological advancements enable migrants to act as transnational entrepreneurs, thereby strengthening links between domestic and international investment networks (Crush & Hughes, 2009).

The social impact of remittances on households encompasses various dimensions that contribute to aspects such as

Living standards: Remittances contribute to better living conditions in developing countries by increasing access to education, healthcare, and social mobility, thereby elevating recipient families' social standing (Gamburd, 2015; Asis and Piper, 2008).

Health and well-being: Research suggests that remittances can boost life expectancy and health, but can also cause emotional stress and social isolation for migrants and their families (Battistella &Conaco, 1998; Parreñas, 2002; Bruyn &Umbareen, 2005).

Employment and entrepreneurship: Remittances support small businesses by generating jobs, reducing poverty, and boosting the economy, claim Giuliano and Ruiz-Arranz (2009).

***Social remittances**:* Lacroix et al. (2016) claim that the networks, values, and knowledge of migrants foster innovation and entrepreneurship back home.

II.2. Effects of the COVID-19 Pandemic on the Flow of Remittances.

The COVID-19 pandemic triggered a significant global recession, harming developing countries and remittance flows, which are critical for migrant families. The World Bank predicted a sharp decrease in remittances in several regions, including Europe (-16%) and South Asia (-11%) (Murthi & Reed, 2021). The pandemic has caused lower incomes, job losses, and the possibility of widespread migrant returns, particularly from GCC countries, in Pakistan. These adjustments could significantly reduce remittance inflows, exacerbating socioeconomic crises such as rising unemployment and living expenses (World Bank, 2020; Murthi and Reed, 2021).

The effect of COVID-19 lockdowns on the distribution of income in developed and developing nations varied. Dang, Huynh, and Nguyen (2020) found that while household savings were impacted by the pandemic, household income losses across income quintiles were not significantly affected in developed nations. However, after the lockdown, sales and household income dropped by 90%, and 70% of loan recipients were unable to repay their loans, according to Malik et al. (2020). This disparity demonstrates how recipient households in LMICs experience a decline in remittance inflows, resulting in a reduction in their overall standard of living, food consumption, and spending.

I. OBJECTIVES:

The objectives of the paper are:

1. To analyze the trends in global remittances over the last decade
2. To investigate the effects of the COVID-19 pandemic on the global inflow of remittances, focusing on the disruptions caused in 2020.
3. To analyze the projected declines and realities of the COVID-19 pandemic on remittance inflows, with India as a focus.
4. To examine the socioeconomic repercussions of the pandemic, if any, on remittance flows and the prospects thereof for recovery in the post-pandemic world.

II. METHODOLOGY:

Research Framework: The study focuses on two core dimensions, namely it analyses how the pandemicaffected global remittance flows to LMICs, and examines India as a representative example of remittance-dependent economies.

Data Collection:

The study refers to secondary sources of data for the period 2014-2024 from various sources- International reports such as the World Bank Migration and Development Briefs,

KNOMAD data sets and latest insights, academic literature such as peer-reviewedjournal articles and books related to LMICs and remittances,Government Reports such as Reserve Bank of India Bulletins and remittance-related data, Ministry of Finance reports, etc., and institutional reports and other sources – articles and reports from reputed institutions like the International Monetary Fund (IMF) and the Organisation for Economic Co-operation and Development (OECD).

Case study Approach: The study examines the flow of remittances to India during the pre-pandemic (2017-2019), during the pandemic (2020-2021), and post-pandemic recovery (2022-2025).

Analysis: This study employs descriptive statistics and analytical techniques to examine and interpret the dataset effectively with the help of tools such as, Microsoft Excel for built-in mean, median, mode, standard deviation, etc., and tables, graphs and charts for summarizing, analysing datasets and for data visualisation.

III. REMITTANCES AND LOW AND MIDDLE-INCOME COUNTRIES: OVERALL GROWTH AND TRENDS.

According to the World Bank Board (2019), foreign expats significantlyimpact both home and host countries' economic and social development and poverty alleviation. According to the UN's International Migration 2020 Highlights, there were 281 million international migrants, making up 3.6% of the global population, up from 173 million in 2000.

According to the World Bank (2019), remittance flows have gradually increased to become one of the main sources of foreign funding for LMICs, surpassing foreign direct investment (FDI). Particularly in Latin America, South Asia, and Sub-Saharan Africa, remittances from nations like China, India, and Mexico have increased dramatically.

The flow of remittances into these countries persisted despite the decline in commodity prices in the year 2015-2016. Recent developments that took place in the fintech sector, particularly digital remittances and mobile money platforms have significantly contributed

to this growth, benefiting regions in Asia and Sub-Saharan Africa (World Bank, 2019).

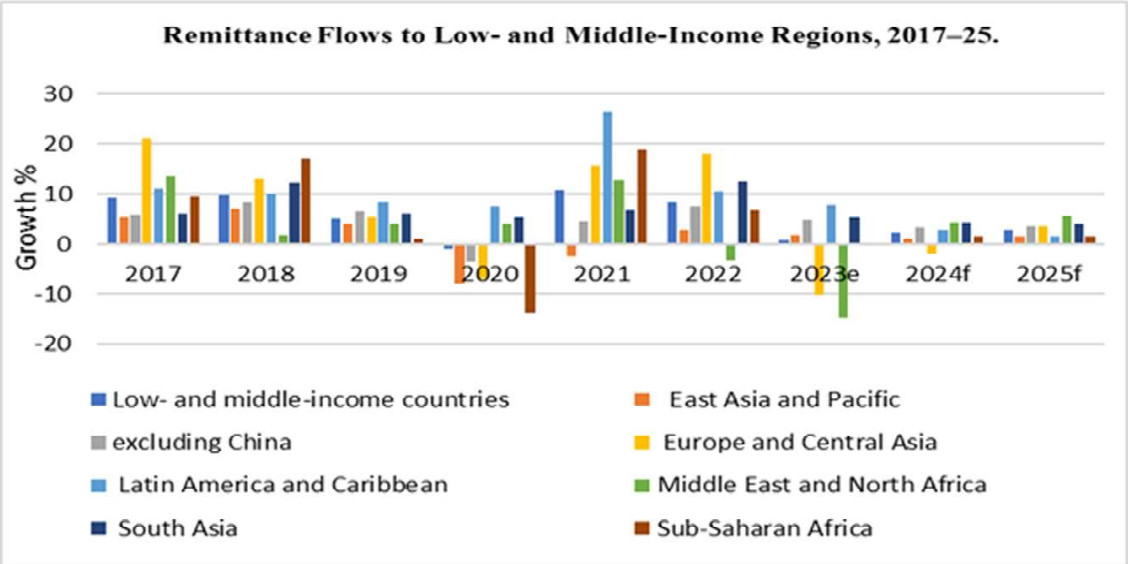

Figure 2: Remittance Flows to Low- and Middle-Income Regions, 2017–25

Source: World Bank/KNOMAD staff estimates. (World Bank/ KNOMAD, 2024)

Note: e = estimate; f = forecast.

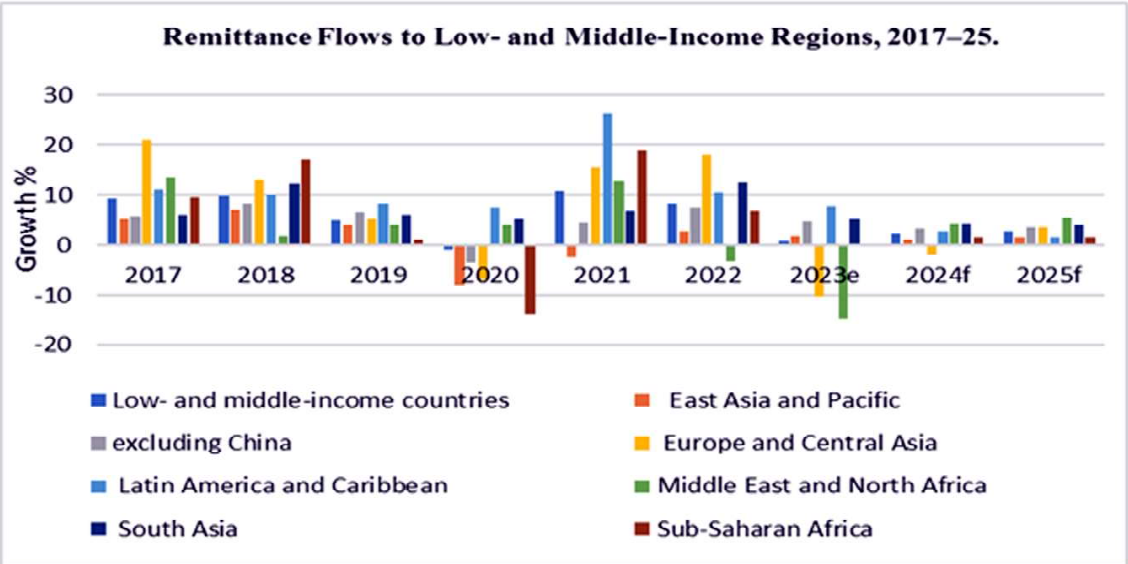

Figure 3:Remittance Flows to Low- and Middle-Income Regions, 2017–25

(**Growth rate percent year-on-year**)

Source: World Bank/KNOMAD staff estimates. (World Bank/ KNOMAD, 2024)

Note: e = estimate; f = forecast.

From *Figure 2* and *Figure 3*, we can recognizethat foreign migration and remittances have a major impact on the global economy and social landscape. Globalisation, improved communication, and improved transportation have all contributed to a substantialsurge in migration over the past two decades, which has benefited both host and home countries.

Because of technological advancements that make digital transfers more affordable, remittances have surpassed foreign direct investment (FDI) as the primary channel of foreign funding for LMICs. Furthermore, remittances have proven resilient in the face of global economic challenges, consistently providing stable income for households, particularly in South Asia, Sub-Saharan Africa, and Latin America (World Bank, 2020; Murthi, 2020).

International remittancesLMICs have steadily increased over the last few decades, accounting for a sizable portion of global financial inflows. They now outnumber foreign direct investment (FDI) and official development assistance (ODA), driving economic growth in critical sectors. This positive impact is reflected in the resilience of remittance flows during global crises, as well as a shift to digital transfer methods and fintech services in the remittance sector.

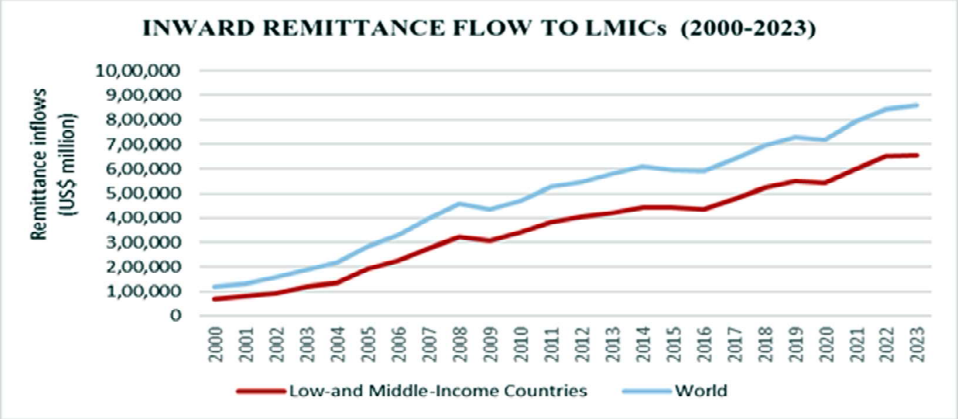

Figure 4: Inward Remittance Flow to LMICs (2000-2023)
Source: World Bank/KNOMAD staff estimates. (World Bank/ KNOMAD, June 2024)

Reports indicate steady growth in global remittances, particularly to LMICs, driven by globalization, boosted migration, and advancements in financial services (Figure 4). The World Bank's 2024 Migration and Development Brief highlights that remittances to LMICs, especially in countries like India, Mexico, the Philippines, and China, rose from $414 billion in 2013 to over $550 billion by 2019, making it the largest source of external finance for these nations (World Bank/KNOMAD, 2024).

The international remittance flow for 2023 was at $US 860 billion, with the inflow to LMICs was $669 billion(Nikolovska, Idorn, & Hodges, 2024). In 2024, the top recipients of international remittances are India with an inflow of $125 billion, followed by Mexico with $67 billion, China with $50 billion, the Philippines receiving $40 billion, followed by Egypt and Pakistan with each receiving $24 billion; Bangladesh had an inflow $23 billion followed by Nigeria with $21 billion and Guatemala at $20 billion; and Uzbekistan with $16 billion(World Bank/ KNOMAD, 2024)(Nikolovska, Idorn, & Hodges, 2024).

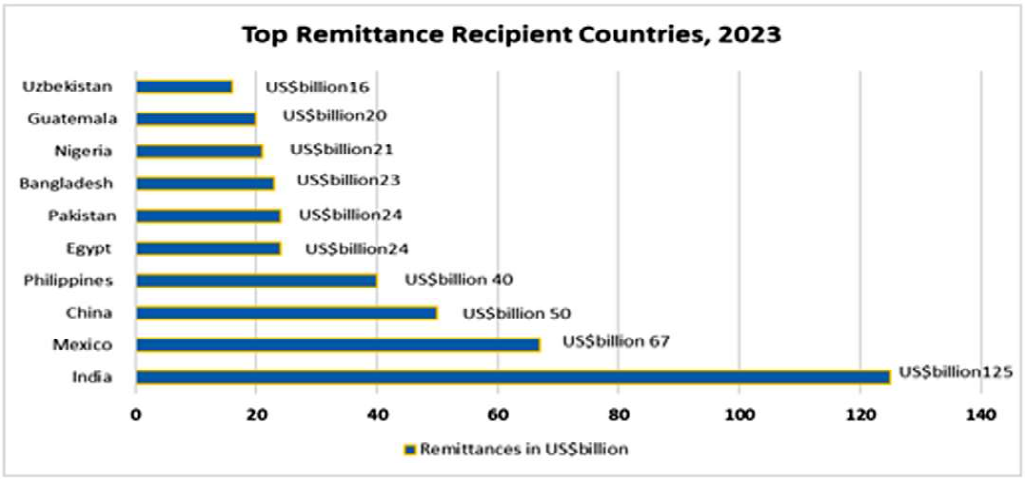

Figure 5: Top Remittance Recipient Countries, 2023
Source: *World Bank/KNOMAD staff estimates.*
(World Bank/ KNOMAD, 2024) (Nikolovska, Idorn, & Hodges, 2024)

India has been the highest recipient of migrant remittance for the past decade. In 2024, India continues to lead by a wide margin, owing to its large diaspora.In all these top recipient countries, internal remittances have proven to play a crucial role in their respective economies, both at the macroeconomic as well as microeconomic and household levels.

IMPACT OF THE COVID-19 PANDEMIC ON REMITTANCES TO LMICs.

Early estimates predicted a sharp 20% drop in remittances in 2020 as a result of economic downturns affecting migrant workers. However, the actual decline was only

1.6%, or $540 billion, due primarily to family support, digital transfer systems, and host-country policies (World Bank, 2021; April 2020).

Government assistance in host countries, such as fiscal stimulus and social protection measures, was critical to restoring remittance flows. These policies enabled migrants to earn a stable income, allowing them to support their families even during economic downturns. According to studies, such government interventions helped to maintain remittance levels despite global employment declines (World Bank/KNOMAD, 2024).

The pandemic accelerated the shift to digital remittance platforms as lockdowns restricted traditional cash-based services. Fintech solutions, particularly mobile money platforms, gained popularity among migrants in Asia and Sub-Saharan Africa due to their efficiency and affordability (Bisong et al., 2020).

Throughout the crisis, migrant workers demonstrated a strong sense of altruism and solidarity. According to Ratha et al. (2023), many migrants increased their remittances to help their families cope with the pandemic's health and economic challenges. This collaborative effort helped stabilise remittance flows to low- and middle-income countries.

Remittance patterns during the pandemic varied by region. South Asia experienced an increase in inflows due to migrants working in stable sectors like healthcare, while Sub-Saharan Africa and Latin America saw declines driven by job losses in vulnerable industries. Similarly, North Africa and the Middle East were affected by economic downturns and fluctuating oil prices (World Bank, 2021; Bisong et al., 2020). Despite challenges, global remittances grew by 7.3% in 2021, following a smaller-than-expected decline in 2020 (Ratha et al., 2020).Global remittance inflows to LMICs rose by 5.6% in 2021 to $460 billion, still below the 2017 figure of $487 billion. In 2020, remittances demonstrated resilience, totaling $540 billion—just below 2019's $548 billion—outperforming earlier forecasts (World Bank, 2020a, 2020b). While Q2 2020 saw a sharp decline due to lockdowns and travel bans, recovery began in Q3 and Q4 as restrictions eased, as illustrated in Figure 6.

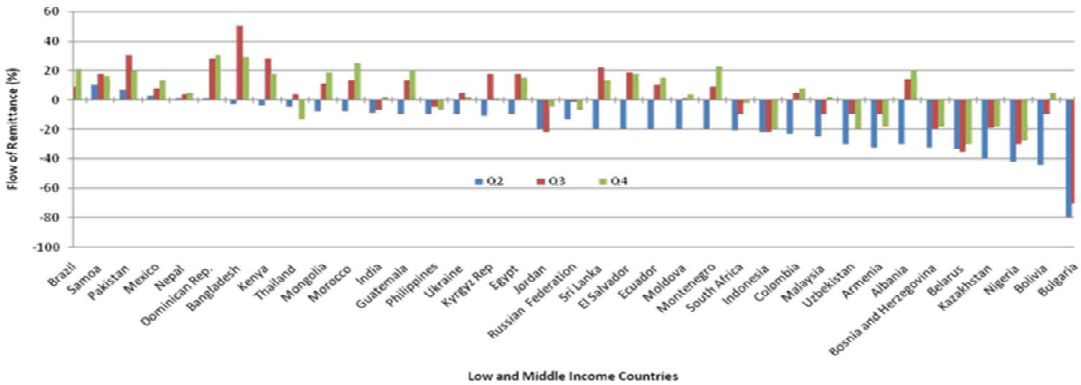

Figure 6: Remittances Plummeted in Q2 2020, but recovered in Q3 and Q4.
Source: Haver Analytics and World Bank–KNOMAD, 2021.

Economic Implicationsof the Covid-19 on Remittance Recipient LMICs

According to the World Bank 2006, the economic implications of remittances and migration are summarised as follows:

i. Remittances reduce poverty even while they appear to have a lesser influence on alleviating inequality

ii. They respond positively to adverse economic shocks, such as agriculture failure, recession, health crisis, and the like; thereby, helping smooth household consumption

iii. Soothe working capital limitations faced by farmers and small-scale entrepreneurs

iv. Boost the demand for household expenditures such as education, health, and entrepreneurship, which have a direct effect on the economic development of a country.

The worldwide economy was significantly impacted by the travel bans and lockdowns imposed during the COVID-19 pandemic. Retail, healthcare, education, and hospitality were among the industries hardest hit. As industries struggled to survive, the labour force shrank and unemployment rose (ILO, April 2020).

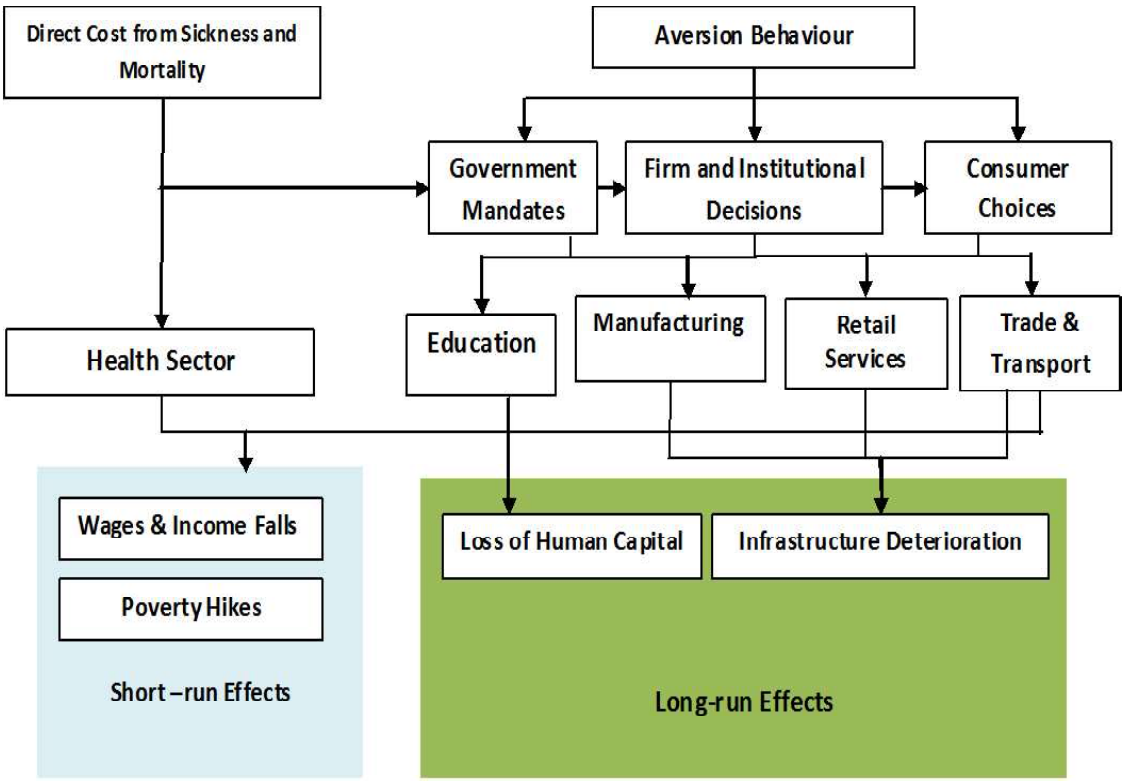

Figure 7: Channels of Potential Economic Impact of the COVID-19 Pandemic
Source: Evans and Over, 2020, adapted from *World Bank*, *2014*.

Evans and Over (2020) identified several potential avenues through which COVID-19 could have an economic impact. People's "aversion behaviour," which involved staying at home to avoid the virus even if it meant losing all or a portion of their income, was a significant contributing factor. There were three primary reasons for this behaviour (World Bank, 2014). Government mandates such as nationwide lockdowns, containment zones, closing down of businesses, and the like.Firm and Institutional decisions, which include private businesses and institutions as well. Closures of business firms, be it due to government mandates or the firm's decisions, result in the loss of jobs, pay, and wages, particularly in the informal sector, where most of the employment and service policies are contractual.Reduced trips to markets, supermarkets, and social activities, and avoidance of traveling and others by individuals.

COVID-19's impact on sectors such as manufacturing, transportation, and healthcare is significant, resulting in significant income losses, including remittances, due to both supply and demand disruptions (ILO, 2020; Malik et al., 2020). Families that received remittances, particularly in Nepal, faced food insecurity and income loss (Abdih et al., 2012; Thapa & Acharya, 2017; Mazumder & Nath, 2018). Migrants experienced job losses and reduced remittances, resulting in increased poverty, food insecurity, and lower household consumption, especially in LMICs (Bisong et al., 2020; IOM, 2020a). These disruptions jeopardized important investments in education and healthcare.

The COVID-19 pandemic reduced inflows into remittance-dependent LMICs due to lockdowns and travel restrictions, putting families under financial strain and forcing them to make difficult decisions about food, healthcare, and education (Dustmann and Kirchamp, 2001; Gamburd, 2000; Siddiqui, 2001; Adams Jr. and Cuecuecha, 2010). The pandemic's travel restrictions fuelled racism and xenophobia, cost migrants their jobs, and jeopardised their health. As a result, families in LMICs had fewer opportunities for better living conditions and education, and financial constraints forced them to put off purchases and accumulate deb, inciting anti-immigrant sentiments, and encouraging racism and xenophobia.(Figure 8).

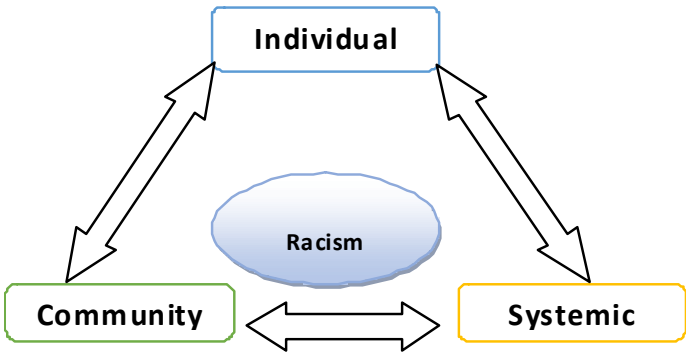

Figure 8: Levels of Racism and Xenophobia
Source: *Hennebry, J. and H. KC, 2020*

Migrant workers have suffered significant physical and psychological harm as a result of social exclusion, discriminatory laws, and unequal pay. They were subjected to discriminatory treatment, such as inadequate housing, strict quarantine regulations, and exclusion from pandemic assistance programs. Structural exclusions that portrayed migrants as threats had long-term consequences for their well-being, making them more vulnerable to violence and health problems (Hennebry et al., 2020).

The Internal Organization of Migration (IOM) recommends the following measures to reassure migrants and ensure they are not subjugated to discrimination:

- Public communication based on facts and scientific data to avoid xenophobia and other forms of discrimination, social cohesion-promoting campaigns and policies.
- Strict measures to prevent and address hostility and stigmatisation of migrants in society.
- Migrant-friendly entry and exit policies that are not based on intolerance and fear. (IOM, 2021).

Digitization and Remittances in the Low and Middle-Income Countries

Remittances to LMICs in 2020 totaled $540 billion, a 1.6% decrease from $548 billion in 2019, despite short-term service disruptions caused by coronavirus pandemic lockdowns (World Bank, 2021).The amount of money transferred via mobile devices rose by 65% from $7.7 billion in 2019 to $12 billion in 2020 (Andersson and Naghavi, 2021, GSMA). The pandemic accelerated the shift from informal to formal remittance channels, which boosted the revenue of operators such as MoneyGram and Western Union by improving their digital services (PYMNTS.com, 2021).(Table 1).

