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For

ONE DAY NATIONAL CONFERENCE

On

RESEARCH AND PRACTICES IN COMMERCE, ACCOUNTANCY, MANAGEMENT, HUMANITIES AND IT FOR SUSTAINABLE DEVELOPMENT

Jointly Organized

by

CITY C. U. SHAH COMMERCE COLLEGE

&

GUJARAT UNIVERSITY AREA ACCOUNTANCY TEACHERS' ASSOCIATION

AHMEDABAD - GUJARAT (INDIA)

(REG. NO.- F/636, DATED-29/10/1977)

Theme

Innovative Approaches to Sustainable Economic Administration

&

IT Practices and Challenges for Sustainable Development

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&

Gujarat University Area Accountancy Teachers' Association

Ahmedabad

1st March 2025, Saturday

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About the Conference

The conference on "Research Practices in Commerce, Management, Humanities and Information Technology for Sustainable Development" basically focuses on addressing global sustainable challenges by integrating insights from these disciplines. It emphasizes the importance of ethical business practices, corporate social responsibilities and efficient resource management to ensure financial stability, while also protecting the environment. Humanities contribute by promoting critical thinking, cultural awareness and moral responsibility, providing a foundation for sustainable effort. Information technology drives innovation through tools for resource management, data -driven decisions and green technologies. The present conference invites scholars, practitioners and policy makers to share their strategies and insights aiming to achieve a balance between economic growth, environmental conservation and social equity.

About GLS

Founded in 1927, Gujarat Law Society (GLS) is one of the most prominent and long-standing educational institutions in Gujarat. It was established by distinguished figures including Shri Sardar Vallabhbhai Patel, Shri Ganesh Mavlankar, the nation's first Speaker, and Shri I.M. Nanavati, with a commitment to educational excellence. GLS has been a trailblazer from the start, offering a diverse range of programs in fields such as Business Management, Computer Science, Engineering, and Applications, Commerce, Business Administration, Education, Law, and Humanities. The courses provided by GLS are highly regarded, both among students and within the corporate sector.

About the College

City Commerce College affiliated to Gujarat University, was founded in 1966. The college was given its name, City C.U. Shah Commerce College on the name of the donar Shri Chimanlal Ujamshibhai Shah in 1970. Since 2010, the College is known as CITY C.U.SHAH COMMERCE COLLEGE. We provide quality education to the students of middle class who choose the best education. The college with morning classes proves to be a real boon for the working class students.

About Gujarat University Area Accountancy Teachers' Association

GUAATA is registered association and is formed by the experts of the accountancy field 45 years back. The objective of the Association is exclusively confined to academic activities in the field of Taxation and Accountancy. This association has membership of more than 1000 members. The territory of members is spread out from Kutch district to Dahod district and from Ahmedabad district to Banaskantha district. The role of association is to form informal syllabus for university in the subjects of Taxation and Accountancy, to organise workshops for training of new syllabus formed, to organise state level, National level and International level Seminars and Conferences. In past quality based good numbers of seminars, Conferences and Workshops are organised by the association. This association has its own journal "Communique" were research papers of young and senior professors are published and best papers are awarded prize.

Themes & Sub-themes

Theme 1: Trends and Challenges in Business Accounting Frameworks

- Corporate Governance and Sustainability
- Digital Transformation in Accounting
- Cyber Security in Financial Reporting
- Risk Management and Reporting
- Reforms in Direct and Indirect Taxation
- Sustainable Supply Chain Accounting
- Cloud Accounting
- Environmental Accounting and Reporting
- Carbon Accounting and Reporting
- Forensic Accounting and Fraud Detection
- Sustainable Financial Instruments

Theme 2: Innovative Approaches to Sustainable Economic Administration

- Public-Private Partnerships for Sustainability
- Digital Transformation for Sustainable Economic Practice
- Climate Change Adaptation in Economic Policy
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- Sustainable Public Finance and Fiscal Policy

Theme 3: Innovations and Challenges in Business and Management for Sustainable Development

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Theme 4: Trends and Challenges in Humanities for Sustainable Development

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- Environmental Ethics and Philosophy
- Language, Communication, and Sustainability

- Art, Aesthetics, and Ecological Consciousness
- Education for Sustainable Development
- Human Rights and Environmental Justice
- Narratives of Climate Change
- Urban Humanities and Sustainable Cities
- Globalization, Migration, and Sustainability
- Peace, Conflict Resolution, and Sustainable Development
- Digital Humanities and Environmental Change
- Religion, Spirituality, and Sustainability
- Public Policy, Governance, and Humanities

Theme 5: IT Practices and Challenges for Sustainable Development

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- E-Governance for Sustainable Development
- Artificial Intelligence for Sustainable Decision-Making
- Tech-Enabled Circular Economy
- Block chain for Supply Chain Transparency
- Cloud Computing for Sustainability
- Internet for things (IOT) for smart management
- Big Data Analytics for Sustainable Business Practices
- Cyber Security for Data Protection and Privacy
- Challenges in Promoting Digital education and training for Sustainable IT Practices

Theme 6: NEP 2020 and its relevance, challenges and remedies for Commerce Education

- A comparative study of different state universities on curriculum of commerce faculty
- A comparative study of different private universities on curriculum of commerce faculty
- A comparative study of state and private universities on curriculum of commerce faculty
- Role of Gujarat Government and its agencies on curriculum of commerce faculty
- Futuristic approach of research work in commerce faculty
- A critical analysis on UG and PG structure of commerce faculty
- An evaluative study on implementation of NEP in commerce faculty by universities
- Role of universities for successful implementation of NEP in commerce faculty
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- NEP and Multidisciplinary Education in Commerce: Opportunities, challenges and remedies

MESSAGE

It is a matter of great pleasure and pride for me to learn that City C. U. Shah Commerce College, one of our premiere colleges in the city area, is organizing a National Conference on "Research & Practices in Commerce, Management, Humanities, and Information Technology for Sustainable Development" on the 01st of March, 2025. Just as the world has been gifted with nine gems from Samudramanthan, I wish in the same way new directions and vistas of knowledge are opened from this national conference.

I wish all the very best to Dr. Prashant Jariwala, Administrative-in-Charge, and the entire team for the success of the conference.

Gujarat Law society has always encouraged and supported such academic endeavours in the past and will continue to support in future also.

Blessings,

Dr. Sudhir Nanavati
Executive Vice President
Gujarat Law Society, Ahmedabad

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LEVERAGING ARTIFICIAL INTELLIGENCE FOR SUSTAINABLE DECISION-MAKING

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Abstract

In tackling corporate sustainability concerns, artificial intelligence (AI) presents a dual-edged dilemma. Artificial intelligence can achieve substantial advancements in addressing the most complex environmental and social challenges encountered by humanity. Conversely, the efficiencies and breakthroughs produced by AI may introduce new hazards, including algorithmic bias and conflicts with human ethics. We contend that corporations and governments must collaborate to tackle sustainability concerns and dangers. Accountable and sustainable AI can be attained through a proactive regulatory framework bolstered by stringent company rules and reports. In light of the swiftly advancing nature of this technology, we advocate for a unified and risk-based regulatory framework that embraces various AI solutions to promote the common good. Maintaining a sufficient degree of technological neutrality and proportionality in regulation is essential for alleviating the diverse potential hazards associated with AI utilization. Unregulated AI poses a hazard rather than encouraging sustainability, as it would hinder effective monitoring of its impacts on the economy, society, and environment. An ideal regulatory framework would establish an agreement on the dangers to mitigate and the methods for doing so, while also incorporating enforcement measures to guarantee the trustworthy and ethical application of AI in the boardroom. Upon achieving this purpose, this technical advancement might be regarded as a common good that serves as a fundamental asset for human development.

Keywords: Artificial intelligence, Sustainable decisions, Regulation, Risk-based approach, Company law

Introduction

Artificial intelligence (AI) denotes the phenomenon of simulating human cognition via computational systems. It is becoming increasingly ubiquitous in our daily lives. In the contemporary era of intelligence and cognition, artificial intelligence (AI) and machine learning (ML) serve as a subfield of AI that facilitates autonomous robots is implemented to fundamentally transform and enhance business practices to foster sustainable growth. AI can autonomously absorb and assimilate knowledge from extensive data sets and utilize this knowledge to assist humans in attaining their practical and technical objectives. Artificial intelligence is a double-edged sword. Applying AI offers benefits, including the advantages of big data and the introduction of new value to the organization through authenticity, augmentation, and automation. Simultaneously, organizations and individuals will encounter the difficulty of excessive data and uncertainty around its utilization.

In a business environment, AI can be utilized to enhance the effectiveness and efficiency of corporate social responsibility (CSR) initiatives. Three Companies and their stakeholders will reap the benefits of AI, which will provide substantial economic value and facilitate solutions to enhance corporate resilience in addressing sustainability concerns and social challenges. It is crucial to examine the possible hazards posed by AI and the problems associated with this powerful technology to ensure that its deployment aligns with human values and beliefs.

CSR, Corporate Law and More Sustainable Decisions

CSR and Corporate Law

Corporate Social Responsibility (CSR) includes sustainable development, corporate governance advancement, business objectives, stakeholder protection, and socially responsible investments. It is a

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concept encompassing numerous efforts, and in a desire to uphold elevated standards in all company dealings. The phrase refers to the process by which firms recognize and mitigate the detrimental effects their corporate actions and operations may impose on society. The prevalence of corporation Social Responsibility (CSR) is evidenced by the relationship between ethical conduct towards stakeholders, to whom there is no legal obligation, and the fulfilment of the shareholder primacy mandate stipulated in corporation law, alongside the judiciary's influence in shaping this dynamic. Corporate Social Responsibility (CSR) entails the duty of directors to operate in a manner that serves the interests of the organization and society at large. Social, environmental, and human rights concerns are fundamental components of sustainable company practices. Corporate Social Responsibility (CSR) has been acknowledged and advanced via corporate law frameworks and governance structures, mostly implemented through informational discourse and the responsibilities of directors, serving as a means to integrate social and environmental considerations into commercial decision-making.

CSR and Sustainable Decisions

Corporate Social Responsibility is a fundamental component in advancing sustainable development. It fosters trust, enhances awareness, and promotes social change. The notion of sustainability is extensive and includes various dimensions. It is characterized as the outcome of an increasing recognition of the interconnectedness among escalating environmental challenges, socio-economic issues related to poverty and inequality, and apprehensions regarding a sustainable future for humanity. This word encompasses three dimensions—economic, environmental, and social—that are interrelated and mutually supportive.

The various components of sustainability were first articulated in the Brundtl and Report in 1987. This paper defines sustainable development as fulfilling the present demands without jeopardizing the capacity of future generations to satisfy their own needs. Consequently, the United Nations formulated Agenda 2030 and a collection of 17 Sustainable Development Goals (SDGs) that harmonize and balance these objectives. This concept is dynamic; it requires continual reassessment to enhance its substance and adjust to emerging social and environmental concerns. Otherwise, it would evolve into an all-encompassing concept, if not a mantra, that would promote unsustainable production and consumption behaviours.

AI and Corporate Decisions

In the contemporary age of intelligence and cognition, AI possesses significant potential to transform corporate governance processes and substantially enhance CSR initiatives by proposing alternatives, resolving intricate issues with educated strategies, or executing appropriate activities to attain specific corporate objectives. It includes a wide array of subfields, such as machine learning, which may learn from data and apply this information to assist boards of directors in achieving their company objectives. Incorporating AI into corporate governance enables board decisions to be informed by the analysis of company patterns and industry trends, rather than relying on intuition.

Definition of AI

The concept of employing computational artificial intelligence to emulate human behaviour was initially introduced by Alan Turing in 1950 when he formulated the 'Turing test' to address the subsequent inquiry: Is a computer capable of communicating sufficiently to convince a human that it is also human? In 1956, John McCarthy introduced the term 'artificial intelligence' to investigate the capacity for robots to think intelligently. It was characterized as 'the science and engineering of creating intelligent machines, particularly intelligent computer programs.' Since then, other definitions predicated on the concept of intelligence have been suggested, however there remains no definitive consensus regarding it.

AI systems may be entirely software-based, functioning in the virtual realm (e.g., voice assistants, image analysis software, search engines, speech and facial recognition systems), or they may be

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integrated into hardware devices (e.g., advanced robots, autonomous vehicles, drones, or Internet of Things applications).

From a functional standpoint, the OECD's AI Experts Group (AIGO) defines

AI as a machine-based system capable of making predictions, recommendations, or judgments that impact real or virtual environments, depending on a specified set of human-defined objectives. It employs machine and/or human inputs to interpret real and/or virtual environments; abstracts these interpretations into models (either automatically, e.g., through machine learning, or manually); and utilizes model inference to generate alternatives for information or action.

Big Data as an Enabler of AI

Artificial intelligence is crucial for developing superior data architecture. The capacity to leverage AI, particularly in the context of machine learning, fundamentally relies on the accessibility of high-quality large data. In the architecture of this system, the resolution to an optimization problem is not pre-programmed but is extracted through data analysis. Therefore, 'instead of deriving answers from rules and data, rules are developed from data and answers. After the data has been gathered from several sources and saved, it will be analysed using algorithms to identify correlations and develop an effective predictive model.

In this context, big data is defined as 'information assets characterized by large volume, high velocity, and/or high diversity that necessitate cost-effective, creative methods of information processing to facilitate improved insight, decision-making, and process automation.'

Using AI in the Boardroom

The capabilities of AI to improve decision-making in the boardroom appear to be limitless. When supplied with sufficient and high-quality big data, AI can assist board members in revealing concealed insights and important knowledge, hence enhancing the efficacy and quality of decision-making processes. It aids in forecasting future needs and dangers, identifying optimal solutions, optimizing resource utilization, enhancing profitability, assessing corporate performance, and assuring ongoing improvement. Nonetheless, AI can also make autonomous choices, serve on the board, or even supplant board directors. The efficacy of AI functions will be contingent upon the maturation of these disruptive technologies.

Challenges of Using AI in the Boardroom: Risks, Uncertainty and Lack of Regulation

The implementation of AI, like any emerging technology, has both advantages and hazards. The preceding section addressed the potential of AI systems to aid directors and improve the decision-making process. We shall now concentrate on the risks. or adverse repercussions that their utilization may have on the organization and society at large. The rapid pace of business transformation and data-driven decision-making intensifies fears and ethical dilemmas. Boards and executives grapple with comprehending the implications of new technologies on their organizations and the ancillary effects on third parties. The ambiguity and intricacy related to AI, along with a deficiency in skills and knowledge within the field, have hindered numerous firms from adopting digital technology. Considering that the utilization of these technologies serves the firms' best interests, the board may be neglecting its duty of care if, given the specific circumstances of a case, it would be prudent to adopt them to enhance directors' performance.

Identifying the primary dangers associated with AI is crucial to achieving an appropriate balance and preventing disproportionate harm, which is harm that cannot be mitigated by the beneficial consequences. The board of directors should seek to achieve a balance when determining the adoption and utilization of new technology in the boardroom. These risks will fluctuate based on the specific technology, its maturity level, and the characteristics of the company. Despite this dynamic character, it is feasible to contextualize many prevalent hazards that may compromise the effective implementation of new technology in this domain.

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AI's Contribution towards More Sustainable Decisions

The innovative essence of AI is often perceived as benevolently optimistic. From an innovation-centric viewpoint, the implementation of AI-driven solutions holds the potential for mutual benefits for both business and society. Moreover, with the issue of attaining complete transparency and accountability in AI decision-making, designers and users must contemplate the transformative and enduring impacts that these technologies may exert on persons and society. Due to the urgency of aligning corporate actions with sustainable development, the three pillars of this idea (environment, society, and economics) must be central to AI ethics. A consensus exists that effectively adopting AI and other sophisticated technologies necessitates collaboration among various stakeholders, particularly directors and the public sector.

The European Commission has proposed that AI engineers should be held accountable for the social, environmental, and human health consequences of AI decisions. This section will address the implementation of AI decision-making in an ethical and sustainable manner to advance the interests of corporations and other societal entities, while minimizing associated costs.

The ramifications arising from the relationship between AI and sustainability have not been thoroughly examined yet. Undoubtedly, the immense potential of AI should be harnessed to further this crucial objective for societal well-being. Evidence indicates that AI can facilitate progress on 134 targets (79%) across all Sustainable Development Goals (SDGs).The notion of sustainable AI encompasses not only the application or utilization of AI but also addresses the complete life cycle of AI, including the sustainability of its design, training, development, validation, re-tuning, implementation, and usage.

Regulating AI for the Common Good: The Need for a Harmonised and Risk-based Approach

Artificial Intelligence is an exceptional opportunity for executives and organizations to enhance their Corporate Social Responsibility portfolio and administer the CSR program in active collaboration with both internal and external stakeholders, guided by extensive data analytics. Artificial intelligence is increasingly becoming more complex and sophisticated, providing significant advantages in efficiency and innovation. Nonetheless, it entails the obligation to oversee data collection, ensure data quality, and assess the influence of data on social justice, alleviate vulnerabilities, and foster resilience.

Big data will assist the board of directors in formulating predictive CSR policies that align with the stakeholder network and priorities of the company's business model, facilitating educated predictions and enhancing trust with constituents. Establishing trust with stakeholders, especially indirect stakeholders like extraterritorial local communities, necessitates the regulation of data quality and governance, encompassing the processes for data collection, collaboration, and examination within the regulatory framework to enhance corporate effectiveness.

Based on this rationale, one could assert that AI not only aids in the attainment of social and environmental objectives but can also be regarded as a 'common good' due to its substantial benefits for society. The First Industrial Revolution utilized water and steam for production, the Second employed electric power, and the Third harnessed information and technology; currently, AI spearheads the Fourth Industrial Revolution, resulting in a convergence of technologies poised to redefine the most valuable human talents. As it is a vital asset for societal advancement, it must adhere to collective ethical principles and aligned values.

The collective will must occupy a vital role in this process and supersede the influence of major technological corporations and the media, which significantly affect the utilization of this technology. This objective necessitates a cohesive and standardized regulatory framework that prioritizes human values and alleviates the possible risks associated with AI Implementation. The logical flow is illustrated and elucidated in Figure 1 below.

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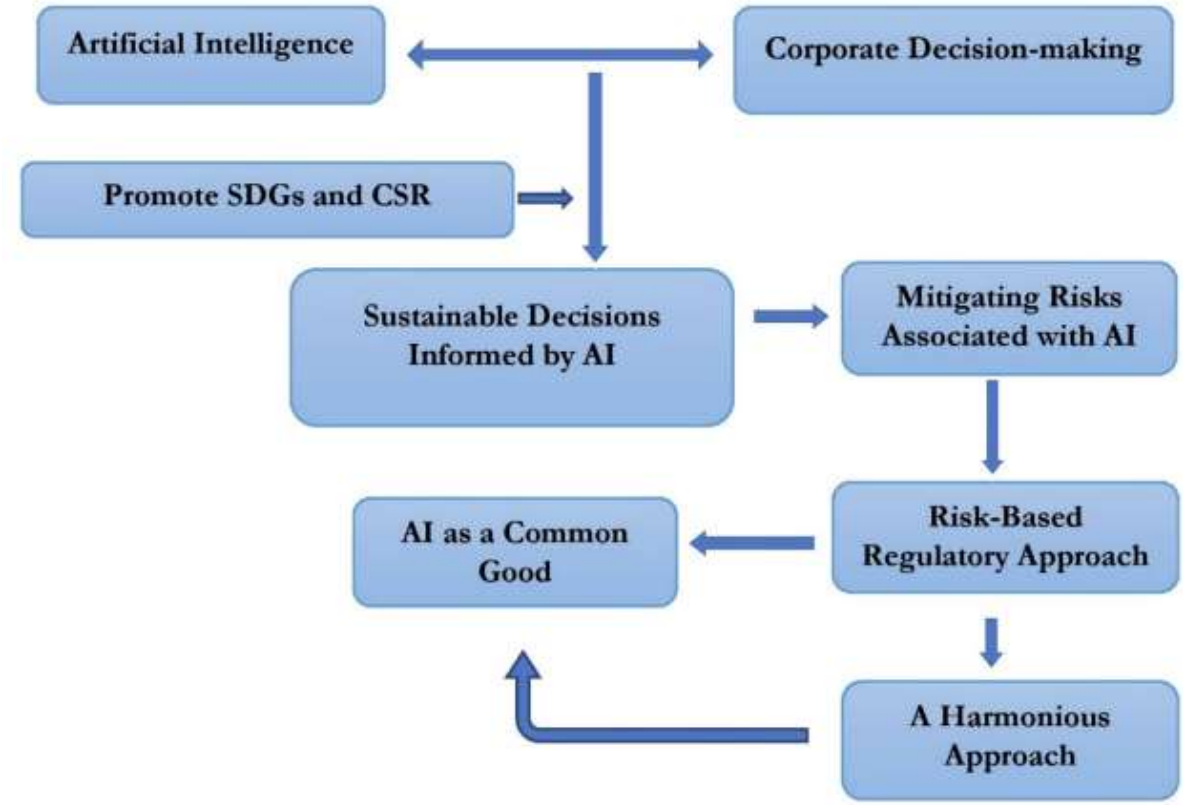

Conclusion

Artificial intelligence exerts a substantial influence across several social and economic sectors, and this effect is anticipated to increase in the foreseeable future. In corporate governance, firms can leverage AI in several ways, achieving significant improvements in efficiency and promoting the long-term goals of the corporation while considering the interests of shareholders and other stakeholders. It can facilitate the achievement of CSR objectives by allowing boards of directors to evaluate extensive data sets in real-time and forecast the most effective course of action. Guaranteeing that corporate decisions are informed and grounded in reliable facts will enhance the decision-making process and improve the efficacy of sustainability Programs.

In the realm of business sustainability concerns, artificial intelligence has been identified as a double-edged sword. Artificial Intelligence can achieve substantial advancements in addressing the most complex environmental and social challenges encountered by humanity. Conversely, the efficiencies and advances produced by AI may potentially introduce new hazards, including automatic bias and conflicts with human ethics. This essay contends that both corporations and governments ought to establish corporate policies and regulatory frameworks to tackle sustainability concerns and hazards posed by AI.

Unregulated AI poses a threat to sustainability, since it would hinder effective monitoring of its impacts on the economy, society, and the environment. In light of the swiftly advancing technology, we advocate for a proactive, coordinated, and risk-based strategy to address the possible challenges posed by AI, thereby facilitating its effective and ethical implementation for the common benefit.

Maintaining a sufficient degree of technological neutrality and proportionality in regulation is essential for alleviating the diverse potential hazards associated with AI utilization. A suitable regulatory framework would establish a consensus on the risks to mitigate and the methods to do this.

Additionally, incorporate enforcement systems to guarantee the trustworthy and ethical application of AI in the boardroom. Upon the attainment of this target, it will be feasible to reference this technical advancement serves as a public benefit and is a vital resource for human development.

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A COMPREHENSIVE APPROACH TO CYBER SECURITY FOR DATA PROTECTION AND PRIVACY

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Abstract

It has been foreseen that the analysis of Big Data will serve as a fundamental foundation for competition, facilitating the development of new waves of productivity growth, innovation, and consumer surplus. Given the critical nature of data, it is imperative to safeguard and ensure its privacy, regardless of its location and method of consumption. Organizations are currently defending against attacks that occurred yesterday, but their adversaries are focusing on exploiting the vulnerabilities of tomorrow. Consequently, sophisticated intruders are bypassing perimeter defenses to execute dynamic attacks that are highly targeted and difficult to detect. In this work, we present a strategy that concentrates on the most critical data vulnerabilities and asks only a few critical questions.

Keywords: Data protection, data access policy, masking, threats and risks, security.

Introduction

Currently, over 2.5 quintillion bytes of data are generated daily in the form of Big Data, encompassing digital images, movies, social network posts, intelligent sensor outputs, buy transaction records, and cell phone GPS signals, among others. There is significant interest in both business and research sectors regarding Big Data. Analyzing Big Data is anticipated to become a fundamental competitive advantage, driving unprecedented levels of productivity development, innovation, and consumer surplus. Big data encompasses not just the magnitude of a singular data set but also the aggregate of data accessible online, including information from governmental bodies, non-governmental organizations, local authorities, and journalists. Integrating this data renders big data valuable to the broader population. Data activists and engineers globally efficiently identify datasets and integrate them coherently for a significant result. For instance, assisting individuals in crisis response scenarios demonstrates significant potential when individuals utilize Google Fusion Tables to generate maps containing essential information following the 2011 Japan earthquake. In the realm of natural resources, we are utilizing big data to enhance the positioning of turbines in a wind farm to maximize energy output while minimizing environmental effect. We can also examine anthropogenic phenomena, for instance, comprehending traffic patterns and leveraging insights for enhanced planning or implementing incentives to mitigate congestion during peak hours is essential. Numerous additional instances illustrate how Big Data is utilized to benefit the planet. Given that data is a pivotal element, it is imperative to ensure privacy and safeguard data irrespective of its location or mode of consumption. Various types of information necessitate distinct protection protocols; thus, organizations must adopt a comprehensive strategy for security. Traditional strategies, often compliance-driven and perimeter-focused, have failed to keep pace with the advanced tactics employed by intruders. Most organizations are currently defending against yesterday's attacks, while their adversaries seek to exploit tomorrow's vulnerabilities.

