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FROM THE EDITOR'S DESK

The Research Journal *Revelation* is being brought out by K.P.B. Hinduja College of Commerce, with a view to assist academicians, professionals and researchers to share information on topics related to Growth and Development of Business in India. The aim of this Journal is to encourage researchers to contribute research articles based on Industry Studies or on findings of Research Projects executed. Issues relevant to the growth and development of Indian Economy, in the streams of Arts, Science, Social Sciences, Economics, Commerce and Management are welcome.

Original research articles based on an up-to-date review of literature and supportive primary/secondary data are invited.

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FOREWORD FROM THE CHIEF EDITOR

In the fast changing scenario of the global world, there is a need to create a learning society to face the challenges of education. Knowledge explosion, emergence of Information Technology, globalisation of trade and economy and rise in social aspirations have given rise to a demand for new professional knowledge skills. Universities and colleges need to gear themselves to meet such challenges. The urgent need is to consciously and decisively invest in enhancing the quality standards of education by providing training to teachers to equip them with capabilities to meet the challenges of change. The aim should be to excel the teacher body at all levels, as valuable resources. Building a vibrant and innovative education system is crucial in a country such as India, which must address the daunting challenges posed by democracy, disparity and development.

India sends the largest number of students to study abroad after China. It was hence natural that in the last few years academic institutes designed various arrangements under which an Indian student could earn an international degree. Foreign education providers interested in tapping the large Indian student base, mostly collaborated with existing Indian institutes to offer a host of degrees. According to U.G.C. data, there are 156 foreign providers, including 90 universities and 20 colleges, who are keen about collaborations with Indian institutions. Opening Indian higher education to foreign competition will strengthen the educational system in India.

India is seen as a huge market with immense potential. The issue of permitting foreign institutions to operate in India has been fiercely debated for over a decade. Many foreign institutions are keeping a watch on educational developments in India. University presidential delegations from Harvard, Yale, Stanford, and Mellon have come to India in the past few years to learn more about and from the country. On March 15, 2010 the Union Cabinet cleared the Foreign Educational Institutions (regulation of entry and operation) Bill, which aims to allow foreign universities to set up campuses in India. HRD minister Kapil Sibal said that the approval of the bill is “a milestone which will enhance choices, increase competition and benchmark quality.” It appears to be a bright horizon and a clear sky!

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CHALLENGES IN DIGITAL MATURITY MEASUREMENT: ADDRESSING CEILING EFFECTS IN BANKING DIGITAL TRANSFORMATION ASSESSMENT

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ABSTRACT:

Digital maturity measurement frameworks are increasingly critical for banking performance assessment, yet their validity in mature digital environments remains unexplored. This study aims to identify and document ceiling effects in digital maturity measurement within Indian banking, examining systematic limitations that compromise assessment accuracy when basic digital capabilities achieve widespread adoption. Measurement of digital maturity using a nine-dimensional Digital Maturity Index (DMI) framework encompassing customer channels, operational digitization, and strategic innovation dimensions. The sample was determined purposively and 20 banks were selected across private and public ownership structures. Methods of data collection using content analysis of annual reports from 2018-19 to 2022-23. The research data was obtained from company annual reports, regulatory filings, and systematic scoring of digital capability indicators. Data obtained from official banking disclosures and regulatory databases. The data analysis technique used descriptive statistics and ceiling effect detection methodologies. Based on the results of data analysis, it can be concluded that severe ceiling effects exist in digital maturity measurement, with 72% of observations achieving maximum DMI scores and 90% clustering in upper measurement ranges. All nine dimensions demonstrated ceiling effects ranging from 84% to 100% adoption rates, indicating systematic measurement inadequacy. The temporal analysis revealed progressive ceiling effect intensification from 55% to 85% maximum scores over five years, with COVID-19 accelerating digital convergence. There is a fundamental limitation in binary assessment approaches when digital capabilities transition from competitive differentiators to operational necessities, supporting the need for enhanced measurement frameworks that capture implementation quality rather than mere presence of digital features.

Keywords: Banking industry, Digital Maturity Index, Digital Transformation, Financial Services

1. INTRODUCTION

Banking's competitive landscape has been fundamentally reshaped by digital technologies, shifting strategy from IT enablement to digital business strategy at the core of value creation (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013)¹. Seminal work on “leading digital” further shows that digitally mature incumbents translate technology into operating model change and superior performance (Westerman, Bonnet, & McAfee, 2014)², while integrative reviews synthesize digital transformation (DT) as organizational change driven by digital technologies to improve performance and value propositions (Vial, 2019)³. The COVID-19 shock accelerated these trajectories: banking rapidly digitized customer journeys, analytics, and remote operations, with front-to-back digitization emerging as a post-pandemic imperative (Boston Consulting Group, 2021)⁴. Empirically, system-wide banking outcomes through the crisis tie resilience and profitability to technology adoption and balance-sheet adjustments (Demirgüç-Kunt, Pedraza, & Ruiz-Ortega, 2021)⁵. Yet despite the urgency, many transformations underperform due to measurement blind spots that obscure where—and whether—capability build translates into outcomes (McKinsey & Company, 2023)⁶. Contemporary outlooks for 2025 reinforce that banks now face macro uncertainty and a “do more with digital” mandate, intensifying the need for rigorous assessment of digital maturity and its link to value (EY, 2025)⁷.

Against this backdrop, measuring digital maturity is not merely descriptive: it guides investment sequencing, capability benchmarking, and performance attribution. Industry benchmarks—such as *Digital Banking Maturity*—have become de facto lenses for cross-bank comparisons and capability gap analysis (Deloitte, 2024)⁸. More generally, cross-sector maturity models (e.g., Forrester's DMM 5.0) translate strategy and execution into level-based profiles for governance, culture, technology, and customer experience (Gill & VanBoskirk, 2017)⁹. Academic syntheses likewise document the proliferation of digital maturity models (DMMs) and their dimensions, implementation contexts, and evidentiary bases (Teichert, 2019)¹⁰; subsequent reviews systematize model purposes, scope, and instrument structures (Ochoa-Urrego & Peña-Reyes, 2021)¹¹. In banking specifically, supervisors and policy research highlight technology-driven transformation of products, channels, and market structure, underscoring the need for metrics that capture capability and risk (Kwan, Lee, & Wu, 2021)¹². Yet practitioner experience warns that culture and leadership—not tools alone—differentiate maturity trajectories, again pointing to measurement as a critical managerial instrument (Kane, Phillips, Copulsky, & Andrus, 2019)¹³.

However, current approaches exhibit methodological tensions. A decade of DMM research concludes that models vary widely in constructs, level definitions, and validation rigor, with limited evidence that higher “levels” consistently predict outcomes (Thordsen & Bick, 2023)¹⁴. Comparative analyses show heterogeneity in dimensions, scoring methods, and aggregation rules, complicating longitudinal use and cross-study synthesis (Kalender, Ulas, Küçük, & Sener, 2024)¹⁵. Foundational work on business model innovation cautions

that transformation is path-dependent and contingent—features that stage models often compress into ordinal scores (Rachinger, Rauter, Müller, Vorraber, & Schirgi, 2019)¹⁶; external enablers (platforms, regulation) create discontinuities that static scales may miss (von Briel, Davidsson, & Recker, 2021)¹⁷. Broader reviews of DT scholarship call for stronger construct clarity, better theorization of capability–performance links, and improved measurement validity (Hanelt, Bohnsack, Marz, & Antunes, 2021)¹⁸. Banking-focused reviews similarly underline the need to operationalize transformation across front, middle, and back office, while ensuring criterion validity for value capture (Terho, Mero, & Järvinen, 2022)¹⁹; recent empirical work maps banking DT impact drivers but also highlights instrument design gaps (Porfirio, Proença, & Fonseca, 2024)²⁰. Meta-analytic findings across sectors suggest a positive DT–performance relationship but stress heterogeneity and measurement artifacts as threats to inference—again underscoring the stakes of how we measure maturity (Barba-Sánchez & Luján Alfaro, 2024)²¹.

A particularly underexamined artifact is the ceiling effect—the compression of scores at the top of a scale that reduces variance, masks improvement, and biases relationships with outcomes. In measurement terms, ceiling effects erode reliability and statistical power, distort associations (e.g., attenuation, nonlinearity), and can induce spurious nulls or plateaus (Field, 2018)²². Method literature shows that floor/ceiling effects can produce illusory stability and biased longitudinal trends if distributional assumptions are violated (Liu & Wang, 2021)²³, and they complicate effect estimation and responsiveness in health and social measurement (Austin & Brunner, 2023)²⁴. Evidence from instrument validation warns that truncated ranges and top-heavy items depress sensitivity to change, threatening both internal and external validity (Paap, Bode, & others, 2019)²⁵. In banking, where capabilities like mobile onboarding, instant payments, and advanced analytics are now near universal among leading incumbents, maturity instruments that relied on adoption checklists risk saturating—precisely the conditions under which ceiling effects are likely to emerge.

This paper makes a methodological contribution to digital transformation measurement by taking into account the following objectives

- (i) To systematically identify and quantify the presence of ceiling effects in existing digital maturity measurement frameworks when applied to contemporary banking institutions
- (ii) To analyze the statistical and practical implications of ceiling effects on research validity, correlation analysis, and strategic decision-making in banking digital transformation assessment
- (iii) To propose methodological refinements that address ceiling effect limitations through weighted scoring mechanisms, multi-dimensional assessment structures, and implementation quality indicators

By addressing a neglected measurement artifact in a domain with high policy and strategy salience, the study strengthens the evidentiary basis for linking maturity to performance.

2. LITERATURE REVIEW

2.1 Digital Maturity Assessment in Banking: Foundations and Evolution

Digital maturity has emerged as a fundamental construct for understanding how banking institutions leverage digital technologies to create value and achieve competitive advantage (Bharadwaj et al., 2013)²⁶. The concept extends beyond technology adoption to encompass strategic integration within operational processes, organizational culture, and long-term vision (Westerman et al., 2014)²⁷. In banking contexts, digital maturity represents institutions' capacity to harness digital technologies for operational efficiency, customer value creation, and competitive positioning (Vial, 2019)²⁸. This has gained critical importance as financial institutions navigate fintech disruption, regulatory pressures, and evolving customer expectations (Feyen et al., 2021)²⁹.

Digital maturity measurement has become essential for banking institutions seeking to benchmark transformation progress and guide strategic investment decisions (Matt et al., 2015)³⁰. Assessment serves multiple functions: enabling competitive benchmarking, informing technology resource allocation, supporting regulatory compliance, and facilitating performance evaluation of digital initiatives (Chanias et al., 2019)³¹. The banking industry has witnessed proliferation of assessment frameworks attempting to capture the multifaceted nature of digital transformation across organizational dimensions (Kane et al., 2019)³². These frameworks typically evaluate institutions across domains including digital strategy, technology infrastructure, customer experience, operational processes, and organizational culture (Hanelt et al., 2021)³³.

Contemporary digital maturity models have evolved from simple technology checklists to sophisticated multidimensional frameworks (Fitzgerald et al., 2014)³⁴. Industry-specific models include the Bank Internet Maturity Model (BIMM), which employs six dimensions and twenty sub-dimensions (Fayon et al., 2015)³⁵. Consulting firms have developed comprehensive tools including Deloitte's Digital Banking Maturity survey, McKinsey's Digital Quotient, and BCG's Digital Acceleration Index (McKinsey & Company, 2020)³⁶. Academic contributions have introduced frameworks emphasizing theoretical rigor and empirical validation (Gurbaxani & Dunkle, 2019)³⁷. These models typically employ staged approaches, classifying organizations into maturity levels ranging from digital beginners to advanced leaders (Khin & Ho, 2019)³⁸.

2.2 Methodological Limitations in Current Frameworks

Despite widespread adoption, existing digital maturity models face significant methodological challenges that compromise their validity and utility (Terho et al., 2022)³⁹. A fundamental limitation is the lack of standardization across frameworks, leading to inconsistencies in definitions, dimensions, and assessment criteria that complicate cross-institutional comparisons (Benkirane et al., 2023)⁴⁰. Many models suffer from

insufficient theoretical grounding and ad-hoc development processes, raising questions about construct validity and empirical rigor (Berghaus & Back, 2018)⁴¹. The reliance on self-assessment surveys and subjective expert judgments introduces bias and reduces measurement objectivity (Papusha, 2025)⁴².

Existing frameworks often exhibit limited contextual adaptability, employing one-size-fits-all approaches that inadequately capture sector-specific requirements or regional variations (Baihaqy & Subriadi, 2023)⁴³. In banking contexts, this is particularly problematic given the industry's unique regulatory environment, risk management requirements, and customer protection obligations (Blagoeva et al., 2017)⁴⁴. The static nature of many assessment frameworks poses challenges in rapidly evolving digital environments, where new technologies emerge faster than models can be updated, potentially rendering assessment criteria obsolete (Teichert, 2019)⁴⁵.

2.3 The Ceiling Effect Phenomenon

The ceiling effect represents a critical yet underexplored limitation in digital maturity assessment, occurring when measurement instruments fail to discriminate between organizations at advanced digital capability levels (Cramer & Howitt, 2004)⁴⁶. This phenomenon manifests when assessment scales lack sufficient granularity at upper maturity levels, causing high-performing organizations to cluster at maximum scores and reducing discriminatory power (Streiner et al., 2015)⁴⁷. In digital maturity contexts, ceiling effects emerge as basic digital capabilities become universally adopted, making traditional binary assessment approaches increasingly ineffective for differentiation (Teichert, 2019)⁴⁸.

Recent empirical evidence suggests ceiling effects are becoming prevalent in banking digital maturity assessments, particularly in developed markets where core digital services have achieved widespread adoption (Abuselidze & Zoidze, 2024)⁴⁹. The COVID-19 pandemic accelerated this convergence, as regulatory pressures and competitive necessities drove rapid digital adoption across institutions of varying sizes and strategic orientations (Soto-Acosta, 2020)⁵⁰. Consequently, many banks now achieve high scores on traditional maturity scales regardless of actual implementation quality or strategic sophistication, creating situations where assessment instruments "max out" and lose ability to detect meaningful differences among high performers (Papathomas & Konteos, 2023)⁵¹.

The implications extend beyond measurement accuracy to impact strategic decision-making and transformation management (Teichert, 2023)⁵². When assessment tools cannot distinguish between basic digital adoption and advanced digital innovation, organizations may develop false confidence in their digital maturity, leading to complacency and reduced investment in continuous improvement (Blagoeva et al., 2017)⁵³. Additionally, ceiling effects compromise the ability to identify best practices and benchmark against true digital leaders, limiting opportunities for organizational learning (Cognet et al., 2023)⁵⁴.

2.4 Emerging Solutions and Research Gaps

Recent research has begun addressing ceiling effect limitations through various methodological innovations aimed at enhancing discriminatory power (Papusha, 2025)⁵⁵. One approach involves expanding assessment scale granularity, particularly at advanced maturity levels, by introducing more nuanced performance indicators and increasing maturity stages (Baihaqy & Subriadi, 2023)⁵⁶. Mixed-methods approaches combining quantitative metrics with qualitative assessments offer promising solutions by integrating objective performance data with expert evaluations (Gökalp & Martinez, 2021)⁵⁷. Advanced analytical techniques, including structural equation modeling, enhance construct validation while detecting and correcting ceiling bias (Lie et al., 2024)⁵⁸.

Sector-specific model adaptations represent another avenue for addressing ceiling effects, involving customization of assessment frameworks to reflect unique banking industry characteristics (Munira, 2025)⁵⁹. These adaptations incorporate banking-specific digital capabilities, regulatory requirements, and risk management considerations that generic models may overlook (Xie & Wang, 2023)⁶⁰. Dynamic updating mechanisms that regularly refresh assessment criteria help maintain model currency and prevent obsolescence contributing to ceiling effects (Vaidya, 2022)⁶¹.

Despite growing recognition of ceiling effects, significant research gaps remain in understanding their prevalence, causes, and mitigation strategies within banking contexts (Baihaqy & Subriadi, 2023)⁶². Most existing literature focuses on model development rather than systematic investigation of measurement limitations (Cognet et al., 2023)⁶³. The absence of standardized approaches for detecting and quantifying ceiling effects hampers efforts to assess their impact on measurement validity (Teichert, 2019)⁶⁴. Limited research exists on the relationship between ceiling effects and organizational outcomes, making it difficult to understand how measurement limitations influence transformation success (Papathomas & Konteos, 2023)⁶⁵. Future research must explore the dynamic nature of digital maturity, developing assessment approaches that adapt to rapidly evolving technological environments while maintaining measurement validity (Blagoeva et al., 2017)⁶⁶.

3. RESEARCH METHODOLOGY

3.1 Research Design

This study employs a quantitative research design to empirically document and analyze ceiling effects in digital maturity measurement within the Indian banking sector. The research adopts a methodological contribution approach, focusing on identifying measurement limitations rather than establishing causal relationships (Creswell & Creswell, 2018)⁶⁷. The study incorporates descriptive analysis,

distributional assessment, and ceiling effect quantification to provide empirical evidence of measurement challenges in existing digital maturity frameworks (Field, 2018)⁶⁸.