Table 1: Digital Remittance of funds 2020-21

Company	**Increased in Transactions In 2020**	**Percent of Total Transactions**	
		2021	2020
Western Union	94%	28%	16%
MoneyGram	80%	29%	16%
Ria Money	>100%	Not available	

Sources: *Western Union Annual Report 2020*.

During the COVID-19 pandemic, digital remittance services have become critical to international remittance flows. They provide 24-hour access, reduce transfer costs, and improve transparency. According to the Global System for Mobile Communications (GSMA), mobile wallet transfers cost only 3.53% in the third quarter of 2020, while the global average for other methods was 6.75%. Recipients can withdraw cash at a lower cost or use funds directly via digital channels (GSMA, World Bank). These services improved financial resilience, especially during the pandemic (ADB, 2021).

The government's actions included the following:

- Support for stranded migrants.
- Creation of Remittance Mechanisms
- Assistance for the families of migrants.

I. PROJECTED DECLINES Vs. REALITIES: THE IMPACT OF THE COVID-19 PANDEMIC ON REMITTANCE INFLOWS WITH A FOCUS ON INDIA.

Remittances to low- and middle-income countries are expected to decline dramatically as a result of COVID-19 lockdowns and job losses, according to preliminary World Bank estimates. Despite the 20% global decline predicted by Ratha et al., remittances to low- and middle-income countries showed resilience by declining only 1.6% to $540 billion by the end of 2020. The host nation's fiscal stimulus programs helped to sustain remittance flows (Ratha et al., 2020). Furthermore, the increasing use of digital transfers made remittances easier to access as more migrants prioritised providing for their families despite personal difficulties (Bisong, Ahairwe, & Njoroge, 2020).

Case Study: India

The country that receives the most foreign remittances has long been India. World Bank Migration and Development Brief 31 (2019) projects that it will receive $87 billion in 2021, more than China and Mexico put together. India has received $70-90 billion annually since 2008, which has had a major impact on the socioeconomic standing of the nation.

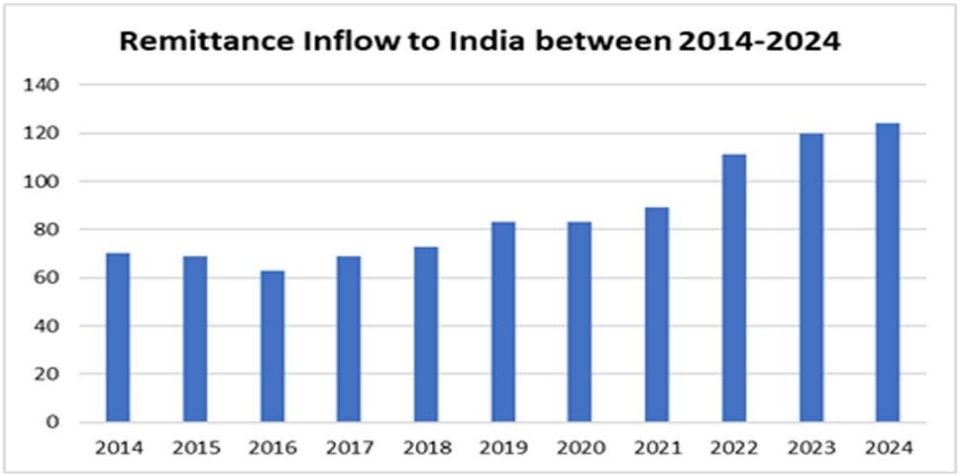

Figure 9: Remittance Inflow to India (2014-2024)
Source: Finance Ministry of India quoting World Bank Report(World Bank, 2024)

Year	Remittances Received (US$ Billion)	Annual Growth Rate (%)
2019	83.3	-
2020	83.1	0.1
2021	89.4	7.5
2022	111.2	11.9
2023	119.5	19.5

Table 2: Remittance Inflows to India (2019–2023)
Source: Bank of Baroda(Bank of Baroda, June 2024).

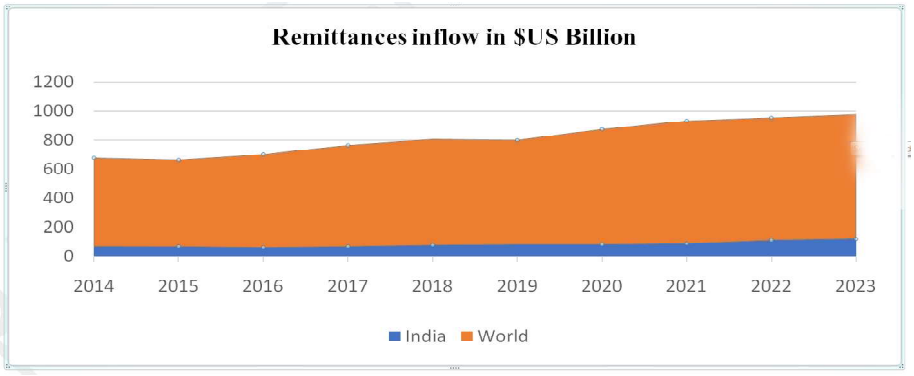

Figure 10: Remittance Inflows to India and World (2014–2023)
Source: Bank of Baroda(Bank of Baroda, June 2024

India is the leading recipient of international transfers for more than a decade, consistently demonstrating an upward trend and resilience in global remittance inflows. In the pre-pandemic period (2014–2019), remittances provided substantial support to household incomes, with inflows reaching an impressive US$ 83.1 billion in 2019.

During the pandemic (2020–2021), despite widespread global disruptions, remittance levels remained stable at US$ 83.2 billion in 2020, marking a marginal growth of 0.1%. In 2021, remittances increased by 7.5% to US$ 89.4 billion, indicating recovery and possibly an improvement in household incomes, as migrants likely sent additional funds to support their families during ongoing challenges.

In the post-pandemic recovery period (2022–2023), remittance inflows saw significant growth. In 2022, inflows grew by 11.9%, followed by a remarkable increase of 19.5% in 2023, reaching a record US$ 119.5 billion. This surge reflects improving economic conditions for migrants and a strengthened support system for households in India, contributing to enhanced income levels in remittance-receiving regions.

Remittances enhance India's economy by boosting household expenditures, promoting human capital investment, and reducing poverty. Their potential to decrease rural poverty by as much as 10% highlights their importance (Ratha et al., 2016). Families often allocate remittances for essential needs like food, healthcare, and education, viewing education as a long-term investment. Furthermore, remittances aid in macroeconomic stability and improve the balance of payments (BoP) by raising India's international exchange reserves, projected to reach 3% of GDP by 2022 (RBI, 2022).

The fact that remittances to India decreased by just 1.6% to $83 billion, rather than the anticipated 23% decline, demonstrated that worries that COVID-19 would significantly reduce remittances were unfounded (World Bank, 2021). Income stability declines in the Gulf Cooperation Council countries were counterbalanced by U.S. unemployment benefits and fiscal stimulus (Ratha et al., 2020; World Bank, 2021).

Further, India struggles to maintain remittance inflows due to high transaction costs of 5%, which exceed the UN's 3% target and the SDG benchmark (World Bank, 2024, 2021). Economic volatility and geopolitical unrest endanger remittance flows, especially in Gulf Cooperation Council (GCC) countries (Ratha et al., 2019). To address this issue, India must reduce spending and develop new strategies.

India is expected to remain the top remittance recipient due to consistent migration and the growth of digital services like fintech and mobile banking, which improve accessibility and lower costs (World Bank, 2021; 2024). Platforms like GPay and Paytm increase inflows, especially in rural areas (McKinsey 2020).Despite South Asia's high transaction fees, digital innovations help to lower them.

Remittances are expected to increase as the global economy improves due to the persistence of Indian migrants, particularly those from important sources such as the United States and GCC (Kpodar et al., 2021; Ratha et al., 2023).

VII. FINDINGS

The key results and findings of this review study are as follows:

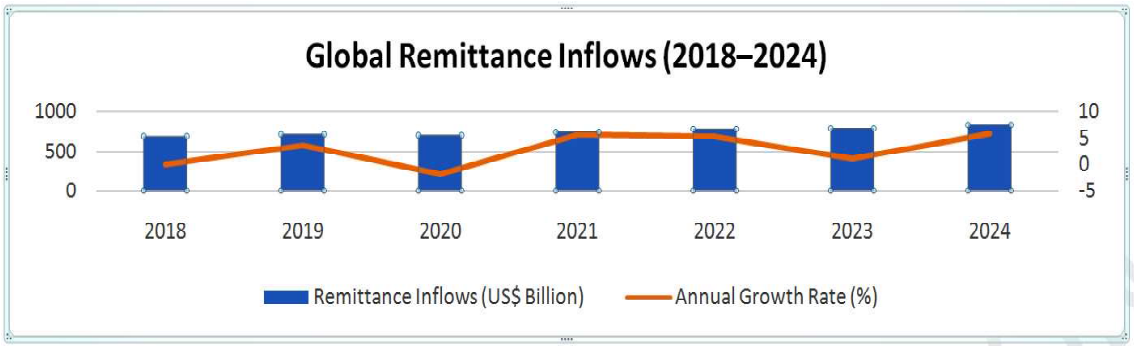

Figure 11: Global Remittance Inflows (2018-2024)
Source: *(The World Bank, May 2021; 2024)*

1.Remittances and low and middle-income countries: overall growth and trends:

In 2000, there were 173 million international migrants worldwide; by 2020, that number had increased to 281 million, a 62% increase and 3.6% of the world's population (United Nations, 2020).Between 2013 and 2019, remittance flows to LMICs surged, growing from $414 billion to over $550 billion, thereby becoming the foremost foreign funding, outpacing FDI (World Bank, 2009).Remittances have also shown a countercyclical pattern; even during global economic crises like the coronavirus pandemic and the commodity price crash of 2015-2016, migrants continued to send money home, demonstrating their financial resilience (World Bank, 2020). Additionally, significant technological advancements have improved the accessibility and efficiency of remittance services in Sub-Saharan Africa and South Asia, propelled by the growing use of digital transfer methods during the coronavirus pandemic (World Bank, 2021).According to World Bank, the top recipients of international remittances in 2024 were China ($50 billion), Mexico ($67 billion), India ($125 billion), and the Philippines ($40 billion), largely because of their diverse diasporas in high-income nations, especially in the construction and healthcare industries.Remittances significantly contribute to the development of LMICs by increasing household-sector income, reducing poverty, and improving access to education and healthcare (World Bank/KNOMAD, 2024).

2. Socio-economic Impact of the COVID-19 pandemic on remittances to LMICs:

When the pandemic began in 2019, the World Bank projected a 20% decrease in remittance flows to LMICs. In reality, the decline was only 1.6% ($540 billion) in 2020,

attributed to protective measures from host countries, migrant solidarity, and a rise in digital remittance usage (World Bank, 2021; Ratha, 2021).Government initiatives such as fiscal stimulus and social protection programs in remittance-sending countries like the U.S. and Gulf Cooperation Council nations helped migrants sustain their earnings and continue sending funds home (World Bank, 2021; Ratha et al., 2020; Khan &Raithatha, 2020).The pandemic prompted a significant shift towards fintech services in the remittance sector, with cash service restrictions driving the adoption of digital and mobile money platforms in regions like Sub-Saharan Africa and Asia (Ratha &Giugale, 2021; Azoulay et al., 2022; Sayeh & Chami, 2020).Despite personal challenges, migrants exhibited a strong sense of duty and altruism toward their families back home (Kumar & Mistral, 2022; Giugale et al., 2021; World Bank, 2022).Remittance flows varied by region; South Asia experienced a slight increase due to robust sectors like healthcare, while Sub-Saharan Africa and Latin America had mixed results, with some countries seeing significant declines (World Bank, 2022; Ratha et al., 2020).By 2021, remittance flows increased by 7.3%, demonstrating their countercyclical nature and resilience during economic shocks (Ratha et al., 2021).Nonetheless, the pandemic inflicted economic stress on LMICs, leading to job losses and reduced remittance income, which exacerbated existing issues in the education and healthcare sectors (Evans & Over, 2020; IOM, 2020a).The pandemic caused economic stress to LMICs as migrants abroad lost their jobs, experienced pay cuts, and experienced aversion behaviors. This significantly contributed to the reduced income and remittances. (Evans & Over, 2020).

The pandemic's short-term effects have led to lasting economic hardships for developing countries, characterized by slow growth and diminished investment in education and infrastructure (Evans & Over, 2020).Remittance flows to migrant households fell nearly 25% compared to non-migrant households, causing considerable food insecurity for families that depend on these funds, struggling to fulfill essential needs like food, housing, and healthcare (IOM, 2020a; ADB, 2020).Although remittances typically promote social development by funding education and healthcare (Page, 2009; Dustmann & Kirchamp, 2001), widespread temporary closing of schools due to the pandemic affected over 87% of students globally, especially in LMICs (UN DESA, 2020).The coronavirus pandemic exacerbated existing healthcare issues in LMICs, revealing underfunded infrastructure and increasing financial pressures on families due to rising out-of-pocket healthcare expenses (Okereke et al., 2020)

3. Impact of the Covid-19 Pandemic on Migrants

COVID-19For the first time in more than 20 years, 19 lockdowns and travel restrictions decreased the number of skilled and unskilled migrants, leaving many stranded or compelled to return home as a result of job losses (World Bank, April 2020).Pre-existing racism and xenophobia against migrants were made worse by the pandemic, leading to mental health problems related to mobility restrictions, quarantine, and discriminatory actions like deportation (Hennebry et al., 2020).To help restore remittance flows LMICs, the demand for services from Western Union and MoneyGram doubled in

the second half of 2020 as digital remittance transfers increased (World Bank, 2021; Andersson &Naghavi, 2021).

4. India's resilience and dominance in global remittance flow:

India has remained a leader in global remittance flows, achieving inflows of $83 billion during the pandemic, with amounts rising from $70 billion in 2014 to $124 billion by 2024 (World Bank, 2019; World Bank/KNOMAD, 2024). The growth is driven by a large diaspora in high-income nations and advancements in digital remittance services, especially in rural areas (Baig et al., 2020).Due to steady migration patterns and the growth of fintech services like GPay and PhonePe, which will promote financial inclusion, the World Bank anticipates that India will continue to dominate the remittance market (World Bank, 2021; Baig et al., 2020). Inflows to India will rise as remittance-sending nations recover.

IX. SUGGESTIONS AND RECOMMENDATIONS

This paper aims to understand the current global trends of remittances in low-and-middle-income countries (LMICs), the significance of these international flows to the economy and household sector, the socioeconomic repercussions due to the COVID-19 pandemic, and the way ahead post-pandemic period. The following are recommendations based on the key findings-

1. *Digital Remittance Platforms:*

   Promote partnerships between governments and financial institutions to expand access to fintech and mobile money services among both rural and urban populations, thereby enhancing the efficiency of international remittances (Baig et al., 2020; World Bank, 2021). In response to increasing digitalisation, invest in cybersecurity initiatives and user education to ensure safe and informed use of digital remittance platforms (Andersson & Naghavi, 2021; Hennebry et al., 2020).

2. *Policy Support for Migrant Workers:*

   To enable migrants to thrive and support their families, host countries must enhance policies that prioritize social welfare, healthcare, and job security (World Bank, 2021; Hennebry et al., 2020). Additionally, fostering bilateral agreements between home and host countries is essential to safeguarding the rights of expatriate workers and ensuring their access to vital services (Kpodar et al., 2021; Andersson & Naghavi, 2021).

3. *Leverage Remittances for Long-Term Development:*

   To foster long-term development, low- and middle-income countries (LMICs) should encourage the allocation of remittances towards productive sectors such as education and healthcare. Additionally, it is essential to provide recipients with

incentives to invest in sustained economic activities rather than making one-time expenditures (Ratha et al., 2020; ADB, 2020).

4. *Financial Literacy and Literacy:*

   Workshops and collaborations with financial institutions can help remittance recipients gain financial literacy.Remittance platforms provide savings, insurance, and loan services to low-income people in remote areas (Kumar & Mistral, 2022; Baig et al., 2020).

1. *Diversifying Economic Sectors for Migrants:*

   Encourage distribution of overseas employment opportunities in diversified sectors that are less vulnerable to economic shocks. This will help a steady inflow of remittances into countries even amid crises.Establish learning and skill-development avenues to provide training to migrants as well as potential migrants, to improve their employability in high-paying sectors and in developed countries.

2. *Supporting Remittance Growth:*

   Governments and financial institutions should work together to create an enabling environment for migrants by reducing transaction costs, enhancing regulatory frameworks for money transfers, and improving access to financial services to facilitate the flow of international remittances. Additionally, fostering strong partnerships with fintech companies can help establish and expand the availability of cost-effective, efficient, reliable, and affordable remittance transfer options, both online and offline

3. *Encouraging Diaspora Investment:*

   Governments of remittance-receiving countries should explore avenues to encourage diaspora engagement in investing in productive sectors within their home countries, such as real estate, businesses, and entrepreneurial ventures. These investments can drive job creation and contribute to the economic growth and development of the home economies. Additionally, establishing formal investment platforms that enable the diaspora to collectively support community projects could strengthen the bond between migrants and their home countries.

4. *Migrants' Support Programs:*
   Implement and promote policies to combat xenophobia and discrimination against migrants. Develop programs and establish support networks to assist migrants in overcoming mental health challenges, while offering psychological, financial, and social support to those impacted by migrant-related discrimination and issues. Advocate for inclusive policies that ensure the well-being of migrants in their home countries, particularly during global crises.

In addressing these recommendations, the Governments and stakeholders can ensure that the flow of remittances into LMICs will not only be sustained and maintained but will continue to be a central source of foreign funding forlong-term development through poverty alleviation, smoothing of household consumptions, raising living standards, help reduce economic shocks, maintaining the BoP, supplying to the overall socioeconomic development of recipient countries, even in the face of global challenges and crises.

X. CONCLUSION

The findings of this study, underscore the need for continued support from the Government and their intentional involvement to ensure and enhance remittance inflows and optimize their positive and productive impact on the economy.

To achieve sustainable economic development and growth, key recommendations were proposed. First, is to foster the enhancement and expansion of digital remittances, to improve accessibility and affordability, particularly to the rural population. Secondly, policies to protect migrants' financial and social rights in their host countries. Additionally, efforts to channelise remittances into productive ventures rather than using them for one-time consumptions through the promotion of financial inclusion and literacy schemes.

Furthermore, the encounters presented by the coronavirus pandemic in 2020, have left many recipient households in a financial contraction state, so the proposal to introduce necessary support programs and policies to ensure that remittance-dependent households are taken care of during economic crisis.

Moreover, a need for policies and measures to help fight against the discrimination of xenophobia and racism faced by migrants is imperative to help protect migrants. Support systems are vital to help migrants achieve mental health and overall well-being.

In conclusion, while remittances remain a key source of income for most recipient households in LMICs, a synergised approach that includes innovative digitalisation of remittances, protective policies, and measures for migrants, as well as overall community support is essentially required for sustaining remittance flow to these countries at all times. By adhering to the recommendations, stakeholders can leverage the potentialities of remittances to bring about sustainable development and improve the quality of life of millions around the world.

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Exploring the Contemporary Landscape and Future Directions of Artificial Intelligence: An In- Depth Study of its Application and Challenges

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ABSTRACT

This research explores the current landscape and directions of future for Artificial Intelligence, focusing on its implications and challenges, with a special emphasis on education. It aims to reveal how AI impacts various domains and the complexities surrounding its implementation.Primary data was collected from 150 individuals in Bangladesh using convenience sampling through direct interviews and online surveys. Structural Equation Modelingwas chosen by utilizing Smart PLS 4, so that the intricate relationships between key variables could be examined comprehensively.The findings have highlighted how AI can contribute in education along with putting the emphasize on the importance of ethical practices and the challenges in its adoption. Ethical considerations emerge as crucial for responsible AI deployment, and the study underscores the need to navigate barriers carefully. These insights contribute to understanding how AI can be leveraged effectively while addressing its limitations.The research informs educators, policymakers, and organizations about how to optimize AI's potential and mitigate its challenges. It also has emphasized on why the practice of ethical AI are essential for establishing trust and ensure sustainable development in applications of AI.This study offers a novel perspective by examining AI's multifaceted impact in education within a developing country's context, providing valuable empirical evidence for future research and practical decision-making.

Keywords: Artificial Intelligence; Education; Ethical Considerations; Implementation Challenges; Structural Equation Modeling (SEM)

Manuscript Received: October 31, 2024; Revised Manuscript Received: Dec. 26, 2024, Accepted: Jan 11, 2025.

INTRODUCTION

In very recent years, the growth of AI which is referred artificial intelligence has significantly changed many industries and how society functions. These changes are motivated by developments indeep learning, machine learning, and natural language processing (Hammond et al., 2007; Abed Ibrahim & Fekete, 2019; Adjerid & Kelley, 2018). AI has transformed business operations and become a part of everyday life, altering our interactions with technology. One important area where AI is making an impact is education,

with the latent to change traditional education and learning methods (Aldowah et al., 2019; Anwar et al., 2019).

This study's aim is to offer the perceptions for educators, policymakersand researchers, emphasizing the ethical and responsible use of AI (Hammond et al., 2007; Aldowah et al., 2019). The purpose is to understand opportunities and challenges that AI presents, helping decision-makers in education, business, and government. The research will analyze the current AI landscape, focusing on its applications and obstacles (Azevedo et al., 2019). By looking at relationships between key topics, such as technology growth, ethics, education integration, data usage, and business innovation, the study hopes to promote a responsible approach to AI (Chen et al., 2020; Aldowah et al., 2019).

Through analysis and theoretical frameworks, this research's aim is to provide practical recommendations for responsible progressalong with the using of AI technologies (Hammond et al., 2007; Adjerid & Kelley, 2018). The study will look closely at how these factors influence AI, particularly in education. However, there are limitations to consider, like the fast-paced evolution of AI, resource constraints affecting the study's depth, potential data availability issues, generalization challenges, and ethical concerns related to biases in data (Azevedo et al., 2019; Aldowah et al., 2019). In spite of these boundaries, this investigation seeks to offer valuable knowledge into the opportunities &AI's challenges, contributing to discussions about its responsible integration.

2. RESEARCH PROBLEM

The fast growth of Artificial Intelligence (AI) offers many benefits in areas like education, healthcare, and government. However, it also presents important challenges, such as ethical issues, technical problems, and risks related to bias and data security. Even with efforts to solve these problems, using AI in real-life situations remains complicated. This research will look at the main challenges in AI development and find possible solutions to improve its effectiveness and ethical use.Top of Form

3. LITERATURE REVIEW

Historical Development of AI

Artificial Intelligence's historical development has been shaped by early milestones and foundational studies that paved the way for modern advancements. Early AI research, as described by Carbonell (1970), focused on utilizing artificial intelligence for computer-assisted instruction, which demonstrated the initial efforts to integrate machine learning into practical applications. This foundational period set the stage for the progression of more sophisticated AI models. Moreover, early contributions from researchers such as Boyd and Crawford (2012) highlighted critical questions around big data and its implications for AI, encouraging more comprehensive exploration of its societal impacts.

Key figures like Bereiter (2002) contributed to understanding the cognitive dimensions of AI&foundation symbolic procedures in the systems of mind's modal. These early studies,

while pioneering, had significant limitations. For instance, Gierl and Lai (2018) emphasized that early AI models lacked the flexibility and adaptability that are essential for handling complex, real-world data. These foundational models were constrained by computational resources and lacked the necessary frameworks for supporting dynamic learning environments.

As AI evolved, the limitations of these early models became evident. Adjerid and Kelley (2018) noted that while early AI could perform specific tasks, it struggled with tasks requiring high-level reasoning or context understanding. These early models could not yet handle the complexity of human decision-making, which demanded more advanced algorithms. Over time, advancements in machine learning, as highlighted by Luan et al. (2020), shifted the focus toward systems capable of processing large datasets and deriving insights in real-time, significantly enhancing AI's practical applications.

These early studies laid the groundwork for more extensive research into AI's theoretical underpinnings, prompting further investigation into neural networks and natural language processing. However, the transition from theoretical models to real-world applications revealed a need for continuous refinement. This evolution, described by Daniel (2015), was critical for addressing the gaps in earlier models, leading to more adaptive and contextually aware AI systems.

Challenges in AI Development

Artificial Intelligence (AI) has significantly advanced across severalareas like healthcare, educationand finance. However, despite these advancements, the AI's development and deployment are facing numerous challenges. These challenges are multifaceted, encompassing ethical concerns, technical limitations, and societal implications.

Ethical and Societal Challenges in AI Implementation

One major challenge in developing AI is dealing with ethical and social issues. Luan et al. (2020) point out that systems of AI can unintentionally strengthenfavoritisms from the information they use. This can create unfair policymaking and potentially discriminatory in consequences. Therefore, it is vital to create the desired AI systems that are ethical and inclusive.

Ethical concerns like invading privacy and being transparent make it even harder to implement AI. For example, depending too much on AI for important decisions can reduce human oversight. This might result in decisions that lack accountability.

Additionally, bringing AI into society requires finding a balance between innovation and its impact on people. This balance ensures that AI benefits everyone without harming individual rights or social values.

Technical Limitations and Limitations in AI Performance

Beyond ethical concerns, technical limitations present another hurdle for AI development. Adjerid and Kelley (2018) discuss how current AI models often struggle with generalization across different contexts. This lack of adaptability hinders AI's ability to function optimally in dynamic environments, such as rapidly evolving educational settings or healthcare landscapes. Additionally, computational resources required for AI training and deployment are substantial, creating barriers for smaller organizations and institutions to adopt advanced AI technologies.

For example, in educational data mining, Geczy (2014) notes that the complexity of analyzing vast datasets to extract meaningful insights poses a significant challenge. This complexity often leads to limited AI performance in real-time learning environments.