As a result, advanced intruders are circumventing perimeter protections to execute dynamic, highly focused attacks that are challenging to detect; STUXNET serves as a pertinent example. Numerous individuals employ meticulously studied phishing vulnerabilities aimed at certain groups. The attack surface encompasses partners, suppliers, customers, and others, and has broadened due to increased data flows and various channels. A 2012 study by Symantec estimated that global cybercrime incurs an annual cost of USD 114 billion and affects over one million victims daily. A research by the Ponemon Institute revealed that the average organizational cost of a data breach in 2011 was USD 5.5 million, with

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notable examples including the attacks at Target and Sony. Moreover, ensuring uniform protection for all data is increasingly impractical due to emerging attack vectors, such as cybersecurity threats (worms, trojans, rootkits, rogues, and spyware), and the security complexities arising from evolving IT architectures, which compel organizations to prioritize data protection and necessitate greater granularity.

This paper presents an approach that addresses the most critical data vulnerabilities by concentrating on the following key questions:

1. Where is classified and sensitive data located throughout the enterprise?
2. How can access to enterprise databases be safeguarded, monitored, and audited?
3. How can data be regulated to prevent both authorized and unauthorized access?
4. How can data in non-production environments be secured while remaining usable for training, application development, and testing?
5. What forms of data encryption are suitable for data at rest and in transit?

Threats and Risks

According to Wiki[7], in the field of IT, a threat is a potential hazard that may exploit a vulnerability to compromise security and thereby inflict harm. A threat may be classified as either "intentional" (e.g., an individual hacker or a criminal organization) or "accidental" (e.g., the potential for a computer malfunction or a natural disaster such as an earthquake, fire, or tornado), or it may pertain to a circumstance, capability, action, or event. Nonetheless, the characteristics of computer crime have evolved over the years in tandem with technological advancements, resulting in a significant rise in potential for criminal activity. While thrill-seeking adolescent hackers remain prevalent, the domain is increasingly governed by professionals who illicitly acquire information for monetary gain and angry employees who sabotage systems or misappropriate information for retribution or profit. Numerous surveys have indicated that the majority of harm is perpetrated by insiders, those possessing authorized access to a computer network. Numerous insiders possess the access and expertise to compromise or disable entire systems and networks [8].

Insider threats

A significant proportion of data breaches originate from internal vulnerabilities. These breaches encompass personnel who may exploit credit card details and other sensitive information, as well as those who store confidential data on laptops that are later stolen. Moreover, corporations are responsible for safeguarding data regardless of its location, whether it is held by business partners, consultants, contractors, vendors, or other third parties. Common sources of risk include excessive privileges and the exploitation of privileged users. When people or apps are bestowed with database privileges that surpass their job function needs, such privileges may be exploited to access confidential information.

- SQL injection. SQL injection attacks involve a user who takes advantage of vulnerabilities in front-end web applications and stored procedures to send unauthorized database queries, often with elevated privileges. Using SQL injection, attackers could even gain unrestricted access to an entire database.
- Denial of service. Denial of service (DoS) may be invoked through many techniques. Common DoS techniques include buffer overflows, data corruption, and network flooding and resource consumption. The latter is unique to the database environment and frequently overlooked.
- Exposure of backup data. Some recent high-profile attacks have involved theft of database backup tapes and hard disks which were not encrypted.

According to one of the leading computer security body the OWASP top 10 threats are:
Threat #1: virus
Threat #2: spam
Threat #3: spoofing, phishing
Threat #4: spyware

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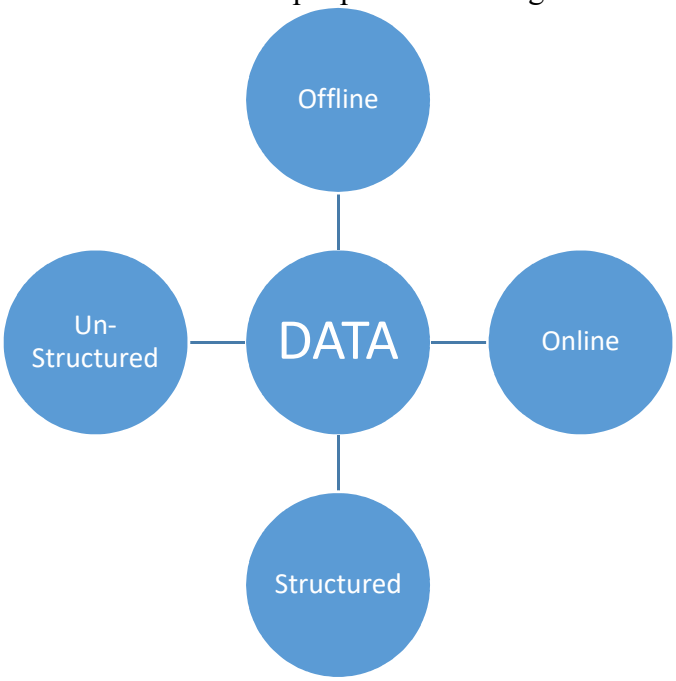
Threat #5: keystroke logging (keylogging)
Threat #6: adware
Threat #7: botnet
Threat #8: worm
Threat #9: trojan horse
Threat #10: denial-of-service attack (dos attack)

Our Approach for Data Protection

Organizations may struggle to safeguard sensitive data unless they are aware of its location and interrelations. Organizations must identify and document all data assets and their interrelations, irrespective of the source. Classifying data, comprehending linkages, and delineating service tiers are essential exercises. The data discovery method examines data values and patterns to ascertain the connections that unite different data items into coherent units of information. The primary concern is to protect sensitive data, encompassing both organized and unstructured forms. Databases must safeguard structured data against illegal access. Unstructured data in documents and forms necessitates privacy policies to eliminate sensitive information while permitting essential business data transactions. Data in non-production, development, training, and quality assurance environments must be safeguarded while remaining accessible for application development, testing, and training activities.

- Structured data: This data is based on a data model, and is available in structured formats like databases or XML.
- Unstructured data: This data is in forms or documents which may be handwritten, typed or in file repositories, such as word processing documents, email messages, pictures, digital audio, video, GPS data and more.
- Online data: This is data used daily to support the business, including metadata, configuration data or log files.
- Offline data: This is data in backup tapes or on storage devices.



Understanding the applicable criteria is crucial, as data security encompasses multiple processes and technologies. Rather, it is approached through a defense-in-depth strategy employing many technologies and controls tailored to unique circumstances within a complex legal and danger environment, as no singular best practice is applicable. Organizations must comprehend the specifics of

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their distinct use cases to facilitate improved decision-making, more economical investments, and more effective technology deployments.

This is particularly difficult due to ongoing uncertainty and limited resources. Organizations have challenges in meeting data security requirements as data is integrated and utilized along a dynamic information supply chain. The data is generated, accessed, utilized, and retired. As data progresses through each phase, its value and associated dangers fluctuate, necessitating the effective management of security protection requirements.

Investment in data security measures must be assessed in relation to corporate objectives, regulatory requirements, and risk levels. This necessitates a comprehensive comprehension of the data's utilization and the pertinent compliance mandates specific to the transaction, as these can vary based on the system's function, access permissions, stored data, and its ultimate application. Upon the discovery of sensitive data, an assessment of its susceptibility is important. This assessment may encompass various elements, including the evaluation of administrative access credentials and the verification of existing database configurations for compliance with known vulnerabilities.

De-identifying data in non-production situations entails the systematic removal, masking, or transformation of data items that may be utilized to identify an individual. Data de-identification allows developers, testers, and trainers to utilize realistic data and generate valid outcomes while safeguarding sensitive information. This is particularly crucial for firms that outsource development or testing functions. Dynamic data masking inhibits unauthorized users from obtaining structured data in real-time. Organizations can implement advanced, adaptable data masking protocols in accordance with corporate regulations and specifications. Dynamic data masking policies obscure sensitive information during transmission after retrieval from the database, with the masked results sent to the requesting web application. Organizations that operate call centers usually adopt dynamic data masking to conceal consumer information from call center personnel. There exists a scalable way to encrypt company data, both structured and unstructured, without compromising application performance or introducing key management complexity.

Data encryption is optimal for safeguarding both online and offline information. Regrettably, comprehending sensitive data and formulating appropriate rules for its protection is insufficient. Organizations must consistently oversee data sources for anomalous activities. Organizations must not to depend on manual auditing processes to identify suspicious activities. This methodology extends audits and is resource-demanding.

Masking Solution

A complete array of data masking techniques is necessary to facilitate compliance with data privacy regulations. The masking functionalities will guarantee that obscured data, such as names and street addresses, retains a semblance to the original information.

- Contextual, preconfigured data masking protocols provide the de-identification of elements such as payment card numbers, street addresses, and email addresses.
- Enduring masking functionalities disseminate masked substitution values uniformly across programs, databases, operating systems, and hardware platforms.
- Static or dynamic data masking is applicable to both production and non-production situations.

The solution must be a singular, manageable, and scalable approach to encrypt company data while maintaining application performance and avoiding key management complexity. It should employ a consistent and transparent encryption mechanism across complex companies, allowing for audit-ability with few or no alterations to applications, databases, or systems, while ensuring secure and centralized key management in remote contexts. The approach may involve sophisticated, easily customizable data security policies to ensure robust and enduring data protection with a clear delineation of responsibilities.

Once data has been identified and secured, companies must demonstrate compliance and continuously monitor systems. Monitoring user actions, object creation, data repository setups, and

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entitlements assists IT professionals and auditors in tracking users across applications and databases.

These teams can establish detailed policies for acceptable conduct and get notifications if these policies are breached. Organizations must promptly demonstrate compliance and enable auditors to validate compliance status. Audit reports and approvals assist in streamlining the compliance process, reducing costs, and minimizing technical and operational disruptions. Consequently, companies must to establish ongoing, detailed audit trails for all database activity.

Conclusion

In conclusion, to maximize effectiveness, information security must be incorporated into the Software Development Life Cycle from the outset of the system's development. The early incorporation of security within the Software Development Life Cycle (SDLC) allows organizations to optimize their return on investment in security initiatives. Early discovery and remediation of security vulnerabilities and misconfigurations lead to reduced costs in implementing security controls and mitigating vulnerabilities.

The identification of common security services and the reutilization of security strategies, alongside the enhancement of security posture via established methodologies and techniques, would enable prompt decision-making through thorough risk management. This article addresses several concerns that establish the framework for a comprehensive strategy to data protection as enterprises adapt to the new era of computing. The responses also assist firms in concentrating on critical areas they may be overlooking with their existing strategies.

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CYBER SHIELD: PROTECTING DATA IN DIGITAL AGE

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Abstract

In the digital age, where vast amounts of personal and organizational data are constantly exchanged, cyber security has become a critical focus. A “cyber shield” refers to the integrated set of tools, technologies, and practices designed to protect digital information from unauthorized access, theft, and malicious attacks. This abstract explores the significance of cyber shields in safeguarding data against a wide range of threats, including hacking, phishing, ransomware, and data breaches. With the rapid advancement of technology and the increasing sophistication of cyber threats, traditional security measures are no longer sufficient. Advanced encryption techniques, multi-factor authentication, and machine learning-based anomaly detection systems are among the modern solutions strengthening the cyber shield. Additionally, regulatory frameworks such as GDPR are pushing organizations to adopt more robust security practices. In conclusion, as the digital landscape continues to evolve, building and maintaining a resilient cyber shield is paramount for the safety of sensitive data and the privacy of individuals and enterprises alike.

Introduction

In today’s interconnected world, data has become one of the most valuable resources. From personal information stored on smartphones to critical organizational databases, digital data drives communication, decision-making, and innovation. However, the increasing reliance on digital technology has also made data more vulnerable to cyber threats. Cybercriminals exploit weaknesses in systems to access, steal, or manipulate sensitive information. As a response to these growing threats, the concept of a "cyber shield" has emerged—an integrated approach that combines tools, technologies, and practices to safeguard data in the digital age.

This document explores the importance of cyber shields, their components, and how they protect data from cyber threats. Additils and organizations to enhance their digital defense strategies.

The Importance of Data Protection in the Digital Age

Data is at the heart of modern economies and societies. Businesses use data to improve operations, deliver personalized services, and gain competitive advantages. Governments rely on data for public services, security, and policymaking. Individuals use digital platforms for communication, financial transactions, and information sharing. Consequently, any compromise of this data can lead to severe consequences, including financial losses, reputational damage, and even threats to national security.

The rise of sophisticated cyber threats such as ransomware, phishing attacks, and data breaches has underscored the need for robust data protection mechanisms. Organizations and individuals alike must adopt proactive measures to defend their digital assets.

What Is a Cyber Shield?

A cyber shield refers to a comprehensive framework of technologies, processes, and best practices designed to protect digital data from cyber threats. It encompasses various layers of defense that work together to detect, prevent, and respond to cyber incidents.

Key components of a cyber shield include:

1. Network Security: Protects the infrastructure through firewalls, intrusion detection systems (IDS), and secure access controls.

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2. Data Encryption: Secures data at rest and in transit by encoding it into unreadable formats accessible only with authorized decryption keys.
3. Endpoint Protection: Safeguards devices such as laptops, smartphones, and IoT devices from malware and unauthorized access.
4. Identity and Access Management (IAM): Ensures that only authorized individuals have access to sensitive data.
5. Threat Intelligence: Provides insights into emerging threats and vulnerabilities.
6. Incident Response: Outlines procedures for detecting, containing, and mitigating cyber incidents.
7. User Awareness and Training: Educates users on best practices to prevent human error, which is a common entry point for cyberattacks.

Cyber Threats in the Digital Age

To understand the importance of a cyber shield, it is essential to recognize the various threats that data faces today:

1. Malware: Malicious software such as viruses, worms, and Trojans designed to disrupt operations or steal data.
2. Phishing: Deceptive attempts to trick individuals into revealing sensitive information by impersonating legitimate entities.
3. Ransomware: A type of malware that encrypts data and demands payment for its release.
4. Denial of Service (DoS) Attacks: Overloading systems to render them inoperable.
5. Insider Threats: Malicious or negligent actions by individuals within an organization.
6. Advanced Persistent Threats (APTs): Long-term targeted attacks by sophisticated actors.

Key Components of an Effective Cyber Shield

1. Advanced Encryption Techniques
   Encryption is a cornerstone of data protection. Modern encryption algorithms such as AES (Advanced Encryption Standard) ensure that data remains secure even if intercepted by unauthorized parties. Encryption should be applied to both data at rest and data in transit.
2. Multi-Factor Authentication (MFA)
   MFA adds an extra layer of security by requiring users to verify their identity through multiple factors, such as a password, a fingerprint, or a one-time code sent to a smartphone.
3. Artificial Intelligence and Machine Learning
   AI and machine learning are increasingly used to detect and respond to threats in real time. These technologies can analyze vast amounts of data to identify anomalies and predict potential security breaches.
4. Zero Trust Architecture
   Zero Trust is a security model that assumes no user or device is inherently trustworthy. Access is granted based on strict verification, and continuous monitoring is conducted to ensure security.
5. Regular Security Audits and Penetration Testing
   Conducting regular security assessments helps identify vulnerabilities before they can be exploited. Penetration testing simulates real-world attacks to evaluate the effectiveness of security measures.
6. Data Backup and Recovery Plans
   Maintaining secure and up-to-date backups ensures that data can be restored in the event of a cyberattack or system failure. Recovery plans outline the steps to resume normal operations quickly.
7. Security Awareness Training
   Human error is a leading cause of data breaches. Training employees and users to recognize and respond to cyber threats is essential for a strong cyber shield.

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Trends in Cyber security

1. Rise of Ransomware-as-a-Service (RaaS)
   Cybercriminals are increasingly offering ransomware as a service, making it easier for less skilled attackers to launch sophisticated attacks.
2. IoT Security Challenges
   The proliferation of IoT devices has expanded the attack surface. Many of these devices have weak security measures, making them prime targets.
3. Cloud Security Concerns
   As more organizations move their data to the cloud, ensuring the security of cloud environments has become a top priority.
4. AI-Powered Cybersecurity
   AI is being leveraged not only by defenders but also by attackers. Organizations must stay ahead by adopting advanced AI-driven security solutions.
5. Regulatory Compliance
   Governments around the world are enacting stricter data protection regulations, such as the General Data Protection Regulation (GDPR) and the California Consumer Privacy Act (CCPA).

Best Practices for Strengthening Cyber Shields

For Organizations:

1. Develop a Comprehensive Cyber security Strategy: Define clear objectives and allocate resources for cybersecurity.
2. Implement Layered Security Measures: Use multiple defense mechanisms to protect data.
3. Conduct Regular Training: Keep employees informed about the latest threats and best practices.
4. Monitor and Analyze Network Traffic: Use threat intelligence tools to detect anomalies.
5. Maintain Compliance: Stay up to date with regulatory requirements.

For Individuals:

1. Use Strong, Unique Passwords: Avoid reusing passwords across multiple accounts.
2. Enable Multi-Factor Authentication: Add an extra layer of security to online accounts.
3. Be Cautious of Phishing Attempts: Verify the authenticity of emails and links.
4. Keep Software Updated: Install security patches and updates promptly.
5. Backup Important Data: Store backups securely and regularly update them.

Conclusion

In an era where data is a critical asset, protecting it from cyber threats is paramount. A robust cyber shield, built on a foundation of advanced technologies, best practices, and user awareness, is essential for safeguarding sensitive information. As cyber threats continue to evolve, staying vigilant and adopting proactive security measures will be crucial for individuals and organizations alike. By investing in a strong cyber shield, we can create a safer digital environment and unlock the full potential of the digital age.

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THE INFLUENCE OF CORPORATE GOVERNANCE DISCLOSURE ON ACCOUNTING CONSERVATISM: EVIDENCE FROM INDIAN-LISTED IT FIRMS

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Abstract

Indian corporate governance regulatory framework has been evolving for a while. However, limited studies have been undertaken regarding corporate governance and accounting conservatism in the Indian context. This study analyzes how corporate governance disclosure influences accounting conservatism in India. The corporate governance disclosure index (CGDI) was developed using 52 essential parameters of governance and accounting conservatism measures, using the Negative Accruals Measure (NA) developed by Givoly and Hayn (2000). The data set comprises BSE100-listed IT firms in India from 2010 to 2024. The study's findings reveal that the corporate governance disclosure index influences accounting conservatism. The study has revealed that effective corporate governance, explicitly using the corporate governance disclosure index, leads to higher-quality financial reporting through increased accounting conservatism. In other words, companies with strong corporate governance practices utilizing this index are better equipped to quickly acknowledge negative news than positive news. This finding is significant for policymakers, researchers, managers, analysts, and investors.

Keywords: Corporate governance, Disclosure index, Governance regulations, Accountingconservatism, IT firms.

Introduction

Corporate governance deals with mechanisms by which stakeholders of a corporation exercise control over corporate insiders and management such that their interests are protected. The term "corporate governance" gained popularity during the economic and political changes in OECD countries in the mid-1980s (Marie L'Huillier, 2014). The Cadbury report (1992) defined corporate governance as codes of conduct for directing and controlling a company and its stakeholders (Gulzar et al., 2020). Corporate governance can be referred to as the set of mechanisms designed to mitigate agency problems that arise between shareholders and managers because of the separation of ownership and control. In other words, corporate governance mechanisms are designed to mitigate agency conflicts between shareholders and external lenders due to information asymmetries.

The adage defines accounting conservatism as "anticipate no profit, but anticipate all losses" (Bliss, 1924). Accounting Conservatism is a prudent reaction to uncertainty to ensure that uncertainties and risks are adequately considered in business situations. Accounting conservatism helps the users of financial statements by limiting the self-serving actions of managers and other parties, such as inflating profits or hiding losses, while also addressing problems that can arise from managerial investment decisions. This approach enhances the efficiency of contracts, including those involving debt, while also making it easier to monitor those contracts. Additionally, it reduces the costs associated with litigation (Watts 2003a, b; Ball and Shivakumar 2005). The Negative Accruals Measure (NA), proposed by (Givoly& Hayn, 2000) is a reliable metric for measuring a company's level of accounting conservatism.

When looking at the link between corporate governance and accounting conservatism, it is also essential to consider the cultural and institutional differences between countries. These distinctions may impact how well corporate governance mechanisms work and how it affect accounting conservatism. Various studies worldwide have used different measures to focus on corporate governance and accounting conservatism. Unlike most existing studies (Sharma & Kaur, 2021), examine the relationship between corporate governance practices and accounting conservatism by considering more internal and external corporate governance practices. Thus, this study explores the relationship between corporate

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governance, as measured by the Corporate Governance Disclosure Index (CGDI), and the level of accounting conservatism exhibited by BSE100-listed IT firms in India. The outcomes can improve governance standards, financial transparency, and the reliability of financial reporting for companies.

The article is structured into three main sections. The first section provides an overview and highlights the empirical studies conducted. The second section explains the methodology used in this study, while the third section presents the results and an analysis. Finally, the article concludes with a summary of the findings and suggestions for future research.

Literature review

Corporate governance practices and disclosure in India

The significance of corporate governance has increased due to concerns over failures by boards of directors and management to comply with financial reporting and accountability standards, resulting in significant losses for investors. In India, Corporate governance evolved after 1996 due to economic liberalization and deregulation (Prusty& Al-Ahdal, 2018). Later, The Securities and Exchange Board of India (SEBI) formed the Kumar Mangalam Birla and Narayan Murthy committees, leading to the inclusion of clause 49 in the listing contract for Indian stock exchange companies. This clause emphasized the formation of an audit committee and the presence of independent directors on the board (Kulkani&Maniam, 2014). The Companies Act (2013) is a significant legislative milestone, elevating governance standards by implementing stricter disclosure norms, mandating consolidated financial statements, and addressing related party transactions. These measures aim to enhance corporate governance practices and safeguard stakeholder interests. In line with this rule, SEBI amended clauses 35B and 41 of the listing agreement (Arora & Bodhanwala, 2018). These amendments aim to ensure that governance rules align with the Companies Act (2013) and emphasize the significance of implementing strong governance practices. Clause 49, enforced by SEBI, has undergone several changes to encompass different aspects of corporate governance.

Clause 49 requires listed companies to include a corporate governance report in their annual reports, with specific disclosure requirements in Annexure 1 C and Annexure 1 D (National Foundation for Corporate Governance, 2004, p. 15). Disclosures are crucial in ensuring integrity, transparency, and accountability. The Disclosure requirements can be voluntary, mandatory, or a combination of both. Increased corporate governance disclosure can improve firm performance by aligning owner and manager interests from an agency perspective (Singhvi, 1968).

Several empirical studies (Omar Al-Sraheen et al., 2014; Saeed & Saeed, 2018; Sharma & Kaur, 2021; Vishnani et al., 2019) have investigated the relationship between corporate governance and accounting conservatism, but the results are inconclusive. A closer look at corporate governance and accounting conservatism literature reveals that results could be more conclusive, particularly across. It is worth noting that India's corporate governance regulatory framework has seen significant changes in the last ten years. However, there seems to be a gap in research when it comes to exploring the relationship between accounting conservatism and corporate governance disclosure within this particular context. More research should also look into these outside factors to get a fuller picture of the relationship between corporate governance and accounting conservatism.

Research methodology

Construct of Corporate Governance Disclosure Index (CGDI)

CGDI comprises the items of disclosure that are mandatory for disclosure in annual reports by the listed companies as prescribed by financial reporting requirements of the Companies Act, 2013 and the then applicable accounting standards issued by ICAI, and the disclosure requirements outlined in Listing Obligations and Disclosure Requirements (LODR) Regulations, 2015, and Clause 49's annexure 1 C and annexure 1 D (Abraham et al., 2015). The CGDI prepared here for the study comprises 52 numbers of items which have been subcategorized into 5 broad categories.

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A dichotomous procedure was implemented to score each disclosed parameter to assess corporate governance effectively. This procedure involved assigning a score of 1 for disclosing a particular parameter and 0 for not disclosing it, with all parameters being equally important and given equal weight (Cooke, 1989; Hossain & Hammami, 2009). In this study, the following formula is used to calculate each company's disclosure score index.

$$CGDS = \frac{dj}{n} \times 100$$

CGDS refers to the corporate governance disclosure score, "dj" represents the total score obtained by the company, and "n" stands for the Maximum possible score obtained by the company (i.e., 52).