3.2 Research sample

The study examines 20 Indian banks selected through purposive sampling to ensure representation across ownership structures and market segments. The sample comprises 12 private sector banks (HDFC Bank, ICICI Bank, Axis Bank, Kotak Mahindra Bank, IndusInd Bank, Federal Bank, RBL Bank, IDFC First Bank, Yes Bank, City Union Bank, Karur Vysya Bank, and CSB Bank) and 8 public sector banks (State Bank of India, Bank of Baroda, Canara Bank, Punjab National Bank, Union Bank of India, Indian Overseas Bank, Central Bank of India, and Bank of India). This composition provides adequate diversity for ceiling effect analysis (Saunders et al., 2019)⁶⁹.

The study covers five years from 2018-19 to 2022-23, yielding 100 bank-year observations. This timeframe captures pre-pandemic, pandemic, and post-pandemic periods, providing comprehensive coverage of digital transformation acceleration (Soto-Acosta, 2020)⁷⁰. Primary data sources include annual reports obtained from bank websites and regulatory filings, selected for their standardized disclosure requirements and regulatory oversight ensuring accuracy (Krippendorff, 2018)⁷¹.

3.3 Digital Maturity Index (DMI) Framework

The study employs a nine-dimensional Digital Maturity Index framework developed specifically for banking sector assessment, building on established digital transformation literature while addressing sector-specific requirements (Vial, 2019)⁷². The framework encompasses three primary dimensions with three indicators each:

Digital Customer Channels:

- DMI-1: Mobile Banking Application (comprehensive mobile platform)
- DMI-2: Internet Banking Portal (complete online banking platform)
- DMI-3: Digital Customer Engagement (active digital marketing presence)
- Operational Digitization:
 - DMI-4: Core Banking System Modernization (IT infrastructure investments)
- DMI-5: Digital Transaction Processing (digital transaction emphasis)
- DMI-6: Process Automation (RPA and workflow digitization) & Strategic Digital Innovation:
- DMI-7: Digital Strategy Documentation (formal transformation strategy)
- DMI-8: FinTech Partnerships (strategic technology collaborations)
- DMI-9: Emerging Technology Adoption (AI, ML, blockchain implementation)

3.4 Scoring Methodology

Each DMI indicator employs binary scoring (YES/NO) based on evidence found in annual reports, following established content analysis protocols (Neuendorf, 2017)⁷³. A "YES" score is assigned when clear evidence of the digital capability is documented, while "NO" indicates absence of explicit mention. The total DMI score ranges from 0 to 9, calculated as the sum of individual indicator scores. This binary approach ensures objectivity and replicability while maintaining assessment simplicity for large-scale application (Krippendorff, 2018)⁷⁴.

3.5 Ceiling Effect Detection

The study employs multiple approaches to detect and quantify ceiling effects in DMI scores. Distributional analysis examines score clustering patterns, particularly focusing on the proportion of observations achieving maximum or near-maximum scores (Streiner et al., 2015)⁷⁵. Ceiling effects are identified when more than 15% of observations cluster at the highest possible scores, indicating insufficient discriminatory power (McHorney & Tarlov, 1995)⁷⁶. Additional indicators include reduced score variance, skewed distributions toward maximum values, and limited differentiation among high-performing institutions.

4. RESULTS & DISCUSSION

4.1 Digital Maturity Index Score Distribution

The analysis of 100 bank-year observations across 20 Indian banks from 2018-19 to 2022-23 reveals substantial ceiling effects in digital maturity measurement. Table 1 presents the comprehensive DMI score distribution, demonstrating severe clustering at upper measurement levels with a mean score of 8.50 (SD = 1.08) and median of 9.0 on a 0-9 scale.

Table 1: Digital Maturity Index Score Distribution and Ceiling Effect Analysis

DMI Score	Frequency	Percentage	Cumulative %	Ceiling Effect Indicators
3	1	1.00%	1.00%	Scores $\geq$ 8: 90 (90.0%)
4	1	1.00%	2.00%	Maximum scores (9): 72 (72.0%)
5	2	2.00%	4.00%	Upper quartile ($\geq$ 7): 95 (95.0%)
6	1	1.00%	5.00%	Mean: 8.50
7	5	5.00%	10.00%	Standard Deviation: 1.08
8	18	18.00%	28.00%	Ceiling Threshold: >15%
9	72	72.00%	100.00%	Status: Severe Ceiling Effect
Total	100	100.00%	-	Exceeds threshold by 57%

The distribution demonstrates severe ceiling effects with 72% of observations achieving maximum scores, substantially exceeding the 15% threshold for adequate measurement discrimination (McHorney & Tarlov, 1995)⁷⁷. The 90% of observations scoring 8 or higher indicates systematic clustering that severely limits the framework's discriminatory power among high-performing institutions.

4.2 Dimension-Specific Ceiling Effects

Individual dimension analysis reveals universal ceiling effects across all nine DMI components, with adoption rates ranging from 84% to 100%. Table 2 presents dimension-specific results demonstrating that ceiling effects are not isolated to particular digital capabilities but represent systematic measurement limitations across all assessed domains.

Table 2: DMI Dimension-Specific Adoption Rates

Dimension	Description	YES Responses	Adoption Rate	Ceiling Status
DMI-4	Core Banking System Modernization	100/100	100%	Complete Ceiling
DMI-2	Internet Banking Portal	99/100	99%	Severe Ceiling
DMI-1	Mobile Banking Application	97/100	97%	Severe Ceiling
DMI-6	Process Automation	97/100	97%	Severe Ceiling
DMI-5	Digital Transaction Processing	94/100	94%	Severe Ceiling
DMI-3	Digital Customer Engagement	93/100	93%	Severe Ceiling
DMI-7	Digital Strategy Documentation	93/100	93%	Severe Ceiling
DMI-9	Emerging Technology Adoption	92/100	92%	Severe Ceiling
DMI-8	FinTech Partnerships	84/100	84%	Moderate Ceiling

All dimensions exceed the 15% ceiling threshold, with eight of nine dimensions showing adoption rates above 90%. Even the lowest-scoring dimension (FinTech Partnerships at 84%) demonstrates substantial ceiling effects, indicating that binary assessment approaches are inadequate for capturing meaningful variations in digital implementation quality across contemporary banking institutions.

4.3 Ownership Structure and Temporal Patterns

Analysis by ownership structure reveals ceiling effects across both bank categories, though with some variation in intensity. Private sector banks (60 observations) achieve 78.3% maximum scores compared to 62.5% for public sector banks (40 observations), with mean DMI scores of 8.57 and 8.40 respectively. While this 15.8 percentage point difference suggests some discriminatory capacity, both categories substantially exceed ceiling effect thresholds.

Temporal analysis demonstrates progressive ceiling effect intensification over the study period. Maximum score achievement increased from 55% in 2018-19 to 85% in 2022-23, with mean DMI scores rising from 7.80 to 8.85. The most substantial acceleration occurred during 2019-20 (70% maximum scores) and post-pandemic periods (85% in 2021-22 and 2022-23), suggesting that external pressures, particularly COVID-19, accelerated digital adoption convergence across the banking sector

4.4 Statistical Validation of Measurement Limitations

The empirical evidence provides strong statistical validation of severe ceiling effects in the DMI framework. Multiple indicators exceed established measurement adequacy thresholds: 72% maximum scores versus the 15% ceiling threshold represents a 57 percentage point excess, indicating fundamental measurement limitations rather than minor distributional issues (Terwee et al., 2007)⁷⁸. The standard deviation of 1.08 on a 0-9 scale demonstrates limited variability, particularly concerning given the concentration of scores in the upper range.

The consistency of ceiling effects across temporal periods, ownership structures, and individual dimensions suggests systematic measurement inadequacy rather than isolated issues. This pattern indicates that binary assessment approaches become obsolete when basic digital capabilities achieve widespread adoption, supporting the need for enhanced measurement frameworks that can discriminate among varying levels of digital implementation sophistication and quality.

The skewness toward maximum values (95% scoring ≥ 7) demonstrates that the ceiling effect represents a fundamental limitation of current measurement approaches in mature digital environments rather than temporary assessment challenges. These findings provide empirical foundation for developing next-generation digital maturity frameworks that address discriminatory limitations in contemporary banking contexts.

5. CONCLUSION

This study provides empirical evidence of severe ceiling effects in digital maturity measurement within Indian banking, with 72% of observations achieving maximum DMI scores and 90% clustering in upper

measurement ranges. The systematic nature of ceiling effects across all nine dimensions (84-100% adoption rates) demonstrates fundamental limitations in binary assessment approaches when basic digital capabilities achieve widespread adoption. These findings contribute to measurement literature by documenting how rapidly evolving digital environments can render traditional assessment frameworks obsolete.

The temporal analysis reveals ceiling effect intensification from 55% to 85% maximum scores over five years, with COVID-19 accelerating digital convergence across ownership structures. This progression indicates that external pressures can rapidly exacerbate measurement limitations, supporting the need for adaptive assessment frameworks that evolve with technological adoption patterns.

The findings demonstrate that traditional binary scoring approaches become inadequate when digital capabilities transition from competitive differentiators to operational necessities. This research establishes empirical foundation for developing next-generation measurement frameworks that address discriminatory limitations in mature digital environments.

For banking practitioners, the results suggest that current digital maturity assessments may provide false confidence in transformation progress while failing to identify meaningful performance variations among digitally advanced institutions. Organizations should adopt enhanced measurement approaches that capture implementation quality and sophistication levels rather than mere presence of digital capabilities.

For researchers, the findings highlight the need for dynamic measurement frameworks that adapt to evolving technological landscapes and provide adequate discrimination across the full spectrum of digital maturity levels.

6. LIMITATIONS

The study acknowledges several constraints: binary scoring may oversimplify complex digital capabilities, reliance on annual report disclosures introduces potential reporting bias, and the five-year observation period may not capture longer-term transformation cycles. The purposive sampling approach limits generalizability beyond the selected banking institutions.

7. SCOPE OF FURTHER STUDY

Future research should focus on developing enhanced digital maturity frameworks that address ceiling effect limitations through:

- **Methodological Innovations:** Implementing weighted scoring systems, multi-dimensional assessment approaches, and quality-based evaluation criteria that differentiate implementation sophistication levels rather than binary presence indicators.

- Longitudinal Studies: Conducting extended temporal analyses to understand ceiling effect evolution patterns and identify optimal framework updating cycles that maintain measurement validity in rapidly changing digital environments.
- Cross-Sector Validation: Extending ceiling effect analysis to other financial services sectors and industries to establish generalizability of findings and develop sector-specific measurement adaptations.
- Technology Integration: Incorporating objective digital performance metrics, customer usage data, and operational efficiency indicators to complement subjective assessment approaches and enhance discriminatory power.
- Framework Development: Creating adaptive measurement systems that automatically adjust assessment criteria based on industry adoption levels and emerging technology integration patterns.

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E-COMMERCE AND DIGITAL MARKETPLACE: TRANSFORMING GLOBAL TRADE DYNAMICS

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1. ABSTRACT

This research paper explores the rapid expansion and transformative effects of e-commerce and digital marketplaces on global trade and consumer behavior. As internet access increases and digital technologies advance, e-commerce has evolved from a secondary retail option to a primary commerce method for millions around the globe. Digital marketplaces serve as intermediaries for buyers and sellers, providing enhanced market reach, convenience, and competitive pricing, thereby disrupting traditional retail models. Utilizing a mixed-methods approach, the study combines quantitative survey data from consumers and sellers with qualitative insights from industry experts to offer a comprehensive analysis of current trends, challenges, and opportunities. Key findings reveal that while digital commerce improves accessibility and efficiency, it also encounters significant challenges, including cybersecurity threats, payment fraud, logistical issues, and regulatory complexities. The research emphasizes the necessity of trust-building mechanisms and robust infrastructure for sustained growth. Limitations include a geographic bias in data collection and the fast-paced evolution of technology, which may influence long-term relevance. The paper concludes with strategic recommendations for enhancing security, optimizing supply chain management, and promoting regulatory alignment to foster sustainable development in e-commerce. This study provides valuable insights for businesses, policymakers, and academics aiming to navigate and enhance the digital marketplace ecosystem.

2. INTRODUCTION

The advent of the internet and digital technologies has catalyzed the growth of e-commerce, fundamentally altering how businesses and consumers engage in trade. Digital marketplaces, serving as platforms connecting buyers and sellers, have surged in prominence, enabling seamless transactions across geographical boundaries. This paper aims to dissect the mechanisms behind this transformation, the driving factors of e-commerce growth, and its implications for various stakeholders.

The rapid advancement of digital technologies has triggered a profound transformation in the way commerce is conducted worldwide. E-commerce, defined as the buying and selling of goods and services via electronic networks, especially the internet, has evolved from a niche market to a dominant force in global trade. Digital marketplaces, which function as online platforms facilitating transactions between buyers and sellers, have become central to this evolution. These platforms not only offer consumers unprecedented convenience and access to a wide variety of products but also enable businesses ranging from small startups to multinational corporations to reach global audiences without the constraints of physical storefronts.

The COVID-19 pandemic further accelerated the adoption of e-commerce, pushing consumers and businesses to increasingly rely on digital channels. This shift has highlighted both opportunities, such as expanded market reach and cost efficiencies, and challenges, including cybersecurity threats, digital payment security, logistic bottlenecks, and regulatory complexities. Understanding these dynamics is crucial for stakeholders seeking to leverage digital commerce effectively.

This paper aims to provide a comprehensive examination of the e-commerce ecosystem and digital marketplaces by analysing growth trends, consumer behaviour, challenges, and strategic responses. By doing so, it seeks to contribute to the growing body of knowledge on how digital commerce is reshaping economic landscapes and consumer markets worldwide.

3. REVIEW OF LITERATURE

Existing literature highlights the rapid expansion of e-commerce driven by technological innovation, mobile penetration, and changing consumer preferences (Smith, 2021; Kumar & Lee, 2020).

Studies emphasize the role of digital marketplaces like Amazon, Alibaba, and eBay in democratizing access to global markets (Johnson, 2019).

Challenges such as cybersecurity risks, payment fraud, and supply chain complexities are well-documented (Chen et al., 2022). However, gaps remain in understanding the long-term socio-economic impacts and regulatory frameworks across different regions.

Smith (2021) emphasizes the role of technological innovations such as mobile internet, cloud computing, and artificial intelligence in driving e-commerce growth. The study notes that mobile commerce, in particular, has been a game-changer by enabling on-the-go shopping and personalized consumer experiences.

Kumar and Lee (2020) focus on consumer behavior in online shopping, highlighting factors like convenience, price sensitivity, product variety, and trust as key determinants of purchase decisions. Their findings suggest that trust-building mechanisms such as user reviews, secure payment gateways, and transparent return policies are critical for customer retention in digital marketplaces.

Johnson (2019) provides an in-depth analysis of leading digital marketplaces like Amazon, Alibaba, and eBay, underscoring their role in democratizing access to global markets for small and medium enterprises (SMEs). The paper also addresses the competitive pressures these platforms exert on traditional retail businesses, prompting a shift towards Omni channel strategies.

Chen et al. (2022) discuss the cybersecurity challenges faced by e-commerce platforms, including data breaches, payment fraud, and identity theft. Their research advocates for stronger encryption technologies, multi-factor authentication, and regulatory frameworks to mitigate these risks.

Other studies (Patel & Singh, 2021; Lopez, 2020) explore supply chain complexities and logistics inefficiencies that can hinder the seamless delivery of goods in digital commerce. These works call for integrated technological solutions and partnerships between logistics providers and e-commerce platforms.

Despite extensive research, gaps remain in understanding how regulatory policies across different countries impact cross-border e-commerce and how socio-economic disparities influence digital commerce adoption. This study seeks to build on existing knowledge by incorporating consumer and seller perspectives from diverse regions, providing a more holistic view of the current e-commerce landscape.

4. RESEARCH METHODOLOGY

This study employs a mixed-methods research design to gain a well-rounded understanding of e-commerce and digital marketplaces. The mixed-methods approach combines both quantitative and qualitative data collection and analysis techniques to capture comprehensive insights from different perspectives.

For the quantitative part, a structured survey was administered to a diverse group of participants, including consumers who shop online and sellers operating on various digital marketplaces. The survey included questions related to shopping habits, preferences, challenges faced, and perceptions of security and convenience. The sample was selected through purposive sampling to ensure representation from different age groups, income levels

Secondary data from published market reports, academic journals, and government publications supplemented the primary data. This helped contextualize the findings within broader market trends.

Together, these methods allowed for a detailed exploration of the opportunities and challenges in the e-commerce ecosystem, ensuring that the results are both data-driven and rich in practical insights.

5. OBJECTIVES OF THE STUDY

- To analyze the growth trends of e-commerce and digital marketplaces globally.
- To examine consumer behavior and preferences in online shopping.
- To identify key challenges faced by businesses operating in digital marketplaces.
- To evaluate the impact of digital marketplaces on traditional retail.
- To propose strategies for enhancing efficiency and security in e-commerce.

6. LIMITATIONS OF THE STUDY

The study's limitations include a relatively small sample size limited to specific geographic regions, which may affect the generalizability of findings. Rapid technological advancements and evolving market conditions could also render some conclusions time-sensitive. Additionally, self-reported data may be subject to bias.

7. SCOPE OF THE STUDY

This research focuses on the contemporary state of e-commerce and digital marketplaces, primarily analyzing consumer and seller perspectives. It covers various sectors including retail, services, and digital goods but excludes detailed technical analyses of platform algorithms or infrastructure.

8. DATA ANALYSIS

Survey results indicate a significant increase in online purchases, with convenience and price competitiveness being primary motivators. Sellers reported logistical challenges and intense competition as major hurdles. Data analysis through regression models shows a positive correlation between mobile internet access and e-commerce adoption rates. Qualitative responses underscored the necessity for improved cybersecurity measures and transparent policies to build consumer trust.