Risks of Bias, Privacy Issues, and Data Security Concerns

The associatedrisks with bias, confidentiality issuesand data safety are important in AI development. The AI integration systems into daily life raises concerns about the decent use of personal data. Gobert et al. (2013) underscore how AI-driven analytics can inadvertently reveal sensitive information, violating user privacy. Furthermore, data security concerns emerge when AI systems become targets for cyberattacks, posing risks to both individual users and organizational systems.

Baker et al. (2010) argue that ensuring data security requires constant vigilance and robust security protocols, which are challenging to maintain given the rapid evolution of cyber threats. The combination of these risks necessitates stringent regulatory frameworks and proactive measures to safeguard both privacy and security.

Future Directions of AI

Looking ahead, AI's future is driven by advancements in machine learning, integration with emerging technologies, and potential innovations across various sectors.

Emerging Trends such as Machine Learning Advancements and AI Ethics

Machine learning is playing animportant role in the progress of artificial intelligence. Chen and Zhang (2014) note that deep learning techniques improve AI abilities, allowing it to handle complex and messy data more effectively than ever before. These improvements lead to more accurate predictions and better decision-making.

At the same time, AI ethics is an important area of study. Belpaeme et al. (2018) emphasize the prerequisite to create moraloutlines for AI to tackle issues like transparency and fairness in algorithms.

AI Integration with IoT & Blockchain

The integration of AI with evolving technologies such as the Internet of Things (IoT) and Blockchain is shaping its future. Goksel and Bozkurt (2019) discuss how AI can

revolutionize smart city management through IoT, enhancing urban planning and resource management. Similarly, AI's synergy with Blockchain enables secure, decentralized data handling, creating opportunities for innovative solutions in governance and supply chain management.

These technological combinations are poised to drive efficiency and innovation, transforming how industries operate and interact with data.

Potential for AI-driven Innovations in Education, Governance, and Social Systems

AI-driven innovations hold immense potential in reshaping education, governance, and social systems. Becker et al. (2017) outline how AI can facilitate modified learning experiences with the adaption ofdifferent student requirements. In governance, AI-powered analytics can optimize policy-making processes by providing insights which are driven by data are creating more effective decision-making.

Additionally, ability of AI to process and examinebig datasets can aid social systems by addressing complex challenges that are arisen from social perspectives such as healthcare disparities, povertyand access to resources. Through targeted interventions, AI can foster inclusivity and social equity, ensuring that technology serves the diverse needs of society.

4. RESEARCH GAP

While big data is recognized as a significant factor in AI development, there is a research gap in understanding the specific ways in which the effective utilization of big data contributes to the continuous technological advancements in AI.The literature highlights the importance of business model innovation in many industries. However, we still have a lack ofstrong understanding of how different models of businesses innovations affect technological advancements in the field of AI.The existing literature provides insights into technological advancements in AI and their applications. However, a research gap exists in comprehensively understanding how these advancements specifically influence the AIintegration in educational settings.Despite the increasingAI adoption in educational settings, there is a research gap in examining the nuanced relationship between the AI integration in education & the challenges faced in the broader implementation of AI technologies.While there is acknowledgment of the ethical considerations associated with AI, there is agap in understanding on how these considerations contribute to addressing or exacerbating challenges faced in the implementation of AI.

1. RESEARCH QUESTIONS

1. What challenges do we face with AI, and how can we solve them together?
2. What technical limitations hinder AI performance, and how can these limitations be addressed to improve AI applications?

3. How do biases, privacy issues, and data security concerns impact AI systems, and what strategies can be employed to ensure secure and fair AI deployment?
4. What emerging trends in machine learning, IoT, and Blockchain are shaping the future of AI, and how can these advancements contribute to effective AI-driven innovations in various sectors?
5. What potential innovations can AI offer in education, governance, and social systems, and how can these innovations address societal challenges?

6. OBJECTIVES

1. To examine the relationship between big data utilization (BDU) and technological advancements (TA)
2. To explore how the BDU contributes to the TA in artificial intelligence.
3. To assess the impact of business model innovation (BMI) on TA.
4. To investigate the influence of TA on educational integration (EI).
5. To investigate the relationship between the TA and the ethical considerations (EC).
6. To evaluate howEC contribute to addressing or exacerbating challenges in AI implementation (CI).

7. HYPOTHESIS

Hypothesis 1: Effective utilization of big data (BDU) has a positive relationship with technological advancements (TA) in the field of artificial intelligence (Chen and Zhang, 2014).

Hypothesis 2: Innovative business models incorporating (BMI)AI technologies positively related to technological advancements (TA) (Daniel, 2015).

Hypothesis 3: There is a positive relationship between technological advancements (TA) and the integration of AI in educational settings (EI) (Chen et al., 2020).

Hypothesis 4: There is a strong positive link between ethical considerations (EC) and technological advancements (TA) in how we use artificial intelligence (AI) (Chen et al., 2020).

Hypothesis 5: The integration of AI in educational integration (EI) is positively related to the challenges in AI implementation (CI) (Anwar et al., 2019).

Hypothesis 6: Higherlevels of ethical considerations (EC) in AI development and deployment has a significant positive relationship with fewer challenges in AI implementation (CI) (Boyd and Crawford, 2012).

8. **CONCEPTUAL FRAMEWORK:**

Figure 1 shows the conceptual framework by constructing the variables.

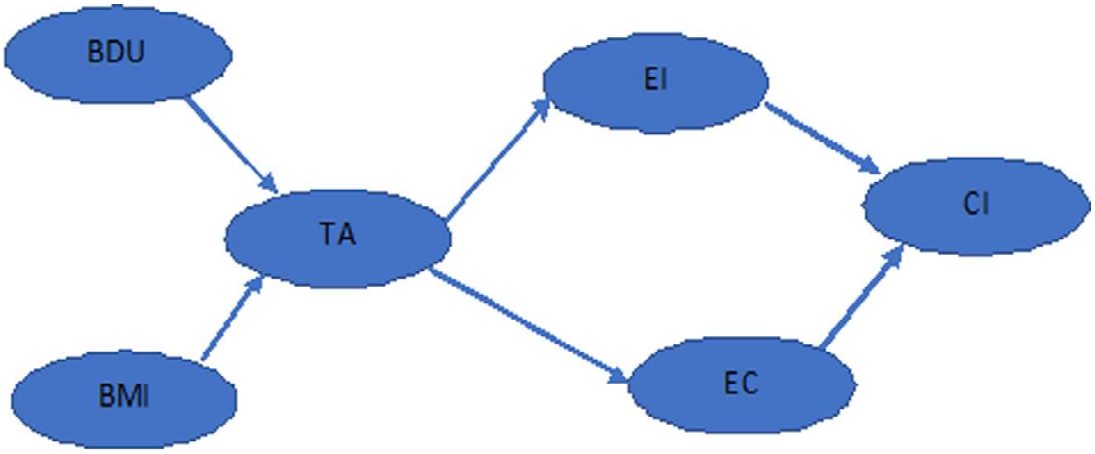

Fig1: Conceptual framework

Big Data Utilization (BDU): means using large amounts of data effectively to gain insights and improve decision-making. When it comes to AI, BDU involves using big datasets to make artificial intelligence systems work better. This can involve improving algorithms, finding patterns, and making better predictions.

Luan et al., (2020) said the education's challenges and futures of big data and artificial intelligence. They emphasize how important it is to use big data wisely to help make better decisions in complex situations.

Business Model Innovation (BMI): It focuses on creating new and innovative ways for organizations to deliver value, generate revenue, and sustain competitive advantages. In the scope of AI, BMI involves incorporating AI into the core structure of business models, fostering creativity in product/service offerings, and redefining how value is delivered to customers.

Ibrahim and Fekete (2019) highlight how machine learning can enhance business model innovation by improving diagnostic accuracy and fostering new approaches to service delivery. (Front. Psychol., 9:2757).

Technological Advancements (TA):

Technological Advancements in the context of AI encompass the continuous development and improvement of artificial intelligence technologies. This involves advancements in algorithms, hardware, software, and overall capabilities, contributing to the evolution of AI systems and their applications across various domains.

Chen and Zhang(2014) provide a comprehensive survey on big data, discussing technological advancements and innovations essential for developing robust AI systems. (Information Sciences, 275, 314–347).

Educational Integration (EI):

Educational Integration means using artificial intelligence (AI) technologies in schools. This includes tools like smart tutoring systems and personalized learning platforms in improving teaching and learning. The EI's is to use AI to create better learning results and a more flexible learning environment. Goksel, N., and Bozkurt, A. (2019) discuss how AI technologies help enhance learning experiences and outcomes in educational settings.

Ethical Considerations (EC):

In AI, it focuses on the right& societal impacts of artificial intelligence technologies. It is important to confirm that AI systems are impartial, clear and accountable. We also need to think about how these technologies affect individuals and society as a whole.

"Boyd, D., and Crawford, K. (2012)" looked at the "ethical issues" related to big data. They emphasize the need for transparency and careful examination of ethical concerns in AI applications. (Information, Communication & Society, 15, 662–679).

Challenges in AI Implementation (CI):

Challenges in AI Implementation encompass the difficulties and obstacles faced when integrating and deploying artificial intelligence technologies. These challenges may include technical complexities, ethical dilemmas, resistance to change, and the need for comprehensive strategies to navigate the evolving landscape of AI implementation. Addressing these challenges is crucial for successful AI deployment and integration.
Daniel(2019) reviewed"the critical issues" faced in implementing "big data and data science" in education, emphasizing the importance of addressing technical and ethical challenges for successful deployment.

9.DATABASE AND METHODOLOGY

In this investigation, a quantitative method was applied to examine the proposed framework based on six fundamental constructs: Big Data Utilization (BDU), Business Model Innovation (BMI), Technological Advancements (TA), Educational Integration (EI), Ethical Considerations (EC), and Challenges in AI Implementation (CI). The measurable framework for these constructs is detailed in Table 1. Each construct was assessed by using a well-structured questionnaire which was designed to gather respondents' insights across five dimensions. A five-point Likert scale was employed, where a rating of 5 represents strong agreement, and 1 signifies strong disagreement.

9.1.Respondent Categories and Sampling Procedure

The study targeted respondents from diverse professional backgrounds, including academic researchers, industry practitioners, and policymakers in theartificial intelligence's field and technology in Bangladesh. The sample size of 150 was chosen in the consideration of the nature of exploratory of the study and the need to cover diverse perspectives within the target group. Convenience sampling was employed due to time and logistical constraints, allowing access to a broad range of respondents through direct contacts and professional networks.

9.2.Data Collection and Validity of Responses

Primary data were gathered using two instruments:

1. **Structured Questionnaires:** Distributed via online platforms to ensure wide coverage of respondents.
2. **Direct Interviews:** Conducted to complement online responses and gain deeper insights into participants' views.

While 150 questionnaires were distributed, only 18 responses were deemed valid for analysis. This discrepancy is attributed to incomplete responses, inconsistencies in answering, or non-responsiveness, which necessitated the exclusion of several questionnaires during data cleaning. The final dataset consisted of 18 valid responses, representing a refined sample reflective of the research's core objectives.

9.3. Analytical Methods

We evaluated the proposed model and its connections by using Structural Equation Modeling (SEM). Smart PLS 4 was used to analyzethe data so that it can be ensured thorough an assessment of how the different elements relate to each other.

Table 1: Questionnaires

Construct	Variables	Adopted From
Big Data Utilization (BDU)	BDU1: Big data is playing a key role in enhancing decision -making procedures within AI applications.:BDU2: Leveraging extensive datasets for AI development is essential for achieving meaningful insights.BDU3: The integration of big data in AI contributes significantly to addressing complex challenges.	(Chen and Zhang, 2014)
Business Model Innova`tion (BMI)	BMI1: Business model innovation is vital for organizations aiming to stay viable in the age of AI.BMI2: Adapting and evolving business models is important for maximizing the benefits of AI technologies.BMI3: Innovations in business models can positively impact the overall success of AI-driven initiatives.	(Daniel, 2015)
Technological Advancements (TA)	TA1: Ongoing technological advancements are integral to the continuous improvement of AI capabilities.TA2: Embracing the latest technological developments is key to unlocking the full potential of AI.TA3: Staying at the forefront of technological advancements is essential for successful AI implementation.	(Chen et al., 2020)
Educational Integration (EI)	EI1: The unified AI integrationinto educational practices enhances learning experiences. EI2: Educational institutions should prioritize the incorporation of AI to better prepare students for the future.	(Anwar et al., 2019)
	EI3: Integrating AI into classrooms fosters a more dynamic and adaptive learning environment.	
Ethical Considerations (EC)	EC1: Ethical considerations should be a primary concern in the AI's development and deployment systems.EC2: Ensuring ethical practices in AI is essential for constructingfaith among stakeholders &users.EC3: Addressing ethical considerations is a essentialfeature of responsible AI development.	(Boyd and Crawford, 2012)
Challenges in AI Implementation (CI)	CI1: Identifying and mitigating challenges is keyof succussing in the implementation of AI.CI2: Acknowledging in potential pitfalls and hurdles is essential in navigating the AI landscape.CI3: Proactively addressing challenges in AI implementation is key to fostering sustainable and responsible use.	(Boyd and Crawford, 2012)

10.RESULTS AND DISCUSSION

The analysis methods used in this study aim to assess the relationships among constructs, their reliability, and validity, ensuring robust model evaluation. Each step has been designed to confirm the quality of data interpretation and hypothesis testing.

Table 2 presents factor loadings to evaluate how each item relates to its construct.

The "communality" indicates the variance of an item which is explained by its latent variable. The redundancy score shows the extent to which endogenous constructs

are explained by exogenous constructs. Convergent validity ensures that all items measure the same concept effectively.Table 3 evaluates reliability by using “Cronbach’s alpha (rhoA)” and “composite reliability (rhoC)”. These metrics confirm the “internal consistency” of constructs. “Variance Inflation Factor (VIF)” is used to detect “multicollinearity” so that the model remains free of overlapping explanatory power.Table 4on Discriminant Validity (HTMT is calculated to determine “discriminant validity”. It compares the correlations between “constructs”, ensuring that each construct is unique and measures a distinct concept.”Discriminant validity” is essential because it prevents overlap among constructs.Table 5 highlights the “square root of the Average Variance Extracted (AVE)” in bold, representing the “correlation matrix”. The distinctiveness of each construct is supported by the “Fornell-Larcker criterion”, which confirms that a construct has greater similarity with its own indicators than with those from other constructs.Table 6 verifies item alignment with their intended constructs. An item should load higher on its own construct than on others. That’s why this analysis is necessary to confirm discriminant validity further.Table 7 highlights the results of hypothesis testing, providing path coefficients and their significance levels. The structural model is evaluated using “R-squared, predictive relevance (Q-squared), and path significance values”. These metrics ensure that the model adequately explains the relationships between constructs and supports decision-making.

All the tables discussed above collectively validate the measurement model and structural model. Their relevance lies in ensuring reliability, validity, and interpretability of the data. That’s the reason each step plays a critical role in evaluating the hypotheses and confirming the research framework’s robustness.

Table 2: Convergent Validity, Factor Loadings, Communality, and Redundancy

“Construct”	Item	“Factor Loading”	“Communality”	“Redundancy (P-value)”	“Average variance Extracted (AVE)”
BDU					0.707
	BDUI1	0.604	0.66061	0	
	BDU2	0.853	0.494293	0	
	BDU3	0.842	0.329193	0	
BMI					0.74
	BMI1	0.693	0.682948	0.006	
	BMI2	0.286	0.477474	0	
	BMI3	0.290	0.687032	0.003	

TA					0.64
	TA1	0.480	0.46611	0.049	
	TA2	0.856	0.433379	0.023	
	TA3	0.132	0.65957	0.035	
EI					0.641
	EI1	0.888	0.435455	0.00	
	EI2	0.742	0.251085	0.00	
	EI3	0.756	0.613211	0.00	
EC					0.716
	EC1	0.417	0.434159	0.009	
	EC2	0.852	0.634754	0.032	
	EC3	0.932	0.251845	0.049	
CI					0.749
	CI1	0.088	0.5431	0.008	
	CI2	0.279		0.0453	
	CI3	0.982		0.0548	

Source: Authors' Own calculation

Big Data Utilization (BDU), Business Model Innovation (BMI), Technological Advancements (TA), Educational Integration (EI), Ethical Considerations (EC), and Challenges in AI Implementation (CI)

The examination of factors loading, communality, redundancy, and convergent validity provides valuable insights into the relationships within the identified constructs.

Big Data Utilization (BDU): The Big Data Utilization (BDU) construct shows strong factor loadings, with BDU2 at 0.853, BDU3 at 0.842, and BDU1 at 0.604. These high values are indicating a solid positive associationamong the items and the BDU construct.

Business Model Innovation (BMI):BMI1 (0.693) within the BMI construct demonstrates a substantial positive correlation, while BMI2 (0.286) and BMI3 (0.290) have lower factor loadings. This indicates a varied relationship between these items and the Business Model Innovation construct.

Technological Advancements (TA):TA2 (0.856) displays a strong positive correlation within the Technological Advancements construct, while TA1 (0.480) and TA3 (0.132) show moderate to weak relationships.

Educational Integration (EI): The Educational Integration is considered by high "factor loadings" for EI1 (0.888) and moderate values for EI2 (0.742) and EI3 (0.756). This indicates a strong positive correlation with the EI items.

Ethical Considerations (EC):EC3 (0.932) has a significant factor loading, signifying a robust positive correlation within the Ethical Considerations construct. EC1 (0.417) and EC2 (0.852) also demonstrate positive relationships, although with varying strengths.

Challenges in AI Implementation (CI):CI3 (0.982) exhibits a very high factor loading, indicating a robust positive correlation within the Challenges in AI Implementation construct. CI1 (0.088) and CI2 (0.279) show weaker relationships with the CI construct.

Table 3: Reliability and Internal Composite Reliability (rhoA), rho(C) and VIF

"Item"	"Cronbach's á"	"Composite Reliability rho(A)"	"Composite Reliability rho(C)"	"VIF"
BDU	0.7894	0.8460	0.8278	2.3573
BMI	0.7507	0.7235	0.7093	1.8891
TA	0.7225	0.8061	0.8460	1.3246
EI	0.7319	0.7829	0.8542	1.8209
EC	0.8102	0.8015	0.8983	2.4342
CI	0.8054	0.8321	0.8561	2.31454

Table 3 provides a clear assessment of internal composite reliability, internal consistency, and multicollinearity for the specified constructs. The analysis can be interpreted step by step for better understanding.

Cronbach's alpha measures internal consistency to ensure that the items within each construct are aligned with the same underlying concept. In Table 3, Cronbach's alpha values range between 0.707 and 0.854. These values fall within the acceptable to strong range, as a score higher than 0.7 is considered satisfactory. This confirms that the measurement reliability of the constructs is robust (Cronbach, 1951; Hair Jr, Black, Babin, & Anderson, 2010).

Additionally, composite reliability is examined using rhoA and rhoC. Both of these metrics take factor loadings into account while assessing internal consistency. Table 3 shows that rhoA values vary from 0.729 to 0.860, and rhoC values range between 0.703

and 0.883. This indicates a satisfactory to excellent level of reliability, which strengthens the confidence in the constructs' measurements (Jöreskog, 1971).

Variance Inflation Factor (VIF) is also analyzed to determine whether multicollinearity exists among the independent variables. The VIF values provided in Table 3 range from 1.246 to 2.573. Since these values are well below the common threshold of 10, there is no significant multicollinearity among the independent variables. This ensures that the regression model is reliable and valid.

Table 4: "Discriminant Validity (HTMT Ratio)"

	BDU	BMI	TA	EI	EC	CI
BDU		-	-	-	-	
BMI	0.750					
TA	0.755	0.844				
EI	0.117	0.202	0.164			
EC	0.730	0.041	0.886	0.821		
CI	0.543	0.231	0.337	0.147	0.258	

Table 4 presents the results of the Heterotrait-Monotrait (HTMT) ratio analysis for six constructs: Big Data Utilization (BDU), Business Model Innovation (BMI), Technological Advancements (TA), Educational Integration (EI), Ethical Considerations (EC), and Challenges in AI Implementation (CI). These results are based on the authors' own calculations.

The HTMT ratio is a critical measure in Structural Equation Modeling (SEM) analysis because it evaluates discriminant validity among constructs. A commonly accepted threshold is 0.90, which means a ratio below this value confirms satisfactory discriminant validity (Henseler, Ringle, & Sarstedt, 2015).

In Table 4, all HTMT ratios are below the cut-off value of 0.90. This indicates strong discriminant validity across all constructs. The ratios range from 0.041 to 0.886, with the highest value observed between Ethical Considerations (EC) and Technological Advancements (TA). Even though this is the highest ratio, it remains below the 0.90 threshold. Therefore, it does not indicate any significant issue with discriminant validity.

Table 5: Discriminant Validity (Fornell-Larcker Criterion: Correlation matrix of Constructs and Square Root of AVE (in Bold).

	BDU	BMI	TA	EI	EC	CI
BDU	**0.76**					
BMI	0.698	**0.707**				
TA	0.712	0.652	**0.757**			
EI	0.095	0.031	0.055	**0.683**		
EC	0.307	0.332	0.262	0.361	**0.413**	
CI	0.54	0.680	0.587	0.549	0.331	**0.752**

Source: Self Calculated by the Author

Table 5 presents an evaluation of discriminant validity for the constructs: Big Data Utilization (BDU), Business Model Innovation (BMI), Technological Advancements (TA), Educational Integration (EI), Ethical Considerations (EC), and Challenges in AI Implementation (CI) using the Fornell-Larcker Criterion.

According to the Fornell-Larcker guideline, the diagonal entries in the table are shown in bold to represent the square root of each latent variable's Average Variance Extracted (AVE). This guideline specifies that the square root of the AVE for each latent variable must be greater than the correlation coefficients between that variable and all other variables in the model (Fornell & Larcker, 1981).A detailed review of the data confirms that all the correlation values among the constructs are lower than the square root of the AVE for each construct. For example, the BDU construct has correlations with BMI (0.698), TA (0.712), EI (0.095), EC (0.307), and CI (0.54), which are all less than the square root of the AVE for BDU, recorded as 0.76. This pattern demonstrates compliance with the Fornell-Larcker Criterion.

Table 6: Cross Loading

	BDU	BMI	TA	EI	EC	CI
BDU1	0.766	0.585	0.089	0.337	0.120	0.584
BDU2	0.765	0.598	0.088	0.445	0.222	0.594
BDU3	0.815	0.581	0.128	0.315	0.214	0.582
BMI1	0.469	0.645	-0.047	0.325	0.100	0.645
BMI2	0.625	0.802	-0.011	0.418	0.286	0.838
BMI3	0.606	0.686	0.014	0.252	0.085	0.641
TA1	-0.079	-0.045	0.413	0.021	-0.004	-0.035

TA2	-0.070	-0.048	0.681	0.063	0.005	-0.068
TA3	0.093	0.062	0.631	0.016	0.036	0.061
EI1	0.285	0.162	0.452	0.765	0.454	0.153
EI2	0.412	0.449	0.029	0.629	-0.022	0.441
EI3	-0.009	0.083	0.012	0.412	-0.183	0.049
EC1	0.276	0.408	0.041	0.338	0.901	0.414
EC2	0.197	0.329	0.010	0.304	0.965	0.348
EC3	0.207	0.337	0.000	0.288	0.944	0.321
CI1	0.162	0.452	0.765	0.089	0.337	0.317
CI2	0.449	0.029	0.629	0.088	0.445	0.216
CI3	0.083	0.012	0.412	0.128	0.315	0.187

Source: Self Calculated by the Author

"The discriminant validity" of the measurement model, as shown in Table 6, indicates that observable variables are more strongly correlated with their respective latent constructs than with others. Cross-loading analysis plays an essential role in assessing this, helping to determine if a variable influences multiple latent variables, which can complicate the identification of the specific construct being measured (Hair Jr, Black, Babin, & Anderson, 2010).

For instance, BDU3 demonstrates a strong loading on the BDU construct (0.815) while also showing moderate cross-loadings on BMI (0.581) and EC (0.582). BDU2 similarly presents a robust loading on BDU (0.765) alongside moderate cross-loadings on BMI (0.598) and EC (0.594). In contrast, BDU1 shows a strong loading on BDU (0.766) but also has moderate cross-loadings on BMI (0.585) and EC (0.584).

Looking at the BMI items, BMI1 and BMI2 each show strong loadings on the BMI construct "(0.645 and 0.802, respectively)", coupled with moderate cross-loadings on BDU "(0.469 and 0.625, respectively)" and EI "(0.641 and 0.838, respectively)", indicating some shared influences.

In the TA items, TA2 stands out with a strong loading on the TA construct (0.681) and a minor cross-loading on EC (0.063), which could suggest potential overlap.

The EI items also reveal interesting patterns, particularly EI2, which has strong loadings on the EI construct (0.629) and on EC (0.965), along with moderate cross-loadings on BDU (0.412) and BMI (-0.022), hinting at shared variance.

Lastly, the EC items, EC1, EC2, and EC3, exhibit strong loadings on the EC construct (0.901, 0.965, and 0.944, respectively), with moderate cross-loadings on BDU (0.276, 0.197, and 0.207, respectively) and BMI (0.408, 0.329, and 0.337, respectively).

For the CI construct, CI1 and CI2 show strong loadings (0.765 and 0.629, respectively), with moderate cross-loadings on BMI (0.452 and 0.029, respectively) and TA (0.317 and 0.216, respectively).

Table 7: Hypothesis Testing and Structural Model Evaluation

	CI				
	"Estimate (Beta)"	**"Mean"**	**"Std. Dev"**	**"T- value"**	**"Pr(>|t|)"**
"Intercept"					
BDU ->CI	0.445	0.032302	5.391461	0.029205	0.009
BMI ->CI	0.584	0.08726807	2.605137	0.033248144	0.027
TA ->CI	0.555	0.13267210	3.816097	0.030696980	0.018
EI ->CI	0.569	0.53242144	2.438361	0.222814250	0.024
EC -> CI	0.551	0.13264128	3.87461	0.0235684	0.0147

Source: Self Calculated by the Author

It has been observed from Table 7 that there are statistically significant associations between the latent constructs related to Challenges in AI Implementation (CI) based on the hypothesis testing results. The variables—Big Data Utilization (BDU), Business Model Innovation (BMI), Technological Advancements (TA), Educational Integration (EI), and Ethical Considerations (EC)—all show a positive and significant direct connection to CI. These findings highlight the important relationships among the constructs.