The Measurement of Accounting Conservatism (ACC-CONS)

Givoly and Hayn propose that conservative accounting leads to consistently negative accruals. The degree of negativity in average accruals is indicative of the level of conservatism in accounting. Usually, accruals tend to reverse over time, but if cumulative negative accruals persist, it suggests a bias towards conservatism in the accounting system of the firm rather than a temporary nature of accruals. On this basis, the following conservatism measure is proposed:

$$\text{Accruals} = \frac{\text{EBEXTit} + \text{DEPit} - \text{OCFit}}{\text{TA}}$$

ACC-CONS = (Accruals / 3 years) × (-1)

ACC-CONS refers to accounting conservatism, measured using an accrual-based approach for firm I in year t. In this context, EBEXT represents income before tax and extraordinary items, DEP stands for the depreciation charge for the year, OCF indicates operating cash flow, and TA refers to total assets.

Data and sample

This study examines the influence of the corporate governance disclosure index on accounting conservatism. The dataset includes BSE100-listed IT firms in India from 2010 to 2024. This study utilizes secondary data from the PROWESS database, maintained by the Center for Monitoring Indian Economy (CMIE), and relevant annual and corporate governance reports from selected firms. The following IT firms have been selected using the purposive sampling method.

Table 1: Selected IT companies for this study

Sr. No.	Name of the selected Information Technology (IT) firms
1	H C L Technologies Ltd.
2	Infosys Ltd.
3	Tata Consultancy Services Ltd.
4	Tech Mahindra
5	Wipro Ltd.

Empirical findings and discussion

Classification of items of the Corporate Governance Disclosure Index (CGDI)

Table 2: Classification of items of CGDI

Sub-categories of CGD Index	Clause of listing agreement	No. of observations (Statements per category)	Percentage of total index
Board structure and management practices	49(I) to 49(IIF)	11	21.15
Audit related compliance	49(III) to 49(IIIE)	7	13.46
Risk management and investor's Grievance related compliance	49(VI) to 49(VI)C	6	11.54
Nomination and remuneration-related compliance	49(IV) to 49(IV)A	6	11.54
Disclosure practices	49(VIII) to 49(XI)	22	42.31
Total		52	100

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Table 2 shows the classification of items of CGDI.The CGDI has been divided into five broad categories. The first significant category was board structure and management practices, which comprised 11 statements explaining the general information about the board structure. This covers 21.15 percent of the total items of the index. Audit-related compliance is another index sub-category comprising seven statements covering 13.46 percent of the index's total items. The following sub-categories in the index are risk management and investor grievance-related compliance, which covers six statements and 11.54 percent of the total items of the index. The last category in the index is disclosure practices, which comprises 22 statements and covers 42.31 percent of the total items of the index.

Average Corporate Governance Disclosure Index(CGDI) and Accounting Conservatism(ACC-CONS) of sample firms over the study period

The index items have been screened in the firms' annual and corporate governance reports. If reported in the annual report, the particular item has been coded with 1, and if not reported, with 0. The average of these coded totals was computed after adding all the ones allotted and then divided by the total number of companies for all fifteen years of the study period.

Table 3 shows the average CGDI and ACC-CONSof selected Indian-listed IT firms from 2010 to 2024 (in %age). The average CGDI scores are used to evaluate the overall performance of these companies, and higher scores indicate better corporate governance practices and disclosures. In comparison, lower scores highlight areas that need improvement.

The CGDI scores for the IT firms range from 92.18% (Infosys Ltd.) to 96.28% (Tata Consultancy Services Ltd.). This indicates that all companies exhibit strong corporate governance practices, as scores above 90% are typically considered excellent. Tata Consultancy Services Ltd. has the highest score at 96.28%, indicating it leads in corporate governance disclosures among the listed firms. H C L Technologies Ltd. (95.13%), Tech Mahindra (94.87%), and Wipro Ltd. (94.23%) are also among the top performers, closely following Tata Consultancy Services Ltd. Infosys Ltd. has the lowest score at 92.18%, which, while still strong, may suggest some room for improvement compared to its peers.

Table 3: Average CGDI and ACC-CONS

Years	IT Firms				
	H C L Technologies Ltd.	Infosys Ltd.	Tata Consultancy Services Ltd.	Tech Mahindra	Wipro Ltd.
2010	92.31	92.31	94.23	94.23	92.31
2011	96.15	94.23	94.23	94.23	92.31
2012	96.15	90.38	96.15	94.23	90.38
2013	94.23	90.38	96.15	94.23	90.38
2014	94.23	90.38	96.15	94.23	90.38
2015	96.15	92.31	96.15	96.15	94.23
2016	94.23	90.38	96.15	94.23	94.23
2017	94.23	90.38	98.08	94.23	94.23
2018	96.15	94.23	96.15	94.23	94.23
2019	96.15	90.38	98.08	96.15	98.08
2020	96.15	90.38	94.23	96.15	96.15
2021	94.23	90.38	96.15	96.15	98.08
2022	96.15	94.23	96.15	94.23	96.15
2023	94.23	96.15	98.08	94.23	96.15
2024	96.15	96.15	98.08	96.15	96.15
CGDI	95.13	92.18	96.28	94.87	94.23

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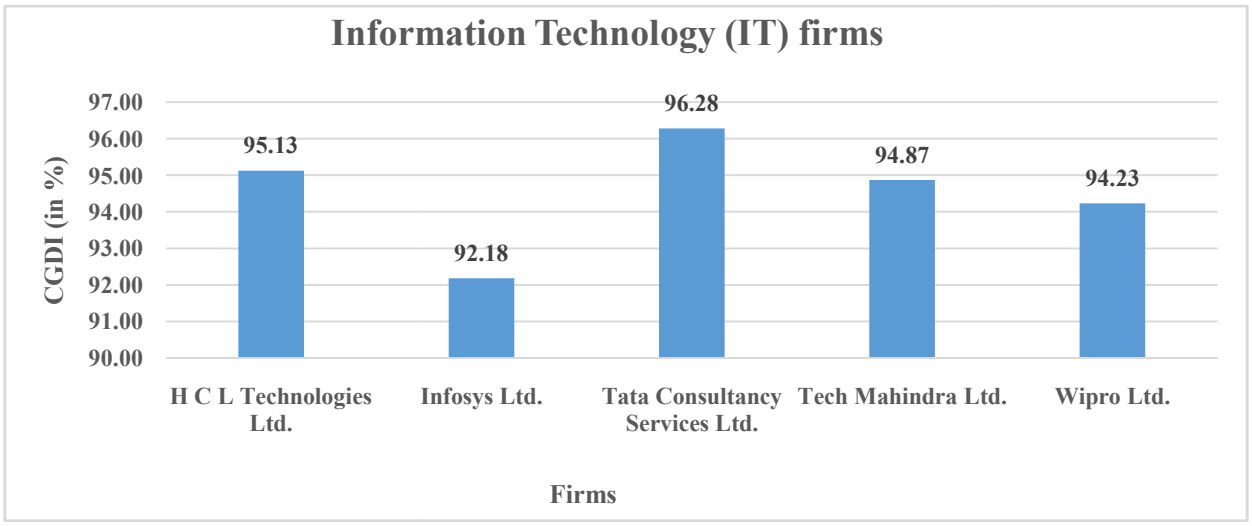
ACC-CONS	-0.17	-0.26	-0.34	-0.29	-0.23

Most companies (Tata Consultancy Services Ltd., H C L Technologies Ltd., Tech Mahindra, and Wipro Ltd.) have scores around 95%, showing consistent and robust corporate governance practices across the industry. Infosys Ltd. scored slightly lower, though still above 92%, suggesting high compliance overall. Strong and consistent CGDI scores demonstrate the IT firms' dedication to transparency, accountability, and ethical governance, which enhances investor confidence. These scores indicate that companies in this sector effectively comply with corporate governance regulations.

Graphical trend of average CGDI and trend line of ACC-CONS:

Figure 1: Trend of average CGDI of the IT firms



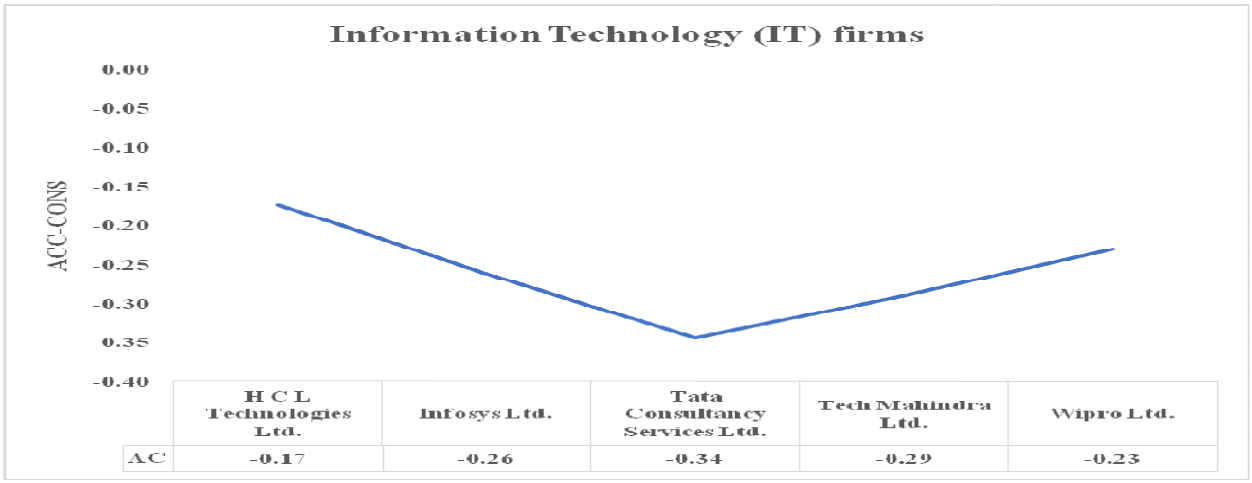


Figure 2: Trend line of average ACC-CONS of the IT firms

The CGDI indicates the transparency and quality of governance within firms. High scores indicate strong transparency and compliance with corporate governance regulations. The CGDI scores for all companies are effectively high, ranging from 92.18% (Infosys Ltd.)to 96.28%(Tata Consultancy Services Ltd.), indicating robust corporate governance regulations. ACC-CONS defines the extent of conservatism in accounting practices. Negative values reflect conservative accounting, in which firms acknowledge potential losses before recognizing gains.The ACC-CONS values are negative for all organizations, varying from -0.34 (Tata Consultancy Services Ltd.)to -0.17(H C L Technologies Ltd.), signifying conservative accounting practices across the industry.

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Firms like Tata Consultancy Services Ltd. (-0.34), Tech Mahindra (-0.29), and Infosys Ltd. (-0.26) have the highest conservatism, while H C L Technologies Ltd. (-0.17) and Wipro Ltd. (-0.23) show relatively less conservative practices. Firms with strong governance (e.g., Tata Consultancy Services Ltd., Tech Mahindra, and Wipro Ltd.) show moderately conservative accounting practices, ensuring transparency while avoiding extreme conservatism. H C L Technologies Ltd. has the least conservative accounting practices (-0.17) but maintains strong governance (95.13% CGDI). This might indicate a balance between transparency and reporting flexibility. This approach could indicate a risk-averse strategy to safeguard stakeholder interests.

The combination of high Corporate Governance Disclosure Index scores with negative Accounting Conservatism values signifies that the IT sector prioritizes robust governance and prudent financial reporting. This dual focus encourages stakeholder trust with the assurance of transparency and prudent financial practices. Firms demonstrating lower conservatism may consider enhancing financial prudence to align more with industry leaders. Conversely, firms demonstrating high conservatism should evaluate whether their practices excessively constrain their growth potential.

Conclusion

The present study examined whether the corporate governance disclosure index influences accounting conservatism exhibited by BSE100-listed IT firms in India. This study rigorously compared two crucial factors - accounting conservatism (ACC-CONS) and the Corporate Governance Disclosures Index (CGDI). In conclusion, the IT sector demonstrates strong corporate governance overall, with Tata Consultancy Services Ltd. setting the benchmark. However, there is potential for even greater consistency among companies. The IT industry also demonstrates a balanced trend of strong corporate governance and conservative accounting. This alignment reveals the industry's adherence to transparency, accountability, and financial prudence. This study focused on mandatory disclosures, while future research can include non-mandatory disclosures such as press releases, corporate websites, and online reporting. This finding is important for policymakers, researchers, managers, analysts, investors, and anyone interested in emerging markets.

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A COMPARATIVE STUDY ON SENTIMENT ANALYSIS BY DIVERSE APPROACHES AND CLASSIFICATION TECHNIQUES

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Abstract

Analyzing sentiments within a textual passage necessitates a comprehensive investigation of web-based information, often achieved through sentiment analysis (SA). Sentiment analysis involves the collection and evaluation of public opinions, thoughts, and feelings concerning a broad range of subjects, products, and services. This research aims to provide a comprehensive overview of diverse sentiment analysis methodologies, emphasizing various classification techniques and their efficacy in discerning sentiment polarity. Sentiment analysis, a crucial subfield of Natural Language Processing (NLP), focuses on dissecting textual data to identify and categorize expressed emotions, such as positive, negative, or neutral sentiment. Prior research has explored diverse sentiment analysis methodologies for collecting and analyzing sentiment polarity (i.e., positive, negative, or neutral). Social media platforms serve as a rich source of data for such analyses. Sentiment analysis offers valuable insights across numerous domains, including business, policy, and social sciences. This study aims to provide a comprehensive understanding of sentiment analysis techniques, encompassing their classification, application, preprocessing methods, feature extraction, commonly used datasets, and reported experimental results. This study brings together the most significant comparison in this area from the past to the most recent studies up to 2024. This paper can also provide researchers with the most up-to-date research by the Charts which are developed by Matplotlib library of python on sentiment analysis and inform future research in this area with comparative study.

Keywords: Sentiment Analysis, Comparative Study, SA techniques, SA classifications, Natural Language Processing.

Introduction

People express their opinions through sentiment. The term "sentimental analysis" refers to the examination of such viewpoints. It is essential to gather insights from various individuals' experiences and evaluations when reaching a conclusion or final output, as these perspectives provide valuable information. Recently, we've been working on promotion and challenging areas, using opinion mining to serve the desires of the people. For that daily, huge amounts of data related to unique individuals are uploaded into digital formats. As a result, the rapid growth of this field co-exists alongside other social media content such forum discussions, blogs, and customer reviews, Twitter and social networks [1]. Businesses and individuals alike can benefit from these polarities on text data and can be overwhelming for users.

In the era of machine learning, machines will think, find problems, and solve them. Patterns for each dataset are set individually. A machine learning algorithm makes use of a certain kind of data to answer other queries by uncovering patterns within the data [2]. Aiming to automate sentiment analysis the challenge is to find opinions and identify their feelings Express and categorize mood polarities. If you're interested in a product but don't want to buy it, you might want to see what another public feel about it. In the real world, companies and organizations seek to learn what customers think of their goods

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and services. Sentiment analysis tools have been used in a broad collection of industries in modern years, ranging from advice platforms, Ad placement, and movement forecasting to healthcare and policy. Opinion and sentiment mining can be made in two primary ways: 1. based on machine learning. 2. Lexical in nature. Several supervised and non-supervised techniques are utilized in the machine learning based approach to categorize the sentiment, On the other hand, sentiment classification in lexicon-based approaches makes use of a lexicon dictionary containing sentiment words associated with a specific domain.

Review of Literature

What is Sentiment Analysis? It is the automated way of shaping whether a text that is being used or written conveys a positive, negative or a consensus view of the content. Three sentiment classification levels exist: Document, Sentence, and Aspect [2]. The Support Vector Machine, Naive Bayes, Random Forest, perception classifier, etc. were used to design the SA model [3]. NLP stands for "Natural Language Processing." It is the study of computer-aided speech and language processing (CASP) and its applications. On other hand NLP is widely used in text mining and machine interpretation, as well as in mechanized inquiry. As demonstrated by the earlier study, NLP employs a broad variety of techniques across various domains, and over 80% of the results are above 80 percent, which is quite impressive when compared to machine learning. [4] One of the best ways to perform market research is to use text analytics for sentiment analysis. Brands can differentiate themselves from the competition with the aid of these insightful statistics. Businesses are beginning to recognize sentimental analysis driven by AI as an essential tool. [40]

Machine Learning Approach

There are two primary categories for ML models in the Machine Learning Techniques section. There are two types of learning: supervised and unsupervised. In machine learning techniques supervised learning is the most widely used method. In this approach, a model is trained with labeled source data. Pre-determinations about an output can be made by the trained model by considering new unlabeled input data. Compared to unsupervised or semi-supervised learning methods, supervised learning is usually more successful. Nevertheless, relying solely on labeled training data can be labor-intensive and is not very efficient [7]. In sentiment analysis, machine learning techniques begin with preprocessing the content data to standardize it and eliminate any unnecessary information. After that, extraction techniques like N-grams and TF-IDF are used to signify the text in arithmetical form, which can then be fed into the machine learning classifier. Decision trees, Random Forest, Naive Bayes, Support Vector Machines, and Logistic Regression are among the classifiers used in sentiment analysis. [5]. with machine learning, systems can learn new skills without having to be programmed separately. To understand context, spelling mistakes, and scrambling, it is necessary to read beyond definitions using sentimental analysis. Popular algorithms include Naive Bayes (NB), Maximum Entropy (ME), Decision Trees (DT), K-Nearest Neighbors (KNN), Support Vector Machines (SVM), Logistic Regression (LR), and Semi Super Supervised Learning [6]. From our data, we can conclude that LR based classifiers are performing well, SVM based classifiers are also performing well, DT based classifiers are providing higher accuracy, and Logistic Regression is outperforming the other classifiers in all scenarios. [21] In particular, several scholars have studied CNN, and the different combination forms of CNN and LSTM. They compared their performance to new models, such as KNN/NN, CNN/LSTM, etc. This model outmatches all other models with a total accuracy of more than 97%. For example, in the CNN LSTM model (Probability-97.8%, Mean-93% and F-Measures-92%), the El-Affinity et al. model (Probability-96.32%, Mean-91% and F-Measure-88%) outperformed the other models. Their assessment outcomes show that consideration method is superior to all models of deep learning using BRCAN is the best at 96.32% [22].

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Lexicon base Approach

The method based on lexicons, the current methodology isolates the words when applying the lexicon-based strategies that are available for a given text. Usually, scores are aggregated to accomplish this. It is primarily separated into two sections: corpus-based and dictionary-based [6]. In the old unigram lexicon system, only the sentiment words were counted as a whole, not the increment, decimals and inverted words, which can be used alongside the sentiment words. The analysis is done at the aspect level using the two classification techniques: lexicon based and SVM. SVM is 84% more accurate than lexicon based [8]. Sentiment analysis at the sentence and feature levels can be performed with great ease using the lexicon-based technique. Since there is no need to process the training data, it might be regarded as an unsupervised technique [6]. It is also known as Dictionary Sentiment Analysis; lexicon sentiment analysis is the procedure of using a set of predefined words and their sentiment scores to determine the sentiment of an article. The approach is found in a dictionary or lexicon of words and their polarity, meaning whether a word has a sentiment positive, sentiment negative or sentiment neutral.

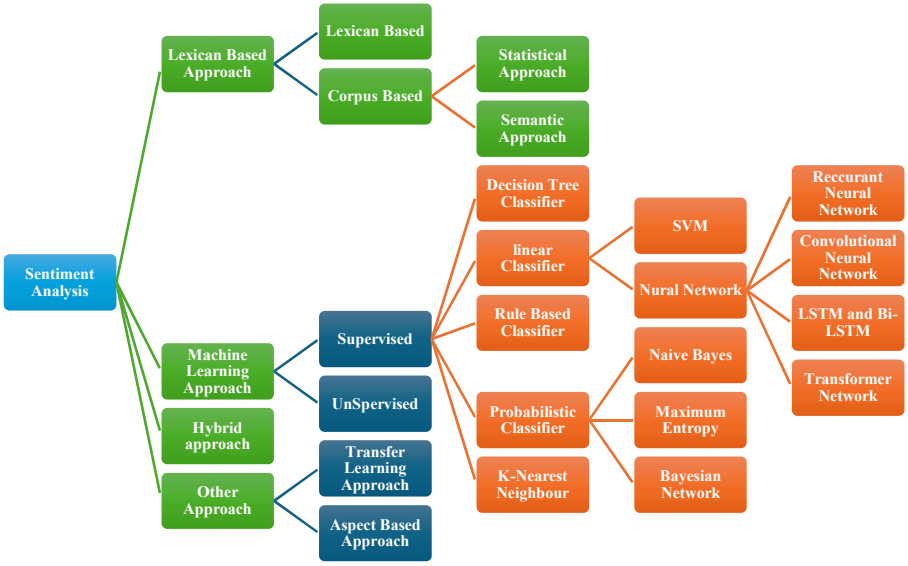

Fig.1. Approaches of Sentiment Analysis

COMPARATIVE STUDY

Methods to determine polarities in Indian language analysis.

Table 1: Analysis of Indian Languages for SA methods

Ref.	Language	Classification Method	Feature collection Method	Dataset & Type	Level of Accuracy
[11]	Hindi	SVM	TF-IDF	Movie Review	78.14
[12]		Naive Bayes	UniGram, Bigram	Movie Review	87.1
[13]		Lexicon Based	Unigram	Movie Review	70%
[9]	Gujarati	Bag-of-Word, Guj-Sento Word Net, Word Net	UniGram	Tweets	52.27%
[10]		SVM	POS & N-Gram	Dataset of 40 Tweets	92%
[14]	Bengali	SVM	UniGram, Bigram, Trigram	Horoscope	98.7%
[15]	Punjabi	Naïve Bayes	N-Gram	Blog, News Paper	Not Available
[16]		Decision Tree	POS	Movie Review	Not Available
[17]	Tamil	SVM	POS Using SentiWord.net	Movie Review	75.9%
[18]	Kannada	Decision Tree	TF-IDF	Kannada Movie Review	79%
[19]	Malyalam	SVM	Unigrams	Movie Review	91%
[20]		Lexicon Based	Unigrams	Movie Review	85%

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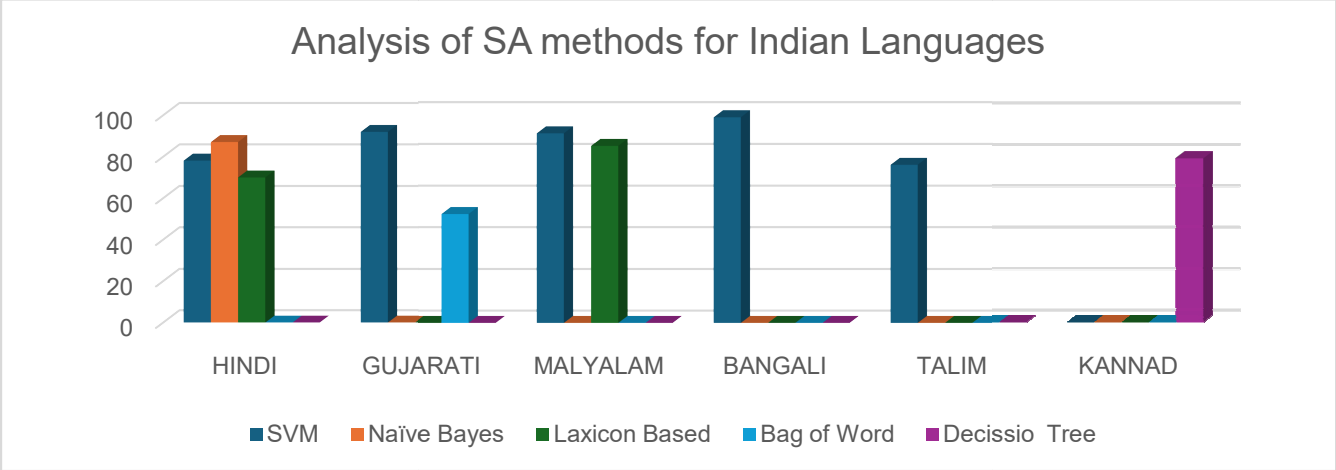