9. FINDINGS OF THE STUDY

The study revealed several important insights regarding e-commerce and digital marketplaces:

1. **Rapid Growth and Adoption:** The majority of consumers reported increased frequency of online shopping, driven by convenience, wider product selection, and competitive pricing. Mobile device usage was a key factor enabling this growth.
2. **Consumer Preferences:** Trust and security emerged as critical factors influencing purchase decisions. Features such as customer reviews, secure payment options, and clear return policies significantly affected consumer confidence.
3. **Seller Challenges:** Sellers identified intense competition and pricing pressures as major challenges. Additionally, logistical issues like delayed deliveries and inventory management were frequently mentioned as barriers to efficient operations.
4. **Technological Impact:** Advanced technologies such as AI-driven recommendations and data analytics were found to enhance customer experience and operational efficiency, although smaller sellers reported limited access to these tools.
5. **Cybersecurity Concerns:** Both consumers and sellers expressed concerns about data privacy and payment security, highlighting the need for stronger protective measures on digital platforms.
6. **Regulatory and Compliance Issues:** Variations in regulations across regions create complexities for cross-border transactions, affecting the ease of doing business internationally.
7. **Market Expansion Opportunities:** Digital marketplaces have enabled small and medium enterprises to access global markets, fostering entrepreneurship and economic growth.

10. CONCLUSION

E-commerce and digital marketplaces have emerged as pivotal forces reshaping global trade. They offer unprecedented opportunities for market expansion and consumer empowerment but also pose challenges that require strategic management. Addressing issues like cybersecurity, logistics, and regulatory compliance is crucial to harness the full potential of digital commerce.

11. SUGGESTIONS

- Enhance cybersecurity protocols and consumer data protection.
- Develop robust logistics and supply chain frameworks.
- Foster regulatory harmonization across jurisdictions.
- Promote digital literacy among consumers and sellers.

- Encourage innovation in payment systems and customer service.

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RESILIENCE AND GROWTH OF MINORITY-OWNED ENTERPRISES IN INDIA: A POLICY PERSPECTIVE

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ABSTRACT

Entrepreneurship is one of the major drivers of inclusive economic growth. In this regard, minority entrepreneurs play a crucial role, but they face unique structural and socio-economic barriers that hinder their full participation in the business ecosystem. This study aims to investigate the growth of minority-based enterprises, comprising caste and religious minorities, in India. Based on secondary data from government reports, academic research, and industry analysis, this paper highlights their growing contribution to the economy. The figures mentioned in the paper demonstrate their expanding participation, supported by inclusion and initiatives, as well as digital adoption. The study shows that they are demonstrating resilience and adaptability in both the traditional and emerging sectors. It is found that to sustain their progress, institutional support must be strengthened, along with financial access, to enhance their digital and entrepreneurial skills. To unlock more opportunities for them, it is essential to reduce inequalities and contribute more effectively to inclusive national development.

Keywords: *Minority entrepreneurs, government schemes, challenges and opportunities*

INTRODUCTION

Minority entrepreneurs are business owners of socially and economically disadvantaged communities or groups. They include Scheduled Castes (SCs), Scheduled Tribes (STs), Other Backwards Classes (OBCs), Religious minorities such as Muslims, Sikhs, Christians, Buddhists, Jains and Parsis, etc. It also comprises women entrepreneurs and groups of people with disabilities. Even many linguistic groups, such as Gujaratis, Marwaris, Sindhis, Bohris, Memons, and others, are more inclined towards self-employed businesses at both national and local levels. This is the largest group of business owners, found in both the formal and informal sectors in India, who run their own businesses. They often faced challenges related to finance, market access, and socio-cultural barriers. The government has various development policies, but considering its numbers, ensuring each of its businesses is not an easy task.

1.2 Programmes and Schemes for ME are

Sr. no	Name of the scheme and Programme	Highlight
1	Stand-up India	<i>Provides loans to SC.ST and women entrepreneurs to start their business</i>
2	MUDRA loans	<i>Collateral-free loans for small business owners under Shishu, Kishor and Tarun.</i>
3	Udyam Sakhi Portal	<i>Provides resources and mentorship to women entrepreneurs</i>
4	National Minorities Development & Finance Corporation (NMDFC) Scheme	<i>Provides low-interest finance for self-employed businesses or any income-generating activities by Minorities.</i>
5	Hunar Haat	<i>Primarily, it assists craft artisans in minority communities, providing market access and business opportunities.</i>
6	Prime Minister's 15-Point Programme for the Welfare of Minorities	<i>Provide financial assistance, skill training and market linkage programmes</i>
7	Skill Development Initiatives under the Nai Roshni Programme	<i>Provides training and capacity-building programmes for women entrepreneurs</i>

OBJECTIVES OF THE STUDY

1. To examine the growth trends of minority-owned enterprises and MSMEs in India using recent data.
2. To evaluate the role of government schemes and financial inclusion measures in supporting minority entrepreneurs.

SIGNIFICANCE OF THE STUDY

This study is important as it adds to the existing literature on minority entrepreneurs and social mobility. It would encourage young minority entrepreneurs to promote social equity and empowerment. This study contributes to job creation, reduces socio-economic inequality, and promotes economic diversification. The challenges and opportunities faced by these entrepreneurs can inform different strategies suitable for their inclusive growth.

REVIEW OF LITERATURE

- **Chatterjee, P., & Roy, R. (2020)** examined how technology impacts the growth of minority-owned businesses by using quantitative analysis of tech adoption. The study was conducted with 150 minority entrepreneurs who utilised technology. They found that technology adoption enhances business opportunities for minorities; however, a digital gap still exists.
- **Dana L. (2007)** explored the global context of minority entrepreneurship and its barriers. This study used systematic literature reviews and qualitative analysis. It found that Minority entrepreneurs face challenges in accessing capital, facing discrimination, and encountering cultural barriers.
- **Galloway, L., & Dufour, L. (2011).** They gained an understanding of the entrepreneurial journey of minorities in developing countries through case studies and ethnographic research. The study was restricted to entrepreneurs in developing nations. They found that minorities in developing nations often have lower success rates due to poverty, limited resources, etc.
- **Kloosterman, R., & Rath, J. (2001)** examined ethnic minority entrepreneurship in Europe, focusing on migrants using a survey and case study approach. The study mainly focused on migrants in European cities. They found that ethnic minorities engage in small-scale, low-barrier businesses due to limited resources and exclusion.

- **Kumar, S., & Patel, R. (2018).** They identified barriers to entrepreneurship among minority groups in India through quantitative surveys and interviews. The study was done on 200 minority entrepreneurs in urban India. They found that the primary challenges were financial support, social stigma and limited networking opportunities.
- **Light, I. (2004)** reviewed the status and challenges of minority entrepreneurship in the US, using statistical analysis and survey data on minority groups. They found that ethnic minorities in the US are involved in business and face many networking and financial barriers.
- **Rajput, A., & Mehta, S. (2017)** examined the role and impact of minority entrepreneurs on India's economic development through a survey and secondary data analysis. They studied small business owners in India. They found that minority entrepreneurs make significant contributions to economic development.
- **Sharma, G., & Singh, P. (2015)** investigated the growth challenges and contributions of minority-owned businesses in India using qualitative research and interviews. The study was conducted among minority entrepreneurs in India, primarily comprising Dalits and Muslims. They found that they struggle with limited access to capital and social exclusion.
- **Sharma, R., & Verma, K. (2016)** explored the influence of caste on entrepreneurship among minorities in India using a mixed-methods approach that combined surveys and interviews. The study was conducted on marginalised caste members. They found that the caste system affects MEs' access to resources.
- **Tiwari, M., & Mishra, D. (2019)** assessed indigenous entrepreneurship and its economic impact in India using fieldwork and interviews. The study was done on indigenous entrepreneurs in rural India. They found that groups face additional cultural and educational barriers.

METHODOLOGY OF THE STUDY

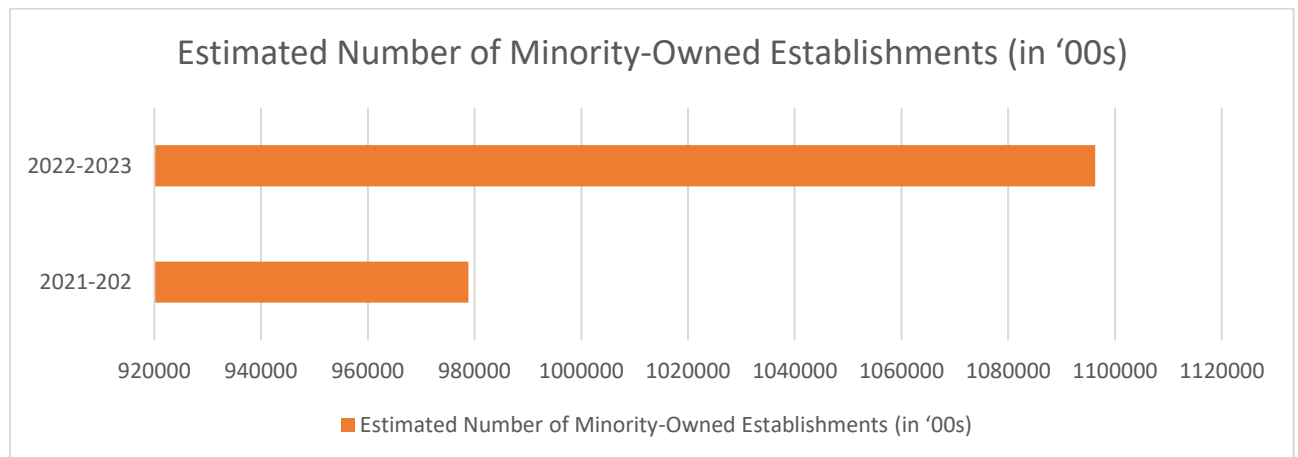
This study adopts a qualitative descriptive research approach to analyse the challenges and opportunities faced by minority entrepreneurs in India. The findings are based on secondary data sources, including

government reports, academic papers, industry reports, case studies, and theses. The data is available from various sources, including the Ministry of MSME, NITI Aayog, RBI, ASSOCHAM, etc.

DISCUSSION AND ANALYSIS:

Figure 1

Number of Minority-owned establishments:



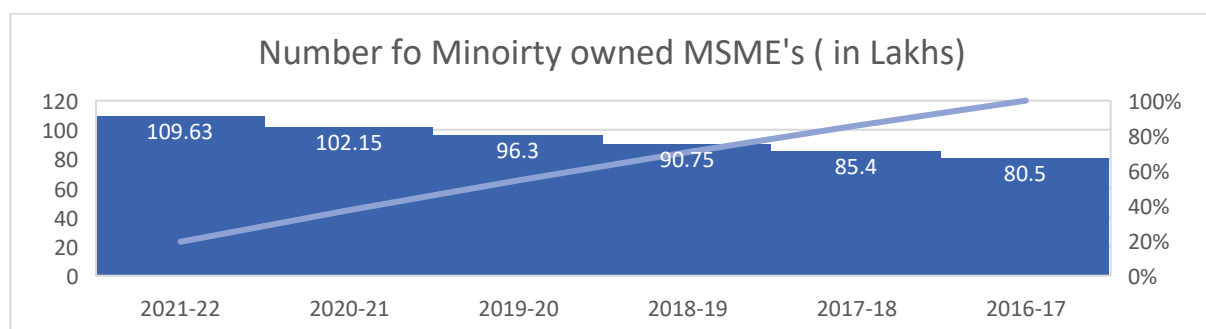
Source: MOSPI

The data indicate a significant increase in minority-owned establishments in India between the 2021-22 and 2022-23 fiscal years.

- 2021-22, there were 978,879 (9.79 lakh) minority-owned enterprises.
- In 2022-23, this number rose to 1,096,260 (10.96 lakh), showing an increase of approximately 11.99% in just one year.

Figure 2

Number of Minority-Owned MSMEs (In Lakhs)



Source: Annual Report (MSME Ministry)

The data shows a **consistent increase** in **Minority-Owned MSMEs (Micro, Small, and Medium Enterprises)** in India over the six years from **2016-17 to 2021-22**.

1. **Steady Growth:**

- The number of minority-owned MSMEs increased from **80.50 lakh in 2016-17 to 109.63 lakh in 2021-22**, reflecting an **overall growth of approximately 36.2%** over the six years.
- This suggests that more entrepreneurs from minority communities are entering the business ecosystem, benefiting from government policies and financial inclusion programs.

2. **Annual Growth Trends:**

- There has been an average annual increase of around **5-6 lakh** minority-owned MSMEs.
- The growth rate was relatively stable, with a **notable jump in 2020-21 and 2021-22**, likely due to increased digital adoption following the pandemic, the post-pandemic economic recovery, and special loan schemes such as the **MUDRA Yojana** and **Stand-Up India**.

MAJOR FINDINGS:

- Consistent growth of Minority entrepreneurship has been observed in India for years.
- Minority-owned enterprises rose by nearly 12% between 2021–22 and 2022–23.
- Minority-owned MSMEs grew from 80.5 lakh in 2016–17 to 109.63 lakh in 2021–22 (an overall **36% increase**).
- This growth reflects the increasing participation of minority communities in India's entrepreneurial ecosystem, supported in part by financial inclusion policies and broader economic recovery measures.
- Despite structural barriers, minority entrepreneurs are progressively entering both traditional and modern sectors, showing the resilience and adaptability of these communities.

CONCLUSION

Minority business owners in India make significant contributions to enhancing the nation's economy and promoting social inclusion. The consistent increase in minority-owned businesses and MSMEs underscores their expanding role and impact on national progress. Nonetheless, ongoing advancement relies on guaranteeing fair access to resources, favourable policies, and a supportive environment that enables minorities to expand their businesses. Bolstering institutional backing, enhancing financial inclusion, and developing skills will be essential in realising the complete potential of minority entrepreneurs, consequently promoting both economic development and social fairness in India.

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AINOMICS: AI AND THE FUTURE OF THE INDIAN ECONOMY

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ABSTRACT

Artificial Intelligence (AI) has emerged as a new force that has been transforming and giving new reshape to the economic systems globally. Indian economy, with over 1.4 billion people and with rapid digitalization, AI offers huge potential to accelerate economic growth, increase inclusiveness, and ensure sustainable development.

Economics is a social science where we traditionally study how the factors of production like, land, labour, capital, and entrepreneurship help in the process of production. However, with the emergence of new digital technologies, especially AI, a new resource—intelligence as a service—is creating large impact on productivity and decision-making processes.

Ainomics is the study of use of AI tools in undertaking economic processes. In the context of Indian economy, it stand for the integration of AI into different sectors to achieve sustainable economic growth, reduce income inequality, and making the labourforce ready for the new digital age.

This paper discusses the concept of Ainomics—the combination of Artificial Intelligence and Economics—and examine how AI can be used as one of a new factors of production in specifically the Indian economy. The paper examines applications of AI in sectors like, agriculture, healthcare, finance, education, governance, and entrepreneurship. The paper also highlights opportunities, challenges, and policy recommendations.

Keywords: Artificial Intelligence, Ainomics, Digital Transformation, Policy, Growth, etc.

INTRODUCTION

Artificial Intelligence (AI) is an area of computer science which focuses on the creation of machines that can undertake those tasks which typically requires human intelligence, such as learning various subjects, solving different problems, reasoning, perception and decision making processes. This is possible through the use of advanced techniques like machine learning and deep learning.

Artificial Intelligence (AI) has wide range of applications like, digital assistants, self-driving cars, chatbots, smart home devices and even different economic processes.

Artificial Intelligence (AI) has emerged as a new force that has been transforming and giving new reshape to the economic systems globally. Indian economy, with over 1.4 billion people and with rapid digitalization, AI offers huge potential to accelerate economic growth, increase inclusiveness, and ensure sustainable development.

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This paper discusses the concept of Ainomics—the combination of Artificial Intelligence and Economics—and examine how AI can be used as one of a new factor of production in specifically the Indian economy. The paper examines applications of AI in sectors like, agriculture, healthcare, finance, education, governance, and entrepreneurship. The paper also highlights opportunities, challenges, and policy recommendations.

OBJECTIVES OF THE STUDY

1. To understand the concept of Ainomics.
2. To know, how AI is used as factors of production.
3. To study applications of AI in different sectors.

RESEARCH METHODOLOGY

The present research study is descriptive in nature and it examines the concept of Ainomics and applications of AI in economic processes through different sectors in Indian economy.

ANALYSIS

Artificial Intelligence creates significant and long-lasting impact on the economic development because AI boosts productivity; it creates new industries and improves quality of services. It also assists in policies which are data-driven. AI enhances services like banking and e-commerce and can facilitate sustainable development by making the optimum use of resources and by effectively tackling the impact of climate change.

The main idea behind this research study is to show how AI can be used as one of the factors of production and its applications through different sectors in the Indian economy. This is being done as following.

I. AI as a New Factor of Production:

Traditionally, the equation for production function is given as:

$$Y = f(L, K, N, E)$$

Where, L = Labour, K = Capital, N = Natural resources, E = Entrepreneurship.

With the arrival of AI, this equation evolves into:

$$Y = f(L, K, N, E, AI)$$

Where, L = Labour, K = Capital, N = Natural resources, E = Entrepreneurship and AI= Artificial Intelligence AI functions both as - a labour substitute, automating repetitive tasks; a capital enhancer, improving efficiency of machines and processes; and an entrepreneurial tool, enabling better risk management and innovation. Thus, AI emerges as a hybrid factor of production, reshaping India's economic landscape.