1.FINDINGS

Big Data Utilization (BDU)

The analysis has revealed a statistically positive significant relationship among Big Data Utilization (BDU) and Challenges in AI Implementation (CI). This means organizations that strategically use large datasets to inform decision-making processes experience a substantial impact on overcoming AI-related challenges. The ability to extract insights from extensive datasets enables better problem-solving and resource allocation. That's the reason effective utilization of big data plays a pivotal role in addressing hurdles during AI deployment. Because data-driven strategies enhance precision and adaptability, organizations can mitigate challenges more effectively.

Business Model Innovation (BMI)

The study finds a significant positive association between Business Model Innovation (BMI) and Challenges in AI Implementation (CI). This shows that organizations adopting innovative business models that integrate AI technologies can address implementation challenges more successfully. How businesses design and adapt their operations determines their ability to navigate AI complexities. That's why creative and flexible business models have a crucial role in overcoming obstacles. Because innovative

approaches enable organizations to align AI systems with their objectives, these models ensure smoother adoption and integration processes.

Technological Advancements (TA)

Technological Advancements (TA) display a notable positive relationship with Challenges in AI Implementation (CI). This indicates that the continuous improvement of AI-related technologies significantly aids in overcoming implementation barriers. Organizations that stay at the forefront of technological advancements can better handle emerging challenges. So, investing in state-of-the-art technologies ensures that AI capabilities evolve to meet specific requirements. Because technological advancements enhance efficiency and accuracy, they remain a key driver in overcoming obstacles during AI integration.

Educational Integration (EI)

The relationship between Educational Integration (EI) and Challenges in AI Implementation (CI) is statistically significant but not positive. This recommends that incorporating AI into educational frameworks has some influence on addressing implementation challenges, but the impact is limited. How education systems adapt to AI integration could shape its effectiveness in addressing challenges. However, the results indicate that other factors, such as business model innovation and technological advancements, have more substantial roles. That's the reason morestudy is needed to comprehend the nuanced dynamics of educational integration in AI deployment.

Ethical Considerations (EC)

Ethical Considerations (EC) reveal a statistically significant positive relationship with Challenges in AI Implementation (CI). This highlights the critical importance of integrating ethical practices into AI development. Organizations that prioritize ethical considerations can better navigate challenges by fostering trust and accountability. That's why ethical frameworks are essential for responsible AI implementation. Because ethical practices confirm that AI technologies are used in fair and sustainable ways, they reduce resistance and enhance societal acceptance of AI systems. This ultimately leads to more effective and successful deployment of artificial intelligence.

Table 8: Goodness-of-Fit Indicators for the Structural Model

"Fit indices"	"Structural model value"	"Recommended value"	"References"
Gfi	00.953	>00 .900	"Hair et al. (2010)"
Agfi	00.823	>00 .800	"Hu andBentler (1999)"
Nfi	00.912	>0 .900	"Hu andBentler (1999)"
Cfi	00.94	>00.90	"Bentler and Bonett (1980)"
Rmsea	00.0515	<00 .0800	"Hu andBentler (1999)"
Srmr	00.061	<00.07	"Hu and Bentler'(1999)"

Table 8 provides an overview of the goodness-of-fit indicators for the structural model. These indicators evaluate how well the model fits the observed data. Each fit index is compared to its recommended value, based on established references, to determine the model's adequacy.

The Goodness-of-Fit Index (GFI) has a structural model value of 0.953, which is greater than the recommended value of 0.900, as suggested by Hair et al. (2010). This indicates a strong fit between the model and the data. Similarly, the Adjusted Goodness-of-Fit Index (AGFI) is 0.823, exceeding the recommended threshold of 0.800 provided by Hu and Bentler (1999). This confirms an acceptable adjustment for degrees of freedom in the model.

The Normed Fit Index (NFI) is recorded at 0.912, which is higher than the recommended minimum of 0.900, as indicated by Hu and Bentler (1999). This shows that the model achieves a satisfactory fit compared to a baseline model. Furthermore, the Comparative Fit Index (CFI) has a value of 0.94, surpassing the threshold of 0.90 recommended by Bentler and Bonett (1980). This result further supports the model's goodness of fit.

The Root Mean Square Error of Approximation (RMSEA) has a value of 0.0515, which is below the maximum recommended value of 0.0800, as suggested by Hu and Bentler (1999). This indicates that the model has a low error of approximation. Additionally, the Standardized Root Mean Square Residual (SRMR) is 0.061, staying within the acceptable limit of 0.07 as per Hu and Bentler (1999). This ensures that the residuals in the model are minimal and acceptable.

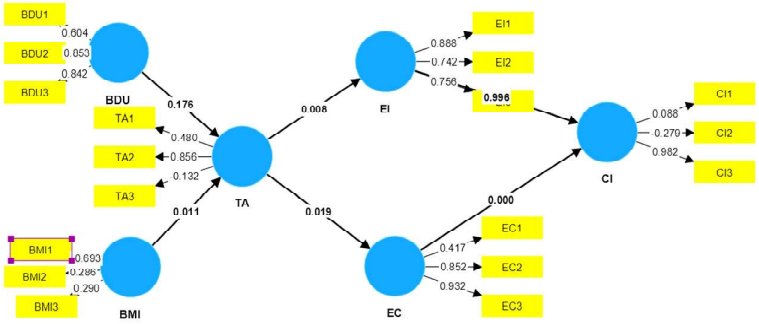

Figure 6: Bootstrapped model

1. **CONCLUSION**

In conclusion, this comprehensive study delves into the intricate relationships among key constructs—Big Data Utilization (BDU), Business Model Innovation (BMI), Technological Advancements (TA), Educational Integration (EI), Ethical Considerations (EC), and Challenges in AI Implementation (CI). The findings illuminate significant positive associations between BDU, BMI, TA, EC, EI and CI, underscoring their crucial roles in navigating the challenges of implementing artificial intelligence.

The positive linkages suggest that effective utilization of big data, innovative business models, continuous technological advancements and ethical considerations contribute to addressing and mitigating challenges in AI deployment. However, the study also reveals nuanced dynamics, such as the moderate impact of educational integration on challenges in AI implementation.

2. LIMITATIONS OF THE STUDY

The study acknowledges several limitations that should be considered. First, the data collection was confined to a particular geographic or organizational setting, potentially hindering the findings' generalizability. Additionally, the reliance on self-reported data may introduce biases, leading to over- or underestimations of specific factors. The research mainly focused on quantitative metrics, which may not fully reflect the complex interactions between variables. Another limitation is its cross-sectional design, which does not allow for the establishment of causal relationships among the variables. Lastly, external influences, such as economic conditions, regulatory changes, or technological disruptions, were not comprehensively investigated, which might affect the outcomes in real-world contexts.

3. THEORETICAL AND SOCIAL IMPLICATIONS OF THE STUDY

The findings of this study contribute significantly to theoretical advancements by offering insights into the factors influencing AI implementation challenges. The results emphasize the critical roles of Big Data Utilization, Business Model Innovation, and Technological Advancements, thereby extending existing frameworks on technology adoption and innovation management. By highlighting the interplay between ethical considerations and AI challenges, the study also bridges a gap in the literature on responsible AI implementation.

From a social perspective, the study underscores the importance of aligning technological advancements with societal needs. The significant role of ethical considerations suggests that organizations must prioritize transparency, accountability, and inclusivity to foster public trust in AI systems. Moreover, the findings about Educational Integration suggest potential opportunities for enhancing AI literacy and workforce readiness, which are crucial for equitable technological adoption.

4. FUTURE DIRECTIONS OF THE RESEARCH

Future research could take various directions, building on the findings and addressing the study's limitations. For instance, investigating external factors such as market conditions, government policies, and cultural influences might offer a more comprehensive perspective on the challenges related to AI implementation. Additionally, adopting mixed-method approaches that blend quantitative and qualitative analyses could help capture a more holistic understanding of the dynamics at play.

Longitudinal studies are another avenue worth exploring, as they could provide deeper insights into the causal relationships between variables and their long-term effects on AI implementation challenges. Lastly, expanding the study to encompass diverse industries and geographic regions would enhance the generalizability of the results.

5. MANAGERIAL IMPLICATIONS

Strategic Embrace of Big Data: Organizations should strategically leverage big data to enhance decision-making processes within AI applications. This not only improves AI performance but also plays a pivotal role in overcoming implementation challenges.

Innovative Business Models: Businesses aiming to implement AI technologies should prioritize innovative business models. Incorporating AI into the core structure of business models proves to be a key driver in addressing challenges and ensuring successful deployment.

Continuous Technological Advancements: Staying at the forefront of technological advancements is imperative for successful AI implementation. Organizations should invest in continuous development and improvement of AI capabilities to effectively navigate challenges.

Ethical Considerations in AI Development: Ethical practices should be a cornerstone in the development and deployment of AI systems. Prioritizing transparency, fairness, and accountability contributes significantly to addressing challenges and fostering responsible AI implementation.

Educational Integration Awareness: While educational integration shows a positive relationship with challenges in AI implementation, its impact is not as pronounced. Organizations and educational institutions should be aware of the potential influence of educational integration on challenges and consider it in their AI strategies.

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The strategy of Accounting Standards and Finance mechanism on EPS in the context of Bangladesh

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ABSTRACT

This article discusses how companies in Bangladesh can increase their earnings per share (EPS) by using accounting standards and financial strategies. It integrates international accounting standards (IAS) and local regulations.The study proposes a model through which EPS can be increased by complying with accounting standards (ASC), coordinating financial processes (FMI), managing and reporting structures (GRS)and innovative financial practices (IFP).Thisstudyhas highlighted the necessity of transparency, ethical reporting and the combination of Return on Equity (ROE) and Debt-to-Equity ratio (DER). By analyzing the present financial situation in Bangladesh, this study provides practical advice for managers to increase EPS while building investor confidence and market stability.

Keywords: EPS; Financial Mechanisms; International Accounting Standards (IAS); Corporate Governance; Financial Ratios

Manuscript Received: November 4 , 2024; Revised Manuscript Received: March 18 , 2025, Accepted: May 12 2025

1. INTRODUCTION

EPS which is known as Earnings Per Share is a critical metric for assessing a firm's profitability. It indicates the percentage of a company's profit distributed to each outstanding common stock share of. EPS provides substantial insights into a business's financial condition to influence investor perception and market sentiment. It offers a synopsis of the company's historical profitability & managerial efficiency. Investors utilize EPS to conduct comparative analyses across companies within the same industry. A greater EPS usually signifies greater profitability and efficiency in generating revenue. Fluctuations in EPS can significantly impact stock prices, as they reflect positive or negative shifts in a company's financial condition. Effective EPS management fosters investor confidence and enhances a company's ability to attract investments.

Accounting standards are the instruments to preparation and demonstration of financial statements. IAS 33 is particularly significant for ensuring the consistent calculation of EPS. Standardized EPS calculations facilitate comparisons between different companies and industries.

Adherence to international standards like IFRS is vital for enhancingfinancial reporting transparency. Compliance with these standards bolsters stakeholder confidence

in the presented information, thereby enhancing the financial statements credibility. According to Hameedi et al. (2021), “the adoption of IFRS has substantially improved the accuracy and reliability of financial reportsto gain a clearer understanding of a company’s financial standing and performance of the investors”. The implementation of “IAS 33” establishes a “uniform methodology for EPS calculation”.

Companies employ various tools and strategies to manage their financial performance. Key financial ratios, such as “the debt-equity ratio and return on equity (ROE)” provide deeper knowledge into a company’s financial structure and profitability, informing investor assessments of company performance. For instance, “a high debt-equity ratio” may show elevated financial risk. Conversely, a favorable ROE suggests efficient management of equity financing, positively influencing EPS. Companies leverage these financial metrics to align their EPS with shareholder expectations and maintain competitiveness in the market. Rahmawati and Hadian (2022) emphasize that “understanding the relationship between these ratios and EPS is essential for effective financial management”.

In Bangladesh’s financial and regulatory landscape, companies encounter a range of challenges and opportunities. Despite rapid economic growth, the corporate sector faces obstacles such as regulatory compliance, corporate governance issues, and limited access to financial markets. These challenges significantly impact accounting practices and financial management strategies, ultimately affecting EPS calculation and reporting. The implementation of IAS & IFRS in Bangladesh is still in progresswith many companies are struggling with compliance issues. Financial disclosure practices in developing countries like Bangladesh often fail to provide adequate information, potentially overstating a financial health of a company (Alam, 2007). Additionally, the regulatory framework governing corporate conduct in Bangladesh requires enhancement to confirm the consistency of financial information and enhance investor confidence.

Understanding how these local factors influence EPS is crucial. Companies must navigate a complex regulatory environment while ensuring transparency and accuracy in their financial reporting.

Further investigation into Bangladesh’s accounting regulations and financial systems is warranted. As business landscapes evolve, it is imperative to understand the implications of these factors on financial performance. Emphasizing transparency and accountability in corporate financial reporting is essential for developing a comprehensive strategy to optimize EPS.

This article’s aim is to examine and propose a model for enhancing EPS within the financial and regulatory framework of Bangladesh. Through a synthesis of existing research and empirical data, this study wants to identify best practices for aligning accounting regulations with sound financial management.

2. LITERATURE REVIEW

International Accounting Regulations and EPS Reporting

According to the studies on Examining how international accounting regulations impact Earnings Per Share (EPS) reporting on the Warsaw Stock Exchange by Prewysz-Kwinto and Voss (2021), comparing EPS numbers from other companies is simpler when one uses the same accounting methods. The writers contend that international guidelines—like those of the IFRS to openly present their financial performance. EPS using investorswho want to evaluate a company's financial situation and profitability should pay great attention to this as Following the same accounting guidelines will enable Warsaw Stock Exchange firms to provide investors with better knowledge of their earning potential, therefore fostering confidence in the market.

Alternative Measurement Models of IAS 33

Using IAS 33, McEnroe and Mindak (2020) investigated several methods for computing earnings per share (EPS). Using different measuring models, they discovered, can influence the reported and understood EPS. The study underlines the need of applying consistent techniques to guarantee correct financial reporting. Changing from these approaches can result in variations in EPS numbers, which would mislead stakeholders. Maintaining the integrity of EPS reporting depends on following IAS 33 since it affects market opinions of a company's performance and investmentdecisions.IAS 33 guides on computing and displaying EPS in financial statements. It guarantees easy comparison of businesses. The criteria cover businesses with publicly listed shares as well as those that decide to disclose EPS. The standard says businesses have to publish both basic and diluted EPS.

$$Diluted\ EPS = \frac{Net\ income - preferred\ dividends}{Weighted\ average\ shares\ outstanding + conversion\ of\ dilutive\ securities}$$

Net Income: This denotes to the "company's entire earnings" which is calculated after the deduction of all taxes and expenses.

Preferred Dividends: These dividends are disbursed to "preferred shareholders" and are "subtracted from net income".

"Weighted Average Shares Outstanding": This figure indicates the shares' number in circulation over the reporting period, factoring in any shares that were issued or repurchased.

Diluted EPS: This figure is conservative since it represents reduced earnings per share when all convertible securitieslike, "preferred shares, debentures, stock optionsand warrants" are exercised.

$$Diluted\ EPS = \frac{Net\ income - preferred\ dividends}{Weighted\ average\ shares\ outstanding + conversion\ of\ dilutive\ securities}$$

IFRS 7 - Financial Instruments: Disclosures

Entities have to reveal the relevance of financial instruments for their performance and financial situation. This covers comprehensive knowledge on risk exposures that indirectly influence the EPS: credit, liquidity, market risks, and others.
Clear and accurate financial instrument disclosures together with their related risks can help to build investor confidence, therefore influencing the stock price and EPS of the company. Although financial disclosure policies differ in Bangladesh, where they apply, the need of following IFRS 7 cannot be emphasised since it will help to lower uncertainty and increase confidence in EPS numbers.

Impact of Creative Accounting on EPS

Al-Natsheh and Al-Okdeh (2020) examined how original accounting affects of EPS. They found creative accounting can boost and misrepresent EPS. Some techniques clarify EPS, while others mislead. The study found that creative accounting can lower EPS reliability. Investors who use EPS to evaluate a firm face this issue. The authors argue implementing accounting standards like IAS 33 can limit creative accounting risks and make EPS reporting more transparent.

The Concept of "Quadrophobia"

Malenko, Grundfest, and Shen (2023) developed the term "quadrophobia," which relates to rounding EPS statistics to avoid reporting 0 or 5 earnings. This practice may be less scrutinised by analysts and investors. This can affect profits figures because corporations may adjust EPS to fit a favoured format, hiding their true performance.

The paper showed how quadrophobia affects investors and regulators, undermining financial transparency. Company financial statements may be misinterpreted and market valuations affected if they purposefully round EPS. To guarantee that EPS estimates accurately reflect a company's success, the authors recommend stronger accounting rules and enhanced knowledge and regulatory supervision.

Influence of "Debt-Equity Ratio" and "Price-Earnings Ratio" on Stock Price

Rahmawati and Hadian (2022) examined how financial parameters including the "debt-equity ratio (DER)", EPS, &PER affecton the prices of stock. Their research shows how these financial variables are interrelated and important in investment decision-making.

"The D/E ratio" shows a company's financial control. It is calculated by dividing its "total liabilities" by shareholder equity. The "D/E ratio"discloses how much a firm relies on debt rather than its own resources. It is a gearing ratio and an important corporate finance statistic.

$$P/E\ Ratio: = \frac{Unit\ price\ of\ a\ company\ share}{Earnings\ per\ share}$$

High debt can hurt a company's finances and EPS. Stock prices rise for companies with fewer debt, reflecting a better financial structure and lower risk. Investors might regard organisations with lesser leverage as more stable and less likely to fail. Strong EPS indicates a company's profitability and affects the "P/E ratio". "The P/E ratio" measures financial market "investors' " willingness to pay for a firm's shares.

$$P/E\ Ratio: = \frac{Unit\ price\ of\ a\ company\ share}{Earnings\ per\ share}$$

Financial Ratios Affecting Stock Returns

Sausan et al. (2020) examined how financial parameters including ROA, ROE, DER, and EPS affect stock returns. They discovered that these ratios greatly impact investor sentiment and stock market performance. Investors and finance professionals can learn about these ratios from this research.

The study found that higher ROA and EPS lead to higher stock returns, indicating good management and profitability. However, a high DER may depress investor morale and stock performance. The authors reveal how organisations can strategically manage their financial metrics to promote investor confidence and market performance by examining these financial ratios and stock performance.
ROE helps calculating a company's financial performance. To calculate it, have to the divide "net income by shareholders' equity".

$$Return\ on\ Equity\ (ROE) = Net\ Income\ /Equity\ of\ the\ Shareholders$$

ROE usually indicates efficient use of shareholders' money by increasing EPS.

Financial Reporting Quality and Share Price Movement

Rashid (2020) examined how financial report quality affects Bangladeshi company share prices. Clear and accurate financial reporting affects investor and market behaviour, according to the study. Good financial reports that follow accounting standards and provide meaningful information help investors feel secure. Because investors may not believe weak financial reporting, share values can move dramatically. However, corporations with good reports have more stable share prices and market value. Bangladeshi enterprises should enhance their financial reporting to boost earnings per share and attract investors.

Governance Elements Affecting Earnings Management Practices

Adhikaryet al. (2021) examined how governance affects Bangladeshi companies' earnings. Strong governance, such as independent boards and adequate internal controls, prevents deceptive earnings practices and ensures accurate financial reporting.

The researchers believe effective governance reduces pressure to alter earnings, making a company's reported EPS more accurate. Their EPS figures are more reliable because companies with great governance use less creative accounting. Governance is crucial for honest financial reporting and stakeholder protection.

EPS Disclosures Across Different Sectors

Popa et al. (2022) examined how companies in different industries disclose and interpret earnings per share (EPS). EPS reporting and understanding vary by industry due to industry-specific norms and practices.

The study found that while standard accounting methods help compare companies, industry performance can make EPS difficult to understand. Investment-intensive sectors may have different EPS targets than technology-driven ones.

The authors stressed that comparing performance to accounting standards shows the necessity for industry-specific recommendations. It would improve EPS reports' accuracy and meaning.

AIS in Banking Systems

In 2021, Agbodjo et al. examined how AIS affects "Islamic, conventional and hybrid banks". They observed that banking stakeholders need clear and accurate financial information. According to the study, different banking models value different information. Islamic banks face Sharia law issues that might affect their financial reporting, particularly EPS. The study also found that Islamic banks must balance making money with doing the right thing, which influences how they present earnings per share and financial statistics.

State of Financial Disclosures

Alam (2007) highlighted how Bangladeshi corporations communicate financial information. The study examined how international accounting standards effect EPS reporting and company issues. Alam claims that financial information is typically poor because there are few laws and companies must know how to handle it.

The study found that investors distrust EPS calculations due to poor financial information. Many Bangladeshi enterprises utilise old-fashioned accounting methods. To guarantee firms are more open and obey international regulations, major adjustments are needed. Company EPS can improve with increased financial disclosure. People may think better of the companies and invest more.

Role of Voluntary Disclosures and Innovation

Karim et al. in 2022 explored how voluntary disclosures and banking innovations affect financial performance and EPS. Voluntary disclosures boost credibility and investor confidence, which boosts EPS, according to the study. Financial technologies and other banking advances improve reporting methods and stakeholder financial information, the authors argue. Voluntary disclosures help companies satisfy investor expectations and improve EPS and financial health.

Sensitivity of EPS in Merger Situations

Dasgupta et al. (2024) examined EPS sensitivity during mergers and stock market performance. Research shows that mergers can significantly affect EPS. This affects investor sentiment and stock prices. We observed that stock prices rise dramatically when EPS is better than predicted after a merger. If EPS is below expectations, stock prices fall. This study stressed the importance of EPS for measuring firm performance during major transformations. Stock market and investor reactions are also affected.

Corporate Governance Mechanisms and EPS

Islam et al. (2023) examined how corporate governance affects Bangladesh's banking sector's EPS and financial performance. The research found that robust governance, such as board supervision and rule compliance, directly impacts EPS report reliability. Good corporate governance can reduce earnings management, ensuring EPS represents actual financial success, according to the authors. Banks may boost EPS and market trust by fostering responsibility and openness.

Synthesis in Literature

The impact of accounting rules is huge. Research reveals that international accounting regulations, specifically IAS 33, strongly affect EPS reporting. These standards improve transparency and comparability, helping investors make informed decisions (Prewysz-Kwinto& Voss, 2021; IFRS IAS 33, 2024).

DER and ROE have been demonstrated to significantly impact EPS. Managing these ratios helps match firm performance with shareholder expectations (Rahmawati & Hadian, 2022; Sausan et al., 2020).

Creative accounting procedures affect EPS, according to the research. False EPS figures can result from financial reporting manipulation (Al-Natsheh& Al-Okdeh, 2020; Malenko et al., 2023).

Strong corporate governance reduces earnings management and ensures accurate reporting, improving EPS reliability (Islam et al., 2023). Effective governance boosts investor confidence and market stability.

Studies in Bangladesh indicate regulatory enforcement and accounting standard awareness issues that prevent transparent EPS reporting (Alam, 2007; Rashid, 2020). Companies report EPS differently due to their financial and regulatory context.

3. RESEARCH QUESTIONS

Adherence to Accounting Standards and EPS Reporting:

- ✓ How does the rigorous application of "IAS 33" affect the precision and clarity of EPS reports for businesses operating within Bangladesh?
- ✓ What industry-specific directives could be formulated within the Bangladeshi context to improve alignment with international reporting standards, specifically IFRS, regarding the computation of EPS?

The ConnectionBetween EPS&Financial Metrics:

- ✓ Considering the Bangladeshi business environment, which financial indicators, like, "Debt-to-Equity Ratio" and "RoE" exert the most substantial influence on EPS outcomes?
- ✓ What regulatory frameworks can be established to ensure effective management of financial disclosures, thereby minimizing the potential for manipulation through aggressive accounting techniques?

Corporate Governance onReporting the EPS:

- ✓ How do elements of corporate governance, including internal control assessments and independent board composition, impact the reliability and promptness of EPS reporting in Bangladesh?
- ✓ What strategies can organizations employ to improve their communication with stakeholders regarding financial performance information related to EPS?

Advancements in Financial Reporting and EPS Transparency:

- ✓ How do practices such as voluntary disclosure and up-to-the-minute financial reporting contribute to increasing the transparency and trustworthiness of EPS figures among Bangladeshi companies?
- ✓ What impact do financial technology tools have on simplifying the process of financial reporting and performance assessment, mainly in relation to EPS?

Market Responses and Strategic EPS Optimization:

- ✓ How do responses from the stock market to published EPS figures shape the financial planning of Bangladeshi enterprises?
- ✓ How might data derived from market activity be used to adapt accounting and financial planning in order to maximize EPS?

Promoting Ethical EPS Practices:

- ✓ What actions can be implemented to deter unethical behaviors, such as the artificial inflation of results, that distort EPS values?
- ✓ How can environmentally sustainable financial practices be incorporated to improve EPS reporting while safeguarding transparency?