Fig. 2: Analysis of SA methods for Indian Languages

Proportional Learning for SA Techniques

Table 2: Proportional Learning for SA Techniques

Ref.	Title	Methodology	Dataset Revive	Result Accuracy
[23]	"Sentiment Analysis Using Neural Networks: A New Approach"	Convolution Neural Network	Product Data Twitter Data	74.15% 64.69%
[24]	"Aspect-Level Sentiment Analysis on E-Commerce Data"	SVM Naïve Bayes	Service and Product Review	89.01%
[25]	"SemEval-2016 Task 4: Sentiment Analysis in Twitter"	SVM	Twitter	84.5%
[26]	"A feature based approach for sentiment analysis using SVM and co reference resolution"	SVM and Co-Reference Resolution	Product Data Set	73.6%
[27]	"Sentiment analysis of Twitter corpus related to artificial intelligence assistants"	Valence Aware Dictionary and Sentiment Reasoer(VADER)	Electronic Product Review	87.4%
[28]	"Neural networks for sentiment analysis on Twitter"	Feed Forward Method	Twitter Dataset	74.15%
[29]	"Document Level Sentiment Analysis from News Articles"	Machine Learning Approach	News Dataset	57.7%
[30]	"Study of Twitter Sentiment Analysis using Machine Learning Algorithms on Python"	Naïve Bayes, SVM, Maximum Entropy	Dataset from twitter	86.4% 73.5% 88.97%
[31]	"A framework for sentiment analysis with opinion mining of hotel reviews"	Naive Bayes	Hotel Review	83.5%

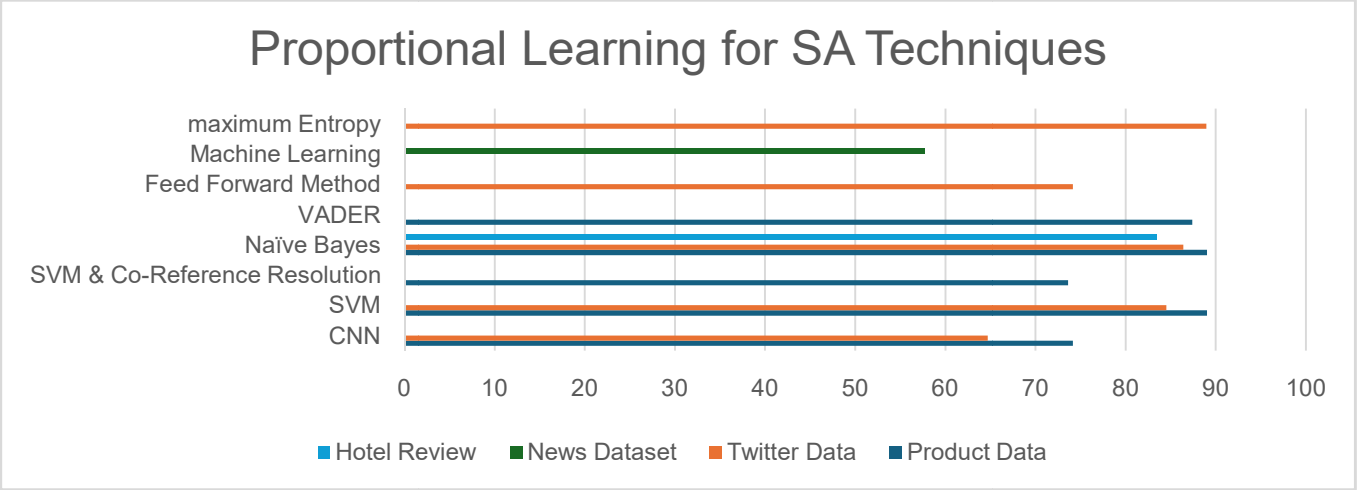

Fig. 3: Proportional Learning for SA Techniques

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Studying Performance of Sentiment Analysis Techniques

Table 3: SA Techniques for Performance Analysis

Paper Title	Dataset	Approach	Techniques	Result Accuracy	Ref.
"A Review on Sentiment Analysis Approaches "	movie review dataset	Supervised Machine Learning	Lexicon based	87.2	[32]
"Thumbs up? Sentiment Classification using Machine Learning Techniques"	IMDB Movie reviews	Supervised Machine Learning	Maximum Entropy, Naive Bayes, SVM	81.0%, 81.5%, 82.9%	[33]
"A Sentimental Education: Sentiment Analysis Using Subjectivity Summarization Based on Minimum Cuts"	Movie and car brand reviews	Supervised Machine Learning	Naive Bayes with Subject identification	87.2%	[34]
"Automatic Sentiment Analysis in On-line Text"	Corpus from Blog	Machine Learning	Naive Bayes Multinomial (NBM)	90.25%	[35]
"Thumbs Up or Thumbs Down? Semantic Orientation Applied to Unsupervised Classification of Reviews"	Automobile and Movie bank	Lexicon Based	PMI	66%	[36]
"Mining and Summarizing Customer Reviews"	Customer reviews	Lexicon Based	Dictionary Based lexicon	80%	[37]
"An artificial neural network based approach for sentiment analysis of opinionated text"	Movie reviews	ML + Lexicon Combined	Sentiment Lexicon with BPANN	95%	[38]
"Survey on mining subjective data on the web"	CNET Software re views, IMDB movie reviews	ML + Lexicon Combined	Sentiment lexicon + Linear SVM	82.30%	[39]

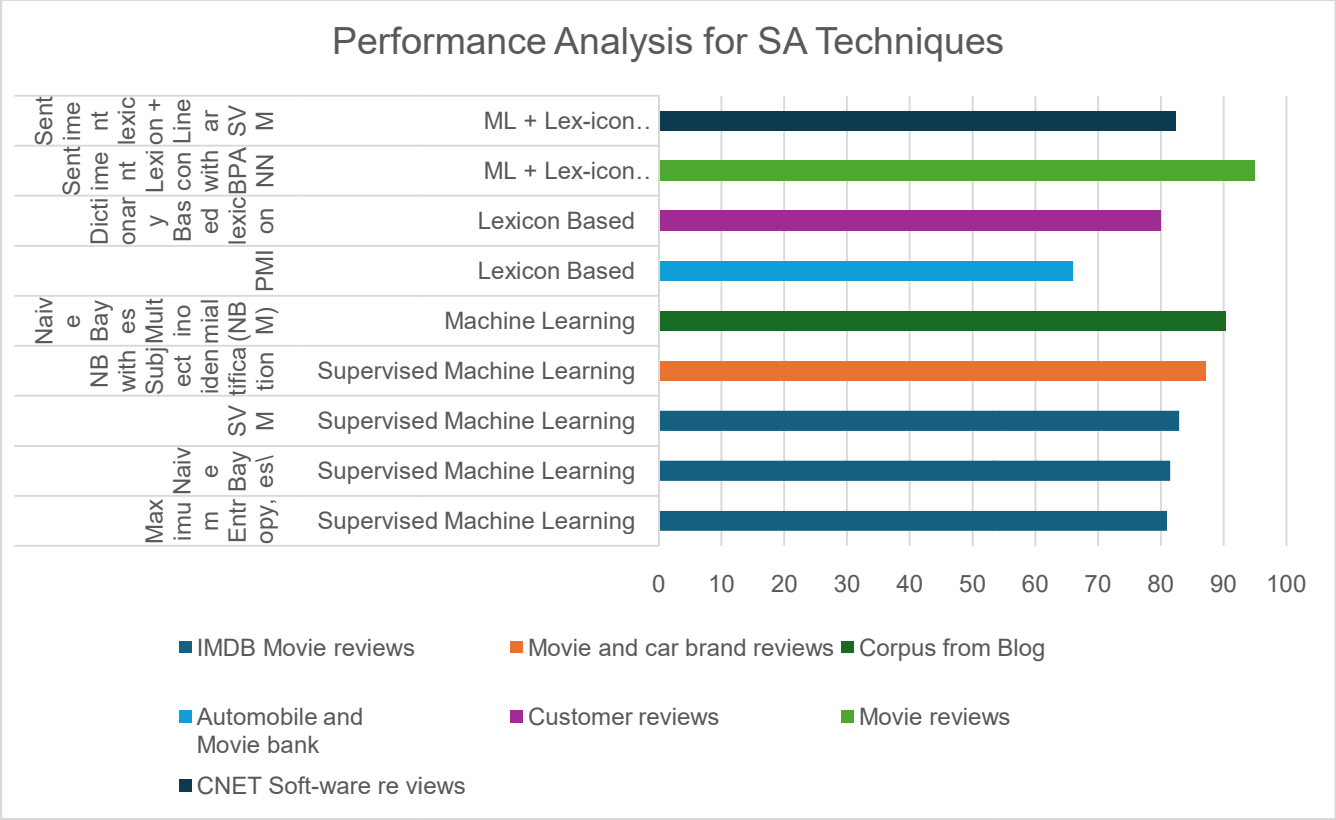

Fig.4: Performance Analysis for SA Techniques

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Result & Summary

With numerous techniques used in different languages and scenarios, sentiment analysis has come to be an essential area of research in natural language processing (NLP). Depending on the dataset and feature extraction techniques, machine learning models like Support Vector Machine (SVM) and Naive Bayes are popular classifiers that produce good results, with accuracy levels varying from 52.27% to 98.7%. Combining SVM with feature extraction techniques like unigrams, bigrams, trigrams, and TF-IDF can lead to effective results. For instance, research employing SVM for Bengali horoscope data obtained an accuracy of 98%, whereas movie reviews in Tamil and Hindi had accuracy rates of 75% and 78%, respectively. On the opposite hand, Naive Bayes usually plays properly with unigrams or bigrams, accomplishing accuracy among 70% and 87.1% in diverse domain names consisting of film reviews. Lexicon-driven approaches, which depend on established sentiment lexicons, have demonstrated impressive outcomes, particularly when utilized alongside machine learning techniques. For instance, 95% accuracy in movie reviews was attained via a hybrid technique that included sentiment lexicons and SVM. More variation can be seen in social media datasets, especially Twitter, where accuracy ranges from 52.27% (Gujarati Tweets) to 92% (using SVM with POS and N-Grams). The accuracy rate for product and service reviews using SVM and Naive Bayes for e-commerce and service data has been 89.01%, which has been a major focus. Furthermore, neural network techniques like Convolutional Neural Networks (CNNs) have been investigated and have demonstrated a moderate level of accuracy (e.g. 74.15%) on Twitter data and product information. In general, hybrid methods that merge machine learning with lexicons have demonstrated significant effectiveness, particularly in areas such as film and product evaluations, achieving impressive accuracy rates of as much as 95%. These results imply that the incorporation of lexicon-based techniques has considerable potential for enhancing performance in sentiment analysis tasks, even while conventional machine learning models like SVM and Naive Bayes continue to be quite successful. The optimization of these hybrid models and their potential application to other domains, like news articles and customer feedback, should be the main goals of future research. However, performance could be greatly enhanced by combining these techniques in a hybrid approach. Higher accuracy rates can be attained by combining machine learning classifiers with sentiment lexicons and sophisticated feature extraction, like N-grams and Part-of-Speech (POS) tagging. This is particularly true in complex domains like social media data, product evaluations, and movie reviews. Future research could go in a promising direction by utilizing these mixed techniques in a synergistic way to optimize results and provide more robust sentiment analysis.

Conclusion

In conclusion, the area of sentiment analysis is still developing quickly, with extensive collection of methods and applications in many languages and fields. When paired with feature extraction methods like unigrams, bigrams, and TF-IDF, Support Vector Machine (SVM) continuously shows itself to be a high-performing model with remarkable accuracy rates across a variety of languages.Comparably, Naive Bayes performs admirably as well, particularly when applied to product data and movie reviews. Although Lexicon-based methods are generally less accurate than machine learning models, they still deliver valuable results, particularly when combined with machine learning models. There are a lot of promises in hybrid models that combine lexical resources and machine learning, especially when it comes to improving accuracy in challenging sentiment classification tasks. Social media data, which includes Twitter, stays a tough area because of its casual nature, however fashions like SVM with POS tagging and N-grams display sturdy results. As we progress, refining hybrid strategies and advancing feature extraction techniques will be essential for boosting accuracy in sentiment analysis across various unstructured data sets. In the initial sentiment analysis study, traditional machine learning methods were used. Stop words were removed, the text was standardized, and represented using frequency attributes, such as a bag of words, using pre-processing. Machine learning algorithms like SVM and Naive Bayes, among others, were used after the text was eliminated. were used in the classification process. But as Natural Language Processing (NLP) gained popularity, researchers turned their focus to deep learning.

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Working with the complete dataset is required to generate results with a high degree of accurateness and precision because the down-sampled data set used for the model evaluation affected the model's accuracy. Further work improves sentiment categorization in a variety of applications, including news articles, social media platforms, and customer feedback, future research should investigate the possibilities of integrating domain-specific lexicons with sophisticated machine learning models.

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CLOUD COMPUTING AND ARTIFICIAL INTELLIGENCE: SYNERGIES FOR FUTURE INNOVATION

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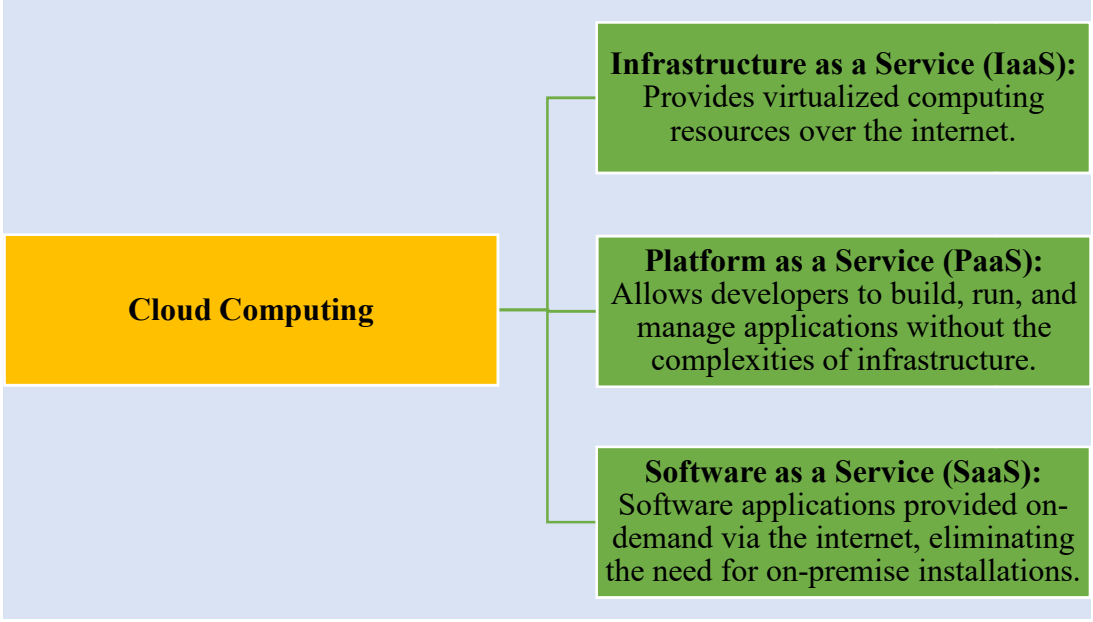
Abstract

Artificial intelligence (AI) and cloud computing are revolutionizing industries by providing scalable, effective, and potent answers to business problems. The synergies between these two technologies are examined in this research, with an emphasis on how their integration is facilitating creative breakthroughs. The study illustrates the advantages, difficulties, and potential future developments of integrating AI with cloud computing by examining a number of real-world applications, showing how these technologies are changing sectors like, Manufacturing, Healthcare, Finance.

Introduction

The term "cloud computing" describes the provision of computer services, including networking, processing power, and storage, via the internet. Important cloud computing models include



Artificial intelligence

The creation of computer systems that are capable of reasoning, learning, and making decisions—tasks that normally require human intelligence—is referred to as artificial intelligence. Important elements of AI consist of: Machine Learning (ML), Natural Language Processing (NLP), Computer Vision and Robotics.

Synergies between Cloud Computing and Artificial Intelligence

While AI aids in the optimization and enhancement of cloud services, cloud computing offers the adaptable, scalable architecture required for AI to flourish. This mutually beneficial relationship is promoting breakthroughs in a number of industries, including Entertainment, Autonomous systems, Healthcare and Finance.

Real-World Applications of Cloud-AI Synergies

AI and cloud computing together have spurred innovation in a number of sectors. Here are some notable instances where these synergies are having a revolutionary effect:

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Healthcare and AI Diagnostics

Advances in patient care, individualized treatment, and medical diagnostics are being brought about by the healthcare sector's adoption of AI and cloud computing.

AI in Medical Imaging

In certain situations, AI algorithms driven by cloud infrastructure may analyze medical pictures (such X-rays and MRIs) more quickly and precisely than human physicians. Massive volumes of imaging data can be processed and stored by healthcare providers via the cloud, and AI can remotely access and analyze this data to identify diseases like cancer or heart disease.

Cloud-Based Virtual Health Assistants

AI chatbots and virtual assistants, running on cloud infrastructure, help healthcare providers answer patient questions, provide mental health support, and even offer preliminary diagnoses or medical advice based on symptom analysis.

AI in Medical Imaging

In certain situations, AI algorithms driven by cloud infrastructure may analyze medical pictures (such X-rays and MRIs) more quickly and precisely than human physicians. Massive volumes of imaging data can be processed and stored by healthcare providers via the cloud, and AI can remotely access and analyze this data to identify diseases like cancer or heart disease.

Finance and Fraud Detection

Cloud-based AI-powered fraud detection tools are revolutionizing the way financial institutions detect and stop fraudulent activity.

Real-Time Transaction Analysis: To identify patterns of fraud or anomalous activity, financial institutions employ cloud-based artificial intelligence (AI) tools to analyze real-time transactions. Banks and other organizations may access enormous volumes of transactional data by utilizing cloud computing, which enables AI to detect behavioral irregularities on a large scale.

Risk Assessment and Credit Scoring

In order to help financial institutions make better judgments, cloud-based AI models are also being utilized to predict risk and create more accurate credit assessments using a larger range of data sources.

Retail and Personalized Shopping Experience

In the retail sector, AI and cloud computing have revolutionized how businesses Engage with consumers and customize their buying experiences.

Recommendation Systems

E-commerce businesses deploy cloud-based AI algorithms to fuel recommendation engines. These systems provide real-time, individualized product recommendations based on an analysis of consumer behavior and interests. The accuracy of these recommendations is increased by the cloud architecture, which enables businesses to manage massive volumes of data produced by consumer interactions.

Supply Chain Optimization

AI algorithms run in the cloud can forecast demand, optimize inventory, and predict shipping delays in real-time, improving the overall efficiency of the retail supply chain.

Future of Cloud Computing

- Serverless Computing
- Edge Computing Integration
- Cloud-Native Technologies
- Decentralized Cloud and Blockchain Integration
- Sustainability and Green Cloud Computing

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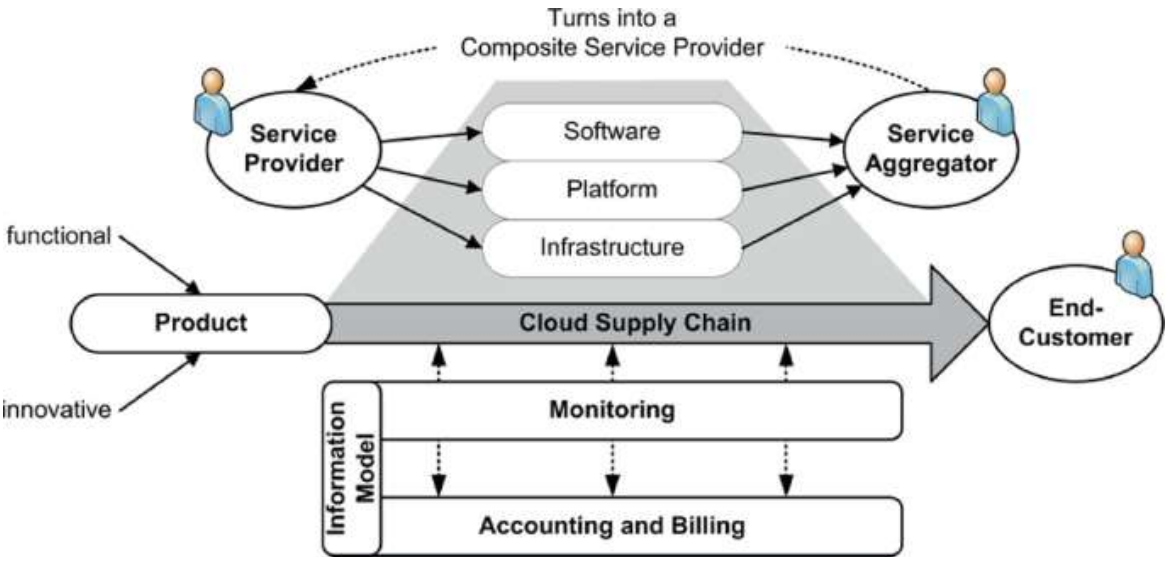

With technology collaborating to create new opportunities for enterprises, sectors, and regular consumers, cloud computing promises to provide a more intelligent, connected, and effective digital environment in the future.

Conclusion

In conclusion, an ecosystem that is essential for propelling future innovations across industries is being created by the combination of cloud computing and artificial intelligence (AI). These two technologies work in concert to provide previously unheard-of scalability, flexibility, and accessibility, enabling enterprises to use enormous volumes of data and processing power to create and implement complex AI models. Cloud platforms facilitate real-time, data-driven decision-making, which is essential for companies looking to maintain their competitiveness in the fast-paced world of today. They also offer the infrastructure required for storing, processing, and analyzing big datasets.Cloud computing and artificial intelligence are working together to enable revolutionary developments in industries including healthcare, finance, autonomous systems, and smart cities. These technologies are driving innovation by democratizing access to AI tools and resources, empowering businesses to address difficult problems, boost productivity, and improve consumer experiences. Additionally, the cloud's cost-effectiveness and security features guarantee that businesses of all sizes can use AI, promoting broad adoption and accelerating digital transformation.

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A STUDY ON THE AWARENESS OF FINTECH AND ITS APPLICATION AMONG THE INVESTOR

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Abstract

As the Fintech sector has grown rapidly, its impact on investment strategies and decision-making has become increasingly significant. Fintech combines the term Finance and Technology refers to any business that uses Technology to enhance or automates financial services and operations using technology. This research paper investigates the awareness and usage of financial technology (Fintech) among investors. Through a survey-based approach and convenience sampling was conducted to collect the data from 100 respondents from Ahmedabad city. The Result obtained from survey results shows that more and more consumers are using digital payment systems because they, are easy to use, affordable, time- and money-saving and accessible.

Keywords: Fintech, Awareness, Usage of Application, Fintech adoption

Introduction

In recent years, financial technology, commonly known as *Fintech*, has emerged as one of the most transformative forces in the global financial services industry. Fintech was coined in the twenty-first century to describe the technology used in the backend systems of established financial organizations. However, since then, there has been a shift toward more consumer-focused services and, as a result, a more consumer-focused definition.

Fintech represents the evolution of technology within the financial sector. It extends beyond mobile applications, significantly influencing various aspects of financial services and products. In the past, trading was conducted through conventional methods; however, it has now transitioned to AI-driven trading, which offers greater efficiency and saves time. The banking system has also transformed, allowing individuals to access a wide range of services at their fingertips.

Fintech is growing significantly in India. The world's highest adaptation rate is seen in India. The Indian economy has benefited from the rising use and penetration of Fintech across more industries. The increase in the penetration and adoption rate of FinTech in various fields has had a positive impact on the Indian economy. The growth of digital transactions makes transparent, safe, fast and profitable mechanisms beneficial to companies, consumers and governments.

Review of Literature

Verni Juita, et al. (2024) examines how gender differences affect the decision to adopt BNPL (Buy Now Pay Later) services in Indonesia. In particular, the effect of these gender differences seen through the user's perception of risk and the level of users' digital financial literacy on their decision to adopt credit online pay later services. They explore that while users' perceived risk does not significantly influence BNPL adoption, users' digital financial literacy significantly influences BNPL adoption. They also studied that the magnitude of the influences of digital financial literacy on BNPL adoption is higher for females than for males.

Jinendra Kumar Jain and Saransh Kumar Srivastav(2023) In their research paper they analyse the relation between mutual funds and fintech and how the emergence of fintech in recent times has helped

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mutual fund industry to grow. This study aims to- (i) identify the level of awareness about fintech among general public and (ii) to know if the emergence of fintech has changed the perception of general public towards mutual funds. After analysing the collected data, it was found that fintech has surely changed people's perception towards mutual fund and people are much aware with the utility of fintech in various aspects of financial decisions.

Darshan Sharad Kadam, Dr. Shalini R (2023) research aims to investigate the awareness of fintech services among students, analyze the impact of fintech on the attitude towards the adoption of services, and examine the usage of fintech apps by the students. The results demonstrated that fintech is becoming increasingly popular among students. The study found that students are generally knowledgeable about fintech and its applications and they view it as a convenient and cost effective way to conduct online transactions. The survey also revealed that comprehending fintech is not complicated and does not require a lot of time.

Dr.V.Kanimozhi & Dayana Rose (2022), this paper discusses on awareness, attitude and the level of adoption about various banking fintech products by the respondents among the customers of Kerala state co-operative bank. The study concluded that customers consider online services more convenient as they can take place at any time. Bankers must continuously look out for the additional benefits and improvements they can provide to satisfy the customers.