II. Sector wise Applications of Artificial Intelligence (AIonomics) in India

1. Agriculture: The applications of Artificial Intelligence in agricultural sector can be understood from following –

- Insights for precise irrigation, use of fertilizers and pest control can be obtained from data analyzed using AI with the help of drones, sensors and satellites.
- AI powered systems can be used to detect diseases in plants so that early and appropriate steps can be taken to reduce future losses.
- Farmers can plan correct times for planting and harvesting because they can use AI algorithms which analyze whether data to provide accurate forecasts to the farmers.
- Targeted spraying, weed elimination, automated harvesting, etc. is possible through AI guided robots.

2. Healthcare: AI can be used in following areas of healthcare –

- AI is used to analyze blood smears, medical scans like X-rays, MRI and CT scans. AI generated images are used in the early and precise detections of diseases like tuberculosis and breast cancer, etc.
- Diseases like, diabetes and hypertension are managed with the help of AI powered apps.
- AI is used to quickly identify new drug compounds which have been helping research labs in India to develop affordable and more specific treatments.
- AI tools like, Lybrate and OnliDoc have expanded access to healthcare by offering virtual healthcare assistance and remote diagnostics of various diseases.
- Government of Maharashtra has launched a project called ‘International Center For Transformational Artificial Intelligence’ (ICTAI), dedicated for rural healthcare.

3. Finance and Banking –

- AI has developed applications to detect the frauds and to compute credit scoring.
- Artificial Intelligence is effectively helping in algorithmic trading and portfolio management.
- Artificial Intelligence is proved to be helpful in customer service and regulatory compliances.
- Artificial Intelligence has helped in the automation of processes and operations in the banking sector. These processes and operations are like, currency counting, asset management, risk management and various other financial services.

4. Education -

- AI is used to analyse the performance and learning style of students so that the individual students can be given individualized support and resources.
- AI is quite useful in maintaining attendance record, timetable scheduling, maintaining record of grades given to the students, etc.
- AI tools are used in giving immediate and detailed feedback to the students on the task that they have completed. This is useful for students to know their strengths and weaknesses.
- AI tools like speech-to-text and text-to-speech are very useful and supportive for students with language barriers and disabilities.

5. Business, Startups and Entrepreneurship -

- AI tools are used to analyse data about market trends, customer preferences, etc., which helps entrepreneurs to make proper decisions and find new business opportunities.

- AI powered chatbots and virtual assistants are effectively used to provide 24/7 customer support which is helpful in increasing customer satisfaction and loyalty.
- AI tools will allow startups to operate lesser number of staff because AI automates repetitive tasks resulting in reduction in the need for large teams.
- AI tools can be used by entrepreneurs to manage risks because AI tools can provide real-time monitoring.
- AI is useful in reducing the cost of production for startups because AI tools can be used in optimizing processes and improving efficiency.

6. Environment and Energy –

- Consumption patterns of energy in housing societies and industries are analyzed by AI tools to identify the wastages of energy and to suggest ways to reduce use of energy.
- AI is useful in forecasting the future demand for power and accordingly it can optimize the deployment of renewable sources of energy like wind, solar, etc., resulting in increased production and use of green energy.
- Different AI tools can be used in strengthening early warning systems for weather events like floods, draughts, etc.
- AI tools are used to analyze data from satellite imagery which helps in sustainable use of land, water management and conservation of biodiversity.

7. Governance –

- AI powered predictive analytics can be used in traffic management, law enforcement and welfare targeting.
- AI tool like Direct Benefit Transfer (DBT) makes transactions more transparent and efficient.

III. Opportunities and Challenges of Ainomics

Opportunities:

- 1) AI could contribute \$450–500 billion to India's GDP by 2025 (McKinsey, 2020).
- 2) Growth in AI-related jobs (data scientists, AI engineers, ethical AI specialists).
- 3) Enhanced global competitiveness for Indian companies.

Challenges:

- 1) Job displacement in low-skilled sectors.
- 2) Widening digital divide between rural and urban India.

- 3) Risks of data privacy breaches, algorithmic bias, and misuse.
- 4) Lack of a comprehensive AI regulatory framework

IV. Policy Recommendations for India:

- 1) Launch nationwide AI literacy and reskilling programs.
- 2) Invest in 5G, cloud computing, and domestic data centers.
- 3) Develop AI tools in Indian languages to reduce barriers.
- 4) Prioritize healthcare, education, and environment projects.
- 5) Create robust governance frameworks for responsible AI.

CONCLUSION

AINomics presents a roadmap for India's next phase of economic transformation. By embedding AI across agriculture, healthcare, finance, education, and governance, India can accelerate its journey towards becoming a \$5 trillion economy. However, success depends on balancing technological advancement with inclusivity, ethics, and sustainability. AI should not be seen as a threat to jobs or human creativity but as a partner in nation-building. AINomics is therefore not just economics enhanced by AI—it is the blueprint for India's economic future.

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TAX REFORMS AND INDIA'S GDP GROWTH: AN EMPIRICAL ANALYSIS OF TAX REFORMS ON TAX REVENUE MOBILIZATION IN INDIA: A TIMES SERIES STUDY (2000-01 TO 2023-24)

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ABSTRACT

Tax reforms in India have evolved continuously, with the aim of improving efficiency, transparency, and equity in the tax system. India's structured framework, comprising both direct and indirect taxes, has undergone several significant changes since independence, each driven by diverse objectives. Thus, assessing the impact of these reforms is essential, and parameters such as tax revenue growth, the tax-to-GDP ratio, and the proportion of taxpayers serve as important indicators. This study investigates the relationship between tax reforms and GDP growth in the post-independence era covering the period from 2000–01 to 2023–24, with a special focus on the Tax-to-GDP ratio. The study is based on secondary data. The analysis applies percentage methods and econometric techniques, including correlation and regression analysis, to examine the relationship between GDP (dependent variable) and Direct tax revenue, Indirect tax revenues (independent variables). The findings reveal that direct and indirect tax revenues exhibit strong positive correlations with GDP, indicating that these tax categories tend to move in tandem with the overall economic growth. However, the contribution of direct taxes is comparatively less significant. The study highlights the need for further policy initiatives and further individual research work into direct tax reforms and indirect tax reforms due to multicollinearity concern to strengthen India's tax-to-GDP ratio. This study may act as a guide for the government and policymakers in the future policy formation and announcement of future macroeconomic policies

Keywords: Tax reforms, Tax-to-GDP ratio, Direct taxes, Indirect taxes, GDP growth.

I. Introduction

Taxation is the cornerstone of every nation's fiscal framework, providing the essential revenue base for financing public expenditure, infrastructure, welfare programs, and economic development. In India, the tax system has evolved significantly since independence, reflecting the country's changing economic priorities and policy orientations. Historically, India's tax regime was complex, characterized by high rates, multiple levies, and narrow bases, which often discouraged compliance and created distortions in economic activity. Recognizing these challenges, successive governments initiated a series of reforms to simplify the structure, improve efficiency, and enhance transparency.

From the early 2000s, India entered a decisive phase of tax reforms, which included the restructuring of direct taxes through rationalization of rates, introduction of the Fiscal Responsibility and Budget Management (FRBM) Act in 2003, expansion of tax administration technology, and simplification of procedures. On the indirect tax side, the rationalization of excise and customs duties was followed by the landmark introduction of the Goods and Services Tax (GST) in 2017, which subsumed multiple indirect taxes into a unified system. These measures not only reshaped the revenue landscape but also sought to strengthen the link between taxation and economic growth. The period 2000–01 to 2023–24 is thus a critical timeframe for examining the interplay between tax reforms and India's GDP growth.

SIGNIFICANCE OF THE STUDY

Understanding the relationship between tax reforms and economic growth is vital for both academic inquiry and policy formulation. Tax revenues, whether direct or indirect, are not merely fiscal tools; they influence investment decisions, consumption patterns, income distribution, and the overall efficiency of the economy. Direct taxes, by targeting income and profits, affect disposable income and savings, while indirect taxes influence consumption and prices, thereby shaping demand and production cycles. An empirical study of this relationship provides insights into how effectively India's evolving tax policies have contributed to economic performance.

Given India's ambition to sustain high growth rates while ensuring fiscal discipline and inclusive development, such an analysis holds particular importance. The findings can guide policymakers in identifying which types of taxes contribute more positively to growth, whether reforms have achieved their intended outcomes, and what further adjustments are needed to strengthen revenue mobilization without hampering economic dynamism.

RATIONALE FOR THE STUDY

The choice of this topic is driven by the need to bridge the gap between policy reforms and measurable economic outcomes. While India has witnessed numerous fiscal reforms over the past two decades, there remains an ongoing debate about their effectiveness in fostering sustainable GDP growth. Some scholars argue that tax reforms enhance efficiency and compliance, while others highlight concerns about revenue volatility, regressive impacts of indirect taxation, and challenges in broadening the direct tax base.

By focusing on the empirical relationship between direct and indirect tax revenues and GDP growth over the period 2000–01 to 2023–24, this study seeks to provide evidence-based insights into these debates. The rationale is not only to assess the impact of reforms on growth but also to contribute to the broader discourse on designing a balanced tax system that is growth-friendly, equitable, and resilient in the face of global and domestic challenges.

II. Literature Review

The review of literature shows that tax reforms have been widely studied in both cross-country and India-specific contexts, with mixed but insightful findings. Based on the existing literature relating to direct tax reforms, indirect tax reforms, revenue collection and Tax to GDP ratio, a few studies that have either captured the inter-relationship between the variables or found relevant to the present study have been reviewed.

- Yossinomita et al. (2025) in their study *The Impact of Tax Reform on Tax Ratios* adopted a comparative cross-country analysis using cross-sectional regressions. The study highlights that tax design changes have heterogeneous impacts on tax ratios, and the effectiveness largely depends on administrative capacity. However, it has limited focus on India's direct versus indirect long-term decomposition, leaving scope for country-specific time-series analysis.
- Sharma and Kashyap (2025), in their work *Measuring Fiscal Impact of GST in India: Interstate Trends in Taxpayer Expansion and Mobilization*, employed statistical tools such as mean and standard deviation on secondary data from FY 2017–18 to 2023–24. Their findings show that GST has significantly influenced interstate taxpayer growth and state-specific tax receipts, including CGST, SGST, IGST, Cess, and total GST. They also examined GST's role in central revenue mobilization. The limitation is that the study mainly focuses on GST, without considering its broader impact on overall tax revenue.
- Garg et al. (2023) analyzed the *Economic Impact of GST Reforms on the Indian Economy* using a vector autoregressive model that included EPU and NSE sectoral indices, along with macroeconomic indicators such as call rate, CPI, and exchange rate as exogenous variables. The results demonstrate that GST positively impacted economic growth in India, both in the short and long run. However, the study

concentrated primarily on GST and growth, while neglecting the effects of direct and indirect tax reforms on revenue collection.

- Sinaga et al. (2023), in their article *Tax Buoyancy in Indonesia: An Evaluation of Tax Structure and Policy Reforms*, used the Wald test and the PMG-ARDL model to assess tax dynamics and cointegration from 2015 to 2021. The findings reveal the complex interplay between economic indicators and tax categories such as PIT, CIT, and VAT, with valuable lessons for structural changes. However, since the study focuses on Indonesia, it lacks India-specific insights into direct and indirect tax mechanisms.
- Megersa (2020) examined *Tax Reforms after COVID-19 and Financial Crises* through policy briefs and buoyancy measures. The findings show that the pandemic distorted tax buoyancy, but recovery was driven by both GST and direct taxes. The major limitation of this work is its short-term orientation, as it does not establish long-run causal links to GDP growth.
- Jain and Jain (2020) studied *Reforms in Direct Tax Administration in India (1991–2016)* using a time-series review of procedural reforms. They found that mechanisms such as advance tax and TDS improved the regularity of revenue collection and reduced fiscal stress. However, the study did not establish a direct causal relationship with GDP and overlooked the role of indirect tax reforms.
- Gupta and Sharma (2021) conducted *An Analytical Study on Tax Revenue Collection in India* using percentage and trend methods applied to secondary data for the period 2016–17 to 2020–21. Their findings emphasize both direct and indirect tax revenue trends during this period. However, the study does not employ advanced econometric models, which limits the scope of inference.
- Ghimire (2020), in *Implications of Tax Reforms in Indirect Tax Collections of the Government of India during the Last Two Decades (2000–2020)*, compared indirect tax collections in terms of growth, share in revenue, and GDP composition using data from 2000–01 to 2019–20. The results indicate that indirect tax reforms failed to enhance revenue productivity, as reflected by a stagnant indirect tax-to-GDP ratio. The limitation is that the study only focuses on indirect taxes and does not integrate direct tax reforms.
- Singh (2019), in *Tax Revenue in India: Trends and Issues*, conducted a descriptive historical analysis of tax collections and their relationship with GDP ratio. The findings highlight long-term trends but lack econometric rigor. The gap lies in its dependence on historical data without any empirical econometric validation.
- Similarly, Singh (2019) also undertook *A Historical and Analytical Study of the Evolution of Taxation in India with Special Reference to the Post-Independence Era*. This work presents a comprehensive historical review of taxation policies in India since independence. Although rich in context, the study limits itself to descriptive historical insights and does not apply quantitative econometric techniques.

The review of literature clearly indicates that while extensive research has been conducted on tax reforms and their impact on revenue mobilization and economic growth, significant gaps remain in the Indian context. Most studies either emphasize GST and its macroeconomic implications or provide descriptive historical accounts of tax evolution without robust econometric validation. International works offer valuable methodological insights into buoyancy and structural reforms, but they lack country-specific micro-level analysis relevant to India. Furthermore, studies tend to isolate direct or indirect taxes rather than analyzing their combined and comparative effects on GDP over a longer time frame. The pandemic period and structural reforms such as GST and digitalization also emerge as turning points, but their long-term impacts are yet to be comprehensively captured. Thus, there is a clear need for a systematic, time-series based empirical study that disaggregates direct and indirect tax revenues and evaluates their relationship with GDP growth, particularly in the post-2000 reform era. This gap underscores the relevance of the present study.

III. Research Gap

Limited studies have been conducted to assess the implications of tax reforms on revenue collection in post-independence period. Further, standalone studies assessing impact of indirect tax reforms and GDP ratio or direct tax reforms and GDP ratio are found. However, no study found understanding the impact of direct and indirect reforms on revenue collection to evaluate their relationship with GDP. Also no study found covering the period 2000-01 to 2023-24.

IV. Objectives of the Study

The present study is undertaken with the following objectives:

1. To examine the trends and patterns of direct and indirect tax revenues in India during the period 2000–01 to 2023–24.
2. To analyse the relationship between direct tax revenue, indirect tax revenue, and India's GDP growth.
3. To compare the relative contributions of direct and indirect taxes to GDP growth over the study period.
4. To provide policy insights on strengthening India's tax system to ensure higher revenue productivity, economic efficiency, and sustainable growth.

V. Research Questions

Based on the objectives of the study, the following research questions are framed:

1. What have been the trends and patterns of direct and indirect tax revenues in India from 2000–01 to 2023–24?
2. How are direct and indirect tax revenues related to India's GDP growth during this period?
3. Do direct taxes or indirect taxes contribute more significantly to India's GDP growth?
4. What policy measures can be suggested to strengthen the effectiveness of India's tax system in promoting sustainable economic growth?

VI. Research Methodology

The present study is empirical in nature, relying on quantitative analysis to examine the relationship between tax revenues and India's GDP growth. It is based on secondary data. A longitudinal time-series design has been adopted, covering the period from 2000–01 to 2023–24. This design allows for an in-depth analysis of the impact of tax reforms on economic performance over time.

Sources of Data

The study is based entirely on secondary data, collected from reliable and authoritative sources, including:

- Union Budget Documents (various years)
- Reserve Bank of India (RBI) publications
- Economic Survey of India
- Central Board of Direct Taxes (CBDT) and Central Board of Indirect Taxes & Customs (CBIC) reports
- National Statistical Office (NSO) and Ministry of Finance data

The variables under consideration are:

- Direct Tax Revenue (independent variable 1)
- Indirect Tax Revenue (independent variable 2)
- Gross Domestic Product (GDP) at current prices (dependent variable)

Period of Study

The analysis covers 24 years, from 2000–01 to 2023–24, a period chosen because it captures significant tax reforms such as the FRBM Act (2003), rationalization of direct taxes, and the introduction of GST (2017).

Tools and Techniques of Analysis

To achieve the research objectives, the following statistical tools and econometric techniques are employed:

1. Descriptive Analysis

- To examine trends and growth patterns of direct tax, indirect tax, and GDP.
- Use of tables, graphs, and growth rates for interpretation.

2. Correlation Analysis

- To study the degree of association between tax revenues (direct and indirect) and GDP growth.

3. Regression Analysis

- Multiple regression models are used with GDP as the dependent variable and direct and indirect tax revenues as independent variables.