4. RESEARCH GAP

- ✓ **Lack of Sector-Specific Guidelines:** IAS 33 lacks sector-specific guidelines for EPS calculation, limiting companies' ability to implement tailored strategies.
- ✓ **Inadequate Integration of Financial Ratios:** Research needed to establish clear methodologies for integrating financial ratios into EPS optimization strategies.
- ✓ **Weak Governance Structures:** Bangladeshi companies need support for better corporate governance for accurate and timely EPS reporting.
- ✓ **Limited Exploration of Innovative Financial Practices:** Real-time reporting and FinTech solutions need exploration for transparency and streamlined reporting processes.
- ✓ **Limited Empirical Data on Market Performance:** Limited empirical data on how stock market responses influence corporate financial strategies hinders EPS optimization efforts.
- ✓ **Ethical Considerations in EPS Reporting:** Clear ethical standards needed for EPS reporting to encourage sustainable practices and enhance credibility.
- ✓ **Holistic Approach to EPS Optimization:** A holistic model integrating accounting standards, financial mechanisms, and corporate governance is needed.

5. OBJECTIVE OF THE STUDY

1. Design a model to optimize Earnings Per Share (EPS) for companies in Bangladesh
2. Ensure compliance with IAS 33 and develop sector-specific guidelines
3. Integrate financial ratios like"Debt-Equity Ratio (DER)" and "Return on Equity (ROE)" into EPS optimization
4. Strengthen corporate governance for transparent EPS reporting
5. Explore innovative financial practices and FinTech solutions
6. Establish a feedback mechanism to evaluate the stock market impact on EPS disclosures
7. Promote ethical EPS reporting and discourage manipulative accounting methods
8. Assess the influence of global accounting standards on local accounting practices and EPS outcomes

6. CONCEPTUAL FRAMEWORK

Strategical Model for Optimizing EPS in Bangladesh

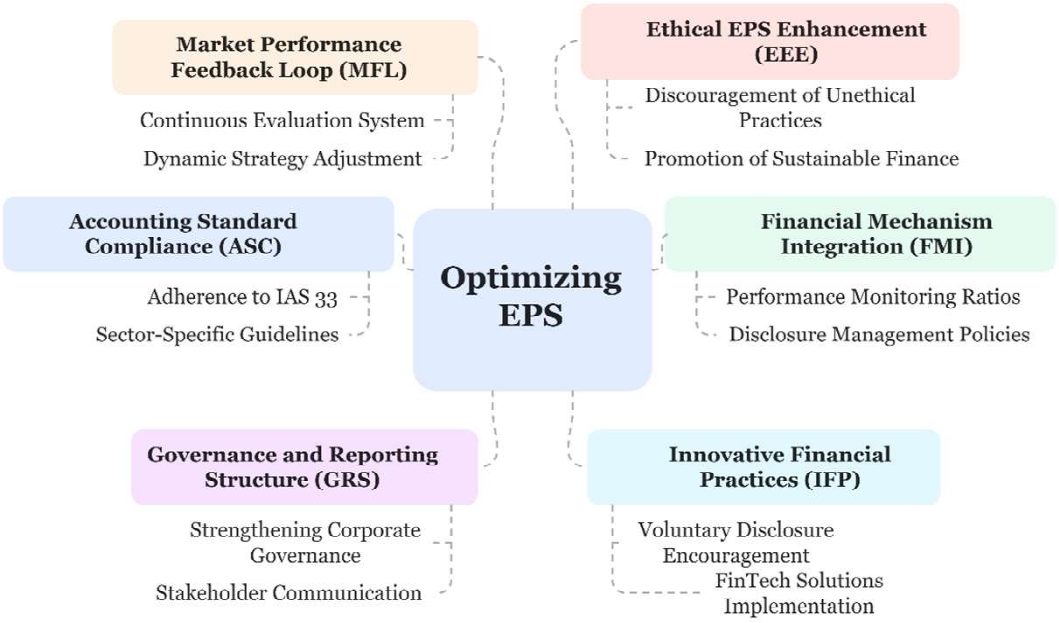

Fig 1: Strategical Model

EPS Optimization Formula

EPS is a continuous process that requires regular monitoring and adjustments. The model we propose features a formula that simplifies this task. This formula takes into account traditional financial performance metrics as well as modern governance practices, which help mitigate the risk of earnings manipulation.

Fig 2: EPS Optimization Formula

$$EPS\ Optimization = \frac{(Net\ Income - Creative\ Accounting\ Adjustments) + Positive\ Financial\ Mechanism\ Influences\ (ROE, DER)}{Weighted\ Average\ Shares\ Outstanding + FinTech\text{-}enhanced\ Governance\ and\ Reporting}$$

7. METHODOLOGY

This study used a case study method to evaluate the effectiveness of a proposed strategy model and EPS optimization formula in Bangladeshi companies. It examines the alignment of accounting standards, financial mechanismsand EPS performance within selected firms. The research analyzes both quantitative and qualitative data from company financial reports, stock market performance and governance scores to provide insights into the strategic model's impact.

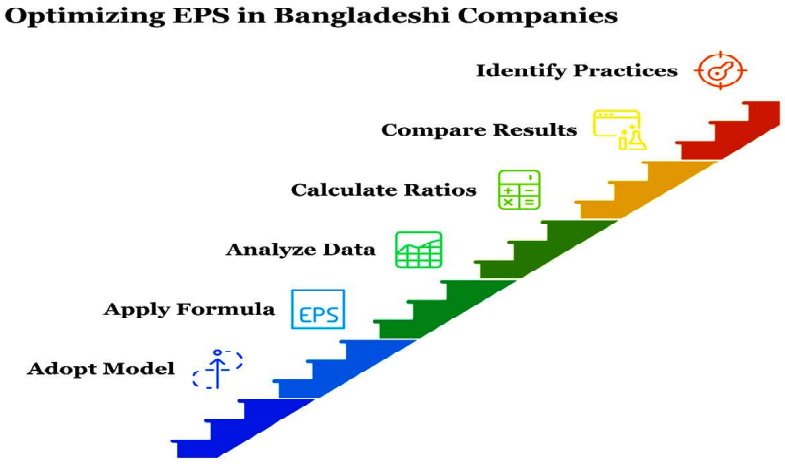

Fig 3: Research Design

The EPS Optimization Formula serves as a vital tool for performance analysis, utilizing metrics such as “Net Income, Debt-to-Equity Ratio (DER)”, and “Price-to-Earnings Ratio (PER)”. It evaluates the influence of governance practices and FinTech adoption on EPS transparency and performance through various financial ratios. Cross-case comparisons reveal best practices and key drivers for effectively optimizing EPS.

Data Analysis

Proposed Model for Strategy

Comparative Study

We aim to prove that the ‘Suggested Model for Strategy’ increases earnings per share (EPS) for companies in Bangladesh. We will analyze data from various companies to show how accounting standards, financial mechanisms, governance, and innovative practices influence EPS. Our goal is to apply the model to different companies and compare their financial results to highlight its effectiveness.

Data for Comparative Study

We’re examining three Bangladeshi companies: “Company X, Company Y, and Company Z”. Each company’s data includes the key variables needed to evaluate EPS under the suggested model.

Company	Net Income (BDT)	Creative Accounting Adjustments (BDT)	DER	ROE	PER	Shares Outstanding	Governance Score (1-5)	FinTech Practices (1-5)
Company X	60,000,000	2,500,000	1.2	13%	18	12,000,000	4	3
Company Y	45,000,000	4,000,000	0.9	10%	16	10,000,000	3	2
Company Z	80,000,000	3,000,000	1.5	15%	20	15,000,000	5	4

Applying the Proposed Model for Strategy

1. Accounting Standard Compliance (ASC)

IAS 33 (EPS) is consistently followed by all companies to promote transparency and comparability. Each organization tailors its reporting according to industry standards while

still aligning with global guidelines (IFRS). As a result, all firms provide clear reporting of EPS to present accurate financial analyses to their stakeholders.

2. Financial Mechanism Integration (FMI)

The “DER, ROE andPER” are important tools for calculating a company’s financial condition and performance.

Formulas:

$$\text{DER} = \frac{\text{Total Debt}}{\text{Total Equity}}$$

$$\text{ROE} = \frac{\text{Net Income}}{\text{Shareholder's Equity}}$$

$$\text{EPS} = \frac{(\text{Net Income} - \text{Creative Accounting Adjustments})}{\text{Shares Outstanding}}$$

For each company:

- **Company X:**

$$\text{EPS} = \frac{60,000,000 - 2,500,000}{12,000,000} = 4.79\,\text{BDT per share}$$

- **Company Y:**

$$\text{EPS} = \frac{45,000,000 - 4,000,000}{10,000,000} = 4.10\,\text{BDT per share}$$

- **Company Z:**

$$\text{EPS} = \frac{80,000,000 - 3,000,000}{15,000,000} = 5.13\,\text{BDT per share}$$

Result: Company Z has the highest earnings per share (EPS). This shows that effective financial strategies, with few adjustments and a high return on equity (ROE), lead to better EPS.

3. Governance and Reporting Structure (GRS)

Companies that have better governance scores and strong internal auditing practices usually provide more accurate and reliable earnings per share (EPS) data. Company Z has the best governance score of 5 and the highest EPS, showing how important good governance is.

4. Innovative Financial Practices (IFP)

Organizations that embrace FinTech practices, such as real-time reporting, are able to exhibit more efficient financial performance and provide more accurate disclosures. Company Z, which has achieved the highest FinTech adoption score of 4 that exemplifies the favorable influence of innovation on financial transparency and performance outcomes.

5. Market Performance Feedback Loop (MFL)

Stock market reactions to EPS disclosures help companies like Company X and Company Z adjust their strategies for better future performance. Company Z, with a high PER of 20, has a stronger market valuation and is directly influenced by its positive EPS performance.

6. Ethical EPS Enhancement (EEE)

Unethical manipulation (quadrophobia) is discouraged. Companies adhering to ethical standards, like Company Z, are showing higher EPS without manipulation, thus ensuring trust and long-term value creation.

Comparative Analysis of Results

Company	EPS (BDT)	Governance Score	FinTech Score	DER	ROE	PER	Market Feedback
Company X	4.79	4	3	1.2	13%	18	Moderate
Company Y	4.1	3	2	0.9	10%	16	Low
Company Z	5.13	5	4	1.5	15%	20	High

Key Insights from the Study

- ✓ Higher governance scores and FinTech adoption correlate with improved EPS performance, as demonstrated by Company Z.
- ✓ Companies with lower creative accounting adjustments achieve higher EPS, highlighting the importance of transparency.
- ✓ Financial mechanisms such as DER, ROE, and PER significantly impact EPS outcomes across all companies.
- ✓ Ethical practices enhance trust and market confidence, illustrated by Company Z's strong performance without EPS manipulation.

EPS Optimization Formula

The text outlines a plan to validate the EPS Optimization Formula through a comparative study by creating a hypothetical scenario using raw data from three companies in Bangladesh.

Raw Data for Comparative Study

Company A reported a net income of BDT 50,000,000 and made creative accounting adjustments amounting to BDT 5,000,000. Its return on equity (ROE) stands at 12%, with a debt-equity ratio (DER) of 1.5 and weighted average shares outstanding totaling 10,000,000. Additionally, Company A achieved a governance score of 4 out of 5 on a FinTech-enhanced scale.

In comparison, Company B posted a net income of BDT 30,000,000, along with creative accounting adjustments of BDT 3,000,000. Its ROE is 10%, and it has a DER of 0.8, with 5,000,000 weighted average shares outstanding. The governance score for Company B is 3 out of 5.

Company C recorded a net income of BDT 40,000,000 and made creative accounting adjustments of BDT 2,000,000. It boasts the highest ROE among the three companies at 15%, with a DER of 1.0 and 8,000,000 weighted average shares outstanding. Company C achieved a governance score of 5 out of 5.

Calculation Steps

Calculate EPS for each company using the formula.

Company A

$$\text{EPS}_A = \frac{(50,000,000 - 5,000,000) + (12\% + 1.5)}{(10,000,000 + 4)}$$

Simplifying:

$$\text{EPS}_A = \frac{(45,000,000) + (0.12 \cdot 50,000,000 + 1.5)}{(10,000,000 + 4)}$$

Assuming the influence of ROE and DER can be represented in monetary terms,

$$= \frac{(45,000,000 + 6,000,000 + 1.5)}{10,000,004}$$

$$= \frac{51,006,001.5}{10,000,004} \approx 5.10 \text{ BDT per share}$$

Company B

$$\text{EPS}_B = \frac{(30,000,000 - 3,000,000) + (10\% + 0.8)}{(5,000,000 + 3)}$$

Simplifying:

$$= \frac{(27,000,000 + 3,000,000 + 0.8)}{5,000,003}$$

$$= \frac{30,003,000.8}{5,000,003} \approx 6.00 \text{ BDT per share}$$

Company C

$$\text{EPS}_C = \frac{(40,000,000 - 2,000,000) + (15\% + 1.0)}{(8,000,000 + 5)}$$

Simplifying:

$$= \frac{(38,000,000 + 5,000,000 + 1.0)}{8,000,005}$$

$$= \frac{43,005,001.0}{8,000,005} \approx 5.38 \text{ BDT per share}$$

Summary of Results

Company	EPS (BDT)	Net Income	Creative Adjustments	ROE (%)	DER	Shares Outstanding	Governance Score (1-5)
A	5.1	BDT. 50,000,000	5,000,000	12%	1.5	10,000,000	4
B	6	BDT. 30,000,000	3,000,000	10%	0.8	5,000,000	3
C	5.38	BDT. 40,000,000	2,000,000	15%	1	8,000,000	5

Analysis

- ✓ Company B has the highest EPS, indicating effective financial management despite a lower net income than Company A.

- ✓ Company A, while having a higher net income, needs greater transparency in financial reporting due to significant creative adjustments affecting EPS.
- ✓ Company C demonstrates that a higher ROE does not necessarily to the highest EPS if governance and transparency are lacking.

Managerial Implications

The study has underlined the importance of following IAS & IFRS& using effective financial methods to improve Earnings Per Share (EPS) in Bangladesh. Managers must comply with IAS 33 and local accounting regulations to ensure transparent reporting, which can build trust and attract investment. Monitoring key financial ratios like “ROE and DER” will deliver clearer insights into economic health and profitability. Implementing strong corporate governance practices will enhance accountability and accuracy in financial disclosures. FinTech solutions can also simplify reporting processes, resulting in more timely and reliable EPS calculations. Overall, these strategies can improve company valuation and investor confidence.

CONCLUSION

The study asserts that severeobservance to accounting rules and the implementation of sound financial practices will empower companies in Bangladesh to significantly boost their earnings per share (EPS). By establishing a robust model that emphasizes these foundational principles alongside strong governance, companies can effectively navigate the complexities of the financial landscape. The recommended strategies are designed to enhance EPS and foster transparent financial reporting, ensuring that these companies excel in the market and achieve sustainable growth, thus solidifying their competitive edge both locally and globally.

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EVALUATION OF FINANCIAL PERFORMANCE OF INDIAN PRIVATE SECTOR BANKS USING CAMEL APPROACH

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ABSTRACT

The CAMEL framework is a widely used tool for assessing the financial performance and strength of banks. It evaluates banks across five key dimensions, i.e., 'Capital Adequacy', 'Asset Quality', 'Management Efficiency', 'Earnings Quality' and 'Liquidity'. These parameters provide a holistic view of a bank's operational efficiency, risk management, and financial stability. The CAMEL approach is particularly significant for regulators, investors, and stakeholders in identifying areas of strength and potential risks in banking institutions. By benchmarking performance across these parameters, the framework aids in ensuring sound financial practices and maintaining confidence in the banking system. This study applies the CAMEL framework to assess the performance of three prominent private sector banks in India, namely, 'HDFC Bank', 'Kotak Mahindra Bank', and 'IndusInd Bank' over a ten-year period (2014–2023). Using secondary data from annual reports and financial statements, the study examines key ratios and metrics under each CAMEL parameter to compare the banks' performance.

Keywords: Capital adequacy, asset quality, management efficiency, earning quality and liquidity.

Manuscript Received: November 21 , 2024; Revised Manuscript Received: January 18 , 2025, Accepted: May 12 2025

INTRODUCTION

The banking sector plays a pivotal role in ensuring economic stability and fostering growth by channelling funds efficiently between savers and borrowers. Evaluating the performance of banks is essential for regulators, investors, and stakeholders to gauge their stability and resilience in dynamic economic conditions (Allen & Gale, 2000; Barth, Caprio, & Levine, 2001). One of the most widely used frameworks for evaluating the performance of banks is the CAMEL model, which analyses five critical dimensions: 'Capital Adequacy', 'Asset Quality', 'Management Efficiency', 'EarningsQuality' and 'Liquidity' (Agyei, 2016). Capital Adequacy assesses a bank's ability to absorb potential losses through its capital base, reflecting its financial soundness and risk-bearing capacity. Asset Quality focuses on the health of the loan portfolio and its impact on profitability, as non-performing assets can erode bank earnings over time. Management Efficiency is a qualitative measure of the competency of the bank's leadership in managing resources effectively and ensuring operational excellence. Earnings performance highlights a bank's

profitability, sustainability, and capacity to invest in future growth, while Liquidity evaluates the bank's ability to meet its short-term obligations without compromising long-term stability (Altman, 1968; Diamond & Dybvig, 1983; Ho & Saunders, 1981). In recent years, the application of the CAMEL model has gained renewed importance amid global economic uncertainties and heightened regulatory oversight. It is particularly relevant for comparing banks across diverse ownership structures, geographic regions, and time frames (Baral, 2005). The present study is an attempt to assess the financial performance of banks using the ratios of the CAMEL model to identify critical insights into their operational strengths and weaknesses. The findings aim to provide an understanding of the banking sector's resilience and guide policymakers and stakeholders in decision-making.

REVIEW OF LITERATURE

Suresh and Pradhan (2023) observed that private-sector banks surpass public-sector banks in several key areas. While public sector banks have shown commendable progress, they fall short of meeting the benchmarks established by their private sector counterparts. Kiran (2018) highlights a performance disparity among Indian banks based on the CAMEL model. The study identifies 'IndusInd Bank', 'HDFC Bank', 'ICICI Bank', 'Axis Bank' and 'SBI' as the top-performing banks. In contrast, the bottom six positions are held exclusively by public sector banks, including BOB, BOI, PNB, UBI, Canara Bank, and IDBI. Private sector banks generally excel in parameters like 'capital adequacy', 'asset quality', 'management efficiency' and 'earning quality', while public sector banks outperform private ones in liquidity management. Nishat (2021) concluded that despite showing weaker performance in terms of capital adequacy, asset quality, and liquidity ratios, SBI outperforms Axis Bank due to its superior management and efficiency. The study suggests that the overall financial performance of public sector banks, like SBI, is better than that of private sector banks when considering the management and efficiency aspects. While private banks excel in certain financial parameters, public sector banks have managed to stay competitive through effective management practices. Kumar and Malhotra (2017) evaluated the financial soundness and performance of select private banks in India from 2007 to 2017 using the CAMEL model. Their analysis, which included the assessment of capital adequacy, asset quality, management efficiency, earning ability, and liquidity, found that Axis Bank ranked first among the five banks analysed, followed by ICICI Bank, Kotak Mahindra, HDFC Bank, and IndusInd Bank. The study concluded that Axis Bank was the safest among the banks in the study, owing to its strong performance across the key CAMEL parameters. Mathuva (2009) examined the relationship between the Cost-Income Ratio (CIR), Capital Adequacy Ratio (CAR), and profitability for banks from 1998 to 2007. The study found that capital adequacy had a differential impact on the profitability of banks, suggesting that a higher CAR did not always guarantee better profitability but played a significant role in financial stability. Mishra et al. (2012) analysed the performance of 12 public and private sector banks over the period from 2000 to 2011 using the CAMEL approach. The findings indicated that private-sector banks were performing better than public-sector banks. Union Bank and

SBI displayed lower economic soundness, with weaker performance on key CAMEL parameters, particularly in asset quality and management efficiency, leading to slower growth compared to their private counterparts. Mishra (2012) evaluated the performance and financial soundness of the State Bank Group using the CAMEL approach. The study found that in terms of the Capital Adequacy parameter, SBBJ (State Bank of Bikaner & Jaipur) and SBP (State Bank of Patiala) ranked highest, while SBI (State Bank of India) ranked lowest. For Asset Quality, SBBJ secured the top position, whereas SBI was again at the bottom. In the Management Efficiency parameter, SBT (State Bank of Travancore) ranked the highest, with SBBJ at the lowest. Regarding Earnings Quality, SBM (State Bank of Mysore) ranked at the top, and SBP at the bottom. Finally, in the Liquidity parameter, SBI performed the best, with SBM ranked lowest. The study suggests that SBI needs to improvethe quality of assets and capital adequacy, SBBJ should focus on enhancing management efficiency, and SBP needs to strengthen its earning quality.

OBJECTIVES OF THE STUDY

1. To evaluate the performance of selected private sector banks over a ten-year period (2014–2023) using the CAMEL model.
2. To conduct a comparative analysis of the performance of selected banks during the specified ten-year period.

HYPOTHESES OF THE STUDY

1. There is no significant difference in the performance of select banks.

RESEARCH METHODOLOGY

The literature review underscores the extensive use of the CAMEL model as a robust tool for assessing bank performance. This supervisory framework evaluates the soundness of banks and financial institutions by focusing on five critical dimensions: ‘Capital Adequacy’, ‘Asset Quality’, ‘Management Efficiency’, ‘Earnings Quality’ and ‘Liquidity’. Only one ratio is considered for each of the five ratios of CAMEL model. The variables used in the study are presented below:

Table 1: Ratios Used for Analysing Performance Using CAMEL Model

Parameter	Ratio	Significance	Assessment
Capital Adequacy	Capital Adequacy Ratio	The Capital Adequacy Ratio reflects a bank’s adherence to regulatory standards, reflects financial stability, and acts as a crucial measure of effective risk management.	Higher the ratio better the financial health of the company.

Asset Quality	Net NPA to Net Advances	This ratio reflects the asset quality of banks by indicating the proportion of Net Non-Performing Assets (Net NPA) to Net Advances.	Lower the ratio better the asset quality.
Management Efficiency	Profit Per Employee	Profit per employee is a key metric that evaluates a company's efficiency and productivity by calculating the average profit generated by each employee.	Higher ratio is desirable.
Earning Quality	Net Interest Income to Total Asset	The ratio of net interest income to total assets is a financial measure that assesses a bank's efficiency and profitability in generating interest income from its total asset base.	Higher ratio is desirable.
Liquidity	Cash Deposit Ratio	The Cash Deposit Ratio (CDR) measures the proportion of a bank's deposits that are utilized for lending purposes.	Higher the ratio better the liquidity.

Source: Compiled by authors

In this study, financial performance is analyzed using secondary data collected from the annual reports of selected banks over a ten-year period (2013–14 to 2022–23). Financial data is being collected from the Reserve Bank of India (RBI) website. Ratios relevant to each CAMEL parameter, as supported by prior research, have been calculated to measure the banks' financial stability. Additionally, the data has been analyzed using mean and SD, along with one-way ANOVA to draw meaningful conclusions from the findings.

RESULTS AND DISCUSSION

Table 2 demonstrates that all the banks included in the study have successfully maintained the minimum Capital Adequacy Ratio (CAR) of 8%, as mandated by BASEL II guidelines. Among the three private sector banks analysed Kotak Mahindra Bank reported the highest average CAR of 18.9420% over the ten-year period, earning it the top rank in terms of capital adequacy. HDFC Bank follows with an average CAR of 17.0340%, securing the second rank, while IndusInd Bank, with an average CAR of 15.4620%, ranks third.

Table 2: Capital Adequacy Ratio

Bank	Mean	Rank	S. D.	F value	p-value
HDFC Bank	17.0340	2	1.76564	7.188	.003
Kotak Mahindra Bank	18.9420	1	2.39721		
IndusInd Bank	15.4620	3	1.95213		

Source: Statistical Tables Pertaining to Banks in India, published by the RBI

To assess whether the differences in CAR among the three banks are statistically significant, one-way ANOVA test has been conducted. The analysis yielded a p-value of 0.003, which is below the threshold of 0.05, indicating a significant variation in CAR across the banks. This highlights that the capital adequacy levels differ substantially among the selected banks during the study period.

Table 3: Net NPA/Net Advances

Bank	Mean	Rank	S. D.	F value	p-value
HDFC Bank	.3270	1	.05813	23.999	.000
Kotak Mahindra Bank	.9820	3	.22250		
IndusInd Bank	.5940	2	.28760		

Source: Statistical Tables Pertaining to Banks in India, published by the RBI

Table 3 indicates the Net NPA/Net Advances ratios of three private sector banks included in the study. Among these, HDFC Bank exhibits the lowest average ratio of 0.3270. Kotak Mahindra Bank, on the other hand, has the highest average ratio at 0.9820, indicating relatively higher non-performing assets compared to its advances. IndusInd Bank lies in between, with a mean ratio of 0.5940.

One-way ANOVA has been employed to determine whether there are significant differences in the Net NPA/Net Advances ratios among the three banks. The analysis shows an F-value of 23.999 and a p-value of 0.000, which is below the 0.05 significance level. This confirms that there is a statistically significant difference in the Net NPA ratios of the banks during the study period.

Table 4: Profit per employee (Rupees in Lakh)

Bank	Mean	Rank	S. D.	F value	p-value
HDFC Bank	20.2000	1	6.61312	10.525	.000

Kotak Mahindra Bank	11.9000	3	2.33095		
IndusInd Bank	12.4110	2	3.53641		

Source: Statistical Tables Pertaining to Banks in India, published by the RBI

Table 4 provides insights into the Profit Per Employee (measured in rupees lakh) for selected banks. Among the banks, HDFC Bank demonstrates the highest average 'profit per employee' at 20.2000. IndusInd Bank follows with a mean profit per employee of 12.4110, while Kotak Mahindra Bank reports the lowest average of 11.9000. Based on the findings, 'HDFC Bank'has been ranked first in terms of 'profit per employee', which is followed by 'IndusInd Bank' and 'Kotak Mahindra Bank'.

One-way ANOVA has been conducted to evaluate whether the differences in profit per employee among the three banks are statistically significant. The analysis yielded an F-value of 10.525 and a p-value of 0.000, which is below the significance level of 0.05. This confirms that there is a significant difference in profit per employee across the banks during the study period.