Kawaljeet Kaur Sygal and Dr. Eknath Zhrekar (2022)
Examine the level of awareness of Fintech solutions among Users,if there are any educational differences in awareness of fintech solutions relating to different factors and highlight different factors of perception and awareness of fintech solutions in the group. They observed that there is significant association between educational qualification and awareness of fintech apps usage. Users hold positive perception about the fintech solutions. Their level of awreness is replicated in the educational background but age bears no significant contribution as determinant factor for awareness and positive perception for fintech solutions.

C Vijay et (2020) The research outlines the size and growth of the fintech market as well as its historical evolution. Additionally, the advantages and disadvantages of the Fintech sector, the Fintech center, and Indian Fintech laws. Additionally, an international magazine of next generation communication and networking published the paper.

Dubey (2019) the article "FinTech Innovations in Digital Banking" explores the function of blockchain, augmented reality, and artificial intelligence in digital banking. AR technology is currently having a significant impact on many different industries. AR technologies are currently being used to improve process efficiency, save costs, and provide a wide range of commercial benefits, including in the healthcare, oil and gas construction, retail, and manufacturing industries. The next big thing in technology is artificial intelligence.

Gurung, (2018) FinTech: A Salvation for India's Dying Banking SectorThe newest buzzword in banking and financial services is fintech. With its products and services that successfully threaten the dominance of traditional financial institutions, FinTech has emerged as a potential disruptor in the financial sector. Given the turbulent times facing traditional financial institutions, particularly in India, which have seen an increase in bad loans in recent years, customer dissatisfaction with a number of financial products and services, and a growing public lack of confidence due to the impending financial crisis, the opportunity appears to be ripe for the emerging FinTech industry, although it is still a relatively new player in the Indian financial sector.

Objectives of the study

1. To study the awareness of fintech services among the investor.
2. To analyse whether fintech influences the attitude toward the adoption of services.
3. To examine the usage of fintech apps by the investor.

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Research Methodology

Research is the process of systematic and in depth study or search for any particular topic, subject or area of investigation, backed by collection, compilation, presentation and interpretation of relevant details of data**.**

Research Design

Descriptive research is used to describe the basis features of the data in the study. Descriptive research type is used in this study as it is used to describe the characteristics of population and being studied.

Data Collection:

Primary data collected through questionnaire and secondary data has been collected from the various secondary

Sample Size and Sampling Method

For present research convenience sampling method used for data collection. A sample of size 100 responded selected from Ahmedabad City, Gujarat.

Hypothesis of the study

1 H0: There is no relationship between awareness of Fintech and the genders of the respondents.
H1: There is relationship between awareness of Fintech and the genders of the respondents.
2 H0: There is no relationship between awareness of Fintech and the age of the respondents.
H1: There is relationship between awareness of Fintech and the age of the respondents.

Statistical tools

The data collection are classified, analysed and calculated. The statistical tools applied by the researcher for the analysis of the data are Simple Percentage and Chi-square test.

Data Analysis and Interpretation

Demographic profile of respondents

Table 1: Demographic Profile of respondents

Demographic Variable		Percent
Gender	Male	70%
	Female	30%
Age	21 to 30	22%
	31 to 40	45%
	41 to 50	15%
	51 and above	18%
Education	HSC or Below	23%
	Graduate	42%
	Post Graduate	26%
	Doctorate	9%
Occupation	Working	69%
	Non- Working	31%
Income	No Regular Income (Non-Working)	31%
	Less than or equal to Rs.25000	23%
	Rs.25001 to Rs.50000	29%
	More than Rs.50000	17%

Interpretation

From above Table 1 indicates the overall demographic profile of the sample respondents. In 100 respondents 70% male and the remaining 30% female. In age distribution of respondents, 30% of the

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respondents from total respondents fall under the category of age group of less than 21-30 years, 45% between 31-40 years, 15% of respondents falls under 41 to50 years and remain 18% age 51 years and above. In case of education qualification 23% of respondents were education HSC or below, 42% were graduates, 26% were Post graduate and remain 9% doctorate. If we talk about occupation 69% from working group and 31% from non working group and in case of income 31% from non working group, 23% monthly income Less than or equal to Rs.25000, 29% have monthly income Rs, 25001 to Rs.50000, and 17% have income More than Rs.50000.

Type of FinTech service used by customer

Table 2: Type of FinTech service used by customer

Services	Percent
Mobile Payments	65.0
Online Banking	24.0
Investment Apps	11.0
Total	100.0

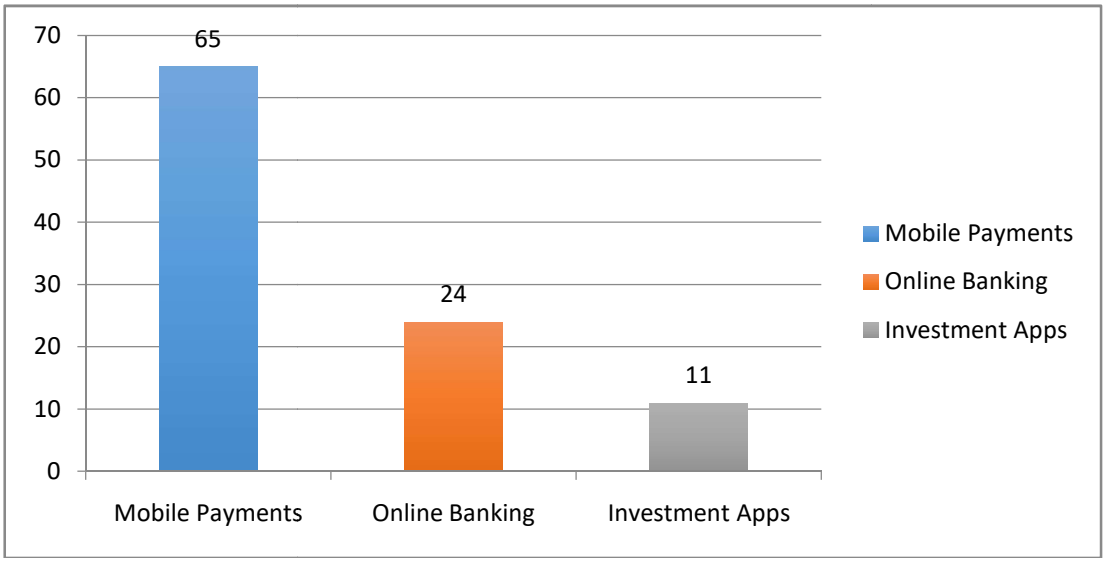

Figure 1: Type of FinTech service used by customer

Interpretation

From above table FinTech service usage highlights the 65% customer use for mobile payment, 24% use for online banking while remain 11% use for investment purpose.

Frequency of use of Fintech services

Table 3 Frequency of use of Fintech services

Use of Fintech	Percent
Daily	43.0
Weekly	24.0
Monthly	11.0
Rarely	22.0
Total	100.0

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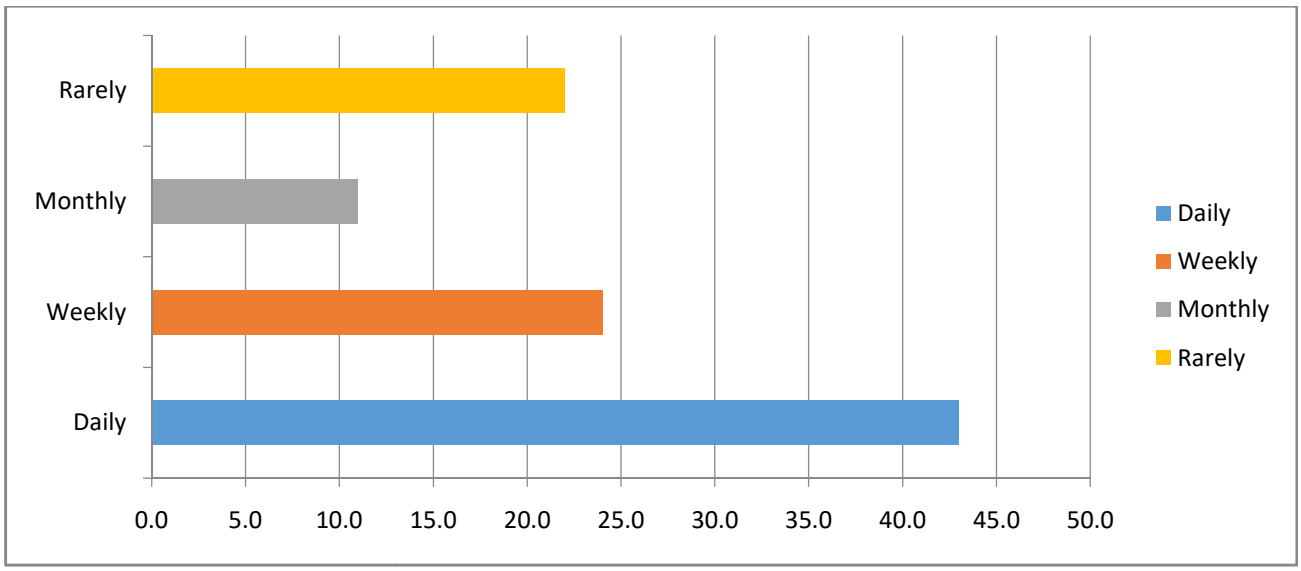

Figure 2: Type of FinTech service used by customer

Interpretation

From above table FinTech service usage highlights the 65% customer use for mobile payment, 24% use for online banking while remain 11% use for investment purpose.

Importance of the factors when choosing a Fintech service

Table 4 Importance of the factors when choosing a Fintech service.

Importance Factors	Mean	Std. Deviation	Mean Rank
Ease of Use	3.92	0.81	3
Security	4.16	0.91	1
Customer Support	3.55	0.97	5
The cheapest method	3.69	0.87	4
Convenient	3.96	0.78	2

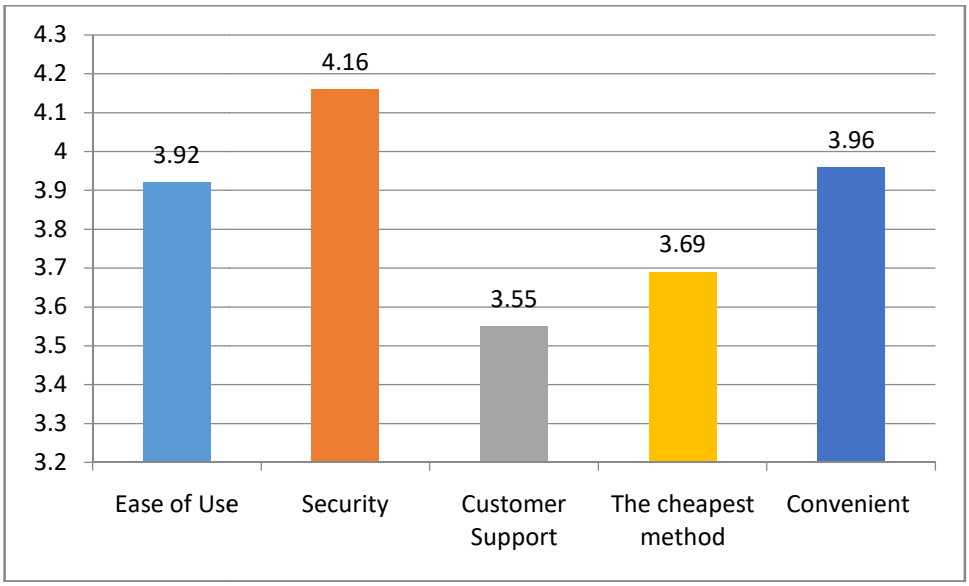

Figure 3: Importance of the factors when choosing a Fintech service

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Interpretation

The above table shows that customers gave top priority to security when chose Fintech followed by convenient, easy to use, cheapest method and customers support.

Testing of Hypothesis

Chi-Square test between Gender and Awareness.

Chi-Square Tests

Gender and Awareness.	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.628[a]	3	.304

Interpretation

From table, it is found that in significance value (0.304) is greater than P value 0.05, since the null hypothesis has been accepted and there is no relationship between awareness of Fintech and genders of the respondents.

Chi-Square test between Age and Awareness.

Age and Awareness.	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.034[a]	1	.854

Interpretation

From table, it is found that in significance value (0.854) is greater than P value 0.05, since the null hypothesis has been accepted and there is no relationship between awareness of Fintech and the age of the respondents.

Conclusion

The wave of digitalization is making the financial services industry more efficient and productive. It is also evident that fintech is helping the financial services industry to grow, and it can be projected those in coming years this sector will play a major role in accelerating the economy. The survey revealed that a majority of them are aware of fintech and understand the technologies behind it. Most of the participants used fintech applications on a daily basis. Most of them used mobile payment applications.

The study results indicate that fintech is becoming increasingly popular among customers. The findings of this study suggest that respondents are generally aware of fintech and its applications and those they find it to be an efficient and cost-effective way to conduct online transactions. Furthermore, the study found that there is no relationship between awareness and age, gender of respondents. When choosing a fintech service, customers consider security as the most important factor, followed by convenience, ease of use, the cheapest method, and customer support. Overall, the fintech industry in India has made financial services more easily accessible, convenient, and user-friendly.

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A STUDY ON FINANCIAL PERFORMANCE OF SELECTED IT COMPANIES IN INDIA

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Abstract

Given the significant contribution of the IT sector to the country's GDP, it is essential to examine how these enterprises have managed to recover, grow, and strengthen their operations during the COVID-19 pandemic. The performance of major IT companies such as TCS, Infosys, HCL, and Wipro was analyzed from 2019-2020 to 2023-2024, given their notable market capitalization. Identifying the leading IT giant in the industry is aided by evaluating their key performance indicators.To assess the overall financial performance, ratio analysis was combined with statistical methods like one-way ANOVA and CAGR.The results revealed that IT companies were not severely impacted by COVID-19, and in fact, these businesses have experienced growth in recent years. Infosys has been the strongest performer, while Wipro has struggled with net profit ratio, return on capital employed, and return on net worth. TCS and Infosys lead in these areas, with Wipro underperforming. HCL outperforms in liquidity stability, while TCS has seen the biggest decline in liquidity, and overall, TCS, Infosys, and Wipro show a slight weakening in liquidity position compared to HCL's stronger position.Overall, Wipro stands out for its exceptional long-term performance in operating profit, net profit, and payout ratio. In terms of proprietary ratio, Infosys leads the pack, while TCS excels in earnings per share, return on invested capital, and debt-to-equity ratio. Although all companies show similar short-term solvency ratios, Infosys leads due to its consistent performance over the years. Despite the high market capitalizations of TCS and Infosys, Wipro takes the top spot, demonstrating outstanding results over the past six years with a consistent upward trend across multiple analyses.The results revealed that IT companies were not severely impacted by COVID-19, and in fact, these businesses have experienced growth in recent years. Infosys has been the strongest performer, while Wipro has struggled with net profit ratio, return on capital employed, and return on net worth. TCS and Infosys lead in these areas, with Wipro underperforming. HCL outperforms in liquidity stability, while TCS has seen the biggest decline in liquidity, and overall, TCS, Infosys, and Wipro show a slight weakening in liquidity position compared to HCL's stronger position.

Keywords: Financial Performance, Ratio Analysis, Profitability, Liquidity, IT Companies

Introduction

The IT and BPM sectors have emerged as key drivers of growth for the Indian economy, significantly contributing to the GDP and overall national development, according to a report by the India Brand Equity Foundation (IBEF). In the fiscal year 2021-2022, the IT sector accounted for 7.4% of India's GDP. With 76 crore people now connected to the internet, India boasts one of the world's largest and most affordable internet user bases. Due to the increasing demand for expertise and skill, the top four Indian IT companies—TCS, Infosys, HCL, and Wipro—expect to create 1.05 lakh new jobs in FY22.
Between April 2000 and June 2022, India's computer software and hardware sector attracted a total of US$ 88.94 billion in foreign direct investment (FDI). (IBEF, 2022). Financial analysis, using data from annual reports, helps assess a company's current situation or predict future performance. In this study, we apply ratio analysis along with statistical methods like one-way ANOVA and CAGR to evaluate company performance. One-way ANOVA is used to compare the means of four different companies,

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assessing whether there is significant statistical evidence of variation within and among them. The Compound Annual Growth Rate (CAGR) helps determine whether a company exhibits a positive or negative trend over a selected period.

This analysis provides assurance to creditors about the safety of their investments and helps potential investors make informed decisions. It also aids management in making sound operational decisions and helps shareholders decide whether to retain their positions in the company. Financial analysis involves assessing a company's liquidity, solvency, and profitability over time, facilitating the comparison of how different companies perform. By drawing insights from these analyses, we can more easily make informed conclusions.

Review of Literature

Dhanraj Gadhvi (2021) TCS and Infosys stand out as major IT giants, making significant contributions to the Indian economy. A review of their performance was necessary to project their future economic impact. An analysis was conducted on their operations from 2017 to 2021 using available data. The findings revealed that TCS outperforms Infosys in terms of net profit, return on capital employed, and earnings per share (EPS). However, both companies exhibited similar performance in liquidity ratios. The IT sector thrived after the implementation of LPG reforms. Through the use of DuPont analysis, Descriptive Statistics, and a Multiple Regression Model, the operations of two leading IT companies—TCS and Infosys—were analyzed. Both companies displayed similar trends in profitability ratios; however, TCS demonstrated superior asset management compared to Infosys. Overall, TCS outperformed Infosys across several financial ratios, solidifying its strong position in the IT sector for the future. (Samrat Banerjee, 2021)

Kishore Kumar Das and Shalini Pathak (May 2020) conducted a study on the impact of Covid-19 on the Indian economy. The study aimed to assess the effects of the pandemic on various sectors and India's GDP. The researchers found that major industries, such as tourism, aviation, telecommunications, automotive, and transport, were severely disrupted by the pandemic. Additionally, the closure of businesses in retail industries put the well-being of employees at significant risk. In response, governments in several countries have provided support to help employers cover employee wages. The researchers also recommended strategies such as remote work and improvements in supply chains to mitigate some of the challenges.

Airtasker (2019) conducted a survey and found that working from home not only benefits employees by eliminating daily commutes but also boosts productivity and promotes healthier lifestyles. It offers a win-win situation that employees appreciate for its flexibility, though this often comes at the expense of their work-life balance.

Khan and Singhal et al. (2015) conducted a study titled "Development and Productivity Investigation of Selected IT Organizations," focusing on the performance of selected IT companies. The study covered the period from 2010 to 2014, and the ANOVA method was used to examine significant differences both between companies and across years. The paper concluded that HCL Technologies demonstrated superior performance, particularly in terms of operational efficiency and net profit margins, when compared to other companies in the study.

Objectives of the Study

1. To analyze the profitability and Liquidity analysis of the chosen IT sector companies.
2. To assess the performance of top IT companies both during and after the COVID-19 pandemic.
3. To determine whether there are significant variations in the financial ratios of the companies, or if the trends remain consistent across the four companies.
4. To illustrate the upward and downward trends in financial analysis over six years using the Compound Annual Growth Rate (CAGR).

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Research Methodology

Research Design

The study focuses on the IT industry in India, with samples selected based on market capitalization. The top four IT companies have been chosen for analysis, as listed below.

1. TCS Limited
2. INFOSYS Limited
3. HCL TECHNOLOGY Limited
4. WIPRO Limited

Scope of the Study

The study covers the period of five years starting from 2019-20 to 2023-24. This paper examines the financial strength and performance of selected Indian IT companies and to determine whether there are significant variations in the financial ratios of the companies, or if the trends remain consistent across the four companies.

Data Collection

For this study, data was gathered from secondary sources including the annual reports of firms available on the BSE website, previous research papers, periodicals, journals, and online sources. Additionally, data from NASSCOM and IBEF were also used to support the research.

Tools and Techniques

For the purpose of the analysis of data, various tools have been used in the study.The researcher employed ratio analysis as an accounting tool while ANOVA and CAGR as statistical tools.

Hypothesis of the study

H0: There is no significance difference between between financial ratios of selected IT Companies of India.

H1: There is significance difference between between financial ratios of selected IT Companies of india.

Data Analysis:

- Profitability Raio
  Net profit ratio
  Return on capital employed
  Return on Net Worth
- Liquidity Ratio
  Current Ratio
  Quick Ratio

Profitability Ratio Analysis

Net Profit Ratio

Net Profit/ Revenue from Operations*100

Table 1: Net Profit Ratio

YEAR	TCS	INFOSYS	HCL	WIPRO
2019-20	25.33	19.66	27.50	17.22
2020-21	22.77	21.00	24.50	20.00
2021-22	23.81	20.43	26.75	20.36
2022-23	20.54	18.76	24.76	13.54
2023-24	21.52	21.12	24.26	13.65
CAGR %	-3.15%	1.44%	-2.46%	-5.44

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Hypothesis testing

H0: There is no significance difference between net profit ratios of selected IT Companies of India.

Table No 5.2

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Column 1	5	113.97	22.794	3.54193
Column 2	5	100.97	20.194	0.97608
Column 3	5	127.77	25.554	2.15828
Column 4	5	84.77	16.954	10.88038

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	202.088	3	67.36267	15.34748	5.73E-05	3.238872
Within Groups	70.22668	16	4.389168			
Total	272.3147	19				

Since the F-value (15.34748) is much greater than the F critical value (3.238872) and the p-value is very small (5.73E-05), we reject the null hypothesis and conclude that there are significant differences in the means of the four groups. Infosys has experienced positive growth, with a CAGR of 1.44%. The other companies (TCS, HCL, and Wipro) have seen negative growth over the five-year period, with Wipro experiencing the steepest decline at -5.44%. TCS and HCL have seen more moderate declines at -3.15% and -2.46%, respectively.

Return on Capital Employed

Return On Capital Employed = Earning Before Interest And Tax/Capital Employed*100

Table 3: RETURN ON CAPITAL EMPLOYED

YEAR	TCS	INFOSYS	HCL	WIPRO
2019-20	52.79	31.28	28.84	23.62
2020-21	52.75	32.23	27.76	27.49
2021-22	60.23	38.46	30.14	27.32
2022-23	65.07	43.03	34.76	19.40
2023-24	75.85	41.23	37.23	20.94
CAGR %	7.82%	6%	5.71%	-2.46

H0: There is no significance difference between return on capital employed of selected IT Companies of india.

Table 4

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Column 1	5	306.69	61.338	93.14392
Column 2	5	186.23	37.246	27.88853
Column 3	5	158.73	31.746	16.51768
Column 4	5	118.77	23.754	13.39198

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	3931.03	3	1310.343	34.7244	3.1E-07	3.238872
Within Groups	603.7684	16	37.73553			
Total	4534.799	19				

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Since the calculated F-value (34.7244) is much greater than the critical F-value (3.238872) and the p-value (3.1E-07) is extremely small, we reject the null hypothesis.This indicates that there are significant differences between the means of the four groups.Thus, the data suggests that at least one group differs from the others in a statistically significant way. TCS has shown the highest growth among the four companies with a CAGR of 7.82%. WIPRO has experienced a negative growth rate with a CAGR of -2.46%. INFOSYS and HCL have shown moderate growth at 6.00% and 5.71%, respectively. This indicates that TCS has outperformed the others, while WIPRO has underperformed over the last 5 years.

Return on Networth

Return on Capital Employed = Earning Before Interest And Tax/Capital Employed*100

Table 5: Return on Net Worth

YEAR	TCS	INFOSYS	HCL	WIPRO
2019-20	44.72	24.97	24.04	18.68
2020-21	41.39	25.23	20.07	22.23
2021-22	49.48	30.63	25.53	22.32
2022-23	52.46	34.34	27.87	14.62
2023-24	60.39	33.54	29.57’	15.78
CAGR %	6.44%	6.09%	4.55%	-3.31%

H0: There is no significance difference between return on net worth of selected IT Companies of india.

Table 6:

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Column 1	5	248.44	49.688	53.94947
Column 2	5	148.71	29.742	19.87127
Column 3	5	127.08	25.416	13.44098
Column 4	5	93.63	18.726	12.68378

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2663.051	3	887.6837	35.52671	2.64E-07	3.238872
Within Groups	399.782	16	24.98638			
Total	3062.833	19				

Since the calculated F-value (35.52671) is much greater than the F critical value (3.238872) and the p-value (2.64E-07) is significantly smaller than the standard significance level (0.05), we reject the null hypothesis. This means there are statistically significant differences between the means of the four groups. Thus, we can conclude that the group means are not all equal, and there is significant variation between at least one pair of group means. TCS shows the highest growth with a CAGR of 6.44%. INFOSYS follows closely with a CAGR of 6.09%. HCL shows a moderate growth rate of 4.55%. WIPRO has experienced a decline in growth, with a CAGR of -3.31%, indicating a decrease over the 5-year period. So, TCS and INFOSYS are the leaders in terms of growth, while WIPRO is the underperformer in this case.