Data Analysis and Interpretation

1. Descriptive Analysis

TABLE 1

YEAR WISE TAX COLLECTION AND IT'S CONTRIBUTION TO GDP

Financial year	Direct Tax Revenue Independent Variable1	Indirect Tax Revenue Independent Variable2	GDP Dependant Variable	GDP Growth rate	Direct tax to GDP ratio (%)	Indirect Tax to GDP (%)
2000-01	68,305	1,19,814	21,02,376	7.7%	3.25	63.69
2001-02	69,198	1,17,318	22,81,058	8.5%	3.03	62.90
2002-03	83,088	1,32,608	24,58,084	7.8%	3.38	61.48
2003-04	1,05,088	1,48,608	27,54,621	12.1%	3.81	58.58
2004-05	1,32,771	1,70,936	32,42,209	17.7%	4.10	56.28
2005-06	1,65,216	1,99,348	36,93,369	13.9%	4.47	54.68
2006-07	2,30,181	2,41,538	42,94,706	16.3%	5.36	51.20

2007-08	3,14,330	2,79,031	49,87,090	16.1%	6.30	47.03
2008-09	3,33,818	2,69,433	56,30,063	12.9%	5.93	44.66
2009-10	3,78,063	2,43,939	64,57,352	14.7%	5.85	39.22
2010-11	4,45,995	3,43,716	76,74,148	18.8%	5.81	43.52
2011-12	4,93,987	3,90,953	90,09,722	17.4%	5.48	44.18
2012-13	5,58,989	4,72,915	1,01,13,281	12.3%	5.53	45.83
2013-14	6,38,596	4,95,347	1,13,55,073	12.3%	5.62	43.68
2014-15	6,95,792	5,43,215	1,25,41,208	10.5%	5.55	43.84
2015-16	7,41,945	7,11,885	1,35,67,192	8.3%	5.47	48.97
2016-17	8,49,713	8,61,515	1,53,62,386	13.2%	5.53	50.34
2017-18	10,02,738	9,15,256	1,70,98,304	11.3%	5.86	47.72
2018-19	11,37,718	9,37,322	1,88,86,957	10.5%	6.02	45.17
2019-20	10,50,681	9,53,513	2,00,74,856	6.3%	5.23	47.58
2020-21	9,47,176	10,74,809	1,98,29,927	-1.2%	4.78	53.16
2021-22	14,12,422	12,89,662	2,35,97,399	19.3%	5.99	47.73
2022-23	16,63,686	13,81,935	2,69,49,646	14.2%	6.17	45.37
2023-24	19,60,166	14,95,853	2,95,35,667	9.6%	6.64	43.28

Source: CBDT (2023)

Graph 1

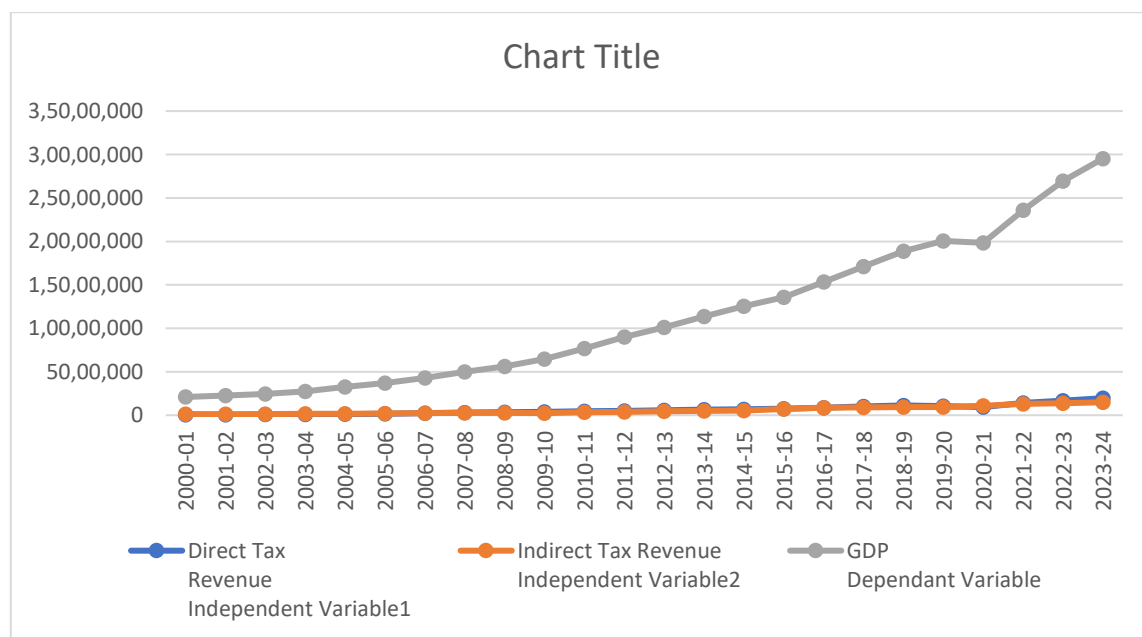


Table 1 and Graph 1 shows increasing trend in tax receipts in terms of direct and indirect tax revenue. It also shows that both direct and indirect taxes contribute significantly tax revenue and also Growth rate. However, it's hard for the model to know which variable is actually causing better scores for GDP. Hence researcher further proposes to use econometric tools for data analysis.

2. Correlation Analysis

Variables	Direct Tax Revenue	Indirect Tax Revenue	GDP
Direct Tax Revenue	1	0.982	0.99
Indirect Tax Revenue	0.982	1	0.99
GDP	0.99	0.993	1

Interpretation:

- Direct Tax & GDP ($r = 0.990$): Strong positive relationship – as direct tax revenue rises, GDP also increases.
- Indirect Tax & GDP ($r = 0.993$): Stronger positive relationship than direct taxes, suggesting indirect taxes track GDP growth very closely.
- Direct Tax & Indirect Tax ($r = 0.982$): Very high correlation, meaning both revenues tend to move together (indicating possible multicollinearity in regression).

3. Regression Analysis

Regression Coefficients

Variable	Coefficient	Std. Error	t-Statistic	p-Value
Constant	6,98,300.42	2,52,129.60	2.77	0.011
Direct Tax	6.691	1.507	4.441	0
Indirect Tax	11.106	1.815	6.12	0

Regression Equation:

$$GDP = 698,300 + 6.691 \times (DirectTax) + 11.106 \times (IndirectTax)$$

Statistic	Value
R-squared	0.993
Adjusted R-squared	0.993
F-statistic	1530.242
Prob (F-statistic)	1.78E-23
Standard Error of Estimate	7,19,864.46
Observations (N)	24

Interpretation

1. Goodness of Fit:

- The $R^2 = 0.993$ shows that 99.3% of the variation in GDP is explained by Direct and Indirect Taxes, making the model extremely strong.

2. Significance of Predictors:

- Both Direct Tax ($p = 0.000$) and Indirect Tax ($p = 0.000$) are statistically significant predictors of GDP.
- Indirect taxes ($\beta = 11.1$) have a larger coefficient than direct taxes ($\beta = 6.7$), meaning they have a relatively stronger association with GDP growth.

3. Constant Term:

- The constant (698,300) represents baseline GDP when both taxes are zero. While not directly meaningful, it ensures the regression line fits the dataset correctly.

4. Multicollinearity Concern:

- Since direct and indirect taxes are highly correlated (0.982), there may be overlap in their explanatory power. This means the coefficients should be interpreted with caution.

VII. Scope of the study

The study focuses exclusively on India and considers aggregate trends in direct and indirect tax revenues without disaggregating corporate and personal direct taxes. The scope is limited to their relationship with GDP growth and does not extend to other macroeconomic variables such as inflation, fiscal deficit, or external trade.

VIII. Limitations of the Study

1. The study is based on secondary data; therefore, its reliability depends on the accuracy of published sources.

2. GDP growth is influenced by multiple factors beyond taxation (e.g., investment, exports, global shocks), which are not explicitly modelled here.
3. The study does not separately analyse the effects of state-level taxes or post-GST state revenue dynamics.
4. The time-series data may exhibit structural breaks due to reforms, policy changes, or global events such as the 2008 financial crisis and the COVID-19 pandemic.

IX. Conclusion

This study set out to examine the impact of tax reforms in India on revenue mobilization and their subsequent relationship with GDP growth over the period 2000–01 to 2023–24. The empirical analysis using correlation and regression techniques highlights that both direct and indirect tax revenues exhibit a very strong and statistically significant positive relationship with GDP. The Pearson correlation coefficients (all above 0.98 with near-zero p-values) confirm that fluctuations in India's GDP are closely associated with changes in tax revenues. Regression analysis further indicates that direct and indirect taxes together explain a substantial proportion of variations in GDP, reaffirming the pivotal role of tax revenue mobilization in supporting economic growth.

The findings also suggest that the Indian tax system has become more buoyant and responsive following successive tax reforms such as the rationalization of direct taxes, introduction of self-assessment, widening of the tax base, digitization of compliance, and the implementation of the Goods and Services Tax (GST). Direct taxes have shown increasing significance in GDP contribution, reflecting improved compliance and progressive tax measures, while indirect taxes continue to provide stability and a broad-based revenue stream.

However, the results also underline that while tax revenues strongly correlate with GDP growth, sustainable economic expansion requires not only efficient tax policies but also reforms that ensure equity, transparency, and taxpayer trust. The study emphasizes the importance of continued reforms aimed at simplifying the tax structure, reducing compliance costs, curbing evasion, and aligning tax policies with developmental priorities.

In conclusion, India's experience demonstrates that tax reforms are not merely fiscal adjustments but critical instruments of economic policy. Strengthening revenue mobilization through balanced direct and indirect tax measures with individual focus on direct tax reforms and indirect tax reforms due to the multicollinearity concern is essential to strengthen India's tax-to-GDP ratio for sustaining long-term GDP growth and achieving inclusive development.

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BEHAVIORAL FINANCE IN EMERGING MARKETS: UNDERSTANDING INVESTOR PSYCHOLOGY IN VOLATILE TIMES

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ABSTRACT

This paper explores the role of behavioral finance in shaping investment decisions in emerging markets, with a focus on how investor psychology responds to volatility. Unlike developed economies, emerging markets are more susceptible to political instability, regulatory shifts, and economic shocks. These dynamics amplify behavioral biases such as overconfidence, herding, and loss aversion, influencing both retail and institutional investors. The study synthesizes theoretical frameworks, empirical findings, and case studies to understand how psychological factors interact with structural market inefficiencies. Implications for policymakers, financial institutions, and investors are also discussed.

Keywords: Behavioral finance, emerging markets, investor psychology, volatility, herding, overconfidence, loss aversion, India

INTRODUCTION

Traditional finance assumes that investors are rational agents who optimize their portfolios based on risk-return trade-offs. However, behavioral finance challenges this assumption by emphasizing psychological and emotional factors that drive financial decisions. This is particularly relevant in emerging markets, where volatility is heightened by macroeconomic uncertainty, weaker institutional frameworks, and rapid market development.

The purpose of this paper is to examine how investor psychology shapes behavior in emerging markets, especially during volatile times. By understanding these dynamics, we can better predict market trends, develop investor education programs, and design policies that enhance market stability.

REVIEW OF LITERATURE

Several Indian scholars have contributed significantly to the field of behavioral finance, especially within the context of Indian and other emerging markets:

- **P.K. Jain and Surendra S. Yadav (2012):** Highlighted the role of behavioral biases in Indian capital markets and emphasized the impact of cognitive errors on retail investor behavior.
- **Sanjay Sehgal and Himanshu De (2012):** Examined herding behavior in Indian stock markets, particularly during volatile trading periods, showing its role in asset price deviations.
- **Madhusoodanan, T.P. (1998):** Studied equity market efficiency in India and discussed how information asymmetry and investor sentiment affect asset pricing.
- **Chandra, Abhijeet (2009):** Focused on individual investor behavior in India, exploring biases such as overconfidence, representativeness, and mental accounting.
- **Bikas, E., & Sharma, S. (2016):** Investigated loss aversion tendencies among Indian investors, linking them to premature selling and underperformance during crises.

These contributions illustrate that behavioral finance is deeply relevant in the Indian context, where rapid market growth, coupled with frequent volatility, makes investor psychology a key determinant of market outcomes.

OBJECTIVES OF THE STUDY

The objectives of this study are:

1. To analyze the impact of behavioral biases such as overconfidence, herding, and loss aversion on investment decisions in emerging markets.
2. To examine the unique characteristics of emerging markets, particularly India, that make them more susceptible to psychological influences during periods of volatility.
3. To integrate insights from behavioral finance theories with empirical evidence from emerging markets.
4. To provide policy implications and recommendations for improving investor education and market stability.

SCOPE OF THE STUDY

The scope of this research is limited to understanding investor psychology within the framework of behavioral finance in emerging markets, with a special emphasis on India. The study focuses on retail and

institutional investor behavior, structural inefficiencies in emerging markets, and how psychological factors amplify volatility. While the primary context is India, insights are drawn from other emerging markets to provide a comparative perspective. The study does not attempt to develop a new behavioral model but applies existing theories to the emerging market context.

LIMITATIONS OF THE STUDY

1. The study relies on secondary data sources, which may not fully capture real-time investor behavior or individual decision-making processes.
2. The qualitative approach limits the generalizability of findings across all emerging markets.
3. Market behavior is influenced by multiple macroeconomic, political, and global factors; isolating the impact of psychological biases is inherently challenging.
4. Cultural factors vary widely across emerging markets, making it difficult to provide universally applicable conclusions.
5. The dynamic nature of financial markets means that insights may evolve rapidly with technological changes and regulatory reforms.

METHODOLOGY

This research adopts a qualitative approach, synthesizing existing empirical studies, financial market reports, and behavioral finance theories. The methodology is structured in three parts:

1. **Theoretical Framework Analysis:** Reviewing foundational literature on behavioral finance, including Prospect Theory, herding models, and overconfidence theories, and applying them to the emerging market context.
2. **Secondary Data Review:** Collecting insights from IMF, World Bank, and RBI reports, along with academic research on Indian and global markets, to identify patterns of investor behavior during volatility.
3. **Case Study Approach:** Analyzing specific episodes of financial crises and shocks (1991 Indian reforms, 1997 Asian Crisis, 2008 Global Financial Crisis, 2016 Demonetization, 2020 COVID-19 pandemic, and 2023 Adani-Hindenburg episode). Each case is examined for evidence of behavioral biases, investor decision-making, and market outcomes.

This approach allows for a holistic understanding of how psychological factors interact with market structures in volatile environments. Although primarily qualitative, the findings are grounded in quantitative indicators such as stock market indices, FII flows, and trading volumes reported in prior studies.

CASE STUDIES

The Asian Financial Crisis (1997)

The Asian Financial Crisis began with the collapse of the Thai baht in July 1997 and spread rapidly across East and Southeast Asia. Investor psychology played a crucial role in amplifying the crisis:

- **Herding Behavior:** Investors—both institutional and retail—engaged in massive capital flight after the baht's devaluation. This herd-driven behavior triggered a domino effect across Indonesia, South Korea, and Malaysia.
- **Overconfidence of Policymakers:** Many governments and investors underestimated risks of foreign-denominated debt, leading to severe currency mismatches.
- **Loss Aversion:** Panic selling of equities and bonds intensified the downturn, as investors rushed to exit even fundamentally strong markets.
- **Impact on Emerging Markets:** Countries not directly exposed, including India, also suffered capital outflows, showing how contagion is reinforced by investor sentiment rather than fundamentals.

Global Financial Crisis (2008)

The 2008 global crisis demonstrated how behavioral finance concepts apply across borders:

- **Panic Selling:** Emerging market equities experienced record outflows as investors shifted to safe assets. In India, Sensex and Nifty dropped nearly 50% in 2008.
- **Herding Across Borders:** Institutional investors liquidated positions across emerging economies indiscriminately.
- **Overconfidence Pre-Crisis:** Investors had assumed continuous global growth, underestimating systemic risks from mortgage-backed securities.
- **Policy Responses:** Despite government interventions and liquidity injections, investor confidence took longer to recover, highlighting the lag between fundamentals and sentiment.

COVID-19 Pandemic (2020–2022)

The pandemic created unprecedented global uncertainty:

- **Fear-Driven Loss Aversion:** In March 2020, Indian markets fell over 30% in weeks, driven largely by panic selling.

- **Speculative Overconfidence:** Retail investors returned strongly in late 2020, betting on a V-shaped recovery and stimulus-driven liquidity.
- **Herding Through Technology:** Social media and mobile trading apps encouraged collective trading behavior, often decoupled from fundamentals.
- **India-Specific Impact:** Small-cap and mid-cap stocks saw high volatility, with many retail investors cycling between panic exits and speculative entries.

INDIAN MARKET-SPECIFIC EPISODES

1991 Economic Reforms

- **Investor Sentiment Shift:** Economic liberalization under Dr. Manmohan Singh attracted large-scale foreign institutional inflows.
- **Overconfidence in Reform Narrative:** Investors pushed valuations of certain sectors beyond fundamentals.
- **Herding by FIIs:** Global funds poured into Indian equities simultaneously, causing rapid rallies followed by sharp corrections.
- **Outcome:** Long-term structural benefits were undeniable, but short-term speculative excess highlighted behavioral dynamics.

2016 Demonetization Shock

- **Market Reaction:** Withdrawal of high-value notes caused immediate liquidity shortages and uncertainty.
- **Loss Aversion:** Retail investors sold aggressively, especially in consumption-driven stocks.
- **Herding Behavior:** Institutional players mirrored retail panic, amplifying market swings.
- **Recovery:** As digital payments grew and liquidity was restored, markets rebounded, showing that sentiment shocks can overshoot fundamentals.

The Adani-Hindenburg Episode (2023)

- **Trigger Event:** A short-seller report accused the Adani Group of governance lapses and stock price manipulation.
- **Herding Behavior:** Both retail and institutional investors dumped Adani stocks, erasing over \$100 billion in market capitalization.
- **Loss Aversion and Fear:** Many investors exited positions prematurely, fearing systemic risks.