Table 5: Net Interest Income/ Total Asset

Bank	**Mean**	**Rank**	**S. D.**	**F value**	**p-value**
HDFC Bank	4.0512	2	.14668	8.843	.001
Kotak Mahindra Bank	4.2154	1	.27941		
IndusInd Bank	3.7829	3	.24937		

Source: Statistical Tables Pertaining to Banks in India, published by the RBI

Table 5 provides an analysis of the Net Interest Income to Total Asset ratio for three banks. Kotak Mahindra Bank exhibits the highest mean ratio at 4.2154, indicating its superior performance in efficiently generating interest income relative to its total assets. HDFC Bank follows with a mean ratio of 4.0512, while IndusInd Bank reports the lowest average ratio of 3.7829. This ranking places Kotak Mahindra Bank first in the case of Net Interest Income to Total Asset ratio, followed by HDFC Bank and IndusInd Bank.

One-way ANOVA has been carried out to assess whether the variances in the Net Interest Income to Total Asset ratio among the banks are statistically significant. The analysis produced an F-value of 8.843 and a p-value of 0.001, which is below the significance threshold of 0.05. This confirms the presence of a significant difference in the Net Interest Income to Total Asset ratio across the three banks during the study period.

Table 6: Cash Deposit Ratio

Bank	Mean	Rank	S. D.	F value	p-value
HDFC Bank	7.0869	2	2.36315	1.820	.181
Kotak Mahindra Bank	5.4551	3	2.20333		
IndusInd Bank	8.3054	1	4.82401		

Source: Statistical Tables Pertaining to Banks in India, published by the RBI

Table 6 examines the Cash Deposit Ratio across three selected banks. 'IndusInd Bank' reports the highest average 'Cash Deposit Ratio' at 8.3054, suggesting its relatively strong liquidity position compared to its peers. 'HDFC Bank' follows with a mean ratio of 7.0869, while 'Kotak Mahindra Bank. records the lowest ratio of 5.4551. This ranking places 'IndusInd Bank' at the top, followed by 'HDFC Bank' and 'Kotak Mahindra Bank'.

One-way ANOVA has been performed to determine if the differences in the Cash Deposit Ratio among the banks are statistically significant. The analysis yielded an F-value of 1.820 and a p-value of 0.181, which exceeds the significance threshold of 0.05. Therefore, the differences in the Cash Deposit Ratio among the three banks are not statistically significant during the study period.

Table 7: Ranking of Banks Based on Select Ratios of Camel Approach

Bank	Rank in Capital Adequacy	Rank in Asset Quality	Rank in Management Efficiency	Rank in Earning Quality	Rank in Liquidity	Average of Ranks of Camel Parameters	Final Rank
HDFC Bank	2	1	1	2	2	1.6	1
Kotak Mahindra Bank	1	3	3	1	3	2.2	2
IndusInd Bank	3	2	2	3	1	2.2	2

Table 7 presents the performance rankings of banks based on individual CAMEL parameters and their average composite rank. 'Kotak Mahindra Bank' excelled in the capital adequacy ratio, ranking first, followed by 'HDFC Bank' and 'IndusInd Bank'. In asset quality, 'HDFC Bank' secured the top position, with 'IndusInd Bank' and 'Kotak Mahindra Bank' ranking second and third, respectively. For management efficiency,

'HDFC Bank' again ranked first, followed by 'IndusInd Bank' and 'Kotak Mahindra Bank'. In terms of earning quality, 'Kotak Mahindra Bank' outperformed, achieving the first rank, with 'HDFC Bank' and 'IndusInd Bank' taking second and third places, respectively. 'IndusInd Bank' led in liquidity, followed by 'HDFC Bank' and 'Kotak Mahindra Bank'. In the overall composite ranking of all CAMEL parameters, 'HDFC Bank' emerged as the best-performing bank. 'Kotak Mahindra Bank' and 'IndusInd Bank' tied for second place, both achieving an average rank of 2.2.

CONCLUSION

The CAMEL model is a widely recognized framework for assessing banks' financial performance, stability, and operational efficiency. By examining five critical dimensions Capital Adequacy, Asset Quality, Management Efficiency, Earning Quality, and Liquidity it provides a comprehensive evaluation of a bank's overall health and sustainability. The importance of this model lies in its ability to guide regulatory bodies, stakeholders, and investors in making informed decisions while ensuring that banks adhere to sound financial practices.

In this study, the performance of three leading private sector banks 'HDFC Bank', 'Kotak Mahindra Bank' and 'IndusInd Bank' was analysed using the CAMEL model. Each parameter of the CAMEL framework was evaluated individually, and the banks were ranked accordingly. The findings reveal that 'Kotak Mahindra Bank' performed best in terms of capital adequacy and earning quality, while 'HDFC Bank' led in asset quality and management efficiency. 'IndusInd Bank' stood out in terms of liquidity.

When considering the composite ranking across all CAMEL parameters, 'HDFC Bank' emerged as the top-performing bank, showcasing its balanced and consistent performance across multiple dimensions. 'Kotak Mahindra Bank' and 'IndusInd Bank' shared the second position with an average ranking of 2.2. This study highlights the utility of the CAMEL model in identifying the strengths and weaknesses of individual banks and provides insights for policymakers and management to enhance performance.

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Financial Performance of Nifty-50 Manufacturing Companies: An AHP-COPRAS Integrated Analysis

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ABSTRACT

The present study aims to develop a performance measurement model for Indian manufacturing companies, which can be used to analyze the success of the selected companies in terms of their relative financial position. An MCDM approach is required to aggregate the multiple financial criteria for a comprehensive overview of any sector. Therefore, the current study analyzed eight financial attributes using the AHP method and ranked the selected companies using the COPRAS method based on the AHP weights. The financial performance of 26 manufacturing companies under the Nifty 50 index was evaluated for the financial year 2023-2024. It was observed that ROE and ROA are the most significant indicators with the highest AHP weights. Following the utility values and aggregate performance scores in COPRAS, Coal India Ltd. is found to be the best alternative among the group. It excelled nearly across all criteria, followed by Nestle India Ltd. and Britannia Industries Ltd., acquiring second and third place.

Keywords: Manufacturing Companies,Performance, AHP, COPRAS, Financial Analysis.
Manuscript Received: November 29 , 2024; Revised Manuscript Received: February 17 , 2025, Accepted: March 2 2025

1. INTRODUCTION

Manufacturing is the process of converting raw materials into their ultimate form, making them readily available to users (Khan et al., 2022). This core function is integral to the efficiency and growth of the firms engaged in the manufacturing business. The current manufacturing environment is highly competitive due partly to global competition, rapidly evolving technologies, and shorter product life cycles. Businesses deal with a lot of uncertainty and globalized business environment, proper performance measurement of manufacturing companies is crucial (Yalcin et al., 2012). India aims to position itself in the global market as a global manufacturing hub and is taking significant initiatives such as ‘Make in India.’ Therefore,stability and efficiency in the manufacturing industry are essential to attract foreign direct investments (FDI) in the sector. Performance assessment is vital for companies and their current and potential future stakeholders.

To ensure the smooth functioning of these firms and to maintain an effortless business cycle, it is crucial to formalize an effective framework to evaluate the stability and long-term viability of manufacturing firms (Chand et al., 2020). A systematic performance evaluation frameworkmay provide afoundation for continuous assessmentcorresponding to globalization, consistently rising competition, and customer demand. The performance evaluation framework is a structured systemintegrating multiple indices and methods to quantify the performance and efficiency of different alternatives

(Khan et al.,2022). Okoshi et al. (2019) argued thatperformance evaluation is a sequence of procedures to measure the accomplishment associated with the organization's goals.

We must consider several financial indicators demonstrating a company's competitiveness to assess its performance. According to Yurdakul &Ic, 2005, financial measures are essential to evaluate companies' current trends and future requirements in terms of profitability. They reflect the cumulative attainmentsof past series of operations and decisions made by the management. Managers of any institution must evaluate the financial stability of their organization (Darji & Dahiya, 2023; Kaya et al., 2024). In today's competitive world,it is an economic imperative to analyze the financial stability and performance of listed for both company management and their shareholders (Kaya et al., 2024). Accurate financial measurement matrices will help stakeholders understand the profitability, solvency, and growth in the sector. Companies must be assessed based on their financial performance to determine their relative position in the market. These will allow companies toovercome potential risks and improve their financial position (Darji & Dahiya, 2023). Nonetheless, the financial ratios are the effective evaluation units that efficientlyconvey the financial position of companies (Shaverdi et al., 2016; Darji & Dahiya, 2023; Kaya et al., 2024).Therefore, assessingthe performance and financial stability of companies involved in core manufacturing activities in India is a crucial research area for both investors andresearchers.

Financial performance analysiscan be consideredone of the multi-criteria decision-making problems since it incorporates several evaluation criteria or financial ratios (Varmazyar et al., 2016). Multi-criteria decision-making (MCDM) identifies the most optimal alternative by analyzing multiple attributes that collectively influence a company's overall performance, decision-making efficiency, and strategic growth (Gavalas et al., 2022). Consequently, the current study evaluates the financial viability of listed manufacturing companies in the Nifty 50 index in India for the year 2023. The study aimed to identify the most significant performance measurement criteria of the manufacturing companies in terms of their financial position and determine the relative ranking of the firms among the group using MCDM techniques. Subsequently, this study employs the Analytical Hierarchy Process (AHP) and the Complex Proportional Assessment (COPRAS)methods for the performance evaluation. The method AHP is used to calculate the weights for each attribute and the calculated AHP weights were then applied to the COPRAS method to rank companies according to their financial position. The data related to selected variables (criterion) are sourced from the CMIE-ProwessIQ database for the period 2023.

This study is structured into five key sections. The first section introduces the research, highlighting its significance and primary objectives. The second section presents a detailed review of relevant literature. The third section outlines the methodologies and analytical tools employed in the study. The empirical results and interpretations of the analysis are discussed in the fourth section.Finally, the fifth section summarizes the main findings, limitations, scope for future research, and policy implications.

2. LITERATURE REVIEW

As a subjective weighing tool, the AHP is used to develop a multi-level hierarchical framework that identifies the objective at the top and the criteria, sub-criteria, and alternatives at the bottom of the structure. To obtain the criteria weights, the method applies a pair-wise comparison between the criterion and the study alternatives (Guru & Mahalik, 2019). The AHP technique may effectively deal with the complexity of the decision-making process by considering both financial and non-financial variables simultaneously. Since the decision is based on expert judgment, it provides a more precise evaluation framework (Yurdakul &Ic, 2005;Pipatprapa et al., 2018). Several MCDM outranking measures were utilized to evaluateperformanceand efficiencyacross various sectors in India. Nevertheless, there are limited applications ofrenowned MCDM approaches specifically for investigating the performance of the manufacturing sector in India in terms of their financial position and viability.Yurdakul and Ic (2005) applied an AHP andTechnique for Order Preference by Similarity to Ideal Solution (TOPSIS)integrated model to explore the operational efficiency of nineteen companies in the fabric industry in Turkey from 2001 to 2003. Yalcin et al. (2012) evaluated selected Turkish manufacturing companies using the MCDM methods based on some basic financial ratios. The AHP technique was employed in the fuzzy environment to determine the relative significance of value-based and accounting-based criteria. The outranking tools TOPSIS and VIKOR were used to obtain the ranking of the companies. It was observed that sector-wise ranking results of companies were similar under the two methods. Digalwar et al. (2013) assessed Indian green manufacturing companies using methods other than MCDM based on 12 non-financial performance indices. Moghimi and Anvari (2014) examined eight selected Iranian cement companiesbased on their financial strength and weaknesses, applying an AHP-based TOPSIS approach under a fuzzy environment. The study incorporated multiple financial indicators under the dimensions of profitability ratios, activity, average ratios, liquidity, and growth ratios. Baran and Zak (2014) investigated the transportation efficiency performance of selected agri-business companies using the AHP model. Accordingly, the importance of stakeholders' participation in decision-making was emphasized in their study.Varmazyar et al. (2016) combined multiple MCDM tools (ARAS, COPRAS, MOORA, and TOPSIS) to rank Iran's research and technology environment. The study also employed the Analytical Network Process (ANP) technique to prioritize the evaluation criteria; the Decision-Making Trial and Evaluation Laboratory (DEMATEL)method was further employed todetermine the interactionwithin selected indicators (financial ratios). Finally, the utility interval technique was used to combine the rankings obtained under different approaches. Yazdani et al. (2017) used DEMATEL and COPRAS techniques in green supplier selection problems using criteria related to environmental performance aspects. The quality function development (QPD) method was employed to establish a central relationship matrix and identify the degree of relationship among criteria. Finally, the method of COPRAS was used to prioritize the alternatives based on their relative performance. Kusumah and Fabianto (2018) investigated the financial performance before and after implementing ISO 9000 for manufacturing companies listed on the Indonesian

stock exchange. The study employed McNemer and Cochran's Q test to check the impact. It was found that the impact on the performance of selected companies was insignificant. Anthony et al. (2019) assessedthe long-term financial viability of Indian chemical companies from 2010-2018. The study applied a Shannon entropy-based MCDM approach combining the TOPSIS, COPRAS, and DEA methods in weighing and ranking 12 financial criteria and selecting seven companies. Sarraf and Nejad (2019) compared two approaches, DEA and GRA, in the performance analysis of water and wastewater companies in Iran. The study used the entropy method to measure the relative importance of indices under the BSC framework to identify significant criteria. The GRA method under MCDM was found to be more efficient than DEA. Chand et al. (2020) examinedthe supply chain performance (SCP) ofcompanies in India involved inproducing mining and earth-moving tools. The study employed a hybrid MCDM approach combining the BWM, Delphi, and DEMATEL techniques. The Delphi technique and DEMATEL were applied to select and evaluate the SCP matrices. Finally, the BWM (Best-Worst Method) approach was used to rank the alternatives.in conclusion, the importance of cross-functional and inter-organizational performance management is highlighted. Liou et al. (2021) developed a green supplier selection model under a novel MCDM model. The study evaluated 13 parameters combining fuzzy BWM and fuzzy TOPSIS.Gavalas et al. (2022) assessed the shipbuilding industry using three approaches under MCDM, e.g., ANP, MOORA, and DEMATEL. Khan et al. (2022) measured the overall performance of steel manufacturing companies in India. Three main and 18 sub-criteria were evaluated using the BWM approach. It was observed that the indicator 'operational efficiency' was significantly reflecting the performance level of the companies.Darji and Dahiya (2023) evaluated the companies involved intextile manufacturing in India using the Data Envelopment Analysis (DEA) approach. Multiple data envelopment analysis (DEA) techniques and a return-to-scale techniquewere employed in the study. Results depict that the textile industry in Haryana had a poorfinancial position. It was further observed that the public sector companies were technically more efficient than companies in private undertakings. Kaya et al. (2024) used nine MCDM tools to rank the selected companies besides banksin Borsa Istanbulacross eight financial criteria for the year 2021. The current ratio was found to be the most significant criterion. The authors concluded that evaluating corporate financial performance is vital in performance measurement.

3. DATA AND METHODOLOGY

The analysis includes 26 companies involved in manufacturing activities listed on the NIFTY-50 in India. The data relating to selected variables (criterion) are sourced from the CMIE-ProwessIQ database for a one-year period, i.e., the financial year 2023-2024. In order to rank the companies according to their relative performance across multiple financial measures, the study used the AHP-based COPRAS model within the MCDM framework. The AHP method is applied to calculate the weights for each attribute, and the calculated AHP weights are then incorporatedinto the COPRAS method to rank

companies according to their financial position.Various industries fall under the manufacturing sector, with differences in labor, overheads, capital intensity, production techniques, and market competitiveness(Abdel-Maksoud et al., 2005).

Table 1: Selected Alternatives (Companies)

Index	Alternatives	Index	Alternatives
A1	Asian Paints Ltd.	**A14**	ITC Ltd.
A2	Bajaj Auto Ltd.	**A15**	JSW Steel Ltd.
A3	Bharat Electronics Ltd.	**A16**	Larsen & Toubro Ltd.
A4	Bharat Petroleum Corpn. Ltd.	**A17**	Mahindra & Mahindra Ltd.
A5	Britannia Industries Ltd.	**A18**	Maruti Suzuki India Ltd.
A6	Cipla Ltd.	**A19**	Nestle India Ltd.
A7	Coal India Ltd.	**A20**	Oil & Natural Gas Corpn. Ltd.
A8	Dr.Reddy's Laboratories Ltd.	**A21**	Reliance Industries Ltd.
A9	Eicher Motors Ltd.	**A22**	Sun Pharmaceutical Inds. Ltd.
A10	Grasim Industries Ltd.	**A23**	Tata Motors Ltd.
A11	Hero Motocorp Ltd.	**A24**	Tata Steel Ltd.
A12	Hindalco Industries Ltd.	**A25**	Titan Company Ltd.
A13	Hindustan Unilever Ltd.	**A26**	Ultratech Cement Ltd.

Source: *Authors' compilation*

Table 1 outlines the selected companies involved in large-scale manufacturing in India listed onIndia's National Stock Exchange (NSE). The companies are divided into distinct industries,although the primary aim is connected to core manufacturing, which provides consumers with easy access to readily available products. For example, businesses in A2, A9, A11, A17, A18, and A23 are engaged in the automotive manufacturing process, whereas A15, A24, and A12 are focused on the production of steel and metal. In a similar vein, A10, A16, and A26 are linked to the production of goods for infrastructure, construction materials, and industrial equipment. A7 is a coal mining company that produces and manufactures coal-based products. A6, A8, and A22 manufacture products for pharmaceuticals and healthcare. A1, A5, A13, A14, A19, A25 manufactures consumer goods and FMCGs. Finally, A3is associated with electronics and technological equipment. A4, A20, A21 deals with oil, gas, and petrochemical manufacturing.

Table 2: Selected Variables (Criterion)

Index	Criterion	Formula	Expected Values
C1	Return on Total Assets (ROA)	Net Income/Total Assets	Max
C2	Net Profit Margin (NPM)	Net Profit /Sales	Max

C3	Current Ratio (CR)	Current Assets / Current Liabilities	Max
C4	Quick Ratio (QR)	(Current Assests -Inventory)/ Current Liabilities	Max
C5	Earning Per Share (EPS)	Net Income/ Number of Outstanding Shares	Max
C6	Return on Equity (ROE)	Net Income/ Total Equity	Max
C7	Debt to Assets Ratio (DA)	Total Debt/ Total Assests	Min
C8	Debt to Equity Ratio (D/E)	Total Debt/Equity	Min

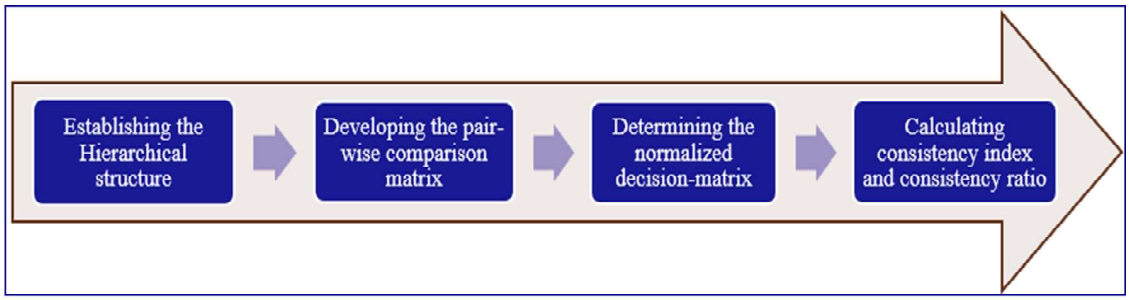
Source: *Compiled by the authors*

We must consider several financial indicators demonstrating a company's competitiveness to assess its performance (Moghimi & Anvari, 2014). Similarly, this study selected eight criteria or financial ratios based on the available literature on related studies (Ertuðrul &Karakaþoðlu, 2009; Yalcin et al., 2012; Moghimi & Anvari, 2014; Parvadavardini et al.,2016; Anthony et al., 2019; Darji & Dahiya, 2023; Kaya et al., 2024).The selected criteriapresented in Table 2 represent specific areas of a company's financial performance, for instance,profitability indicators (ROA, NPM), liquidity indicators (CR, QR), market-based indicators (EPS, ROE), and solvency ratios (DA, D/E). MCDM combines multiple criteria that are usually conflicting, i.e., maximizing or minimizing in nature simultaneously in a single heading.

AHP method

The analyticalhierarchy process (AHP) is a weighting approach in the MCDM developed by Thomas Saaty in 1970. It has been extensively used as a subjective-based weighing technique in the presence of multiple conflicting criteria. The AHP technique systematically determines the relative importance of alternatives and incorporates different criteria/sub-criteria to assess these alternatives (Gupta et al., 2020).

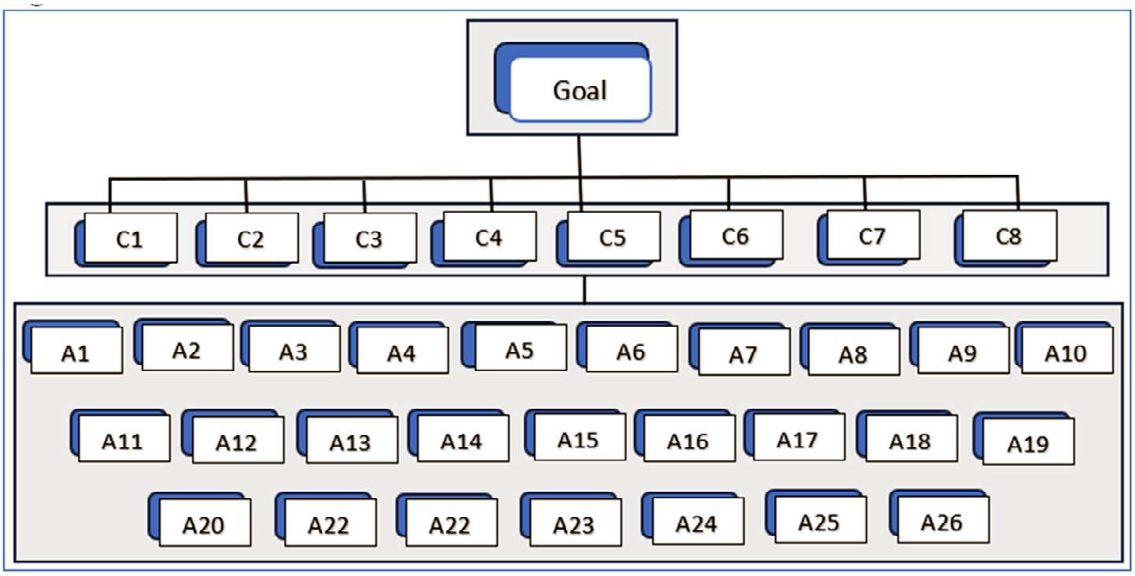
Fig.1. Steps in the AHP approach



Source: Developed by the authors

The AHP method consists of 4 significant stages depicted in Figure 1. However, studies have mentioned six steps involving determining AHP weights and reliability tests using consistency ratio (Mitra et al., 2022; Gupta et al., 2021; Yalcin, 2012).

Fig.2. Hierarchical structure in AHP



Source: Developed by the authors

***Step 1:** Construction of the hierarchical structure*

Figure 2 describes the hierarchical structure to be used in the AHP method. To develop an AHP model, the goal, criteria,and alternatives must be defined. The upper level consists of the goal, and the bottom of the hierarchy includes the criteria and alternatives. Each factor in the hierarchy has an impact on another factor.

Following the establishment of the hierarchy, a pair-wise comparison matrix was developed. For each level, factors are compared with others in the level above, utilizing Saaty's comparison scale as outlined in Table 3 and Eq.1.

Table 3: Saaty's 1-9 comparison scale

Intensity of Importance	Definition	Explanation
1	Equal importance	The paircontributes equally to the objective
3	Moderate importance	One element is slightly preferred overanother

5	Strong or essentialimportance	One factor is preferred
		strongly to the other
7	Very strong or demonstrated importance	Onecriterionis preferred very strongly over another
9	Extremely important importance of one factor over	The evidence favoring the another has enough evidence
2,4,6 and 8 indicate the intermediate values and reciprocals for inverse comparisons.		

Source: *Compiled by the authors*

The outcome is a series of matrices, each sized n × n, where n is the number of elements. The matrices are formulated according to Equation (1), with diagonal elements set to '1' and others representing reciprocals of initial comparisons

$$A = X_{ij} = \begin{bmatrix} 1 & X_{12} & \cdots & X_{1n} \\ \frac{1}{X_{12}} & 1 & \cdots & X_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ \frac{1}{X_{1n}} & \frac{1}{X_{2n}} & \cdots & 1 \end{bmatrix}_{i*j} \quad (1)$$

Three different pair-wise comparison matrices were obtained from the judgment of three different decision-makers. Later, a combined pair-wise comparison matrix was developed using the formula $X_{ij}^{C} = \left[X_{ij}^{1} \times X_{ij}^{2} \times \ldots \times X_{ij}^{N}\right]$ where, X_{ij}^{C} is the combined comparison matrix, and *N* is the number of decision-makers.

Step 3: *Creating the normalized decision matrix*

The pairwise comparison matrix, as formulated in Equation (1), undergoes normalization using Equation (2). This crucial step ensures uniformity in the data and prepares it for subsequent weight calculation.

$$\bar{X}_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} \quad (2)$$

Step 4: *Calculating the Factor Weights*

The determination of factor weights involves applying Equation (3) to the normalized matrix obtained in Step 3. This step assigns weights to the factors based on their perceived importance in the decision-making process.

$$W_j = \frac{\sum_{j=1}^{m} \bar{x}_{ij}}{m} \quad (3)$$

Step 5: *Calculating the consistency index*

The consistency of matrices is scrutinized to ensure the reliability of the pairwise comparisons of criterion. The Consistency Index (CI) is estimated using Eq. (4), incorporating the eigenvalue. Simultaneously, the Random Index (RI) is utilized to compute the Consistency Ratio (CR) following Equation (6). The value of RI is obtained from Table 4.

$$CI = \frac{\lambda_{max} - m}{m-1} \quad (4)$$

Table 4: Random Index (RI)

m	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.52	0.89	1.12	1.26	1.36	1.41	1.46	1.49

Source:Gupta et al., 2021; Dey et al., 2011

Step 6: Determining the consistency ratio

$$CR = \frac{CI}{RI} \quad (5)$$

If the resulting CR exceeds 0.10, indicating inconsistency, the matrix requires revision with different values.