Liquidity Ratio Analysis

Current Ratio = Total Current Assets/ Total Current Liabilities

Table 7: Current Ratio

YEAR	TCS	INFOSYS	HCL	WIPRO
2019-20	3.30	2.88	1.69	2.78
2020-21	2.92	2.74	2.77	2.50
2021-22	2.49	2.10	2.97	2.23
2022-23	2.36	1.90	2.68	2.86
2023-24	2.20	2.62	2.82	2.74

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H0: There is no significance difference between net current ratios of selected IT Companies of india.

Table 7:

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Column 1	5	13.27	2.654	0.20188
Column 2	5	12.24	2.448	0.18072
Column 3	5	12.93	2.586	0.26193
Column 4	5	13.11	2.622	0.06602

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.123375	3	0.041125	0.231511	0.873083	3.238872
Within Groups	2.8422	16	0.177638			
Total	2.965575	19				

Since the F-value (0.231511) is much smaller than the critical F-value (3.238872) and the p-value (0.873083) is much larger than 0.05, we fail to reject the null hypothesis.

This indicates that there are no significant differences between the means of the four groups. Therefore, based on the ANOVA analysis, we conclude that the group means are statistically similar and that the differences observed between the groups are likely due to random variation rather than any real differences. HCL stands out with the highest growth in current ratio, suggesting an improvement in liquidity over the past five years.TCS and INFOSYS have seen a decline in their current ratios, but INFOSYS shows a slight recovery in the last year. WIPRO has had some fluctuations in its liquidity, but its overall current ratio has declined marginally.

Quick Ratio

Quick Ratio = Current Assets – Inventory And Prepaid Expenses /Current Liabilities*100

Table 8: Quick Ratio

YEAR	TCS	INFOSYS	HCL	WIPRO
2019-20	3.30	2.88	1.69	2.77
2020-21	2.92	2.74	2.76	2.50
2021-22	2.48	2.10	2.97	2.23
2022-23	2.36	1.90	2.68	2.86
2023-24	2.20	2.62	2.82	2.74
CAGR %				

H0: There is no significance difference between quick ratios of selected IT Companies of india.

Table 9

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Column 1	5	13.26	2.652	0.20272
Column 2	5	12.24	2.448	0.18072
Column 3	5	12.92	2.584	0.26103
Column 4	5	13.1	2.62	0.06525

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.1208	3	0.040267	0.226944	0.876261	3.238872
Within Groups	2.83888	16	0.17743			
Total	2.95968	19				

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The F-value (0.226944) is much smaller than the F critical value (3.238872) and the p-value (0.876261) is much greater than 0.05, indicating that the variation between the groups is not statistically significant. Therefore, we fail to reject the null hypothesis, meaning there is no significant difference between the group means.

In summary, based on the ANOVA results, we conclude that the four groups do not have statistically significant differences in their means. Any observed differences between the groups could be due to random variation. HCL has demonstrated the strongest performance in terms of liquidity, with a significant improvement in its quick ratio over the period.

TCS, Infosys, and Wipro all saw a decline in their quick ratios, but the decrease was more pronounced in TCS and Infosys. Wipro's quick ratio remained relatively stable.

Results and Findings

1. This suggests that Infosys has been the strongest performer over this period, while Wipro has faced the greatest challenges in terms of net profit ratio.
2. TCS and INFOSYS are the leaders in terms of return on capital employed, while WIPRO is the underperformer in this case.
3. TCS and INFOSYS are the leaders in terms of return on networth, while WIPRO is the underperformer in this case.
4. In terms of liquidity stability and improvement, HCL is the strongest performer, while TCS has experienced the most significant decline in its liquidity position.
5. The overall trend for TCS, Infosys, and Wipro suggests a slight weakening of liquidity, whereas HCL has positioned itself with better liquidity strength.

Conclusion

The Indian IT sector, including IT services and BPO, contributes 7% to India's GDP and is a global leader in outsourcing due to its large pool of skilled professionals, government support, and export focus. Major players like TCS, Infosys, Wipro, and HCL thrive globally, while India's strong STEM education and English proficiency make its workforce highly sought after. Government initiatives like Digital India further foster growth, and key services include software development, IT consulting, and BPO. A significant portion of revenue comes from exports, especially to the US. The sector is embracing emerging technologies such as AI, ML, and cloud computing, which drive innovation. Originating in the 1960s with institutions like IITs, the sector's growth has been fueled by cost-effective talent, language skills, and government support, though challenges like talent retention and competition remain.

From 2019-20 to 2023-24, researcher has selected the top four IT companies to compare their performance using three key ratios: profitability and liquidity.Infosys is the top performer, while Wipro struggles with net profit ratio. TCS and Infosys lead in return on capital employed and return on net worth, with Wipro lagging behind. HCL excels in liquidity, while TCS sees a notable decline. Overall, TCS, Infosys, and Wipro show a slight decline in liquidity, whereas HCL strengthens its position.

Delimitations of the study

1. This analysis is limited to the period from 2019-20 to 2023-24, and any conclusions drawn from the performance over the past five years may not be definitive.
2. Since the study relies mainly on secondary data, such as annual reports, magazines, and journals, the validity of the conclusions depends on the accuracy of the data collected.
3. The study focuses solely on the top four IT companies based on their market capitalization.
4. The scope of this study is restricted to the use of ratios, one-way ANOVA, CAGR, and graphic representations for comparison. Therefore, the inferences derived from these tools cannot be generalized and may not accurately predict or correlate with the outcomes of other methods

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IMPACT OF GREEN AI ON SUSTAINABLE FINANCIAL DECISION

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Abstract

The incorporation of Green Artificial Intelligence (AI) in the banking sector presents significant potential for transforming sustainable finance. This study explores the role of Green AI in promoting environmental responsibility and sustainability within financial institutions. It examines both the opportunities and challenges associated with adopting Green AI, with a particular focus on its applications in climate risk assessment, green credit evaluation, and sustainable investment decision-making. The findings of green AI emphasis and enhance the banking sector contribution to goals of global sustainability. By providing real-time insights into emerging climate risks and opportunities, Green AI strengthens portfolio resilience and enables proactive risk mitigation. Beyond investment strategies, it also drives the development of eco-friendly banking and insurance products, fostering innovation across the industry. However, several challenges persist, including the need for high-quality environmental data, compliance with complex regulatory frameworks, and the financial burden of infrastructure upgrades.

Keywords: Green Artificial Intelligence, Sustainable finance, climate risk, global sustainability, credit assessment, investment analysis,

Introduction

The integration of artificial intelligence (AI) with environmentally sustainable practices in the banking industry serves as a valuable tool for predicting consumer purchasing patterns and improving overall banking services. AI's significance is evident in its fundamental components, such as big data, machine learning, and innovative solutions. The concept of big data enables organizations to handle large volumes of information efficiently, minimizing manual efforts and reducing their environmental impact. Advanced techniques like deep learning, green banking, and machine learning allow financial institutions and marketers to perform tasks such as pattern recognition, sales forecasting, natural language processing, predictive customer support, and customer segmentation with greater accuracy. Ongoing research continues to investigate the evolving relationship between AI and marketing strategies. Experts across various fields, including IT leaders, market researchers, financial analysts, software developers, and business stakeholders, are keenly observing AI-driven innovations and their potential contributions to sustainable development.

Green AI is a branch of artificial intelligence (AI) focused on minimizing the environmental impact of AI-driven technologies. Compared to traditional AI, Green AI is more sustainable and inclusive, as it delivers accurate results without significantly increasing computational costs. Additionally, it enables researchers to conduct high-quality studies using standard laptops, eliminating the need for expensive cloud computing resources. In the banking sector, AI plays a crucial role in demonstrating how technology can drive both environmental and social impact. However, concerns regarding privacy and data integrity remain significant challenges. This paper explores the role of Green AI in sustainable banking by examining its contributions to the financial sector and the obstacles it faces in promoting sustainable finance.

Statement of the Problem

The adoption of Green Artificial Intelligence (AI) in the banking sector is crucial for promoting sustainable finance, as it addresses pressing global issues such as climate change and environmental

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degradation. Given the banking industry's substantial influence on the economy, transitioning to sustainable financial practices is vital for mitigating climate-related risks and promoting environmental responsibility. Green AI's advanced analytical capabilities—such as processing large datasets, identifying patterns, and optimizing financial decision-making—enable banks to make informed investment choices, efficiently manage climate risks, and enhance their environmental, social, and governance (ESG) performance. As regulatory expectations and industry commitments continue to rise, integrating Green AI becomes essential for banks to maintain competitiveness, reduce reputational risks, and contribute to achieving the United Nations' Sustainable Development Goals (SDGs). This paper aims to explore the role of Green AI in sustainable finance within the banking sector, along with the challenges associated with its implementation.

Objectives of the Study

1. To evaluate the current adoption of Green AI in banking and examine its applications in promoting sustainable finance.
2. To analyse the benefits and challenges of implementing Green AI in the financial sector, focusing on its impact on efficiency, risk management, and environmental sustainability.
3. To explore the role of Green AI in climate risk assessment and its contribution to responsible investment and sustainable banking practices.
4. To assess the impact of Green AI on ESG (Environmental, Social, and Governance) performance and its role in regulatory compliance and sustainable development.
5. To identify best practices and strategies for banks to effectively integrate Green AI while addressing potential ethical and operational challenges.

Green AI in Banking: Current Practices

The incorporation of artificial intelligence (AI) alongside environmentally sustainable strategies in the banking sector plays a vital role in forecasting consumer purchasing patterns and enhancing the overall banking experience (Agarwal & Sharma, 2024). The importance of AI is underscored by its key components, including big data, machine learning, and advanced analytical solutions. Big data enables organizations to efficiently handle vast amounts of information, allowing financial institutions to deliver seamless services with minimal manual intervention and a reduced carbon footprint. Technologies such as deep learning, green banking, and machine learning empower financial institutions and marketers to optimize various operations, including image recognition, sales forecasting, natural language processing, predictive customer service, and customer segmentation. Ongoing research continues to explore the evolving relationship between AI and marketing strategies, with IT executives, market analysts, financial professionals, software developers, and business stakeholders eagerly anticipating the advancements AI will bring to sustainable development.

Green AI facilitates the integration of environmental, social, and governance (ESG) considerations into investment decision-making processes. By utilizing ESG data and advanced analytics, financial institutions can evaluate their portfolio exposure to climate-related risks, including physical, transition, and liability risks. For example, machine learning algorithms can analyse corporate disclosures, satellite imagery, and climate models to assess the potential impact of climate change on asset valuations (Monaghan & Kjaer, 2020). The application of Green AI in financial decision-making enhances resilience by providing timely insights into emerging climate risks and investment opportunities. By adopting a forward-looking strategy, banks and financial institutions can proactively prepare for the transition to a low-carbon economy and mitigate the adverse effects of climate-related disruptions on their portfolios (Lu & Li, 2020).

Risk Assessment and Management

AI-powered algorithms enable financial institutions to analyse vast datasets to identify environmental risks associated with investments and insurance policies. By incorporating environmental

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considerations into risk assessment models, banks and insurers can mitigate potential financial losses from climate-related events while enhancing decision-making processes (Rajput et al., 2014).

Product Development

Green AI plays a crucial role in creating sustainable financial products, such as green loans that support renewable energy projects and energy-efficient technologies. Insurance companies can also leverage AI to promote eco-friendly behaviours by offering incentives for initiatives like electric vehicle adoption or solar energy installations (Wang et al., 2017).

Customer Insights and Personalization

AI-driven analytics provide valuable insights into consumer preferences and behaviours related to sustainability. Financial institutions can use this data to personalize recommendations for eco-conscious products and services, strengthening customer engagement and loyalty among environmentally aware clients (Tkacheva et al., 2023).

Operational Efficiency

Green AI enhances internal banking operations by optimizing energy consumption, reducing paper waste, and streamlining workflows. Automated systems improve administrative functions, including customer service and document management, helping financial institutions lower their overall environmental impact (Sharma & Choubey, 2021).

Regulatory Compliance

AI helps banks and insurers comply with evolving environmental regulations by monitoring regulatory changes, analysing compliance requirements, and automating sustainability reporting. This ensures adherence to legal standards while reducing the complexity of compliance processes (Sahoo & Nayak, 2007).

Challenges of Green AI in Banking

While Green AI offers significant advantages for sustainable finance, its implementation in the financial sector comes with several challenges:

- Equitable Distribution of Benefits: Ensuring that Green AI initiatives benefit all communities fairly is essential to prevent widening environmental inequalities.
- Data Availability and Quality: Access to high-quality environmental data is critical for Green AI decision-making, yet acquiring such data remains a challenge, especially in developing economies.
- Complexity of Environmental Factors: The interdependence of environmental variables affecting financial risks makes it difficult to develop AI models that accurately predict sustainability-related impacts.
- Regulatory and Compliance Challenges: Financial institutions must navigate intricate regulations related to data protection, environmental reporting, and sustainability compliance, making AI adoption more complex.
- Infrastructure Costs: Developing AI systems capable of processing large-scale environmental data in real time requires substantial investments in technology, which can be a barrier for smaller institutions.

Conclusion

This study highlights the transformative role of Green AI in the banking and insurance sectors, emphasizing its impact on sustainable investing, climate risk management, product innovation, and regulatory compliance. By leveraging AI technologies, financial institutions can align financial performance with environmental and social goals while maintaining competitive advantages.

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Green AI enhances investment strategies by integrating ESG (Environmental, Social, and Governance) criteria, fostering the transition to a more sustainable economy. Additionally, AI-driven insights enable the development of environmentally friendly banking and insurance products, catering to the evolving demands of sustainability-focused consumers.

Despite its benefits, the adoption of Green AI faces hurdles, including data accessibility issues, regulatory complexities, and high infrastructure costs. Ethical considerations are also paramount, ensuring that sustainability-driven financial solutions are inclusive and equitable. Addressing these challenges will be key to unlocking the full potential of Green AI in shaping a sustainable financial future.

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ARTIFICIAL INTER AND CLAIM SETTLEMENT IN HEALTH INSURANCE

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Abstract

Traditional procedures have been completely transformed by the application of artificial intelligence (AI) in health insurance claim settlement, which provides unmatched accuracy, efficiency, and customer-focused solutions. AI-powered solutions greatly speed up turnaround times while guaranteeing policy requirements are followed by automating claim validation, processing, and decision making. Real-time fraud detection is made possible by cutting-edge technology like machine learning and Natural Language Processing (NLP), which spot irregularities and trends in claim submissions. While AI-driven chatbots offer smooth customer service across the claim lifecycle, predictive analytics improve underwriting accuracy by predicting claim trends and risks. Adoption of AI is fraught with difficulties despite its revolutionary promise, including as bias in algorithmic choices, data privacy issues, regulatory compliance and interaction with existing systems. However, the use of Artificial Intelligence in health insurance is expected to grow in the future because to blockchain integration, sophisticated analytics and expand transparency, paving the way for more efficient and secure claim settlements. This paper explores the impact, benefits, challenges and prospects of AI in health insurance claim settlement.

Keywords: Artificial Intelligence, Technology, Claim Settlement, Health Insurance, Machine Learning, Natural Language Processing

Introduction

Artificial Intelligence (AI) has emerged as the most influential technology in a number of sectors, including insurance. Its dynamic technological talents and abilities have opened up a world of opportunity for all the sectors. It significantly altered the insurance market and revolutionized the insurance sector, changing conventional insurance operations like risk assessment, claim processing, customer support, and underwriting process for policies. This allowed insurers worldwide to embrace AI-powered solutions, achieve remarkable efficiency, and promote sustainable growth. Al has the potential to transform the insurance sector by using proactive strategies that imitate human thought processes (Rao and Tirumalaiah,2024). This change will impact the agents, clients and financial intermediaries, service providers and insurers in the best possible way, it assesses to improve decision-making, productivity and customer experiences through most appropriate use of the latest technology.

The application of Artificial Intelligence (AI) to health insurance claim resolution is revolutionizing the sector by increasing consumer satisfaction, accuracy, and efficiency. The manual verification process, copious amounts of documentation, lengthy processing timeframes, and vulnerability to fraud have long been hallmarks of traditional claim settlement procedures. Insurers have experienced inefficiencies, payment delays, and higher operating expenses as a result of these difficulties. The processing and settlement of health insurance claims is being completely transformed by the introduction of AI-driven technologies including machine learning, natural language processing (NLP), robotic process automation (RPA), and predictive analytics.

Insurance companies can use AI to improve decision- making through data- driven insights, automate claim evaluation, and identify fraudulent activity. Health insurance firms may improve fraud detection systems, speed up claim processing, and boost customer satisfaction by utilizing AI-powered algorithms. Additionally, AI is essential for lowering administrative expenses, decreasing human mistakes and guaranteeing regulatory compliance.

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The application of AI in health insurance claim settlement has many benefits, but it also has drawbacks, such as issues with data privacy, ethics, system integration, and regulatory compliance. Furthermore, the quality of the data used to train models determines how accurate AI-driven conclusions are, which raises questions regarding possible biases in claim appraisals.

This study examines the advantages, difficulties, and possible impacts of artificial intelligence (AI) in the settlement of health insurance claims. The research effort will look at how AI-driven solutions increase the effectiveness of processing claims, boost fraud detection, and contribute to improving the health insurance sector as a whole. The study will additionally look into the legal and moral problems surrounding the use of AI in insurance claims, offering insights into how AI- powered healthcare insurance systems are developing.

This research aims to enhance the comprehension of how AI influences health insurance claim settlements by examining these elements, and to offer guidance for insurers, policymakers, and technology developers on how to utilize AI in a responsible and effective manner within the industry.

Objectives of the study

The study seeks to find the impact of Artificial Intelligence on claim settlements in Health Insurance. Additionally, it compares the AI to traditional process and lastly the overview of evaluation of some specific AI applications.

Literature Review

Conventional Health Insurance Claim processing

A study by Dr. Singhal (2024) this study clarifies the crucial area of health insurance claims settlement by emphasizing the problems,fixes and sectoral effects. A detailed analysis of industry practices has shown that obstacles including complex regulatory requirements, manual procedures and technology constraints seriously reduce productivity.

Integrating AI in Claim Settlement:

According to InfoBeans in article “Integrating AI in insurance claim settlements” found due to AI in 2021, the size of the global market for AI in insurance was valued at $ 2.74 billion and is projected to bit $ 45.74 billion by 2031, around 90% of insurance customers believe efficient claim processing influence their faithfulness to a service provider”.

Additionally, the cost benefits in automated claims settlement- The benefits of integrating AI in the insurance sector are not limited to better workflows and there are some most important financial benefits that AI brings:

- Reduced labour costs- One of the biggest costs for insurance firms is labour, and the automation of the several components involved in claims processing directly affects labour costs.
- Lower payouts with improved fraud detection-By adopting machine learning algorithms developed for effective behaviour analysis and abnormal identification, firms may build a distinction between real and misleading claims.

AI in Claims Processing: Boosting Efficiency and Accuracy

As per Markovate in their article, with the introduction of sophisticated automation, predictive analytics, and machine learning models, artificial intelligence is transforming this crucial industry. The following important usage cases illustrate its impact:

1. Modelling Predictive Risk: AI helps insurers optimize premium pricing and claims reserves by using past data and patterns to predict risks with accuracy. This boosts the insurance market’s competitiveness while also making financial planning easier.
2. Identification of Fraud: AI detects possible fraud in real time by analysing patterns and abnormalities in claims data, using sophisticated algorithms. By reporting suspicious activity early, insurers can manage financial losses and guarantee equitable payouts.

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3. Automated Evaluations of Claims: AI systems rapidly assess allegations through the analysis of documents and images.

Table 1: A Comparison of Conventional vs. AI Enhanced Claim Processing

Particular	Coventional	Ai-Enchanced Process
Processing Time	Days to Weeks with multiple manual steps	Minutesto Hours automating routine tasks
Error Rate	High due to human intervention, manual data entry	Low due to automation and machine learning which make sure consistency
Fraud detection	Low, reactive, depend on past data and human audit	Proactive and on real time

Significance of the Study:

The potential for the artificial intelligence (AI) to completely change the health insurance settlement of claims market by resolving a number of long-standing issues, increasing operational effectiveness, reducing expenses and improving customer satisfaction makes research into this topic more significant. The implications of artificial intelligence in claim settlement process are examined in this paper, along with how it could promote more accurate, customer-focused and efficient procedures.

Methodology:

Employing a mixed methods approach, this study offers an extensive overview of how AI affect the processing of claims settlement in health insurance by combining quantitative data analysis with qualitative case studies. The quantitative part is examining the metrics for performance including processing, error rates and significant savings in money both pre and post of the use of AI. The qualitative component comprises in depth case studies of top health insurance providers that are using AI powered claim processing system including information on deployment techniques, challengescame across and results attained.

AI Applications use in Claim processing:

Some of the applications of AI use while processing the claims:

Automating Common Tasks: One of the fundamental AI technologies for automating repetitive and rule based operations in claim processing is robotic process automation, or RPA. RPA bots are capable of doing tasks including data entry, assessing information of claim and modifying documents with minimal help from humans. Insurance companies drastically cut down on processing times and lower the possibility of human error by automating these repetitive procedures.

Natural Language Processing (NLP): By allowing robots to comprehend and interpret human language, natural language processing makes it easier to retrieve pertinent information from unstructured data sources. NLP can be used in claim processing to analyse other textual sources. This attribute speeds up the information extraction process and lessens the need for manual data review.

Relevant Case Studies:

Case Study 1: Care Health Insurance cuts claim settlement time by half using AI

In 2020, Care Health Insurance, priorly known as Religare Health Insurance has introduced an online claims solution “Claim -Genie” which is available both in mobile app and on website too. Through “Claim Genie” the policyholders can file and track claims from the comfort and safety of their homes. All claim related data, updates and documents are made available to their customers via WhatsApp and chat bot. There has been a 40-45% reduction in time to process the claims. Earlier, the policyholders would call to get the updates on their status of claim processing, with the advent of Claim Gene they can see the status on their phones only. Therefore, the number of calls has gone down by 30-40%. By utilisation of artificial intelligence and machine learning methodologies has enabled the company significantly enhance its operations.

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Case Study 2: The Implementation of AI in Health Insurance Claim Settlement at Lemonade Insurance

Lemonade launched its first AI claims agent, "AI Jim", in 2020. Adopting AI involved more than just automating processes; it involved revolutionizing the whole claims.

From evaluating claims to distributing compensation, AI Jim was built to manage most claims settlements on its own. This represents how the system operated:

Automated Data Collection and Verification: By evaluating submitted documents, ensuring policy conditions, and confirming eligibility, AI Jim employs machine learning algorithms to autonomously investigate and process health insurance claims. By using Optical Character Recognition (OCR) to scan documents and integrate with several healthcare providers, the system eliminates the need for manual data entry.

Instant Claim Assessment: The AI determines whether a claim is valid and fulfills the insurer's approval requirements based on pre-established rules, historical claims data, and real-time information. Lemonade can offer quicker resolutions since this process takes only a few seconds.

Fraud Detection: AI Jim has advanced fraud detection algorithms that are able to that are able to identify questionable trends, such excessive claims for certain medical services or repeated claims for the same treatment. The company's capacity to identify and stop fraudulent activity has greatly increased due to these algorithms.

Payment Distribution: AI Jim has the ability to automatically start payment as soon as a claim is accepted. Payments for simple claims can be completed in as little as three minutes.

Findings and Results

The claim settlement procedure at Lemonade was significamntly impacted by the introduction of AI Jim

Processing Time Reduction: Reducing off processing time was the important result. It used to take days or weeks to process claims, but today it only takes minutes. Lemonade was able to resolve disputes in less than 3 minutes in certain circumstances.

Reduction of Cost: Lemonade lowered its need on human claims adjusters by automating the claims procedure. The operating expenses related to claims processing were cut by 50% as a result of this adjustment.

Accuracy and Error Reduction: With the adoption of AI, the claim settlement error rate, which was formerly as high as 10% in the manual process, reduced to less than 1%.

Fraud Preventions: When compared to manual procedures, Al Jim's fraud detection skills resulted in 30% improvement in fraud detection. In order to minimize such losses, AI Jim was able to detect irregularities in real-time and flag fraudlent claims, such as duplicate claims or differences between treatment rendered and the amount claimed.

Conclusion

The case of Lemonade illustrates the potential of artificial intelligence to revolutionize the health insurance claims settlement process, transforming it from a labour -intensive and manual endeavor into a swift, efficient and customer centric operation. Through the integration of AI driven systems such as AI Jim, the company achieved the following outcomes:

- A substantial decrease in processing time
- Reduction in operational expenses
- Enhanced accuracy and elevated customer satisfaction.