- **Contrarian Overconfidence:** Some long-term investors treated the crash as a buying opportunity, betting on recovery.
- **Broader Impact:** The event raised concerns over corporate governance in India, with investor psychology amplifying volatility far beyond initial claims.

DISCUSSION

Behavioral biases in emerging markets are magnified due to structural vulnerabilities, cultural predispositions, and high exposure to external shocks. Investor psychology not only drives short-term volatility but also influences long-term capital allocation.

1. **Role of Behavioral Biases:** Overconfidence fuels excessive trading and speculative bubbles; herding creates momentum that disconnects asset prices from fundamentals; and loss aversion leads to sharp corrections during downturns. In India, these biases are particularly visible during shocks such as demonetization and the Adani crisis.
2. **Interaction with Market Structures:** Weak regulatory enforcement and information asymmetry amplify psychological effects. For example, limited disclosure norms can lead to rumor-driven trading, while low financial literacy increases susceptibility to framing and anchoring biases.
3. **Cultural and Social Dimensions:** In collectivist societies like India, social networks, media narratives, and family influence play a larger role in investment decisions than in Western markets. This encourages herd-like behavior, especially in retail trading.
4. **Policy Implications:** Regulators must recognize that investor education alone may not overcome deep-rooted biases. Nudges such as default diversification options in mutual funds, circuit breakers during panic selling, and transparent corporate disclosures can reduce irrational market swings.
5. **Future Outlook:** As technology-driven investing grows through digital platforms, behavioral biases may be magnified by algorithmic herding and social media hype cycles. However, advanced data analytics also present an opportunity for regulators to monitor sentiment in real time and intervene when necessary.

In sum, the discussion emphasizes that behavioral finance is not a peripheral consideration but a core determinant of market dynamics in emerging economies.

CONCLUSION

Behavioral finance provides critical insights into the functioning of emerging markets, especially in volatile times. Investor psychology—shaped by biases like overconfidence, herding, and loss aversion—plays

a significant role in amplifying volatility. By acknowledging and addressing these psychological factors, policymakers, institutions, and investors can foster greater market resilience.

This study highlights that market outcomes in countries like India are not only a function of macroeconomic variables and regulatory frameworks but also of human behavior, which can both stabilize and destabilize financial systems. The interplay of sentiment and fundamentals often determines the speed and magnitude of market swings, with psychological biases sometimes outweighing rational analysis.

For policymakers, the findings suggest the need for regulation that integrates behavioral insights. Investor protection frameworks should consider cognitive biases when designing disclosure norms, taxation policies, or trading restrictions. For institutions, incorporating behavioral indicators into investment strategies and risk management can help identify unsustainable trends earlier. For individual investors, self-awareness of biases is crucial in avoiding suboptimal decisions, such as panic selling or speculative excess.

Ultimately, behavioral finance is not simply an adjunct to traditional models—it is an indispensable lens through which to interpret the complexities of modern financial markets. In emerging markets, where volatility is the norm, its relevance becomes even more pronounced. A behavioral perspective provides pathways for designing more resilient financial systems that balance rational efficiency with the realities of human psychology.

FUTURE RESEARCH DIRECTIONS

While this paper provides a comprehensive analysis of behavioral finance in emerging markets, several avenues remain open for future exploration:

1. **Quantitative Behavioral Metrics:** Future research could employ high-frequency trading data, sentiment analysis from news and social media, and experimental studies to quantify behavioral biases more precisely in emerging markets.
2. **Cross-Cultural Comparisons:** Comparative studies between emerging and developed markets, or between different emerging economies (e.g., India vs. Brazil), could highlight how cultural differences shape investor psychology and amplify certain biases.
3. **Technology and Fintech Influence:** With the rise of digital platforms, algorithmic trading, robo-advisory, and mobile-based investing, it is important to examine how these technologies interact with investor behavior, potentially amplifying herding or overconfidence biases.

4. **Behavioral Policy Design:** Research can further explore how nudges, regulatory tools, and financial literacy programs influence investor decision-making in volatile times. Experiments and pilot programs could test interventions such as simplified disclosures or digital alerts for retail investors.
5. **Sustainability and ESG Investing:** Another emerging area is how behavioral finance interacts with socially responsible and ESG-driven investing in developing economies. Do investors display biases in evaluating environmental or social returns alongside financial ones?
6. **Psychological Resilience in Crises:** A critical direction is exploring how investor resilience—shaped by prior exposure to volatility, cultural risk attitudes, and trust in institutions—affects recovery from financial shocks.

By addressing these gaps, future studies can provide richer insights into the evolving landscape of investor psychology in emerging markets and inform more effective policy and investment strategies.

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A STUDY ON AWARENESS AND PERCEPTION OF GREEN BONDS AMONG RETAIL INVESTORS IN MUMBAI CITY

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ABSTRACT

This study investigates the level of awareness, perception, and willingness to invest in green bonds among retail investors in Mumbai, India. A quantitative approach was employed, utilizing a structured online questionnaire distributed to a sample of 218 retail investors. The findings reveal a significant awareness gap, with only 38.5% of respondents familiar with green bonds. However, upon understanding the concept, a strong majority (72.3%) expressed a positive inclination to invest. The primary motivator is environmental impact (Mean=4.32), while the chief barriers are a lack of information (65.1%), perceived complexity (58.7%), and concerns about financial returns (54.1%). The study concludes that a formidable latent demand exists but is stifled by an information and accessibility gap. Recommendations include targeted financial literacy campaigns, the development of simplified retail-friendly green investment products, and enhanced transparency from issuers to unlock this critical capital source for India's sustainable development.

Keywords: Green Bonds, Sustainable Finance, Retail Investors, Awareness, Perception, energy efficiency

1. INTRODUCTION

India's ambitious goal of achieving net-zero emissions by 2070 necessitates an estimated \$10 trillion in investments (CPI, 2023). Green bonds, debt instruments designed to fund environmentally beneficial projects, are pivotal to mobilizing this capital. While India's green bond market has grown, including a landmark sovereign issuance in 2023, retail investor participation remains minimal. Green bonds raise money for climate and environmental projects, and are issued by governments, corporations, and financial institutions. The green bond market is now, even though it's a decade or so old, the market is still very much in its infancy but Green bonds are grabbing headlines given the solid growth of that bond market over the past few years. The green bond market is likely to continue to grow over the next decade. It promises to be an important source of capital for much-needed climate initiatives and a source of investment opportunities for

SRI investors and funds. As the green-bond market matures, it is developing offshoots . Green bonds are fixed-income securities issued to fund projects that have a positive environmental or climate impact. Examples include renewable energy projects, energy efficiency projects, or pollution control initiatives.

2. REVIEW OF LITERATURE:

Transitioning to sustainable development necessitates financial resources for investments. Over the past decade, green bonds have emerged as a remarkable innovation in the field of sustainable finance. Green bonds serve as fundamental financial instruments for funding green projects. Given the rapid growth of the green bond market in the current context, only a limited number of research studies have been conducted in this domain.(Thirumal 2021)

Green bonds have emerged as a significant component of India's financial and fiscal framework. They offer an efficient means to fund initiatives that foster sustainability and environmental protection. The Government has implemented measures to encourage the adoption of green bonds by offering incentives and tax advantages to investors. The progress of green bonds in India has been promising and has created new opportunities for financing sustainable initiatives. The Government should persist in promoting the use of green bonds and establish a supportive environment for their development. This will assist India in progressing towards a greener and more sustainable future. Additionally, India can capitalize on the second mover advantage by learning from the errors of the West and proactively addressing challenges such as greenwashing, low greenium, and green bond audits.(Kumar 2023)

India's vast financial needs to tackle climate change and facilitate a fair transition for its economy cannot be fulfilled solely by the public sector; it necessitates the mobilization of private finance and institutional investment in climate initiatives. Green bonds present a developing financial tool that has the capacity to draw private investors into climate action. Nevertheless, despite the rapid expansion of green bonds in the global market, they still represent only a minimal portion of the Indian bonds market.(Shrivastva 2024)

Green bonds have garnered increasing interest throughout Asia and globally as an alternative means to finance low-carbon investments. Green finance remains in its nascent stages within ASIAN countries and encounters several significant challenges. These challenges affect both the issuers of green bonds and the investors. There are limitations in issue of green bonds such as the limited credit retention capacity and the expenses associated with fulfilling green bond requirements. For investors, challenges are such as restricted investment capacity, insufficient data and analytical capabilities, as well as a lack of green bond indices, listings, and ratings (Aggarwal 2020)

The growth of the country's green bond market is propelled by government initiatives, corporate sustainability commitments, and technological advancements. Nevertheless, obstacles such as ambiguous regulations, elevated costs, and limited investor awareness impede progress. Addressing these challenges is essential for realizing the market's complete potential. To stimulate the growth of India's green bond market, policymakers should concentrate on three primary areas. Firstly, it is vital to create a clear and widely accepted green taxonomy to delineate eligible projects, mitigate greenwashing, and enhance investor confidence. Secondly, lowering issuance costs and streamlining the process, along with educating investors, will promote broader participation. Lastly, establishing a strong secondary market, potentially through innovative financial instruments and increased involvement from institutions, will improve liquidity and draw in more investors. Understanding the motivations of investors, particularly retail investors, is of utmost importance. (Reddy 2024)

Investor engagement in India's green bond market has been shaped by a mix of financial returns, perceived environmental benefits, and the credibility of the issuers. Institutional investors tend to place a greater emphasis on ESG criteria, whereas retail investors are more concerned with financial performance. Furthermore, regulatory support and market transparency play vital roles in enhancing investor confidence. Although interest in green bonds among Indian investors is on the rise, it is crucial to tackle challenges like limited awareness, perceived risks, and the absence of standardization to facilitate further market development. It is understood that strengthening the regulatory framework and cultivating a more informed investor base, which could aid in the sustainable growth of India's green bond market. (Malgaonkar2024)

3. RESEARCH OBJECTIVES:

1. To quantify the awareness level of green bonds among retail investors in Mumbai.
2. To analyze their perceptions regarding the financial and ethical attributes of green bonds.
3. To identify the primary motivators and barriers influencing their investment intention.

4. SIGNIFICANCE OF STUDY:

This study is that it acts as a vital bridge between a macro-level problem i.e. financing sustainable development and a macro –level solution i.e. engaging the retail investors Through diagnostic analysis the research provides

a actionable blueprint for regulators, financial institutions, and issuers to cultivate a deep and inclusive green bond market in India, thereby contributing directly to the nation's economic and environmental well-being.

5. LIMITATIONS OF THE STUDY

1. The study is geographically confined to Mumbai, which may limit the generalizability of findings to rural or less financially developed areas of India.
2. The use of an online questionnaire may introduce a bias towards more tech-savvy investors.
3. As a cross-sectional study, it captures perceptions at a single point in time and cannot track how they evolve.

6. RESEARCH METHODOLOGY:

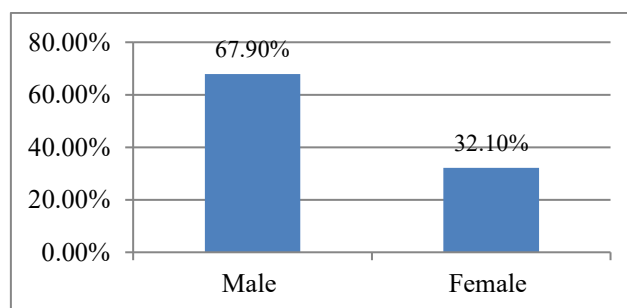
A descriptive and cross-sectional research design was employed. Primary data was collected via a structured online questionnaire using a 5-point Likert scale for perceptual statements. Non-probability sampling (convenience and snowball) was used to reach 218 retail investors in Mumbai who have invested in at least one financial instrument Data was analyzed using SPSS. Descriptive statistics (frequencies, mean, SD) were used for profiling and perception analysis. Inferential statistics (Chi-Square test) were used to test associations.

6.1 DATA ANALYSIS:

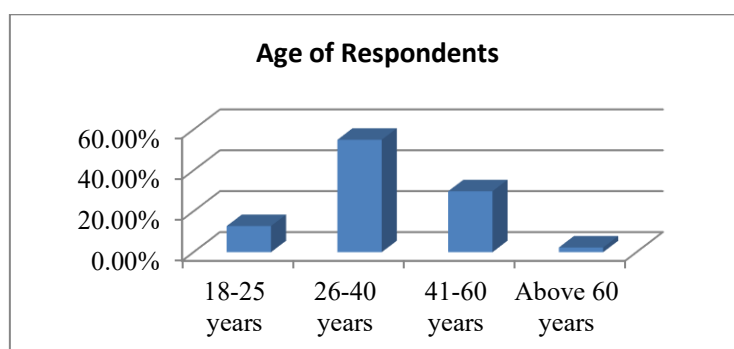
A. Demographic profile of respondents:

Table 1.1: Gender of Respondents

Gender	Number	Percentage
Male	148	67.90%
Female	70	32.10%
Total	218	100

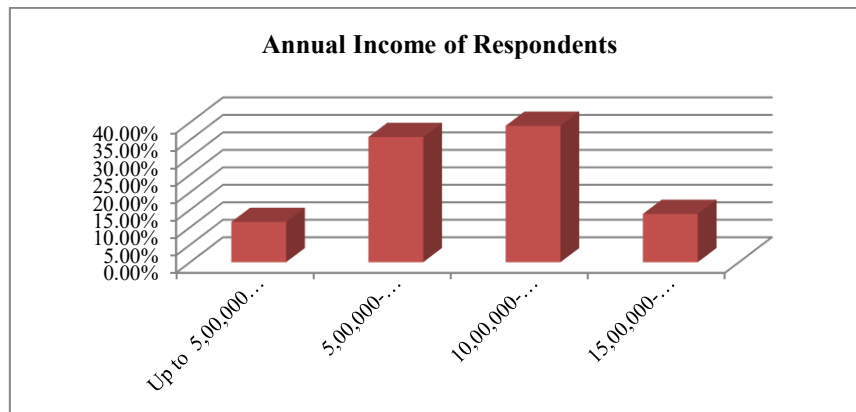
Graph 1.1: Gender of Respondents**Table 1.2: Age of Respondents**

Age	Number	Percentage
18-25 years	28	12.80%
26-40 years	120	55.00%
41-60 years	65	29.80%
Above 60 years	5	2.30%
Total	218	100.00%

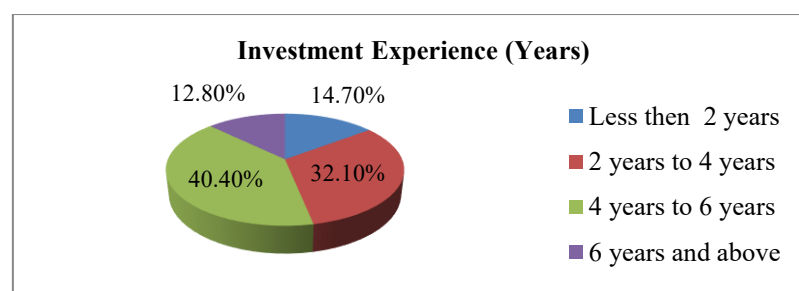
Graph 1.2: Age of Respondents**Table 1.3****Annual Income of respondents**

Annual Income (INR)	Number	Percentage
Up to 5,00,000 Lakhs	25	11.50%
5,00,000-10,00,000 Lakhs	78	35.80%

10,00,000-15,00,000 Lakhs	85	39.00%
15,00,000-20,00,000 Lakhs	30	13.80%
Total	218	100%

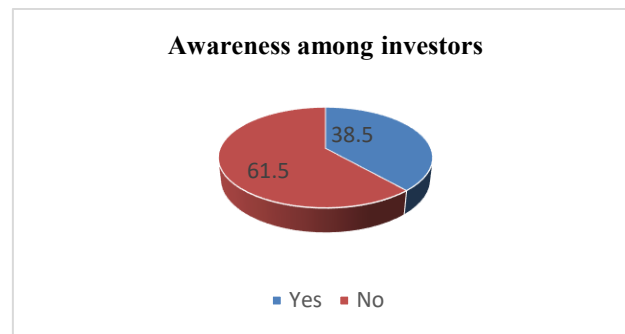
Graph 1.3**Annual Income of Respondents****Table 1.4****Investment Experience of investors :**

Investment Experience (Years)	Number	Percentage
Less than 2 years	32	14.70%
2 years to 4 years	70	32.10%
4 years to 6 years	88	40.40%
6 years and above	28	12.80%
Total	218	100.00%

Graph 1.4**Investment Experience of investors**

B) Awareness among investors about Green Bonds:**Table 1.5****Awareness about Green Bonds**

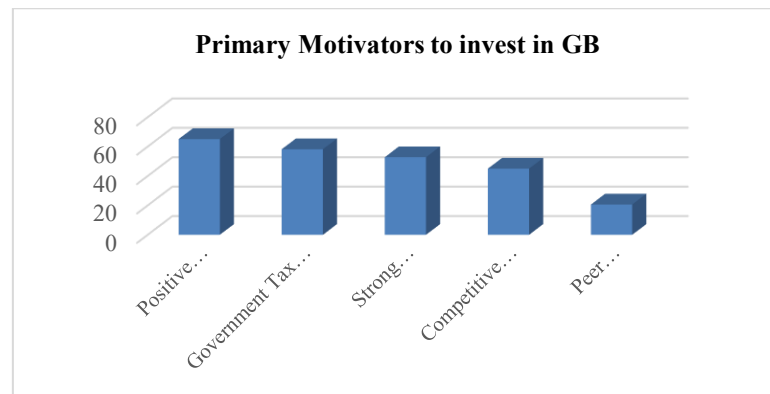
Awareness among investors	Number	Percentages
Yes	84	38.5
No	134	61.5
Total	128	100