COPRAS Approach

Zavadskas et al. (2008)first introduced the Complex Proportional Assessment (COPRAS) as an MCDM outranking technique in the study of multi-criteria decision-making in civil

engineering and construction projects.COPRASfollows the conceptthat ranking alternatives based on their relative importance directly and proportionately depends on a set of criteria (Popovic et al., 2012; Ustinovichius et al., 2007). The approach determines the best alternative/companies by taking into account the ideal (best) and anti-ideal (worst) solutions, along with the degree of utility and level of significance related to the alternative(Hezer et al., 2021).

The method can be expressed concisely following the four major steps (Das et al., 2012; Hezer et al., 2021)

Step 1: Calculate the normalized decision matrix

$$r_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} \quad (6)$$

Step 2: Determine the weighted normalized matrix

$$v_{ij} = r_{ij} w_j \quad (7)$$

Step 3: Calculating the maximizing and minimizing indexes for each alternative

$$S_{+i} = \sum_{j=1}^{k} v_{ij} \quad (8)$$

$$S_{-i} = \sum_{j=k+1}^{n} v_{ij} \quad (9)$$

Step 4: Determine the relative significance of alternatives

$$Q_i = S_{+i} + \frac{\min_i S_{-i} \sum_{i=1}^{m} S_{-i}}{S_{-i} \sum_{i=1}^{m} \left(\frac{\min_i S_{-i}}{S_{-i}} \right)} \quad (10)$$

Step 5: Rank alternatives based on the quantitative utility (U_i) values

$$U_i = \frac{Q_i}{Q_{max}} \times 100 \quad (11)$$

1. RESULTS AND DISCUSSION

The MCDM begins with determining the criteria weights using a proper weighting method and ends with ranking the alternatives based on the weights obtained in the earlier stage.

This study applies theweighting method AHPto obtain the relative importance scores (weights) of selected criteria, while the COPRAS approach is utilized to rank the companies based on their financial scores.

Table 5: Relative importance of decision indices

	C1	C2	C3	C4	C5	C6	C7	C8
C1	1	2	3	2	2	1	5	7
C2	½	1	2	2	1	1/3	3	5
C3	1/3	½	1	1/3	3	1/5	7	9
C4	½	½	3	1	1	1/3	9	9
C5	½	1	1/3	1	1	1/6	2	3
C6	1	3	5	3	6	1	7	7
C7	1/7	1/3	1/7	1/9	1/2	1/7	1	1
C8	1/7	1/5	1/9	1/9	1/3	1/7	1	1

Source: *Calculated by the authors*

InTable 5, each element compares two criteria, showing the relative importance of one criterion over another. If, in the pair-wise comparison matrix, the a_{ij} is the value in the i^{th} row and j^{th} column, then$a_{ji} = 1/a_{ij}$ (Eq.1). This ensures consistency in pair-wise comparison. The diagonal elements aii are all one since a criterion is equally important to itself.

Table 6. Normalized decision matrix

	C1	C2	C3	C4	C5	C6	C7	C8
C1	0.24277	0.23438	0.20566	0.20930	0.13483	0.30129	0.14286	0.16667
C2	0.12139	0.11719	0.13711	0.20930	0.06742	0.10043	0.08571	0.11905
C3	0.08092	0.05859	0.06855	0.03488	0.20225	0.06026	0.20000	0.21429
C4	0.12139	0.05859	0.20566	0.10465	0.06742	0.10043	0.25714	0.21429
C5	0.12139	0.11719	0.02285	0.10465	0.06742	0.05022	0.05714	0.07143
C6	0.24277	0.35156	0.34276	0.31395	0.40449	0.30129	0.20000	0.16667
C7	0.03468	0.03906	0.00979	0.01163	0.03371	0.04304	0.02857	0.02381
C8	0.03468	0.02344	0.00762	0.01163	0.02247	0.04304	0.02857	0.02381

Source: *Calculated by the authors*

The normalization of values in Table 5isperformed using equation (2) and presented in Table 6. The normalization is performed by dividing each value in the matrix (values shown in Table 5) by the column sum. The normalization is essential since the values in the matrix may not be on the same scale. Normalization involves adjusting the values in the decision matrix so that they are proportionate and comparable on the same scale, and typically, the values are between 0 and 1.

Table 7. Calculated weights using AHP method

C1	C2	C3	C4	C5	C6	C7	C8
0.205	0.120	0.115	0.141	0.077	0.290	0.028	0.024

Source: *Calculated by the authors*

Table 7 presents the AHP weights of each attribute. The weights of each criterion are determined using Equation (3), where the values in the normalized evaluation matrix are divided by their column sum.Fromthe table, it transpires that the ratios of ROE (C6) and ROA (C1), with the highest AHP weights of 0.290 and 0.205, are the most significant performance indicators of companies in the manufacturing sector, followed by Quick ratio (C4) and NIIM (C2). Conversely, the attribute D/E ratio (0.024) is the least significant in reflecting the financial performance of selected companies.

Table 8. Calculation of consistency ratio

λmax	8.799
Consistency index (C.I)	0.114
Random Index (R.I)	1.41
Consistency Ratio (C.R.)	0.081

Source: *Compiled by the authors*

The consistency index (C.I) and consistency ratio (C.R.) were determined using Eq. (4) and (5) and are shown in Table 8. In Table 8, the λmax is the largest eigenvalue of the pair-wise matrix. In a perfectly consistent matrix, lambda m a. x equals n, wherein is the number of criteria. Here, n appears to be 8(asλmax is close to 8.799) Deviation of from n indicates inconsistency in judgments. The closer is to n, the more consistent the matrix is. The Consistency Index (C.I.) measures the deviation from consistency. C.I. is calculated using Eq. (4). The smaller the C.I., the closer the judgments are to be perfectly consistent. Random Index (R.I.) represents the average consistency index of the randomly generated pairwise matrix of size n. It is used as a benchmark to evaluate whether the matrix's inconsistency is acceptable. For n=8, the R.I. value is 1.41 (Table

4), Saaty's random index value. The consistency ratio (C.R.) divides the value of C.I. by R.I. If the C.R. is d"0.1(i.e., 10%), the level of inconsistency is generally considered acceptable. Here, C.R. is 0.081, which indicates the matrix is consistent enough for decision-makingpurposes.

In the second stage, the COPRAS approach utilizes the AHP-derived weights to rank the selected companies. The COPRAS approach assumes a direct and proportional relationship between the criteria weights, their values, and the relative significance of the evaluated alternatives based on a set of criteria that effectively defines the decision variants (Pamuèar et al., 2018; Akram et al., 2022).

Table 9. Normalized decision matrix

	C1	C2	C3	C4	C5	C6	C7	C8
A1	0.05630	0.02981	0.05975	0.05625	0.02243	0.04743	0.01590	0.01012
A2	0.05274	0.03890	0.04150	0.05311	0.10347	0.04014	0.00452	0.00289
A3	0.02287	0.04265	0.03650	0.04288	0.00209	0.03894	0.00376	0.00145
A4	0.00562	0.00160	0.01925	0.00865	0.00771	0.00569	0.09143	0.12572
A5	0.07134	0.03209	0.02825	0.02675	0.04201	0.11847	0.10226	0.12283
A6	0.02384	0.03922	0.11000	0.12352	0.01426	0.01986	0.00383	0.00145
A7	0.18739	0.23441	0.08000	0.09677	0.01272	0.11989	0.00323	0.00145
A8	0.03081	0.04004	0.07375	0.08851	0.08398	0.02507	0.00388	0.00145
A9	0.04938	0.04696	0.03000	0.02439	0.05077	0.03615	0.00591	0.00289
A10	0.01054	0.02058	0.02800	0.02321	0.01775	0.00749	0.03096	0.01734
A11	0.03623	0.02255	0.04250	0.05468	0.07710	0.03079	0.00529	0.00289
A12	0.00998	0.01098	0.04300	0.02518	0.00753	0.01234	0.06413	0.05347
A13	0.04008	0.04331	0.03425	0.03895	0.02194	0.03457	0.00787	0.00434
A14	0.07019	0.06836	0.07150	0.07514	0.00797	0.04922	0.00450	0.00145
A15	0.00812	0.00949	0.02450	0.02164	0.01039	0.01505	0.10689	0.13728
A16	0.01207	0.01670	0.03550	0.04878	0.02726	0.01825	0.03634	0.03902
A17	0.02722	0.02010	0.02925	0.02990	0.02834	0.02927	0.02447	0.01879
A18	0.03031	0.01715	0.01400	0.01298	0.13972	0.02284	0.00817	0.00434
A19	0.08117	0.03664	0.02750	0.01849	0.14119	0.17569	0.01292	0.01734
A20	0.03676	0.07259	0.01525	0.01141	0.01868	0.03304	0.02279	0.01590
A21	0.01410	0.01944	0.02425	0.02596	0.03373	0.01540	0.07985	0.06792
A22	0.03128	0.05525	0.03800	0.03895	0.01011	0.00974	0.06111	0.04913
A23	0.01295	0.00960	0.01150	0.01180	0.00464	0.00760	0.09849	0.12861
A24	0.01901	0.02792	0.01950	0.00905	0.00671	0.01962	0.05904	0.04769

A25	0.04312	0.02303	0.04175	0.01298	0.01990	0.04941	0.10396	0.09682
A26	0.01657	0.02066	0.02075	0.02006	0.08761	0.01805	0.03852	0.02746

Source: *Calculated by the authors*

The first step in the process is to normalize the values for each alternative associated with each criterion in the decision matrix. In order to handle the problems associated with various units and scales of measurement across numerous criteria, normalization is necessary for weighing and outranking techniques. The normalized values under the COPRAS approach are presented in Table 9. The values are determined using Eq. (6).

Table 10. Weighted Normalized Matrix

	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
A1	0.01153	0.00357	0.00687	0.00794	0.00172	0.01378	0.00045	0.00025
A2	0.01080	0.00466	0.00477	0.00750	0.00792	0.01166	0.00013	0.00007
A3	0.00468	0.00510	0.00420	0.00605	0.00016	0.01131	0.00011	0.00004
A4	0.00115	0.00019	0.00221	0.00122	0.00059	0.00165	0.00256	0.00307
A5	0.01460	0.00384	0.00325	0.00378	0.00322	0.03441	0.00287	0.00300
A6	0.00488	0.00469	0.01265	0.01744	0.00109	0.00577	0.00011	0.00004
A7	0.03836	0.02806	0.00920	0.01366	0.00097	0.03482	0.00009	0.00004
A8	0.00631	0.00479	0.00848	0.01250	0.00643	0.00728	0.00011	0.00004
A9	0.01011	0.00562	0.00345	0.00344	0.00389	0.01050	0.00017	0.00007
A10	0.00216	0.00246	0.00322	0.00328	0.00136	0.00217	0.00087	0.00042
A11	0.00742	0.00270	0.00489	0.00772	0.00590	0.00894	0.00015	0.00007
A12	0.00204	0.00131	0.00494	0.00355	0.00058	0.00358	0.00180	0.00131
A13	0.00821	0.00518	0.00394	0.00550	0.00168	0.01004	0.00022	0.00011
A14	0.01437	0.00818	0.00822	0.01061	0.00061	0.01430	0.00013	0.00004
A15	0.00166	0.00114	0.00282	0.00305	0.00080	0.00437	0.00300	0.00335
A16	0.00247	0.00200	0.00408	0.00689	0.00209	0.00530	0.00102	0.00095
A17	0.00557	0.00241	0.00336	0.00422	0.00217	0.00850	0.00069	0.00046
A18	0.00621	0.00205	0.00161	0.00183	0.01069	0.00663	0.00023	0.00011
A19	0.01662	0.00439	0.00316	0.00261	0.01081	0.05103	0.00036	0.00042
A20	0.00753	0.00869	0.00175	0.00161	0.00143	0.00960	0.00064	0.00039
A21	0.00289	0.00233	0.00279	0.00367	0.00258	0.00447	0.00224	0.00166
A22	0.00640	0.00661	0.00437	0.00550	0.00077	0.00283	0.00171	0.00120
A23	0.00265	0.00115	0.00132	0.00167	0.00035	0.00221	0.00276	0.00314
A24	0.00389	0.00334	0.00224	0.00128	0.00051	0.00570	0.00166	0.00116

A25	0.00883	0.00276	0.00480	0.00183	0.00152	0.01435	0.00291	0.00236
A26	0.00339	0.00247	0.00239	0.00283	0.00671	0.00524	0.00108	0.00067

Source: *Calculated by the authors*

Table 9 depicts the weighted normalized matrix produced using Eq.7. The values in Table 8 were multiplied by the weight coefficients in Table 7 to ascertain the relative importance of each criterion.After weighted normalization, benefit, and cost criteria were treated separately in further computations, leading to the determination of utility degrees for alternatives.

Table 11. Performance scores, utility values, and relative rankings of companies

	Sum of beneficial criteria (S+)	**Sum of Non-beneficial criteria (S-)**	**S-min/S-**	**Qi**	**Ui**	**Rank**
A1	0.04540	0.00069	0.18181	0.04540	0.36298	8
A2	0.04730	0.00020	0.63849	0.04730	0.37817	5
A3	0.03151	0.00014	0.89596	0.03151	0.25191	13
A4	0.00702	0.00563	0.02236	0.00702	0.05613	26
A5	0.06309	0.00587	0.02147	0.06310	0.50446	3
A6	0.04652	0.00014	0.88335	0.04652	0.37196	6
A7	0.12507	0.00013	1	0.12507	1	1
A8	0.04579	0.00014	0.87464	0.04579	0.36607	7
A9	0.03701	0.00024	0.53330	0.03701	0.29589	10
A10	0.01465	0.00129	0.09752	0.01465	0.11713	23
A11	0.03757	0.00022	0.57505	0.03757	0.30035	9
A12	0.01602	0.00310	0.04059	0.01602	0.12806	22
A13	0.03455	0.00033	0.38582	0.03455	0.27621	11
A14	0.05629	0.00016	0.78018	0.05629	0.45005	4
A15	0.01384	0.00635	0.01984	0.01384	0.11063	24
A16	0.02283	0.00197	0.06388	0.02283	0.18250	19
A17	0.02623	0.00114	0.11003	0.02624	0.20976	17
A18	0.02903	0.00033	0.37613	0.02903	0.23208	15
A19	0.08861	0.00079	0.16034	0.08861	0.70844	2
A20	0.03060	0.00103	0.12261	0.03061	0.24470	14
A21	0.01872	0.00390	0.03232	0.01872	0.14968	20
A22	0.02649	0.00291	0.04324	0.02649	0.21179	16
A23	0.00935	0.00590	0.02134	0.00935	0.07476	25
A24	0.01697	0.00282	0.04467	0.01697	0.13566	21
A25	0.03409	0.00528	0.02386	0.03409	0.27255	12
A26	0.02303	0.00175	0.07196	0.02303	0.18415	18

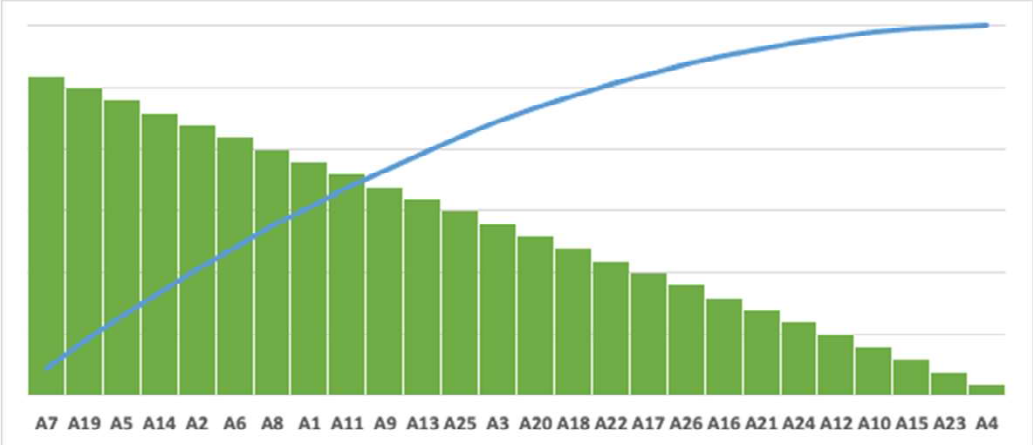
Source: *Estimated by the authors*

Table 11 presents the performance scores and relative importance (ranks) of selected alternatives (companies) determined using Eq. (8) and (9). In Eq.(8-11),k represents the number of benefit criteria, i.e., indices of which a maximum valueis expected. On the other hand, the attributes from k+1 to nare favorable when they have a lower value. S_{+i} and S_{-i}represents the aggregate score of attributes that positively and negatively influence performance.

A greater value of impliesthe relatively good performance of an alternative in beneficial criteria, whilethelowest value of reflects better performance due to a decrease in non-beneficial or costfactors. represents the aggregate performance calculated by incorporating maximizing (benefit) and minimizing (cost) criteria. Additionally, the relative efficiency of each alternative is presented with the utility value indicated by , which stands for the utility degree, where a higher score implies a stronger position for the company.

Company A7 has the highest of '0.125' and maximum '1' making it the best-performing company in the group. Companies A4 and A23 received the lowest scores of 0.056 and 0.075, indicating poor performance compared to other alternatives (Fig.3).

Fig.3. Relative performance of companiesbased on AHP-COPRAS



Source:*Authors' compilation*

Figure 3 outlines the comparative performance of companies based on the combined AHP-COPRAS approach. Among all the selected companies, A7 and A19 stood out with stronger performance, whereas A4 with the lowest or values, making it the weakest performer in the evaluation. Companies A5, A2, and A14 exhibit moderately strong performance scores, though there are areas that require improvement. In contrast, other alternatives exhibit lower relative utility and minimal efficiency within the sector.

5.CONCLUSION

The contemporary manufacturing environment demands greater worker accountability alongside rigorous assessment and reporting of financial and non-financial performance metrics. In today's highly competitive business world, organizations require a comprehensive evaluation system to assess the performance and efficiency of all units effectively. Financial performance evaluation, in particular, is crucial for stakeholders and plays a vital role in ensuring long-term growth within the industry. Consequently, establishing a robust and accurate performance assessment framework is essential for benefiting both shareholders and management. Therefore, an attempt is made to evaluate the manufacturing companies listed in Nifty 50 for the financial year 2023-2024 using an AHP-COPRAS hybrid approach; it includes 26 selected companies based on eight financial criteria, providing insights into their rankings and areas for improvement. The analysis of financial performance criteria using the AHP reveals that ROE and ROA are the most important indicators that reflect the financial health of the selected manufacturing companies. Meanwhile, the D/E ratio was identified as the least significant criterion. Incorporating eight financial ratios, the model captures essential facets of financial health, including liquidity, profitability, solvency, and efficiency. This ensures that choices are grounded in sound financial principles that consider immediate and long-term results. Additionally, the COPRAS ranking further revealed unique findings; it is observed that Coal India Ltd. outperformed during the period with a higher performance score and relative utility. Nestle India Ltd. and Britannia Industries Ltd. ranked second and third. Bharat Petroleum Corpn. Ltd.is found to be the poor performer and showed the least efficiency during the period. AHP is a structured approach that ensures the decision-making process is transparent. While the outranking method, COPRAS, adds consistency by applying proportional assessments systematically.An integrated MCDM approach is crucial for strategic planning and decision-making because it combines rigorous quantitative analysis, is flexible in nature, and can produce industry-specific insights effectively.

Planning for strategic growth relies heavily on financial performance matrices, which help companies efficiently allocate their resources. The proposed AHP-COPRAS integrated model may assist stakeholders in determining the positive or negative aspects and market potentials of the companies involved in core manufacturing and allied activities by providing a clear, quantitative ranking. Additionally, policymakers can leverage these insights to design industrial policies, subsidies, and incentives aimed at enhancing the manufacturing sector's growth and competitiveness.

Despite its contributions, this study has certain limitations. The sample size is relatively small, and the analysis is limited to a single year, which may not capture long-term financial trends or external market fluctuations. Future research can expand the study period and include a larger dataset to improve the robustness and generalizability of the findings. Furthermore, other weighting methods in MCDM, such as ANP and SWARA, can be explored to determine the relative weights of criteria. At the same time, different outranking methods like VIKOR, TOPSIS, and PROMETHEE can be employed for alternative ranking. A comparative analysis of various hybrid models could also be conducted

to enhance decision-making accuracy. Additionally, incorporating qualitative factors such as managerial expertise, market sentiment, and policy changes could provide a more comprehensive evaluation of financial performance.

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Consumer Engagement with Organic Beauty Retail Products' Brand Posts on Facebook

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ABSTRACT

The study aims to examine consumer engagement with organic beauty retail product brand posts on social media platforms, with specific reference to Facebook, while taking into consideration different media types and brand post content, its uploading time and day318 posts from twobeauty organic retail brands in Indiahaving organic certification has been considered. One Way ANOVA was conducted in order to know the consumer engagement with the brand post and compare the items amongst the brands. Media Richness Theory and User and Gratification Theoryhas been taken into consideration. It has been found that, text got higher consumer engagement than other media types.Moreover, the combination of social and remuneration content got higher than consumer engagement than the other types of content considered in the study.As the demand for organic products is growing, future studies may be carried out with more organic brands from various product categories. Moreover, the study focused on the timing of the posts, types of media as well as content types, hence more dimensions can be considered by the future researchers.As the study considered the organic beauty brands in Indian market, it will help to determine enduring feasibility of the brand/company to better understand consumer engagement. Moreover, the brand will be benefited in a good way if they adopt multi-message strategy to increase consumer engagement.

Keywords: Consumer engagement, brand post, media type, content type, social media, organic retail product, Facebook

Manuscript Received: March 21 , 2024; Revised Manuscript Received: April 6 , 2025, Accepted: May12 2025

1. INTRODUCTION

Social media attracts markets because it offers a dynamic platform for them to engage with consumers. People around the globe have involved themselves in the social networking sites to associate themselves and develop relationships with other individuals (Pillai & Mukherjee, 2011). Customers' interactions with brands have become increasingly reliant on social networking sites during the purchase cycle. However, there are many different factors that can affect how people connect with brands or companies around the world, but social media can be more or less interactive, which means that the reasons consumers have for choosing, understanding, using, and reacting to information are important for understanding how they respond to communications.

Moreover, unless a user receives a private message, brand communication on various social media platforms is inherently public, despite their varying privacy settings. In this case, it is up to the brand or company to decide whether to allow public feedback or simply use the Social Networking Sites(SNS) page to display official brand content (Araujo&Neijens, 2012). There are various categories of media types, such as text, images, and videos, that signify different levels of media richness on a social networking site, and informational posts, entertainment posts, remuneration posts, and social posts are all examples of content categories for brand posts (Schultz, 2017). More specifically, different media types in the post demonstrate varying degrees of content interactivity, and these media categories represent varying degrees of media richness, which normally indicates how vivid the content in the post is (Pletikosa Cvijikj & Michahelles, 2013).

In today's market, the behaviour of consumers is changing, and the concern for the perception of chemicals in personal care products is increasing. It is said that organic products are more environmentally friendly than conventional products (Ghazali&Nguyen, 2017). The beauty products fall under personal care, which can comprise skin care, hair care, oral care, colour cosmetics, deodorants, toiletries, and feminine hygiene products. The level of environmental awareness, health consciousness, and attentiveness to harmful chemicals on skin has increased the demand for healthy, harmless, and mostly paraben-free organic beauty products. Moreover, organic skincare products ascertain that they are safer for the skin, as they are made of natural ingredients like extracts of roots, leaves, flowers, and herbs (Narang & Radhika, 2021). However, the Indian organic beauty brands are taking place in the market, and the market for Indian organic skincare products is valued at $125 million, growing at 25% per annum. It can be seen that the younger consumers in the Indian market are adopting trends in the global beauty and personal care in order to use or consume the products free of chemicals (Ravishankar & Dhekle, 2021). Hence, it is very important to understand in what manner engagement is associated with the efficiency of customer relationships in online media (Tiruwa & Suri, 2016).

In the global market, Ecocert, the USDA, the ICEA, the Soil Association, the BDiH, CosmeBio, and the Control Union are the leading organic certification bodies (Ghazali et al., 2017). It is observed that studies have been made on organic foods in different contexts. Moreover, very few studies have been made on the purchasing behaviour towards organic personal care products.

In the rapidly growing Indian organic beauty sector, social media platforms-particularly Facebook-have emerged as essential tools for brand communication and consumer interaction. Despite the growing number of brand posts endorsing organic beauty retail products, there is a paucity of empirical insight into how Indian consumers engage with this content. Global research indicates that engagement is affected by elements such as content type, brand trustworthiness, and user interaction patterns; however, the operation of these factors within the Indian environment, especially in the niche of organic beauty goods, remains ambiguous.To fulfil the existing gap, the study has been undertaken to look after the consumer engagement towards organic personal

care products in the Indian market, which are promoting themselves on social media platforms, which is lacking or could not find any study related to it. The study considers media types like videos, photos, and text, as well as content types like information, entertainment, remuneration, and social, to understand consumer engagement with a specific post. The purpose of this study was to better understand consumer engagement with organic beauty brands in India, which can still be considered a booming market in India. As a result, this study will help marketers gain a deeper understanding of the data and fill gaps in their company's marketing and promotion strategy, with an emphasis on Indian organic products. The current study is a modest attempt to fill existing gaps by concentrating on a single goal: to look into consumer engagement with organic beauty retail product brand posts on the Facebook social media platform, taking into account posting time, media types and brand post content. Likes, comments, and shares were counted to determine how engaged consumers were with organic brand pages on social media platforms.