This case study underscores that the implementation of AI in health insurance claims settlement extends beyond mere task automation; it aims to foster a smooth and efficient experience for both insurers and their clients. By adopting AI, Lemonade has established a new standard within the industry, demonstrating that technology can significantly enhance customer service and financial viability.

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CHALLENGES IN PROMOTING DIGITAL EDUCATION AND TRAINING FOR SUSTAINABLE IT PRACTICES

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Abstract

The promotion of digital education for IT sustainability is crucial in fostering environmentally responsible technology practices. However, several challenges hinder its effective implementation, including inadequate infrastructure, limited awareness, outdated curricula, cybersecurity threats, and insufficient faculty training. This paper explores these challenges in detail and proposes strategic solutions such as enhancing digital infrastructure, integrating sustainability into IT curricula, raising awareness, improving cybersecurity measures, and upskilling educators. A collaborative effort involving governments, educational institutions, and industry leaders is necessary to ensure that digital education effectively contributes to sustainable IT practices. By addressing these obstacles, digital learning can play a significant role in shaping a future workforce that prioritizes environmental responsibility in the IT sector.

Keywords: Digital Education, IT Training, Sustainable IT Practices, Digital Learning, Environmental Responsibility, Skill Development

Introduction

Digital education and training have revolutionized the field of information technology (IT), making knowledge and skill acquisition more accessible, flexible, and efficient. The rapid advancements in technology have led to a growing demand for IT professionals who are proficient in various domains, including software development, cybersecurity, data science, cloud computing, and artificial intelligence. To meet this demand, digital education platforms and online training programs have emerged as essential tools for individuals seeking to enhance their IT expertise. These platforms provide learners with access to high-quality resources, interactive learning experiences, and real-world applications that help them stay updated with the latest industry trends.

One of the primary benefits of digital education in IT is the flexibility it offers to learners. Unlike traditional classroom-based training, online courses allow individuals to learn at their own pace and convenience. This is particularly advantageous for working professionals who wish to upskill or reskill without compromising their job responsibilities. Massive Open Online Courses (MOOCs) offered by platforms such as Coursera, Udemy, edX, and LinkedIn Learning provide a diverse range of IT courses designed by industry experts and top universities. These courses include video lectures, hands-on coding exercises, virtual labs, and assessments that enable learners to develop practical skills essential for IT roles.

Another significant aspect of digital education in IT is its emphasis on hands-on learning through interactive simulations and real-world projects. IT professionals require not only theoretical knowledge but also practical experience in applying concepts to real-life scenarios. Many online training programs incorporate coding boot camps, hackathons, and project-based learning methods to enhance problem-solving abilities and technical proficiency. Cloud-based platforms such as Amazon Web Services (AWS) Academy and Google Cloud Training provide learners with access to virtual environments where they can experiment with different technologies, deploy applications, and troubleshoot issues in a risk-free setting.

Certifications have also become a crucial component of digital IT training, as they validate an individual's expertise in specific domains. Leading IT companies and organizations recognize industry-standard certifications such as CompTIA, Microsoft Certified Azure Solutions Architect, Cisco Certified

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Network Associate (CCNA), and Certified Information Systems Security Professional (CISSP). These certifications not only enhance career prospects but also provide professionals with a competitive edge in the job market. Many digital education platforms offer preparatory courses and practice exams to help candidates successfully obtain these certifications.

The integration of artificial intelligence and adaptive learning technologies in digital education has further enhanced the efficiency of IT training. AI-powered learning management systems analyse learners' progress and provide personalized recommendations based on their strengths and weaknesses. Adaptive learning platforms use machine learning algorithms to create customized learning paths, ensuring that learners focus on areas that require improvement. This personalized approach enhances retention and accelerates skill development, making digital education more effective than traditional one-size-fits-all training methods.

Corporate IT training has also evolved with digital education, enabling organizations to train their employees efficiently. Many companies invest in customized e-learning solutions to provide continuous learning opportunities for their workforce. Learning management systems (LMS) such as SAP Litmos, Moodle, and Blackboard allow organizations to develop and deliver training programs tailored to their business needs. These platforms facilitate employee onboarding, cybersecurity awareness, software development training, and compliance education, ensuring that employees remain competent in the ever-changing IT landscape.

Need of the Study

The rapid evolution of information technology (IT) has necessitated the widespread adoption of digital education and training to ensure a skilled workforce capable of meeting industry demands. In Ahmedabad, a growing hub for IT and technology-driven enterprises, digital education plays a crucial role in equipping professionals, students, and businesses with the necessary competencies to sustain IT practices. However, despite its advantages, the promotion of digital education and training faces several challenges that hinder its effectiveness and reach. This study aims to identify and analyse these challenges to develop strategies that can enhance the accessibility, adoption, and sustainability of digital education for IT practices in Ahmedabad.

One of the primary reasons for conducting this study is the disparity in digital literacy and infrastructure among different sections of society. While Ahmedabad has witnessed significant technological advancements, gaps in internet accessibility, availability of digital devices, and awareness about IT training programs still exist. Many aspiring IT professionals, particularly from economically weaker sections, face barriers in accessing high-quality digital learning platforms due to financial constraints and lack of proper infrastructure. Understanding these challenges will help policymakers and educational institutions develop targeted initiatives to bridge the digital divide.

Another critical aspect necessitating this research is the need to evaluate the effectiveness of existing digital education and training methods in IT practices. With the rise of e-learning platforms, virtual labs, and AI-driven personalized learning, it is essential to assess whether these tools are adequately preparing learners for real-world IT challenges. Many online training programs lack interactive and practical components, limiting their ability to provide hands-on experience. This study will examine the gaps in current digital training models and suggest improvements that can enhance the employability and skill development of IT learners in Ahmedabad.

Furthermore, businesses and organizations in Ahmedabad increasingly rely on digital solutions for operations, cybersecurity, and innovation. However, many enterprises struggle to up skill their workforce due to the fast-paced nature of technological changes and the absence of structured digital training programs. This research will explore how organizations perceive digital education and what challenges they encounter in implementing IT training for their employees. Understanding these challenges will enable businesses to adopt more efficient digital learning strategies that contribute to sustainable IT practices. Government policies and initiatives play a crucial role in promoting digital education, but their impact and effectiveness need to be analysed in the local context. Several national

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and state-level programs aim to enhance digital literacy and IT training; however, their adoption and implementation in Ahmedabad require further investigation. This study will assess the role of government and institutional support in digital education, identify policy gaps, and recommend measures to improve the overall ecosystem for IT training.

Literature Review

Smith (2019) examined the impact of digital education on workforce preparedness in IT industries. The study highlighted that digital learning platforms enhance accessibility and flexibility in IT training, enabling professionals to upskill and reskill efficiently. Smith found that interactive online courses, virtual simulations, and project-based learning significantly contribute to IT professionals' ability to adopt sustainable practices, such as optimizing software performance and reducing energy consumption in IT infrastructure. The research further emphasized the importance of integrating sustainability modules in IT courses to ensure that learners are aware of eco-friendly technological solutions.

Johnson and Lee (2020) explored the role of artificial intelligence (AI) in digital education for IT training. Their study found that AI-driven learning management systems (LMS) personalize training programs based on learners' progress, thereby improving efficiency and knowledge retention. They argued that the use of AI in IT training enhances sustainability by reducing the need for physical infrastructure, lowering carbon footprints associated with traditional classroom setups, and allowing real-time skill assessment. The study also revealed that AI-based analytics help organizations track employee progress and adjust training content to align with sustainable IT practices.

Garcia et al. (2020) investigated the effectiveness of digital training programs in promoting sustainable IT practices among corporate employees. Their research found that companies integrating e-learning modules focusing on energy-efficient coding, green data centers, and ethical hacking practices experienced improved environmental sustainability outcomes. The study further stated that companies offering continuous digital education programs saw increased employee engagement and awareness regarding sustainable IT solutions, such as cloud computing and virtualization, which minimize resource consumption.

Kumar (2021) studied the challenges and benefits of digital education in developing sustainable IT skills among university students. The research found that while digital education significantly improves students' technical expertise, it also faces challenges such as a lack of practical exposure and limited industry collaboration. Kumar recommended integrating virtual labs and real-world case studies to enhance the effectiveness of IT training. The study also emphasized the role of government policies in funding digital education initiatives to ensure equitable access to sustainable IT training resources.

Miller and Thompson (2021) analysed the role of gamification in digital IT education and its contribution to sustainability. Their findings indicated that incorporating game-based learning in IT training increases learner engagement and knowledge retention, making it a valuable tool for promoting sustainable IT practices. The study showed that gamification elements such as leaderboards, virtual rewards, and interactive coding challenges motivate learners to explore energy-efficient computing, cybersecurity awareness, and responsible AI development. They concluded that gamification helps bridge the gap between theoretical knowledge and practical implementation, leading to more sustainable IT practices in real-world scenarios.

Chowdhury et al. (2022) explored the relationship between digital literacy and the adoption of sustainable IT practices in developing economies. Their study found that a significant portion of IT professionals in emerging markets struggle with adopting sustainable computing practices due to a lack of specialized training programs. The research recommended targeted digital education initiatives, including localized e-learning content and community-driven digital training workshops, to bridge the digital literacy gap and promote sustainable IT solutions. The study further emphasized the need for collaboration between academia, industry, and policymakers to create inclusive digital training programs that cater to diverse socio-economic backgrounds.

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Patel (2023) conducted a longitudinal study on the effectiveness of cloud-based digital education platforms in advancing sustainable IT practices. The findings revealed that cloud-based learning reduces the dependency on physical infrastructure, thereby lowering carbon emissions associated with traditional classroom-based training. The study also highlighted that cloud computing skills are essential for modern IT professionals, as they enable organizations to optimize resource allocation, implement energy-efficient data storage solutions, and enhance cybersecurity measures. Patel recommended that IT education curricula integrate sustainability-driven cloud computing modules to ensure future professionals are well-equipped to manage digital resources responsibly.

Major Challenges in Promoting Digital Education for IT Sustainability

Promoting digital education for IT sustainability presents several significant challenges that hinder widespread adoption and effectiveness. These challenges stem from infrastructural limitations, lack of awareness, inadequate curriculum integration, cybersecurity concerns, and faculty preparedness. Each of these barriers plays a crucial role in determining the success of digital education efforts aimed at fostering sustainable IT practices.One of the primary challenges is the issue of infrastructure and accessibility. Many regions, particularly in developing countries, still lack reliable internet connectivity and access to necessary digital tools. A stable digital education system relies on high-speed internet, modern computing devices, and cloud-based learning platforms. However, in rural and underserved areas, students and professionals often face difficulties accessing online courses and training materials. Additionally, the cost of acquiring updated software and hardware for digital learning can be prohibitively high, preventing widespread participation. Without proper infrastructure, the implementation of sustainable IT training programs remains largely ineffective, leading to an uneven digital education landscape.

Another critical issue is the lack of awareness and motivation regarding sustainable IT practices. Many students, professionals, and even educators are unfamiliar with the concept of sustainability in IT, including topics such as energy-efficient computing, e-waste management, and carbon footprint reduction in digital operations. The lack of understanding leads to resistance toward adopting digital education methods that emphasize sustainability. Furthermore, some individuals perceive sustainability-focused training as an additional burden rather than a necessity, reducing their willingness to engage in such programs. Changing this mindset requires large-scale awareness campaigns and incentives to highlight the long-term benefits of sustainable IT education.

A major obstacle also lies in the quality and relevance of training programs. Many educational institutions and IT training centers still follow outdated curricula that do not align with modern sustainability standards. While IT education focuses heavily on coding, software development, and cybersecurity, it often neglects critical sustainability components such as green computing, data center energy efficiency, and responsible e-waste disposal. Additionally, there is often a disconnect between industry demands and academic training. Employers seek IT professionals who understand sustainable practices, but many graduates lack the necessary exposure due to inadequate course offerings. Without regular updates and industry collaborations, IT education will continue to fall short in preparing individuals for a sustainable digital future.

Another pressing concern is cybersecurity and data privacy risks associated with digital education. Online learning platforms store vast amounts of personal and institutional data, making them attractive targets for cyberattacks. Students and professionals participating in digital education programs often share sensitive information on cloud-based learning systems, increasing their vulnerability to data breaches. Furthermore, the ethical implications of digital education, such as surveillance in e-learning environments and the use of AI-driven analytics, raise additional concerns about user privacy. Without robust cyber security measures, the trust and credibility of digital education for IT sustainability can be severely compromised.

Lastly, the readiness of educators and trainers remains a significant challenge. Many instructors lack the necessary training to integrate digital tools effectively into their teaching methodologies.

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Additionally, there is a scarcity of educators who specialize in sustainable IT practices, making it difficult to impart relevant knowledge to students. Professional development programs for teachers and trainers are often limited, preventing them from staying updated with evolving digital education trends and sustainability principles. Without adequately prepared faculty, even the most advanced digital education platforms and sustainability-focused curricula will fail to deliver meaningful outcomes.

Overcoming these challenges requires a concerted effort from governments, educational institutions, IT industry leaders, and non-profit organizations. Addressing infrastructure gaps, raising awareness, updating curricula, enhancing cybersecurity, and training educators are crucial steps toward ensuring that digital education effectively promotes IT sustainability. Only through strategic interventions can digital education serve as a transformative tool for fostering a more sustainable and responsible IT ecosystem.

Strategies to Overcome These Challenges

To successfully promote digital education for IT sustainability, it is crucial to address the existing challenges through well-structured strategies. These strategies should focus on improving infrastructure, increasing awareness, updating curricula, strengthening cybersecurity, and enhancing faculty training. A collaborative approach involving governments, educational institutions, private sector organizations, and technology experts is essential for implementing sustainable solutions.

One of the most critical strategies is enhancing digital infrastructure and accessibility. Governments and private organizations must invest in expanding broadband connectivity, particularly in rural and underserved areas. Initiatives such as subsidized internet access, public Wi-Fi hotspots, and low-cost digital devices can help bridge the digital divide. Additionally, the adoption of open-source software and cloud-based learning platforms can reduce the financial burden on institutions and students, making digital education more accessible. Partnering with tech companies to provide affordable or free digital learning resources can also encourage greater participation in sustainability-focused IT training.

Another vital step is raising awareness and fostering engagement in sustainable IT education. Governments, universities, and industry leaders should launch large-scale awareness campaigns emphasizing the importance of sustainable IT practices. Social media, webinars, and interactive workshops can be used to educate students and professionals about energy-efficient computing, e-waste management, and green IT practices. Moreover, offering incentives such as certification programs, scholarships, and career opportunities for those who complete sustainability-oriented IT courses can motivate individuals to actively participate in digital education initiatives.

To ensure relevance and effectiveness, IT education curricula must be updated and aligned with industry needs. Universities and training institutions should collaborate with IT companies to develop modern courses that integrate sustainability topics. Green computing, cloud sustainability, eco-friendly software development, and responsible data management should be core components of IT education. Hands-on projects, case studies, and internships focused on sustainable IT solutions can provide practical exposure to students. Additionally, integrating artificial intelligence (AI) and machine learning in course delivery can help personalize learning experiences, making sustainability concepts more engaging and easier to understand.

Strengthening cyber security and data protection measures is another crucial strategy. Online learning platforms must implement robust security protocols to safeguard personal and institutional data. This includes multi-factor authentication, end-to-end encryption, and regular security audits to prevent cyber threats. Additionally, educational institutions should train students and educators in digital safety best practices to reduce vulnerabilities. Governments and regulatory bodies should establish policies that ensure the ethical use of AI and data analytics in digital education while maintaining user privacy.

Conclusion

Promoting digital education for IT sustainability is essential for shaping a future where technology is used responsibly and efficiently. However, several challenges—such as inadequate

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infrastructure, lack of awareness, outdated curricula, cybersecurity risks, and insufficient faculty training—hinder the widespread adoption of sustainable IT education. Addressing these obstacles requires a comprehensive and collaborative approach that involves governments, educational institutions, industry leaders, and technology experts.Enhancing digital infrastructure, raising awareness, updating educational programs, strengthening cybersecurity, and upskilling educators are key strategies to overcome these barriers. By making IT sustainability an integral part of digital education, we can ensure that future professionals are equipped with the knowledge and skills needed to implement environmentally responsible practices. Additionally, leveraging emerging technologies such as artificial intelligence, cloud computing, and virtual reality can further enhance the effectiveness of digital learning. Ultimately, digital education for IT sustainability is not just about equipping individuals with technical skills; it is about fostering a mindset that prioritizes sustainable development and responsible technology use. With the right policies, investments, and collective efforts, digital education can become a powerful tool in driving sustainable IT practices and ensuring a greener, more technologically advanced future.

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A STUDY ON AI APPLICATION IN MICROFINANCE INSTITUTIONS

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Abstract

The research paper focuses on the critical role of technology in microfinance institutions (MFIs) and the challenges they face in leveraging it effectively. It highlights that while technology can reduce costs, improve efficiency, and expand outreach, many MFIs struggle with poor technology investments or lack of investment altogether. The European Microfinance Network (EMN) conducted a survey to assess the use of technology among its members, revealing that most organizations have been operating for over ten years and spend an average of 9% of their operational budget on ICT. The report emphasizes the importance of a robust Management Information System (MIS) for managing data and making informed decisions. It outlines the process of planning, evaluating, and implementing technology solutions, including the need for thorough needs analysis and stakeholder involvement. The document also provides examples of successful technology innovations in microfinance, showcasing how organizations have utilized technology to enhance outreach, streamline operations, and improve client services. Ultimately, it calls for MFIs to continuously adapt to technological advancements to remain competitive and effective in their mission.

Keywords: Microfinance, AI Tools, Technology, Challenges, MFIs

Introduction

Microfinance was first introduced in India in the year 1974 by Self-Employed Women's Association (SEWA) in Gujarat in the year 1974.Initially, this bank was providing financial services for the growth of businesses in rural areas. Fourteen models of microfinance institutions cover association, bank guarantees, community banking, cooperatives, credit unions, intermediary, NGOs, peer pressure, ROSCAs, small business and village banking model etc. Functioning of Micro Finance institutions become more effective with the usage of technology. The microfinance sector in India has experienced significant growth and transformation over the past decade, driven by technological advancements, regulatory changes, and the push for financial inclusion. With an 80% increase in loan disbursals in Q1 FY 2022-23, the industry, in 2023 has served more than 6.6 crore households covering loan of Rs. 4,50,000 crores in India. Thereby microfinance institutions (MFIs) have played a crucial role in providing financial services to underbanked populations, particularly in eastern and northeastern India. The integration of digital technologies, such as the JAM trinity (Jan-Dhan, Aadhaar, Mobile), has enhanced the accessibility of microfinance services. Regulatory frameworks, including the Reserve Bank of India's guidelines, have further supported the sector's expansion. The study emphasizes the importance of leveraging technology, such as big data and AI, to create tailored financial products and improve customer engagement. Additionally, it highlights the need for workforce development and collaboration among stakeholders to address challenges in financial literacy and fraud. The evolving landscape presents opportunities for MFIs to innovate and enhance

Literature Review

Anusha H G (2023) basically focuses on the role and uses of AI in micro financing and the challenges faced in implementing AI in Micro Finance Industry. The study accomplishes that banking services have improved, also it has helped banks to achieve their regulatory state of reducing poverty and achieve economic growth. The limitation identified in successful implementation of AI is customer are not completely aware of AI technology.

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Tonye AI-Onyanabo (Jume 2024) attempts to identify how Artificial Intelligence enhances operations of Microfinance unit specially in developing economies based on secondary data collected from industry, published interview and financial report. The study concluded that although AI provides strong backing for better services of microfinance institution yet most of the populace remain underbanked in developing economy. For better performance it is recommended to frame strict regulatory policy and demands investments for digital infrastructure.

Objectives

1. To identify various AI technologies used by microfinance institutions in India.
2. To study the effect of AI driven services on affordability and approachability.
3. To detect the challenges against microfinance institutions while implementing AI technologies.

Research Methodology

The study will utilize secondary data based on research publications, articles in newspaper, report from financial institutions.

Challenges Faced by MFIs in implementing AI tools

- Internal Factors affecting effective implementation of Ai in MFIs
  - Lack of Funding: 81.3% of organizations cite lack of funding as a significant constraint in making better use of technology.
  - Defining Requirements: 37.5% of organizations struggle with accurately defining their technology requirements.
  - Fear of Making Poor Choices: 12.5% of organizations are concerned about making poor technology investment choices.
  - Uncertainty of Benefits: 6.3% of organizations are unsure of the benefits that technology can bring to their operations.
  - Lack of Applications: Two-thirds of organizations lack applications to ensure data flows automatically from portfolio management to financial accounting software, and about half lack applications to share data with credit bureaus.
  - Staffing Issues: Some organizations do not have full-time IT staff, and there is a need for training and hiring qualified personnel.
  - Integration and Adoption: Incorporating new technologies into operational processes and getting clients to adopt them can be challenging.
- **External Factors affecting effective implementation of AI in MFIs**
  - Customer Awareness and Literacy: A significant challenge is the lack of awareness among customers regarding the financial products available to them. This is compounded by low levels of financial literacy.
  - Dependence on Physical Interaction: Traditional MFI models rely heavily on physical sales and service channels, which can be limiting, especially in rural and low-income segments where digital adoption is low.
  - Credit History and Documentation: Many potential borrowers from low-income households lack a credit history, sufficient documentation, and collateral, making it difficult to assess their creditworthiness.
  - Diverse Customer Segments: The microfinance ecosystem serves a diverse range of customer segments, each with different needs and levels of comfort with financial products and digital literacy. This requires MFIs to offer highly customized products and services.
  - Fraud Detection: Identifying and preventing fraud is a significant challenge, especially with the increasing use of digital platforms.
  - Regulatory Compliance: MFIs must navigate a complex regulatory environment, which includes ensuring compliance with guidelines aimed at protecting customers and preventing over-indebtedness.

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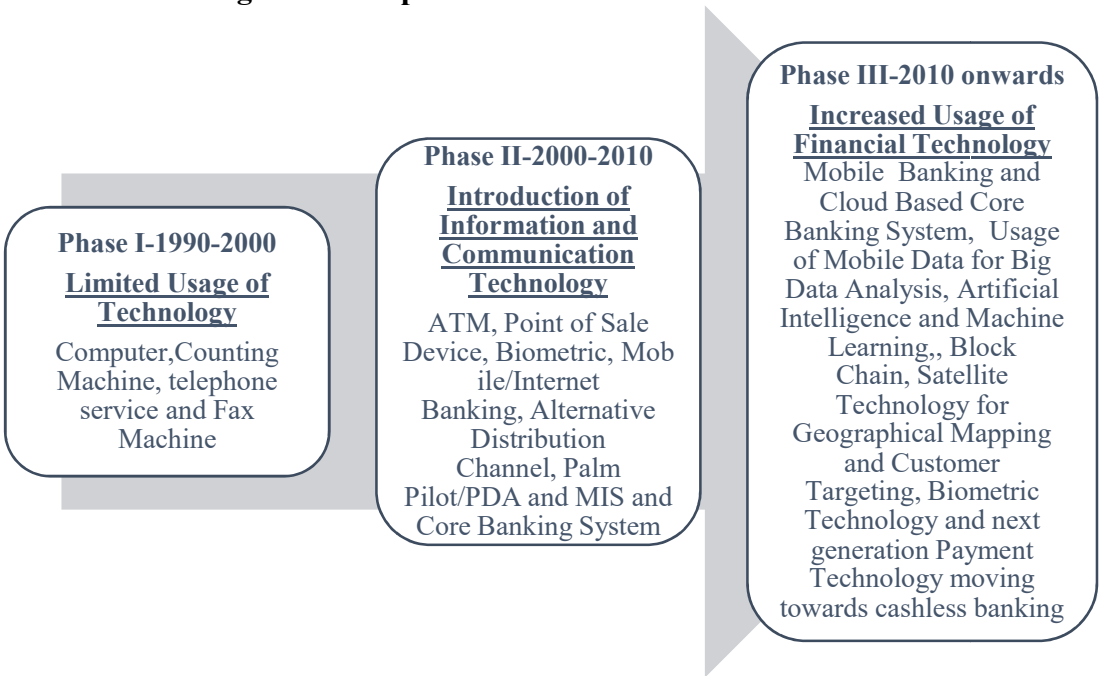
- Cost of Capital: Increasing interest rates and dependence on commercial banks for funding can raise the cost of capital for MFIs, affecting their ability to offer competitive rates and maintain profitability.
- Talent Development: There is a need for continuous upskilling of the workforce, including banking correspondents, to effectively deliver services and adapt to the evolving digital landscape.