Graph 1.5**Awareness about Green Bonds****c) Perception of Investors regarding Green Bonds:****Table 1.6****Perception of Investors**

Perception of investors	Mean	Std. Deviation
I) Ethical Perception		
GB are beneficial for the environment.	4.32	0.71
Investing in GB aligns with my ethical values.	4.1	0.82
II) Financial Perception		
GB offer competitive returns.		
GB are less risky than conventional bonds.	3.12	1.05
I trust that the funds are used for green projects.	2.98	1.12
III) Market Perception		
GB are a trendy investment.	3.65	0.88
Financial advisors rarely recommend GB	3.88	0.76

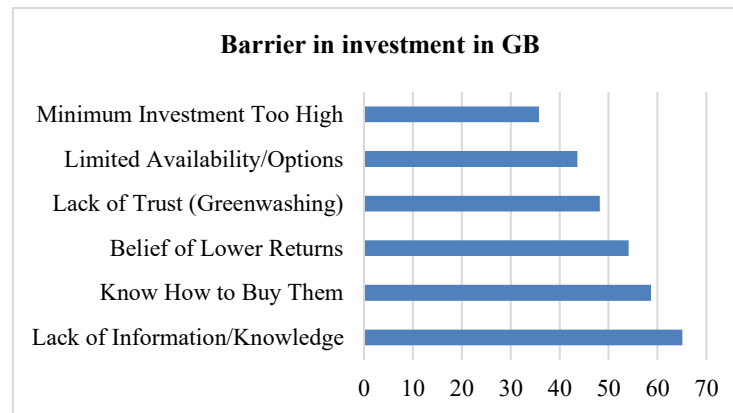
D) Primary Motivators to Invest:**Table 1.7****Primary Motivators to Invest in GB**

Primary Motivators to Invest	Number	Percentage
Positive Environmental Impact	142	65.1
Government Tax Incentives	127	58.2
Strong Regulatory Oversight	115	52.8
Competitive Financial Returns	98	45
Peer Recommendation	45	20.6

Graph 1.6**Primary Motivators to Invest in GB****E) Key barriers influencing investment intention:****Table 1.8****Key Barriers to Investment**

Key Barriers to Investment	Number	Percentage
Lack of Information/Knowledge	142	65.1
Know How to Buy Them	128	58.7
Belief of Lower Returns	118	54.1
Lack of Trust (Greenwashing)	105	48.2
Limited Availability/Options	95	43.6
Minimum Investment Too High	78	35.8

Table 1.7

Key Barriers to Investment**7. DISCUSSION:**

The study shows a paradox i.e. there is high investment intention coexists with critically low awareness. This suggests a massive failure in communication and financial product distribution targeted at the retail level. The positive ethical perception (high means for environmental benefit) is a strong foundation to build upon. The significant barriers are lack of information and not knowing how to invest point to a failure in both education and accessibility. The concern over returns persists despite evidence from other markets showing comparable performance. This perception risk must be actively managed by issuers and advisors.

The findings of the study align with the Theory of Planned Behavior i.e. attitude of investors towards green bonds is positive, their perceived behavioral control is the belief that they can easily find and invest in these instruments is very low, which suppresses actual investment behavior. This study concludes that a significant latent demand for green bonds exists among Mumbai retail investors. However, this potential is locked behind substantial barriers of awareness, accessibility, and financial skepticism.

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5. <http://dx.doi.org/10.2139/ssrn.5049254>
6. https://doi.org/10.2991/978-94-6463-612-3_19

LINKING SDGS TO VIKSIT BHARAT 2047: AN ANALYSIS OF CONNECTIVITY PILLARS FOR SUSTAINABLE NATIONAL DEVELOPMENT

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ABSTRACT

The agenda behind the Sustainable Development Goals put forward by the United Nations and the Viksit Bharat 2047 vision by the Government of India coincides as they aim to achieve inclusive, equitable and sustainable growth. The present study tries to examine the progress achieved by India with respect to SDGs and the challenges it faced in achieving the target. It also looks into the Viksit Bharat vision objectives, its multiple frameworks and the important connectivity pillars which bind the SDGs with Viksit Bharat. Special focus is given to the four connectivity pillars like physical, digital, social, economic and global, which plays an important role in bridging the global goals with the national development vision of India. Using secondary data, the study found out that there exists a mutually beneficial relationship between the SDGs and Viksit India, wherein SDGs through the connectivity pillars act as a catalyst to achieve the vision objective of a developed India by 2047. The study arrived at the conclusion that aligning SDGs with Viksit Bharat objective enables the country to achieve its vision objective in an inclusive and sustainable manner.

Keywords

Sustainable Development Goals, Viksit Bharat 2047, Inclusive Growth, Infrastructure, Connectivity Pillars.

INTRODUCTION

The Sustainable Development Goals (SDGs), also called the Global Goals, were adopted by the United Nations in 2015 as a global framework, in order to achieve inclusive, equitable, and sustainable growth by the year 2030. Whereas, the government of India's Viksit Bharat 2047 vision aims India to become a developed, prosperous, environmentally sustainable, and technologically advanced nation by its hundredth year of independence. Linking SDGs with India's Development Vision helps the country to achieve rapid economic growth, which will be socially inclusive and environmentally sustainable. India can transform the international development goals to its advantage with the help of physical, digital, social, economic, and global connectivity pillars and achieve a resilient and prosperous future. The success of the Viksit Bharat vision of India depends on how the country coordinates its national policies with the global goals. The four pillars of physical, digital, social and economic connectivity act as a catalyst that links the SDG targets with the national aspirations, promoting inclusive growth, sustainability and resilience.

RATIONALE OF THE STUDY

India's commitment towards achieving the targets of Sustainable Development Goals (SDGs) by 2030 is very important for fulfilling its long-term vision of becoming a developed nation under the Viksit Bharat 2047 framework. Understanding the progress, challenges, and association between these two agendas is essential as it helps in integrating policies across sectors and attain sustainable growth. This study tries to identify the connectivity pillar linking SDGs with the Viksit Bharat framework and investigate their role in aligning global and national development goals.

LITERATURE REVIEW

India could meet the SDG targets to a certain extent, but studies have shown that unemployment and disparity still exist between the regions within India. There has been progress in terms of poverty reduction and educational attainment, but there still exist disparities across various regions and sections of the population, especially among the marginalised sections. The National Indicator Framework developed by the Ministry of Statistics and Program Implementation (MoSPI) provides an extensive way to monitor and check overall SDG progress at the national level (Singh & Pandey, 2017).

The Viksit Bharat 2047 project seeks to turn India from a developing nation into a developed power in 100 years of its independence. Paul and Rena (2017) in their study argue that India requires an administrative framework that coordinates sustainability, technology, and inclusiveness to realize this vision. Moreover, the master plan put forward by the PHD Chamber of Commerce and Industry (2017) stresses greater interconnectivity, improved ease of doing business, and an up-to-date industrial structure to achieve the Viksit

Bharat Vision. The final goals of both SDGs and Viksit Bharat are the same, as both follow a common vision to achieve inclusive and sustainable development. According to Anand (2017), progress in SDGs forms the basis for the realization of the Viksit Bharat vision, as both these goals are highly connected and interrelated.

RESEARCH PROBLEM

Even though India made commendable progress in terms of the sustainable development goals, there still exists some gap in terms of employment, gender equality and environmental sustainability. On the other hand, the Viksit Bharat sets a target to achieve economic prosperity, social justice and environmental protection. The major research problem is as follows:

How can the SDGs be integrated into India's 2047 vision of Viksit Bharat and what are the roles played by the connectivity pillars (infrastructure, digital networks, social systems, and international partnerships) in aligning international goals with the national aspirations?

RESEARCH OBJECTIVES

1. To understand the progress of SDGs in India and the challenges in achieving the 2030 target.
2. To examine the Viksit Bharat framework and its key policy mission.
3. To identify the connectivity pillars that link SDGs with the Viksit Bharat 2047.
4. To analyze the role of these connectivity pillars in aligning SDGs with Viksit Bharat 2047.

RESEARCH METHODOLOGY

The study has used a largely adopted mixed-method approach to analyse the data. Secondary data were collected from UN reports, NITI Aayog, Government of India policy papers, research journals, etc. The study has used simple statistical methods to arrive at a conclusion. Since the study was based on the available selected secondary data, the result may not be comprehensive.

Scope and Limitations

The study tries to examine the progress of SHGs and analyse the connectivity pillars, which link SDGs with the India Development Vision 2047. The research is based on secondary data collected from UN reports, NITI Ayog and various government sources and uses a mixed method approach to arrive at the conclusion. Since the study confines to secondary data, it may limit the accuracy of the findings.

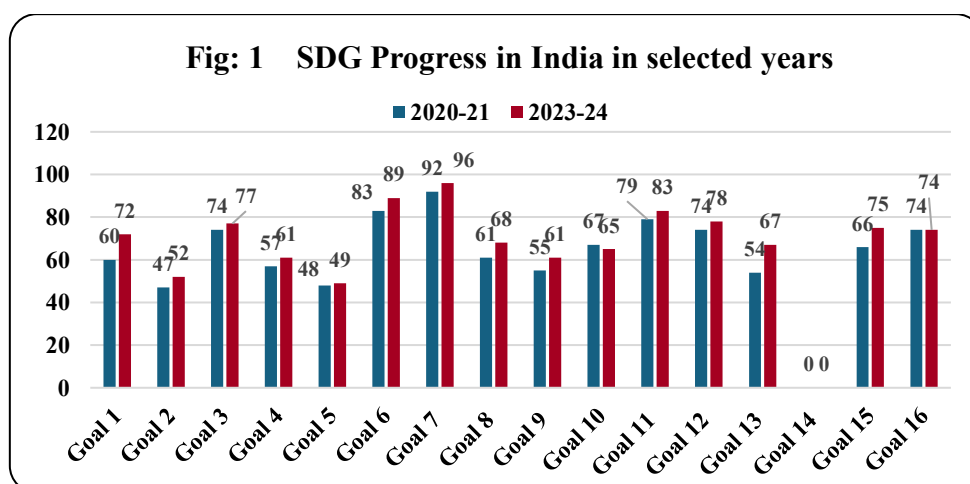
BACKGROUND OF SUSTAINABLE DEVELOPMENT GOALS (SDGS)

Development is very essential and the countries in order to achieve higher economic growth ignore the environment and contribute negatively to the environment, ecology and the ecosystem. This uncontrolled expansion, without giving importance to the protection of the environment, has contributed to challenges in the form of climate change affecting life on earth and in water. Understanding the importance of protecting the living species and dealing with the climate related problems, countries across the globe came together to find solutions in the form of Sustainable Development Goals.

The Sustainable Development Goals (SDGs), were adopted by the member states of the United Nations in 2015, as a global call for action to end poverty, protect the planet, and promote peace and prosperity for all people across the globe by 2030 (UNDP, n.d.). They seek to address the world's worst environmental, social, economic, and political problems and demand immediate direction on a more sustainable path. Moreover, community involvement helps to build a more sustainable, safer, and prosperous planet for all humanity.

SDGS AND INDIA'S DEVELOPMENT AGENDA

Countries across the world understood the importance of global partnership to address the broader problems of climate change, environmental issues, and ecological imbalance, which adversely affect the globe putting the living species at risk (Narayanan & Sengupta, 2025). India's performance with respect to sustainable development goals has been improving over the years. India has made notable progress in goals 1, 4, 12, and 13 (See Fig.1).



Source: Niti Aayog (2024)

Note: Achiever (100); Front Runner (65-99.9); Performer (50-64.99) & Aspirant (0-44.99)

India is a front-runner with respect to Sustainable Development Goals (SDGs) 1, 3, 6, 7, 8, 10, 11, 12, 13, 15, and 16, as per the data for 2023-24. The country is a performer in goals 2, 4, and 9. The country has to give more importance to goal 5 based on the data for the year 2023-24. Gender inequality is a matter of concern for the country, and important measures need to be taken for promoting gender equality.

CHALLENGES IN MEETING THE 2030 TARGETS

The country faces several challenges in meeting the targets of SDGs. Key challenges include the following (Niti Aayog, 2024).

- **Inadequate Funding:** Developing countries, like India, face significant gap in terms of the financial resources required and available for funding to achieve the SDGs.
- **Uneven State Performance:** In terms of achieving SDGs, there exist disparity across various states in terms of performance indicators. In spite of the increased spending by the central and the state governments in certain regions, there was no improvement in terms of the outcomes, which is a matter of concern.
- **Measurement and Inadequate Quality Data:** Lack of adequate, accurate, and timely data can affect the tracking of progress of SDGs and its effective policy implementation.
- **Gender Inequality:** High rates of child marriage and teenage pregnancy, as well as partner violence are factors which act against the country in achieving gender equality by 2030.
- **Climate Change Problems:** Rapid urbanization, along with climate change, causes extreme weather conditions and water shortages, which pose tremendous problems to agricultural output, public health, and environmental sustainability.
- **Weak Governance Structures:** Urban and local administrative frameworks generally weak, giving rise to a number of problems in terms of implementation for SDG actions on the grassroots level.
- **Policy and Institutional Gaps:** There needs to be a concentrated effort to establish strong institutional frameworks, better linkages between various government departments as well as consistent policies to address the policy gaps and challenges in achieving the SDGs.
- **Limited Public Awareness and Participation:** Lack of knowledge and involvement of local people especially from the marginalised sections can hinder the progress with respect to SDGs.
- **Poverty and Inequality:** A large section of the population still face problems of hunger and lack of electricity, which indicates the existence of poverty and inequality in wealth distribution.
- **Urbanization and Pollution:** Rapid urbanization has resulted in increased air and water pollution and at the same time cause challenges in waste management stressing the need for better urban development planning.

- Job Creation: The provision of adequate employment opportunities has become a challenge, leading to increase in urban unemployment causing income pressures on families.

India, as a federation of states, has regional differences and disparities in performances in terms of SDG indicators across various states that affect the 2030 SDG target achievement. State-specific policies and goal specific initiatives need to be undertaken by the respective state governments in association with the central government to achieve the predefined target.

FRAMEWORKS OF VIKSIT BHARAT- PILLARS AND THEMES

The framework for 2047 is the Government of India's dream of driving the nation to full development during its centenary year of independence. This development strategy stresses on inclusive development, sustainable progress, and effective governance. The prime minister emphasized the importance of youth both as drivers of change and beneficiaries themselves (GoI-PIB, 2024). The creativity, skill, ideas, and energy level of younger generations should be diverted in such a way as to align their aspirations with national development, which in turn can stimulate innovation, progress, and overall growth.

The Viksit Bharat vision mainly depends on four core pillars- the Yuva (Youth), Garib (Poor), Mahilayen (Women), and Annadata (Farmers), who forms the key demographic and occupational groups. Moreover, it highlights six specific areas (six pillars) where the government needs to focus: making India a global manufacturing hub, reviving the glory of Indian knowledge systems, ensuring the global presence of Indian products, powering green energy, expanding tourism, and promoting inclusive global development (Viksit India, 2025).

Apart from this, the Viksit Bharat initiative has been structured around five broad themes- Empowered Indians, Thriving and Sustainable Economy, Innovation, Science and Technology, Good Governance and Security, and India in the World, which provide a broad approach in achieving its vision objective (Viksit India, 2025). These multi-faceted approaches and multiple frameworks- four pillars, six pillars, and five themes help in coordinating the activities across various sectors thereby enabling the country to march towards making the Viksit Bharat vision a reality.

GOVERNMENT POLICIES AND PROSPECTS

The government of India introduced several new schemes and programs to achieve the objective of Viksit Bharat. Among these, the Make in India and Aatmanirbhar Bharat schemes are both central to this objective as they specifically aim to increase domestic production and reduce imports. Through the Digital India initiative, the government seeks to expand internet access, promote digital literacy, and improve e-governance. The Skill India Mission intends to enhance the skills of Indian youth, making them more

employable. Finally, the PM Gati Shakti Master Plan aims to boost infrastructure and improve connectivity across various sectors to achieve a comprehensive national development.

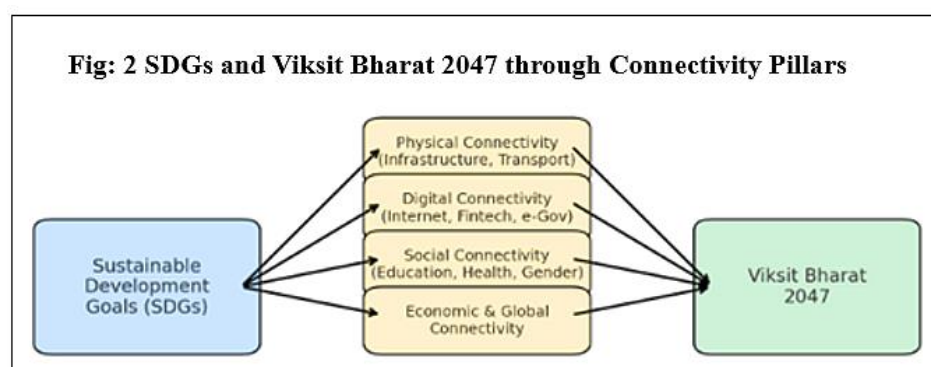
The National Education Policy (NEP) 2020 brings about transformative reforms in the educational sector, thereby reshaping the entire educational system. The Government of India has introduced health programs, such as Ayushman Bharat–Pradhan Mantri Jan Arogya Yojana (PMJAY) and the National Health Mission (NHM), of which the former aims to provide health insurance to the poorest and most vulnerable sections of the society. Both programs seek to improve healthcare infrastructure and enhance provision of health services in both rural and urban areas thereby making health care more affordable, accessible, and inclusive for all.