2. REVIEW OF LITERATURE

In the context of the study, the following literature review was conducted:

2.1. Theoretical background

In the year 1986, Daft and Lengel proposed the media richness theory that proposes a communication medium that assesses the richness of a particular medium. Media richness is determined by the ability to assist the message with instant feedback, the number of cues and communication channels used, personalisation, and language variety (Daft & Lengel, 1986). Moreover, the User and Gratification Theory (Katz & Gurevitch, 1973) enables us to comprehend media users' motivations for engaging with content (Pletikosa Cvijikj & Michahelles, 2013). Katz and Gurevitch (1973) identified five distinct types of needs among many others. First, there are cognitive needs, such as learning, understanding the social environment, curiosity, and exploration; second, there are effective needs, such as aesthetic and emotional experiences and pleasure; and third, there are personal identity needs, such as self-confidence, personal stability, integrity, social status, and the need for self-respect. Fourth, there are the needs for integration and social interaction, which include family ties and friendships, as well as a connection to the outside world and a sense of belonging. The fifth need is escapism, which includes the desire to escape, the release of tension, and the shift of attention from unpleasant to pleasant. Brand fans or consumers are more likely to engage with content if it contains information about the brand or its products/services (De Vries et al., 2012). Social commerce networks adapt UGC theory to sell products on their sites (Sethna & Bergiel, 2017).

2.2.Consumer Engagement:

Customer engagement, according to Doorn et al. (2010), is specifically defined as a customer's behavioural appearance that focuses on a brand or a firm beyond purchase

as a result of motivational drivers. According to Chaffey (2007), consumer engagement is defined as "repeated interactions between a customer and brand that strengthen the emotional, psychological, or physical investment a customer has in that brand. From the standpoint of an organisation, Vivek (2009) defined customer engagement as "interactions that strengthen the emotional, psychological, or physical investment a customer has in a brand."

According to Brodie et al. (2011), consumer engagement demonstrates customers' interactive and co-creative practices among other participants in pivotal service network relationships. Sashi (2012) mentioned that consumer engagement entails trust and commitment among the buyers and sellers, and it is the trust which possesses long-term relationships with integrity and reliabilit'y. The formation of a worthful association between both parties is strategically constructed by customer engagement to comprehend common benefits in that relationship (Chaffey, 2007).Consumer engagement may be developed in the form of onsumption, contribution, creation, cognitive processing, affection, activation, emotional/behavioral/passive/active engagement, likes, comments, and shares etc., (Saikia & Bhattacharjee, 2023)

2.3. Engagement with Facebook:

Facebook enhances interactivity among the consumers, and the brand pages shall foster the followers not only to like or comment but also to develop the purchasing behaviour (Sharma et al., 2017). The perceived enjoyment of Facebook users after using the Facebook page increases their intention and attitude toward attending the event (Lee et al., 2012). The execution of the Like button by Facebook is gaining success for various industries as well (Kabadayi & Price 2015). The establishment of connection takes place between the Facebook users and a brand because whenever any consumer of Facebook likes a brand, it used to be seen in their profile and let his/her friends see who have liked that particular brand too (Kabadayi & Price 2015; Wallace et al., 2012). Moreover, commenting on a Facebook page or brand post also generates engagement because the users would be able to see the comments of others even if they are not known to each other, and it is more accessible to the users (Kabadayi & Price 2015). Consumers can share their thoughts on the content of the brand post, which establishes a link between the brand and the consumer, which is visible to other members of the consumer's network (Wallace et al., 2012). The comments help the company or brands to hear feedback which allows the company to understand the consumers (Malhotra et al., 2013). However, the share button also enhances engagement, which enables the users to share the original post, including photos, videos and URLs. After sharing a particular post, it appears to the users that the wall also gets updated to the news feed of their friends, and hence it can be said that sharing a post is a commitment to a brand along with its message (Malhotra et al., 2013).The visual relevance directly fosters connection and engagementthrough contact on Facebook (Chen et al., 2025).

2.4. Consumer Engagement and Social Media Content

Consumer engagement is a motivating factor that incorporates cognitive, emotional, behavioural, and social knowledge, skills, and operating resources to create an interface between service systems (Hollebeek et al., 2019). According to Lee et al. (2014), emotional and philanthropic content has a positive effect on user engagement, whereas product informational content has a negative effect. As a result, marketers may find it difficult to create new product promotions using social media. Because of a positive emotional response to a brand's social media post, a consumer may engage in the behaviour of liking the post (Demmers et al., 2020). The more positive comments a brand post receives, the higher the likelihood that the number of likes will rise (De Vries et al., 2012). Posts of a brand that are liked, shared, or commented on by other consumers can have a significant impact on the broader audience. This is due to the fact that information from other consumers can be inspired and trusted, having a significant impact on receiving consumer insight and performance (Peters et al., 2013). Customers' cognitive and emotional responses to brand-created content are tracked, recognising the interactive nature of consumer engagement that requires consumers to respond to brand-generated content with their own actions (Doorn et al., 2010). People who like, share, or comment on a brand's social media posts provide the brand with immediate feedback on how they perceive the content. As a result, whenever a customer likes, shares, or comments on brand-generated content, it spreads to their social networks (Demmers et al., 2020). Consumer engagement can also be established by the increase of relational brand community benefits from a particular brand (Doorn et al., 2010 ; Eriksson et al., 2019). The establishment of commitment or engagement occurs with a specific company's page on Facebook, which includes liking a post as a mild level of consumer engagement. The emotional response to a specific post may include love, anger, sadness, and so on. Commenting on a specific post plays a larger role in describing consumer engagement. Sharing a post in which consumers make an effort to share the content, whereas creation extends beyond the state of engagement and involvement that leads to the establishment of co-creation (Sharma et al. 2017). Schultz (2017) found there exist variations in consumer engagement across different industries. Furthermore, according to Kim et al. (2015), the efficiency of different posts on a brand page indicates that consumers have varying intentions to work with different brands because posts with self-orientated content, such as product information, received more likes than posts with interaction-orientated content, and this is for the convenience brand. Establishments regularly invite clients to share their experiences and offer feedback via social media channels (Azzam, & Katbeh, 2025). Engagement is influenced by the narrative conveyed, specifically the content's substance; this study expands the understanding of engagement by examining the "Who"-through Endorser type, the "When"-through posting time and day, and the "How"-through vividness, interactivity, appeal, and message length (Drossos et al., 2024).

2.5. Media Post Type

According to Coursaris et al. (2016), there are various media types of Facebook brand pages that represent various levels of richness, including photo, video, and URL. Consequently, it is essential to examine consumers' engagement with the promoted products, which enhances their attention and cognitive processing (Mucundorfeanu et al., 2025). Furthermore, it is the actual communication carried out by the brand page moderator within a social media page that shares photos, videos, and links, among other things (De Vries et al., 2012; Pletikosa Cvijikj & Michahelles, 2013). The photos and text of the brand post can provide information about the products to the consumer (Luarn et al., 2015). Rich media tools such as video, audio, and animation enrich the content and make it more vivid (Coyle & Thorson, 2001). Vividness refers to a post's richness as defined by its formal characteristics in terms of displaying knowledge to the senses (Steuer, 1992). Demmers et al. (2020) found that there are three levels of vividness: low, medium, and high, depending on the content of the post: text, photos, and videos. According to Schultz (2017), posts with a clear message and a lot of media can increase consumer involvement (i.e., likes, comments, and shares). Whereas if someone wants to increase the number of likes, they should consider the vividness of the brand post containing videos because it stimulates one's hearing. This contributes to an increase in likes (De Vries et al. 2012).

Photos, according to Lu (2019), are more effective at generating consumer engagement; however, videos with a medium level of vividness (Demmers et al., 2020) elicited significantly higher levels of engagement than videos with a high level of vividness. If a video contains the same level of interactivity as a link but is more vivid, the user is more likely to engage. Status updates, which have a low level of interactivity and lack vividness, were found to be more engaging than links and videos (Pletikosa Cvijikj & Michahelles, 2013).

2.6. Content Post Type

Service providers with important information stipulate that consumers engage in SNS effectively (Lin & Lu, 2011). Tafesse and Wien (2018)studied how social media message strategy affects consumer behaviour. The study found that the most effective way to engage customers' behaviour was through the use of transformational messages, rather than informational or interactive ones. Compared to information and entertainment posts, brand posts with remuneration received more likes but had higher consumer engagement, according to Luarn et al. (2015). They were also less likely to like posts with social elements.

Sharing was significantly higher in posts about entertainment and information than in posts about compensation and socialising. Entertainment has been found to have a significant impact on a social media platform's likes, comments, and shares ratios (Pletikosa Cvijikj & Michahelles, 2013). While providing brand-related information positively impacts the likes and comments ratio, it does not have the same effect on shareability. The observed increase in the likes/ comment's ratio is greater when compared to the

remuneration content type. Remuneration significantly influences the ratio of likes and comments.

Contrary to expectations, the effect on the like's ratio turned out to be negative. Furthermore, there was no discernible effect on the shares ratio. Informational content has a higher engagement mean value than other content types, leading to higher levels of consumer engagement (Lu, 2019). If a brand post includes entertainment content types, consumers are more likely to consume it with pleasure and amusement (De Vries et al., 2012). Interactivity and vividness are examples of content characteristics; content domains include education, entertainment, and information; content valence includes emotions such as anger, anxiety, and joy; tonality includes positive and negative; and content volume includes counts and volumes (Peters et al., 2013). Posts about the company/brand and its products, on the other hand, may contain content which is not directly related to that company/brand (such as a funny movie or anecdote). It is also used as a base category in the analyses because some brand posts are neither entertaining nor informative (De Vries et al., 2012). Overall, the most weighted engagement numbers were found for inspirational and entertaining content (Eriksson et al., 2019). Pre-consumption posts with informative content generated significantly more engagement than posts with entertainment content, while posts with entertaining content generated significantly more engagement during the consumption stage and post-consumption stages (Demmers et al., 2020). Furthermore, entertaining content exhibits a higher engagement rate among followers of the Facebook brand page (Jayasingh, 2019).

2.7 Posting Time:

In the case of online advertising, scheduling, i.e., time and space, is the significant component to enhance the revenue, and where Facebook is concerned, timing is the central characteristic of scheduling (Kumar et al., 2006). Balio and Casais (2021) stated that the time frame has been studied from three different viewpoints, such as posts published on weekdays or weekends, their time of publication, and different months of the year. However, the posting times of brand posts are of two categories: day of the week and peak hour. When the brand post is generated on weekends (Saturday and Sunday), they are called day of. Moreover, consumer activity peaks from 10:00 a.m. to 7:00 p.m., and the rest of the time is implied as low peak hours (Zhao et al., 2021). But Golder et al. (2007) found that the engagement rate is high in the evening and during the night. According to Pletikosa Cvijikj & Michahelles (2013) and Golder et al. (2007), Facebook users are eager to devote more time on workdays where they find Facebook with better strength. Each brand identifies its optimal posting times, which may be determined solely by analysing the company’s data. The optimal timing for posting likely varies based on multiple brand-specific aspects, including the industry affiliation and characteristics of the target audience, such as age and region (Drossos et al., 2024)

1. Research Questions:

RQ1: Which types of media and content generate higher consumer engagement in Facebook?

RQ2: Does posting time and posting day create any difference in generating consumer engagement in Facebook?

RQ3: Which brand received highest consumer engagement in terms of its posting time, media and content types in Facebook?

2. Research Methodology

2.1.Study Design

The data has been gathered from two organic beauty brand pages, which showcased various posts created by the companies. The data was collected manually over six months, from September 1, 2024, to February 28, 2025, with a total of 318 brand posts.The goal of the content analysis was to look at the company's brand posts. The scientific method of converting qualitative data into quantitative message analysis is known as content analysis (Luarn et al., 2015). Researchers commonly use it in media effects to examine the transmission of content (Roznowski, 2003). Luarn et al. (2015) used content analysis as a systematic and objective method for sample comparison.

The coding process for the analysis was done in three steps, similar to the steps proposed by Bronstein (2013), but the steps in the study were slightly modified to fit the study's objectives. To begin, the different types of media that a post can contain, such as photos, videos, and texts were identified. Secondly, the content of the post has been identified. In the end, the number of likes, comments, and shares received by each of the brand pages' posts has been tallied up. The study used Facebook as a platform to gather brand information. With over one billion users, Facebook has dominated the social media landscape, allowing businesses to create brand pages to generate content such as photos, videos, and links, as well as engage with customers by liking and commenting on those posts and messages (Kabadayi & Price, 2015).

2.2.Sample brand(s)

Two organic beauty brands of India based on the organic certifications have been selected. Organic Harvest has been certified by global organizations such as EcoCert, OneCert and Natrue. Naija Organics got Organic certified by NPOP, GMP certified by AYUSH and ECOCERT (Refer Table I).

Table I: Organic Brand Pages with number of posts and followers

Brand Pages	Product	Product category followers (In thousand)	No. of posts	No of	Liked
Organic Harvest	Beauty	Hair care, Face care,	202	376K	365K

Naija Organics	Beauty	Soaps, Body wash, Body lotion, Creams, Shampoo, Conditioner.	116	3.4K	3.4K
Total no. post			318		

Source: Primary data

4.3. Variables considered:

4.3.1. Independent Variables

The independent variables were media type (video, photo, text) and content type (information, entertainment, remuneration, and social). Posting time includes day of the week (weekend and weekdays) and time of the day (before 9:01 AM, between 9:01 AM and 12:00 PM, 12:01 PM and 3:00 PM, 3:01 PM and PM-6:00 PM, 6:01 PM and 9:00 PM and after 9:01 PM) that have been considered for the study.

4.3.2. Dependent Variable

The dependent variable was consumer engagement (Like, Comment, and Share). Consumer engagement was measured by the total number of likes, comments, and shares for each of the company's brand posts. To express one's feelings in response to a particular Facebook post, emojis are available. Because the like/dislike/heart emojis and reactions were not separated, the word "likes" includes them all (Eriksson et al., 2019). Therefore, the study also included emojis while considering likes/dislikes.

4.4. Data Coding Procedure

The data for the study were manually coded, and one of the researchers served as an independent coder. The raw material was first gathered from the selected companies' Facebook brand posts and then coded into different dimensions, as shown in Table II.

Table II: Coding Classification.

Dimensions	Measures	Description
Posting Time (Pletikosa Cvijikj & Michahelles, 2013; Deverux, Gremmer & Gremmer, 2020; Zhao et al., 2021)	Day of the week and time of the day	Weekdays (Monday to Friday), Week-end (Saturday and Sunday); Time of the day includes hours of the day
Media Type (Demmers et al., 2020; Pletikosa Cvijikj & Michahelles, 2013)	Video	Post published with video (High vividness)
	Image	Post published with image (Medium vividness)
	Text	Post published with text (Low vividness)

Content Type (Luarn et al., 2015; Eriksson et al., 2019)	Information Content	Promotional content relating to a specific product or company (such as a review or a recommendation), as well as information about the brand itself.
	Entertainment Content	Funny videos, anecdotes, teasers, slogans, and wordplay are all available.
	Remuneration Content	Promotions, trials, coupons, special offers, and other incentives to get people to act.
	Social Content	Questions and statements were used to encourage users to interact with the posts by allowing them to respond to them, allowing for more interaction.
Consumer Engagement (Luarn et al., 2015; Demmers et al., 2020)	Like(s) Comment(s) Share(s)	

Source: Review of Literature

Finally, to align with the study's goal, the texts and data from has been rated from qualitative to quantitative. It has been observed that the brand posts consisted of text and images, along with the combination of text & images and text & video. It is also spotted that the content of the post was not only based on informational, entertainment, social and remuneration content but also a combination of the different content types.

4.5. Data Analysis

The information was gathered for content analysis and then recoded into numbers for use with the statistical program SPSS 26.

4.5.1. Descriptive Analysis:

- The media types of the posts were such that 15.9% of them were text and 5.4% were images. 8% were only videos, 53.0% of posts were a combination of both text & images, and 24.9% of the posts were a combination of both text & videos.

The content types of the post were such that 33.4% of the post consisted of informational content, 2.9 % of the post were of entertainment content types, 3.7% of the post consisted of remuneration content, 14.4% of the post consisted of social content, 1.9% of the post consisted of both informational & entertainment content, and 6.4% consisted of both informational & remuneration content. 28.7% of the posts consisted of both informational & social content; 2% of the posts consisted of both entertainment & remuneration content;

again, 2% of the posts consisted of both entertainment & social content; and 8.2% of the posts were both remuneration & social content.

The timing of the posts is such that 2.1% of the posts were generated before 9:01AM; 23.5% of the posts were generated between 9:01AM and 12:00PM; 14.6% were generated between 12:01AM and 3:00PM; 28.5% were generated between 3:01PM and 6:00PM; 25.4% were posted between 6:01PM and 9:00PM; and 6.0% were posted after 9:01PM. Moreover, 76.9% of the posts were posted on weekdays, and 23.1% of the posts were on weekends.

4.5.2. Inferential Analysis:

Further analysis was done in order to find out the engagement of the consumers with the posts of the brands.

A one-way ANOVA was conducted in order to know the consumer engagement with the brand post and compare the items that have considered in the study. In order to answer research question 1, it is observed that the highest value for consumer engagement with text is (x= 63.63), image is (x= 19.67), video is (x= 15.00), a combination of both text & image is (x= 14.11), and text & video (x= 44.38). Therefore, it can be said that text received higher consumer engagement than other media types. Moreover, the highest values for information (x=19.50), entertainment (x=19.55), social (x=x=8.74), information & entertainment (x=x=8.50), information & remuneration (x=x=101.56), informational & social (x=9.54), entertainment & remuneration (x=x=5.00), entertainment & social (x=x=18.00), and remuneration & social (x=x=69.26). Therefore, it can be said that a combination of remuneration & social content leads to higher consumer engagement *(x=98.38)* than the other content types.

Further, in order to achieve research question 2, the time of day and day of the week have been checked separately. However, in the case of the day of the week, it was found that weekdays and weekends do not significantly differ *($p = .470$ or $p > 0.05$).* In the case of the time of day, it was found that there does not exist a significant difference in terms of the time that post was updated on brand pages (p*=.542 or* p>0.05).

In order to look into the best performance of a brand (research question 3) among the two in terms of consumer engagement, a comparison has been made:

Table III: Comparison among the brands

Dependent Variable= Consumer Engagement

Dimensions	**Organic Harvest**		**Naija Organics**	
	N	**Mean**	**N**	**Mean**
Week days	152	***23.54***	86	23.33
Weekend	50	***27.52***	30	4.03
Before 9:01AM	2	26.50	6	3.83
9:01 AM-12:00PM	18	13.06	23	3.96
12:01AM-3:00PM	46	50.24	12	3.50
3:01PM-6:00PM	49	15.82	58	11.60
6:01PM-9:00PM	66	18.64	15	85.93
After 9:01PM	21	16.67	2	4.50
Text	35	12.74	8	63.63
Image	3	19.67	9	2.89
Video	2	15.00	2	4.00
Text and Image	88	12.90	82	18.62
Text and Video	74	44.38	15	3.80
Informational	47	17.66	74	19.55
Entertainment	6	19.50	5	5.20
Remuneration	-	-	9	4.00
Social	35	8.74	10	3.40
Informational and				
Remuneration	16	101.56	8	64.88
Informational and				
Social	76	9.54	1	3.00
Remuneration and				
Social	19	69.26	3	12.33
Informational &				
Entertainment	2	8.50	5	4.00
Entertainment &				
Social	1	18.00	-	-
Entertainment &				
Remuneration	-	-	- 1	5.00

Source: Authors' calculation (Note: The bold and italic numbers indicate the highest Consumer Engagement for each dimension whereas the underlined value indicates highest consumer engagement amongst all the dimension of the brands).

4.5.3Observation(s): Comparison has been made among the brand and differences has been observed in Table III:

*i. Consumer engagement in terms of Posting Time:*Organic harvest received the highest consumer engagement for the post posted between 12:01PM and 3:00PM. Naija Organics received the highest number of consumers between 6:01 PM and 9:00 PM.

ii. Consumer engagement in terms of media types: Organic Harvest received the highest consumer engagement for the post, which is a combination of both text & videos.

*iii. Consumer engagement in terms of content types:*Organic Harvest received the highest consumer engagement for the post containing both the combination of informational & remuneration content; also it gained the highest consumer engagement in terms of the post that contained the combination of informational & social content; the brands in terms of the combination of entertainment & social content types could not compare since only Organic Harvest has such content types. Moreover, the comparison of posts for the combination of entertainment & remuneration content was not compared because only Naija Organic contained that type of content in the post.

5. Discussion :

The majority of studies have used posts generated by various brand pages, such as top retail brand pages identified by several Facebook metrics, brand pages of the largest fairs and conferences, various bloggers' posts on fashion products, and so on. It has beenobserved that no specific research has been conducted using the brand pages of organic products. Moreover, the findings of the study are such that:

5.1. Posting Time:

Posting time was observed by looking into the day of the week and time of the day. It has been found that posts that were updated on the weekend got the highest consumer engagement compared to posts that have been updated on weekdays, which contrasts with the study of Pletikosa Cvijikj & Michahelles (2013) and Golder et al. (2017). This may have happened because of the brand types, their followers or the activeness of the consumer on the day of the week. The consumers are seen to be active on the weekend, where we assumed that consumers get their free hours mostly on the weekend. However, the study supports the findings of Deverux et al. (2020) that there is no significant difference in the days of the weeks in generating consumer engagement. Moreover, it can be said that posts made between 12:01 PM and 3:00 PM received more consumer engagement than the other timings of the day, which supports the study of Zhao et al. (2021), which said that consumer engagement is high between 10:00 AM and 10:00 PM, and the time that results in enhanced consumer engagementfalls under 10:00 AM - 7:00 PM.

5.2. Media: *types:*According to the findings, text generated higher levels of consumer engagement than any other media types, which contrasts with the findings of other studies (Lu, 2019), which portrayed photos as generating more consumer engagement; Demmers et al. (2020) found that videos generate more consumer engagement. The study confirms

the text that generates more consumer engagement, which might be the result of the reason that the brands that have been considered for the study are organic beauty brands where the consumer is assumed to read the text because of the honesty and authenticity of the brand/product.

5.3. Content:

*Types:*Another finding of the study was that consumer engagement has been increased by the combination of social & remuneration content types, with followers showing greater interest in posts that include interactions such as questions and answers in the form of comments and interactive sessions initiated by the brand page administrator and with the benefits of receiving discounts, offers, etc., from the brand, which ensures the engagement of consumers towards a particular brand. Depending on the brand, the post may serve a different purpose and contain different content, which will result in a different level of engagement. The findings of the study support the result of Luarn et al. (2015) in terms of remuneration.

Moreover, the study confirms that there exist different combinations of the content types and also the combinations of media types. This contributes to the idea that the combination of the contents works better in enhancing consumer engagement rather than only one content in a particular post.

In addition, it has been observed from the comparison of the brands that the number of posts did not prohibit the post from generating consumer engagement. The table provided a clear picture that the small number of posts generated better consumer engagement than a large number of posts. Moreover, it can be said from the study that content is the most important factor in generating consumer engagement since, from Table No. III, it is observed that content types (social and remuneration) received the highest value amongst all.

6. Theoretical Implication:

To learn about different media and content types for consumer engagement, the Media Richness Theory (Daft & Lengel, 1986) and the User and Gratification Theory (Katz & Gurevitch, 1973) were applied. With a focus on organic retail brands, this study will assist brands and other businesses in determining the impact of various messages contained in a particular post on increasing consumer engagement. Likes, comments, and shares are the most important metrics for determining a social networking site's success. However, users must be able to use a social media strategy to promote a new brand so that they are at least aware of it. Moreover, the companies or brands should welcome consumers' opinions to strengthen the accomplishments of the company. The study stipulates a worthful understanding that content types are the most important aspect in enhancing consumer engagement with a brand. From this, it is expected that the behaviour of the consumer can be judged towards the organic beauty brand of India.

7. Managerial Implications

The findings will help businesses improve their organic retail brand promotion strategy. The brand page administrator will gain a deeper comprehension of the post types that enhance consumer engagement. In other words, the administrator will notice

that videos generate more consumer engagement than photos. Brand posts that combine both remuneration and social content types generate more engagement, according to the study. As a result, the findings would benefit the company/brand as well. The brand which has a very low number of posts (observation from the study) is expected to increase the number of posts to be updated to have regular engagement with the consumer. The brand/company can also create multi-message brand content to increase consumer engagement. Because the brand has a variety of organic retail products on the market, the study will aid them in determining their long-term viability among consumers, as well as pave the way for other nascent organic retail brands to better understand consumer engagement.

The consumer or follower interacts with the brand through likes, comments, and shares, and the marketer creates posts with vibrancy and a variety of content types to increase consumer engagement.

8. Limitations and Further Research

The investigation focused on two Indian organic beauty retail brands. However, as the demand for organic products grows, future studies may include more organic brands from various product categories. The study took into account the type of media and content, and future researchers can consider more dimensions of the posts.

The results of a future study may differ because the number of followers on brand pages may increase. In addition, a future study could look at how customers interact with organic retail brands on social media platforms or any other social networking sites besides Facebook.

9. CONCLUSION

This study has made a contribution to the limited body of literature on customer engagement with organic beauty product brands on Facebook. The study focusses primarily on Indian brands, which is a niche that was mostly missed in earlier research that focused on top retail brands, fashion bloggers, or worldwide brand pages. The study provides a number of important insights into the ways in which various post-related criteria, such as the time of posting, the type of media, and the type of content, influence the level of interaction that consumers have on Facebook. The findings of the study indicate that the posting time, the type of material, and the quality of the content are incredibly important factors in increasing consumer interaction with organic beauty brand posts on Facebook in the context of India. The specific customer behavior toward organic brands also implies a preference for real, educational, and interactive information, suggesting a break from interaction patterns reported in more commercialized or visually focused product categories.

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