Significant emphasis is placed on infrastructure development, identifying its direct and indirect benefits as well as its multiplier effect on economic growth, and infrastructural projects like Sagarmala and Bharatmala are examples in this regard (Economic Survey, 2025). The government has also made adequate budget allocations in order to achieve its developmental vision.

Recognizing the importance of the active participation of all citizens, including the youth, in fulfilling the Viksit Bharat objectives, the government has launched youth-specific initiatives such as the Ambassador-Yuva Connect Programme and the Viksit Bharat Youth Parliament. Through these initiatives, the government aims to transform the youth into responsible, skilled citizens capable of contributing to nation building. In addition, “Jan Bhagidhari,” or public participation, emphasizes that all citizens should contribute to the successful achievement of this ambitious vision (Niti Aayog, 2025).

THE CONNECTIVITY DIMENSION OF SDGS AND VIKSIT BHARAT 2047

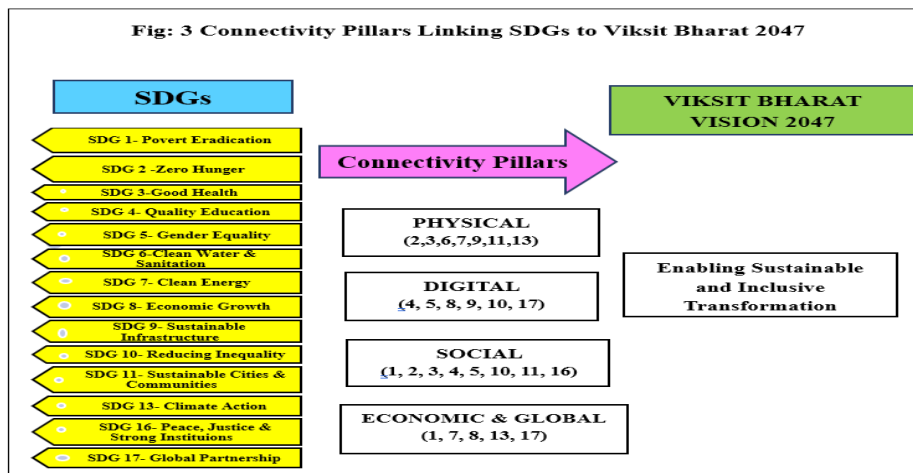
The four connectivity pillars play an important role in creating synergy between SDGs and the Viksit Bharat vision. Fig. 2 indicates the pillars connecting SDGs and Viksit Bharat 2047. The progress in SDGs can contribute to India’s development vision by aligning with physical, digital, social, and economic connectivity pillars, reinforcing that Viksit Bharat 2047 is not separate from SDGs but a continuation of them in the Indian context.



Source: Developed from Niti Aayog, 2024

CONNECTIVITY PILLARS LINKING SDGS WITH VIKSIT BHARAT 2047

The mapping of SDGs to Viksit Bharat shows that connectivity acts as a bridge linking SDGs with India's long-term vision of becoming a developed, equitable, and sustainable nation by 2047. See Fig: 3.



Author's contribution based on input from various secondary sources

The achievement of SDGs eventually leads to fulfilling India's vision to become a developed nation by 2047. The connectivity pillars act as a binding force to achieve the Bharat vision objectives. This can be explained as follows.

- **Physical Connectivity:** Construction of roads, railways, ports, power generation from renewable sources and urban infrastructure enables access to healthcare, education, and markets. Such moves are in direct support of SDGs 2 (Zero Hunger), 3 (Good Health), 6 (Clean water & Sanitation), 7 (Clean Energy), 9 (Industry Innovation and Infrastructure), 11 (Sustainable Cities) and 13 (Climate Action), while also supporting the Viksit Bharat goal of national development in an integrated manner.
- **Digital Connectivity:** With universal internet access, digital governance, and e-services, the rural-urban disparities can be reduced and, learning, financial inclusion, and skill development can be enhanced, which in turn facilitate SDGs 4 (Quality Education), 5 (Gender Equality), 8 (Decent Work), 9 (Innovation and Infrastructure), 10 (Reduce Inequality), and 17 (Global Partnership) and align it with the Viksit Bharat dream of a knowledge-based, technologically empowered country.
- **Social Connectivity:** By promoting community participation and social inclusion initiatives, equitable participation of all sections of the population can be ensured, which in turn helps achieve SDGs 1, 2, 3, 4, 5, 10, 11 and 16 and can set the values of social harmony and empowerment in Viksit Bharat.
- **Economic and Global Connectivity:** Better trade relations, financial networks, and market connections drive inclusive economic growth (SDG 8); reduce poverty (SDG 1), and promote entrepreneurship.

International cooperation in trade, technology transfer, and sustainable development activities enhances knowledge sharing, climate action (SDG 13); Clean Energy for all (SDG 7), and global partnerships (SDG 17) thereby enabling India to achieve its Viksit Bharat objectives and emerge as a global leader and resilient nation.

In short, these four forms of connectivity serve as a unifying framework, enabling the SDGs to translate into tangible, visible progress, while driving the Viksit Bharat vision of holistic and sustainable national transformation.

Both the Sustainable Development Goals and Viksit Bharat 2047 align in various ways. They share a common vision of achieving inclusive growth, environmental sustainability, infrastructural connectivity, human development, and finally economic growth and innovation. But at the same time, certain gaps exist between the two agendas.

- **Scheduling Gap** - The target achievement time period of both SDGs and Viksit Bharat are different which may cause divergence in the planning perspective. SDGs are targeted for 2030 whereas Viksit Bharat for 2047.
- **Scope Gap** - The SDGs are global and universal in nature, whereas Viksit Bharat focuses on India's national ambitions. But India through its outreach will be able to accommodate cultural differences domestically and internationally.
- **Priority Gap** - Reducing global disparities is the main aim of SDGs, whereas Viksit Bharat focuses on improving domestic competitiveness and working towards a developed nation.
- **Implementation Gap** - India's policies under Viksit Bharat may be ambitious but sometimes lack direct alignment with SDG frameworks, especially in measurement and monitoring indicators.
- **Approach Gap** - The SDGs give particular emphasis on international cooperation, while Viksit Bharat emphasizes self-reliance (Aatmanirbhar Bharat) and strategic partnerships. However, the idea of self-reliance under Viksit Bharat doesn't mean isolationist. Moreover, it aims to harness our strength for the common good of all humanity in keeping with the watchword of Vasudhaiva Kutumbakam, "the world is one family." This way of thinking showcases both national self-sufficiency and participation in global development.

CONCLUSION

The study shows a close connection between SDGs and the Viksit Bharat vision of 2047. The overlapping objectives and targets indicate that the progress towards SDG will eventually help the country to achieve its development vision objective. However, certain challenges and gaps need to be addressed so that the country, while fulfilling its SDGs, can create a pathway to achieve India's vision of 2047. Strengthening

connectivity factors can serve as a binding force that enables the transformation of the country and help achieve its Viksit Bharat vision objective, with SDGs acting as catalysts for realizing this goal.

The Sustainable Development Goals (SDGs) provide a global framework for addressing various social, economic, and environmental challenges, while the vision of Viksit Bharat 2047 outlines India's roadmap to become a developed and inclusive nation by the centenary year of independence. Aligning the SDGs with the India Development mission ensures that growth in India happens in an equitable and sustainable manner. By reinforcing physical, digital, social, economic, and global connectivity pillars and integrating them into the national, regional and local planning, progress can be achieved across various sectors simultaneously and the country will be able to fulfil its commitment. Bringing global sustainability goals in line with national priorities helps India to achieve its Viksit Bharat vision faster.

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AI-POWERED CUSTOMER SERVICE IN INTERNET BANKING: AN EMPIRICAL STUDY OF USER PERCEPTIONS

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ABSTRACT

There is a rapid growth in the use of Artificial Intelligence (AI) in financial services, due to which internet banking has become highly dynamic and a customer-focused platform. There is a significant rise in the adoption of AI-powered tools by banks, such as the use of chatbots, virtual assistants, and predictive algorithms, with an aim to improve customer service experience and shorten the response time. The research paper aims to explore how customers perceive the use of AI-driven services in internet banking. A survey of 150 respondents was conducted to analyze the impact of AI on customer satisfaction, convenience, trust, and acceptance of internet banking. Statistical methods such as descriptive analysis, correlation, and regression were used to analyze the data collected. The findings determine that, while AI services significantly improve ease and transaction speed, there are still concerns with trust, personalization, and data security that continue to hinder broader adoption. The study concludes with suggestions for banks to strengthen AI-powered customer service and highlights the need for future research on ethical AI and effective human-machine collaboration in the banking sector.

Keywords: Internet Banking, Artificial Intelligence, Customer Service, Customer Perception.

INTRODUCTION

The banking industry has transformed significantly over the last two decades, mainly due to rapid improvements in information and communication technology. Internet banking, which was previously considered a supplementary service, has now become a major mode of transacting with one's bank. The use of Artificial Intelligence (AI) in internet banking services represents an initial step in this evolution. The major intention of the banks in providing AI-powered customer service systems, in particular, is to increase efficiency, reduce the cost of operation, and provide personalized financial solutions.

Nowadays, the banks have started using chatbots, language processing applications, and recommendation engines in their various functions. They use them to answer customer enquiries and also provide guidance to identify potential fraud. Automation helps banks to gain through a decrease in operational costs due to reduced human intervention, but the major success for the banks is a satisfied customer experience in using such AI-driven services.

SIGNIFICANCE OF THE STUDY

Although artificial intelligence (AI) has become a major component in internet banking, empirical research on how clients perceive these developments remains scarce. The success of AI-driven services is determined not just by the technology's capabilities and cost reduction, but also by client trust, acceptance, and contentment. This study aims to close that gap by thoroughly investigating customer perceptions. As a result, it provides significant information for banks to improve service quality while also exposing key concerns that require additional attention.

OBJECTIVES OF THE STUDY

- To analyze how customers perceive AI-powered customer service in internet banking.
- To study the relationship between AI-driven service quality and overall customer satisfaction.
- Evaluating the impact of trust, convenience, and personalization on user perceptions.
- To propose recommendations for improved AI-based customer service efficacy for banks.

REVIEW OF LITERATURE

• Artificial Intelligence in Banking

Research has shown that AI applications in the banking sector cover a wide range of functions, from credit scoring and fraud detection to customer engagement (Davenport & Ronanki, 2018). Tools such as chatbots and digital assistants have become especially popular, as they help banks lower operational costs while ensuring round-the-clock customer support (Maruti & Tripathi, 2020).

• Customer Service in Internet Banking

Customer service quality has long been acknowledged as an important aspect in internet banking satisfaction. Parasuraman et al. (1988) identified reliability, responsiveness, and assurance as essential aspects of service quality. Later research suggests that online banking acceptance is significantly influenced by characteristics such as simplicity of use, trust, and perceived utility (Davis, 1989; Zhou, 2011).

- **AI and Customer Perceptions**

The customer services are considered to be faster and efficient using AI, but they lack the personal touch when compared to human interaction (Grewal et al., 2020). Even though many customers are highly satisfied with the convenience and speed that AI offers in banking services, there are still concerns about data privacy, security, and the lack of emotional understanding (Makridakis, 2017). Trust continues to remain a crucial factor influencing not only adoption but also continuous use of banking services (Lu et al., 2019).

RESEARCH GAP

Despite the growing presence of AI in digital banking, there is still limited empirical evidence on how customers perceive AI-powered customer service specifically in the context of internet banking. This study seeks to fill that gap by providing survey-based evidence and offering insights into customer attitudes, expectations, and challenges in using AI-driven banking services.

RESEARCH OBJECTIVES

- To analyze the impact of AI-driven customer service on customer perception, focusing on factors such as speed, convenience, trust, and satisfaction.
- To evaluate how demographic factors such as age, education level, and banking usage affect customer perceptions of AI-driven customer services.
- To study the relationship between perceived quality of AI-driven services and overall customer satisfaction.

HYPOTHESES

H1: AI-powered customer service does not influence customer satisfaction in internet banking.

H2: Trust in AI systems has no significant effect on customers' acceptance of AI-powered services.

H3: Younger customers do not perceive AI-powered services favorably compared to older customers.

H4: Greater perceived personalization in AI services does not lead to higher user satisfaction.⁴

RESEARCH METHODOLOGY

Research Design

This study employs a descriptive and empirical research design to explore user perceptions of AI-powered customer service in internet banking. A structured questionnaire was prepared, focusing on key constructs such as service speed, trust, convenience, personalization, and overall satisfaction.

Sample Size and Population

The study surveyed 150 respondents who are active users of internet banking services. Participants were selected through convenience sampling, primarily from urban areas, to ensure access to individuals familiar with digital banking platforms.

Data Collection

An online questionnaire was used to collect primary data by circulating via email. Secondary data was gathered from academic journals, industry reports, and banking publications to provide context and support the analysis.

Tools for Analysis

- Descriptive Statistics is used for summarizing data by use of mean, percentages, and frequencies.
- Correlation Analysis is used to analyze the relationship between AI-driven service quality factors and customer satisfaction.
- Regression Analysis is used to assess the influence of AI-driven service quality variables on overall customer satisfaction.

Data Analysis & Findings

Demographic Variable	Categories	Frequency	Percentage
Gender	Male	85	56.70%
	Female	65	43.30%
Age Group	18–25 years	40	26.70%
	26–40 years	70	46.70%

	41–60 years	35	23.30%
	Above 60 years	5	3.30%
Education	Undergraduate	45	30.00%
	Postgraduate	85	56.70%
	Others	20	13.30%
Internet Banking Use	Less than 3 years	40	26.70%
	3–6 years	60	40.00%
	More than 6 years	50	33.30%

Table 1: Demographic Summary of Respondents**(Source: Compilation from Primary Data)**

Interpretation: The majority of respondents are aged between 26 and 40, hold postgraduate degrees, and have been using internet banking for over three years, suggesting that they are well-acquainted with digital banking services.

Factor	Correlation Coefficient (r)	Significance (p-value)	Interpretation
Service Speed	0.72	0.001	Strong positive correlation
Trust	0.65	0.004	Moderate positive correlation
Convenience	0.7	0.002	Strong positive correlation
Personalization	0.6	0.006	Moderate positive correlation

Table 2: Correlation Analysis between AI Service Quality Factors and Customer Satisfaction**(Source: Compilation from Primary Data)**

Interpretation: Service speed and convenience emerge as the most significant predictors of customer satisfaction. While trust and personalization also have a positive impact, their influence is slightly less pronounced.

Variable	Beta Coefficient	t-value	p-value	Significance
Service Speed	0.42	5.8	0	Significant
Trust	0.28	4.2	0.001	Significant

Convenience	0.31	4.6	0	Significant
Personalization	0.22	3.9	0.002	Significant
R² = 0.68				

Table 3: Regression Analysis of AI Service Quality Factors on Customer Satisfaction

(Source: Compilation from Primary Data)

Interpretation: Approximately 68% of the variation in customer satisfaction can be attributed to the four AI service quality factors, with service speed exerting the strongest influence, followed by convenience, trust, and personalization. The empirical findings support all four hypotheses, indicating that AI-powered customer service significantly enhances customer satisfaction, particularly through improvements in speed and convenience. At the same time, trust and personalization remain essential for ensuring long-term acceptance of these services. The results also reveal that younger respondents tend to be more receptive to AI-powered systems than older users, highlighting a generational difference in adoption.

These findings are consistent with Davis’s (1989) Technology Acceptance Model, which emphasizes the importance of perceived usefulness and ease of use in technology adoption. They further align with recent studies suggesting that successful AI implementation in banking requires a careful balance between operational efficiency and trust-building measures.

CONCLUSION

This study highlights that AI-powered customer service has a substantial impact on customer satisfaction within internet banking. Although customers value the efficiency and convenience offered by AI-driven solutions, concerns regarding trust, data security, and personalization continue to persist. A hybrid approach, combining human support with AI capabilities, may offer the most effective way to deliver high-quality and customer-centered banking services.

RECOMMENDATIONS

- **Enhance Transparency:** Banks should clearly explain how their AI systems operate and ensure that customer data is handled ethically and securely.
- **Improve Personalization:** AI tools should be designed to deliver context-aware, tailored responses that meet the specific needs of individual customers.
- **Adopt a Hybrid Service Model:** Maintaining a balance between AI-driven automation and human customer support can provide a more comprehensive and satisfactory service experience.
- **Strengthen Trust-Building Measures:** Banks should implement robust cybersecurity protocols and actively communicate these measures to customers to reinforce confidence.

- **Promote Customer Education:** Providing tutorials, guides, and awareness campaigns can help customers better understand and trust AI-powered banking services.

Future Research

Future studies could explore cross-country comparisons, longitudinal analysis of changing perceptions, and deeper insights into the role of AI ethics and emotional intelligence in customer service.

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