Artificial Intelligence (AI) Technologies that are used by Microfinance Institutions

AI Tools	Application in Micro Finance
Big Data Analytics,	Accurate Analysis of Credit Worthiness of Client, Automated approval of Loans
Artificial Intelligence (ai)/Machine Learning (ml),	24*7 services that can handle queries
Mobile and Internet Services	Improves approachability and effectiveness
Firewalls	Provide security in Micro Finance transaction
Chatbots	Provide information, guide regarding process of getting loans

Phases of Technological Development in Microfinance Institutions



Major Microfinance Software Solutionthat are used by MFIs Globally:

Available Software	Operational Area	Major Services Provided
Velmie	Africa, Asia and MENA MRegion	• Workflow automation • Online loan application • Risk scoring • Collections • Compliance management • Document management
HesFinTech	Headquartered in London, United Kingdom Europe, Asia, Africa, and the Americas	• Online loan origination • Asset management • Automated document flow • AI-powered application scoring • Customisable calculations
Finastra	Head Quarter in London, England, UK	• Loan origination • Credit risk assessment • Loan management • Integration and customization • Analytics and reporting

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TurnkeyLender	United States, Canada, Singapore, Malaysia, Poland, Australia and United Kingdom	• AI-powered credit scoring • Machine learning integration • Versatility • Comprehensive features
Craft Silicon	Nairobi, Kenya, and has a global presence with operations in multiple countries, including India and the United Arab Emirates	• Loan origination • Portfolio management • Risk management • Client relationship management
CloudBankin	Headquarter in Chennai, Tamil Nadu	• Loan origination system • Loan management system • Accounting management • Reports and dashboard

The regulatory framework evolved for MFIs in India

The regulatory framework for Microfinance Institutions (MFIs) in India has evolved significantly over the years. Initially, the sector remained largely unregulated, which led to issues such as the Andhra Pradesh microfinance crisis. Recognizing the need for regulation, the Reserve Bank of India (RBI) began regulating MFIs operating in the company form. One of the major regulatory interventions was the recognition of a separate type of NBFC as NBFC-MFI, following the recommendations of the Malegam Committee. This included eligibility criteria for microfinance loans, prudential norms, qualifying assets, capital adequacy, and grievance redressal.

In March 2022, the RBI issued the Master Directions for Regulatory Framework for Microfinance Loans, which marked a new era for the sector. Key features of the revised framework include:

- Applicability to all regulated entities including commercial banks, cooperative banks, and NBFCs.
- Increased annual household income criteria for microfinance loans.
- Linking loan amounts to household income to prevent over-indebtedness.
- Allowing MFIs to decide the maximum interest rate on loans, subject to supervisory review.
- Increased compliance requirements for income and other related information submission to credit information companies.

The RBI has also recognized industry bodies like MFIN and Sa-Dhan as Self-Regulatory Organizations (SROs) to supervise the implementation of the code of conduct and raise awareness on compliance matters. As a result of this the Indian microfinance sector raised by 21% in the financial year 2022-2023, with an overall total amount of Rs 3,19,948 crore as against Rs 2,53, 966 crore in the financial year 2021-2022.

Together Microfinance institutions (MFIs) and NBFCs has contributed robust growth of MFIsresulting into lending Rs 1,24,063 crore, closely followed by traditional lenders, including banks. These shows that microfinance services are essential for rural and weaker section upliftmentin India. Indian Government in order to drive the growth of microfinance sector in India has promoted certain schemes which include opening of bank accounts under Pradhan Mantri Jan-DhanYojana (PMJDY), which was promoted in 2014.

Future Prospects and Implications

Adaptability and Capability – Application of AI in MFI Sector demands the technology to be user friendly and scalable that can help other MFIs for its successful implementation. Business model that performs best in any MFI should be capable enough to be replicated among other MFIs situated in different geographical and cultural areas. Such business model should support MFIs both from local as well as international background.

Association of Fintech with Microfinance – Financial services of MFIs has undergone modifications in its services due to its collaboration with the Fintech. The technological expertise provided by Fintech firm will help microfinance institutions to understand the unique challenges that are

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faced by destitute populations. Jointly both of them can build strong partnership that can result in innovation and will help to provide better financial services covering various financial settings.

Government and Regulatory Support – In order to implement AI successfully in MFIs government support is of utmost important. Strong and supporting regulations with financial incentives will provide environment that will promote favourable environment resulting in innovation that will uphold the interest of borrowers as well as lenders.

Conclusion

In India microfinance institutions in combination with Artificial Intelligencewill provide a powerful tool towards its financial inclusion. Application of AI will assist MFIs in taking accurate decisions, identifying fraudulent activities, and providing better services to its customers.

It is equally true that microfinance institutionare facing many challenges like maintaining privacy of data, guaranteeing equality in accessing technology and promising justifiable treatment to all its customers. Therefore by promoting association among government, techno providers and microfinance institutions a strong financial ecosystem can be created that provides inclusive and easy accessibility to its user without any discrimination of financial status or geographical location.

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GREEN FINTECH: THE INTERSECTION OF FINANCIAL TECHNOLOGY AND SUSTAINABILITY

By
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Abstract

By combining environmental, social, and governance (ESG) principles into financial services, green fintech—the combination of sustainable finance and financial technology—is transforming the finance sector. The development, uses, and effects of Green Fintech are examined in this study, along with how it may support sustainable investments, solve regulatory issues, and identify research gaps. Through a thorough assessment of the literature, the study shows how Green Fintech can encourage investment in green projects, but it also exposes issues including inconsistent regulations, data transparency, and the requirement for standardized ESG indicators. According to the findings, Green Fintech has a lot of potential for developing sustainable finance, but its wider acceptance and effectiveness depend on resolving these issues.Greater technological integration and alignment of regulations across regions are key to unlocking its full potential in fostering long-term, sustainable financial growth.

Keywords: Green Fintech, Sustainable Finance, ESG, Blockchain, AI, Fintech, Digital Banking

Introduction

Green FinTech embodies the intersection of financial technology and environmentally friendly initiatives, aiming to create sustainable solutions within the financial sector. This developing field utilizes technology to promote or support sustainable development efforts, such as minimizing carbon emissions, improving energy efficiency, or financing renewable energy projects. In contrast to conventional FinTech, which concentrates on advancements in financial service technology without prioritizing ecological impact, Green FinTech places environmental considerations at its foundation, ensuring that financial progress is in sync with ecological sustainability.

Climate change and environmental concerns have led to a global push for sustainable economic practices. The financial sector plays a crucial role in this transformation by directing capital toward environmentally responsible investments. Green Fintech, a fusion of financial technology and sustainability, aims to bridge this gap by leveraging digital innovations like blockchain, artificial intelligence (AI), and big data analytics to enhance sustainable finance practices (Huang et al., 2023). This paper examines the significance of Green Fintech, its impact on financial sustainability, and the challenges obstructing its widespread adoption.

Literature Review

Defining Green Fintech

Green Fintech refers to digital financial services that integrate environmental sustainability into financial decision-making. This includes green bonds, carbon trading platforms, and AI-driven ESG analytics (Berg et al., 2022). The field has gained prominence as financial institutions increasingly adopt technology to meet global sustainability goals.

Applications of Green Fintech

Green Fintech encompasses a range of applications, including:

Blockchain technology is used to promote green bonds and symbolize carbon credits, improving transaction efficiency and transparency (Divyashree & Mishra, 2024) (Singh &Kaunert, 2024).

Climate Fintech Models: According to "Leveraging of Climate Fintech Model in India: Scoping

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through a Qualitative Approach using a Sentiments Analysis", 2023, these models focus on promoting sustainable projects and use already-existing fintech tools to drive climate action.

Green Digital Banking: Digital banks promoting sustainable investments and ethical banking practices (Lo & Medda, 2021).

Blockchain in Carbon Trading: Blockchain improving transparency and efficiency in carbon credit markets (Xu et al., 2022).

AI in ESG Analysis: AI-driven analytics improve ESG performance assessment and risk management (Zhang & Li, 2023).

Green Crowdfunding and P2P Lending: Fintech platforms enable crowdfunding for sustainable projects, enhancing financial inclusion (Nguyen et al., 2023).

Regulatory Landscape and Challenges

The regulatory framework for Green Fintech remains fragmented. While regions like the European Union (EU) have made progress in green finance regulations, inconsistencies across global markets pose challenges (Chen et al., 2023). Key regulatory concerns include greenwashing, data privacy, and compliance with ESG reporting standards.

Objectives of the Study

This research intends to:

1. Investigate how Green Fintech contributes to the advancement of sustainable finance.
2. Assess the influence of digital innovations on green financial services and pinpoint the regulatory obstacles blocking the adoption of Green Fintech.
3. Emphasize areas lacking research and propose directions for future studies.

Research Methodology

By analyzing peer-reviewed journal papers, industry reports published between 2019 and 2024, this study takes a qualitative approach. The sources were examined according to their applicability to sustainability, Green Fintech, and legal frameworks. The study also looks at how Green Fintech is really used in various financial industries.

Findings and Discussion

Impact of Green Fintech on Sustainable Finance

Green Banking Awareness and Fintech Adoption: Increased awareness of green banking significantly influences the adoption of green fintech solutions. This adoption leads to higher environmental, social, and governance (ESG) investments, enhancing the sustainability of personal investment portfolios(Sharma et al., 2024).

Climate Finance and Ecological Sustainability: The synergy between climate finance and fintech has been shown to reduce ecological footprints, thereby improving long-term ecological sustainability. This relationship is particularly evident in advanced economies, where fintech acts as a catalyst for climate finance initiatives(Kashif et al., 2024).

Role of Fintech in Enhancing Bank Performance: Fintech amplifies the benefits of green credit for banks, enhancing their performance through cost reduction, reputation enhancement, and risk mitigation. This dynamic encourages banks to integrate green credit into their operations, further supporting sustainable finance initiatives(Li & Chen, 2024).

Green Fintech is reshaping financial markets by making sustainable investments more accessible and transparent. AI-powered ESG analytics enhance decision-making for investors, while blockchain improves the credibility of green bonds and carbon credits (Huang et al., 2023). Fintech solutions also drive financial inclusion by providing digital access to green loans and impact investments.

Challenges and Delimitations

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Despite its potential, Green Fintech faces several challenges:

Risk Aversion: The adoption of fintech is limited by the strong preference of many people, especially farmers, for conventional cash transactions over online transactions (J et al., 2024).

Lack of Awareness: Potential users' desire to interact with these technologies is impacted by a substantial knowledge gap about green financial products (Jaura, 2023).

Technology Access: Users are discouraged from embracing fintech solutions by limited access to technical help and complex user interfaces (J et al., 2024).

Data and Infrastructure: The efficiency of green finance programs is restricted by inadequate infrastructure for data collecting and analysis (Gupta et al., 2023).

Regulatory Uncertainty: The lack of standardized ESG regulations creates inconsistencies in implementation.

Policy Inconsistencies: Investors and institutions face uncertainty as a result of regulatory gaps and inconsistent green finance regulations (Jaura, 2023).

Standardization is required because the evaluation of green finance efforts is made more difficult by the lack of established standards for assessing environmental results (Jaura, 2023).

Data Transparency Issues: Inaccurate ESG reporting and greenwashing concerns limit investor trust (Berg et al., 2022).Technological Barriers: High implementation costs and cybersecurity risks hinder the widespread adoption of blockchain-based solutions.

Low Awareness: General lack of knowledge about Green Finance Principles and Practices among investors, financial institution, and project developers.

Research Gaps

Even if current study shows Green Fintech's assurance, the following gaps still exist:

Standardization of ESG Metrics: Further study is required to create internationally recognized ESG assessment standards.

Regulatory Harmonization: There is an absence of comparative research on Green Fintech laws in various geographical areas.

Integration of Emerging Technologies: More research is required to determine how blockchain and artificial intelligence might be ESG compliance.

Consumer Behaviour and Adoption: There aren't much research on how customers see and use Green Fintech services.

Conclusion

Green Fintech presents a transformative opportunity to align financial markets with sustainability goals. By leveraging digital innovations, it enhances ESG investments, green lending, and carbon trading. However, regulatory inconsistencies, transparency issues, and technological barriers remain significant challenges. Future research should focus on standardizing ESG metrics, developing regulatory frameworks, and exploring consumer behaviour toward Green Fintech adoption. Addressing these gaps will be crucial in unlocking the full potential of Green Fintech for a sustainable financial future.

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GIG ECONOMY: PLATFORMS, OPPORTUNITIES AND CHALLENGES IN INDIA

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Abstract

Gig Economy is a way of working that is based on people having temporary jobs or doing separate pieces of work, each paid separately, rather than working for an employer. According to global freelancing and crowd sourcing marketplace Freelancer.com, India is one of the top countries in the world where gig economy culture is on the rise. The Gig work platform is one of the supportive systems and programs for the development of Growth of the Indian economy. The gig workforce was already popular before the pandemic, but since the covid outbreak, many individuals who lost their normal employment have turned to gig workers, and they are finding an excellent opportunity to increase their Per Capita income over a period of time. Many business units are turning their workforce from full time work to gig work. This allows them to hire a more talented workforce for a short period of time who works effectively and finishes their work in targeted hours. This paper examines the development, opportunities and challenges of Gig economy in India. The paper also discusses the recommendations for government, individuals and companies to help them leverage the benefits of Gig economy.

Keywords: Gig Economy, Gig work platform

Introduction

The Gig economy is reshaping the global business landscape, transforming traditional employment structures with flexible, project-based work models. In other words Gig economy refers to, "is an economy that offers a work platform to all the workers which is flexible, choice based, independent and involves exchanging of labour and resources through Physical and digital platform that facilitates effective gaining opportunities". Gig economy is also known as 'Sharing economy', 'Gift economy', 'On-demand Economy'. Gig economy matches the most efficient business unit to consumer satisfaction level.

Cambridge dictionary defines Gig Economy as 'a way of working that is based on people having temporary jobs or doing separate pieces of work, each paid separately, rather than working for an employer.' Gigs' are piece of work or tasks done for different clients over a stipulated period. With the growth of e-commerce and start-ups, Gig economy and freelancing is growing at a fast rate in India. In order to reduce the costs of keeping a permanent employee, firms are preferring freelancers or contractual workers.

The Gig economy encompasses various forms of contingent work arrangements facilitated by digital platforms. It involves individuals taking on short-term projects or tasks for which they are hired, often through online marketplaces, to work on demand. The gig economy is not limited to a specific industry and includes a wide range of occupations, such as construction, media, communications, transportation, and material moving. Gig work offers flexibility and autonomy, allowing individuals to set their own hours and work from anywhere with an internet connection.

Review of Literature

Kathuria R, Kedia M, Varma G, Bagchi K, Khullar S (2017)highlight the growth of online freelancing and microwork in India as a promising opportunity for the informal labor market. Digital platforms are evolving to connect talent with businesses, enhance productivity, and provide training for technological advancements. Efforts are also being made to address challenges like payments, bidding, and platform navigation through algorithmic improvements, fostering greater participation in this expanding ecosystem.

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Dr. M. Sateeshnadha Reddy (2022) concluded that the gig economy is growing rapidly in India, driven by the fourth industrial revolution. It offers significant benefits for developing countries like India. Success will depend on collaboration between the government, workers, and educational institutions. Government policies and labor laws will play a key role in shaping the gig economy, and individuals will need to embrace lifelong learning to adapt to changing job requirements.

Roy Gobinda and Shrivastava Avinash (2020) highlights the gig economy's growth in the fourth industrial revolution, offering significant potential for India. Collaboration among the government, employees, and educational institutions can transform challenges into opportunities. The gig economy's success depends on supportive policies, labor laws, and individuals' readiness for lifelong learning and reskilling to adapt to the evolving environment.

Tyagi, Akansha (2017) highlights challenges in India's gig economy, including legal uncertainty, resistance to part-time workers, and leadership's lack of understanding. The study suggests integrating skills-based gig roles, revising employee policies, and reforming labor laws to support the growing gig workforce.

Dr. Vikas Kumar Jaiswal and Dr. Ashish Kant Chaudhari (2023) conclude that while the gig economy offers flexibility and opportunities, it also brings challenges like job security, income inequality, and lack of benefits. A balanced approach with collaborative efforts from policymakers, businesses, and society is essential to protect worker rights, promote equality, and support skill development for an inclusive future of work.

Need for the Study

The Gig economy is reshaping traditional work structures in India, offering new opportunities while presenting challenges. This study analyses its impact on the workforce and economy, providing insights for policymakers and businesses to develop strategies and policies that maximize its potential and address its challenges.

Scope of the study

This study examines India's gig economy, focusing on digital platforms, opportunities, and challenges. It explores how flexible, short-term work benefits diverse workers while raising concerns about job security, benefits, and regulatory gaps. Insights aim to help policymakers and businesses create frameworks for fair labor practices, economic growth, and inclusive employment opportunities, shaping India's future workforce.

Objective of the Study

1. To examine the drivers behind the growth of the Gig economy in India
2. To understand the Role of Gig work platform.
3. To explore opportunities provided by the Gig economy.
4. To explore the challenges faced by Gig workers in India.
5. To provide recommendations to improve the working conditions and sustainability of the gig economy for stakeholders.

Research Methodology

Research Design: This research adopts a descriptive and exploratory design to analyse the platforms, development, opportunities and challenges of the gig economy in India.

Sources of Data: The present research paper “Gig Economy: Platforms, Opportunities, and Challenges in India” is mainly based on secondary data and the data is collected by reviewing various literatures, magazines, journals, articles and report published by Niti Ayog. Data present in the form of table and figure.

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Gig Economy Platforms

The gig economy offers a wide range of platforms catering to various industries, skills, and needs, making it possible for individuals to find flexible work arrangements that align with their expertise. Following are the most popular platforms of Gig economy.

Upwork: Upwork is a platform that connects businesses with freelancers in various fields, including writing, design, and programming. It offers a comprehensive platform with embedded payment, scheduling, and communication features.

Fiverr: Fiverr is a platform that allows freelancers to offer their services in various categories, such as graphic design, writing, and video editing. Freelancers set their own prices and clients can browse and hire them directly.

Freelancer: Freelancer is a platform that connects businesses with freelancers in various fields, including writing, design, and programming. It offers a bidding system where freelancers can bid on projects posted by clients.

Toptal: Toptal is a platform that connects businesses with top-tier freelance talent in various fields, including software development, design, and finance. It offers a rigorous screening process to ensure that only the best freelancers are accepted

99designs: 99designs is a platform that connects businesses with freelance designers for various projects, such as logos, websites, and packaging. Clients can browse and hire designers directly or launch a design contest

TaskRabbit: TaskRabbit is a platform that connects individuals with local freelancers for various tasks, such as cleaning, moving, and handyman services. Clients can browse and hire freelancers directly

Uber: Uber is a platform that connects drivers with passengers for ride-sharing services. Drivers can work on their own schedule and earn money by providing rides to passengers

Airbnb: Airbnb is a platform that connects travellers with hosts who rent out their homes or apartments. Hosts can earn money by renting out their space to travellers

Postmates: Postmates is a platform that connects couriers with customers who need food, groceries, or other items delivered. Couriers can work on their own schedule and earn money by delivering items to customers

Lyft: Lyft is a platform that connects drivers with passengers for ride-sharing services. Drivers can work on their own schedule and earn money by providing rides to passengers

Guru: Guru is a platform that connects businesses with freelancers in various fields, including writing, design, and programming. It offers a bidding system where freelancers can bid on projects posted by clients

Peopleperhour: Peopleperhour is a platform that connects businesses with freelancers in various fields, including writing, design, and programming. It offers a bidding system where freelancers can bid on projects posted by clients

Dog Walkers: Individuals who offer dog walking services on a freelance basis, often through digital platforms or local networks

For-Hire Babysitters: Freelance babysitters who offer their services to families on an as-needed basis, often through word-of-mouth or online platforms

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Caterers, Bartenders, and Food Prep Workers: Individuals who find gig work at various private functions, such as conferences and events, providing catering and hospitality services

Gig economy platforms offer diverse opportunities, ranging from transportation and delivery services to creative and professional freelancing, allowing individuals to earn income through flexible, project-based arrangements. Spanning multiple industries and skill sets, these platforms empower a broad range of workers—including women and persons with disabilities-by fostering financial independence and supporting inclusive growth. Through innovation, gig platforms facilitate skill development, social security, financial access, and job creation, which are critical for personal and economic development. As the gig economy is projected to grow from 7.7 million workers in 2021 to 23.5 million by 2030, it is set to play a transformative role in shaping future economic development. Understanding these platforms helps individuals find the right opportunities suited to their skills and needs.

The Role of Gig Work Platforms:

The gig economy has become a prominent feature of the informal workforce, offering a flexible solution for both job seekers and companies. Accelerated by the Covid-19 pandemic, many individuals turned to independent work to supplement their income, altering the traditional work environment and enabling businesses to access adaptable labor. This summary discusses the ways in which gig work platforms contribute to economic growth.

Start-up Initiatives: The Indian economy relies on innovative platforms to boost GDP growth, and the gig economy has become essential to start-ups. Approximately 56% of new start-ups in India are connected to the gig economy, employing skilled individuals in IT, data science, marketing, and finance.

Micro and Small Enterprises: Gig work fosters the growth of micro and small businesses, providing rural and urban populations with opportunities to increase income and improve economic conditions.

Employment Opportunities: The gig economy spans various roles, including independent contractors, online platform workers, and temporary staff. With 15 million freelancers, India ranks as the world's second-largest freelance market. In 2019, 81% of major corporations in a Noble House survey reported engaging gig workers for key projects.

Self-Employment: Gig platforms offer self-employment prospects, allowing skilled individuals to independently build careers and earn income.

Growing Sectors for Gigs: Sectors such as construction, manufacturing, retail, transportation, and logistics are generating significant job opportunities. The "Gig Economy in India" report notes that personal services alone account for 7.7 million gigs, followed by construction and real estate (4.4 million), transport and logistics (3.4 million), and manufacturing (3.1 million).

Diverse Job Options: Post-Covid, the need for diversified work increased, with the gig economy enabling people to take on multiple roles. This allows individuals to achieve financial stability and work satisfaction.

Flexible Work Options: Gig work offers flexibility, enabling people to work independently and choose their hours. Many workers can operate remotely, without needing a physical office.

Technological Advancements: Gig platforms capitalize on technology, streamlining work processes and supporting national growth. This environment provides workers with numerous opportunities to explore different fields.

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Project-Based Work Model: The gig economy's project-focused model allows workers to engage in a variety of tasks, enhancing their skills and expanding their knowledge.

Cost-Efficiency for Companies: Gig work reduces operational expenses for businesses, as it lessens the need for large offices and costly workspaces.

Increased Participation of Women: Gig work creates part-time opportunities, helping women balance household responsibilities with earning an income.

Analysis of Development of Gig Economy in India;

Workforce engaged in the Gig economy

Year	Gig Workers (In Millions)
2019-20	6.8
2020-21	7.7
2029-30	23.5

Source- NITI Aayog report, 2022

The gig economy in India is growing steadily, with gig workers increasing from 6.8 million in 2019-20 (1.3% of the workforce) to 7.7 million in 2020-21 (1.5%). By 2029-30, this is expected to rise to 23.5 million workers (4.1%). Sectors like retail trade and transportation employ the largest number of gig workers, while education has the fewest. About 47% of gig workers are in medium-skilled jobs, 31% in low-skilled jobs, and 22% in high-skilled roles.

The total value of gig economy companies has grown significantly, reaching $400 billion in 2020, driven by technological advances, changing work preferences, and increased acceptance of gig roles. This reflects not only the growing workforce but also rising market value, highlighting the gig economy's expanding role in India's economy.

The gig economy in India is growing steadily, with transportation employing the most gig workers and education the least. Around 47% of gig jobs are medium-skilled, 31% are low-skilled, and 22% are high-skilled. The share of gig workers in the total workforce has increased from 1.3% in 2019-20 to a projected 4.1% by 2029-30.

As the gig economy expands, it plays a larger role in India's economy. However, for sustainable growth, it is important to ensure fair opportunities and inclusivity for all workers.

Opportunities in the Gig Economy

As artificial intelligence and technological progress advance, traditional job roles are at risk of being displaced. However, this shift creates a unique opportunity for many young people, especially those entering the workforce for the first time, to find employment through online freelancing and micro work. It also offers potential avenues for informal labor, with particular benefits for women.

Flexible Work Schedules: Many skilled professionals are drawn to freelance work and flexible projects as it allows them to balance other essential commitments, such as higher education. Women, in particular, benefit from this flexibility, as they can manage paid work alongside personal, educational, or leisure activities. Online gig work enables them to work on their terms, at the time and place of their choosing.

Cost Reduction for Employers: Employers can reduce costs by hiring a mix of full-time employees and lower-cost freelancers. This helps companies access specialized skills while improving efficiency and saving money.

Reducing Unemployment: The gig economy helps reduce unemployment by providing more job opportunities, especially for women. Its flexible work options allow more people to join the workforce, increasing labor participation and job availability.

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Increasing Female Workforce Participation: The gig economy offers flexible work that helps more women join the workforce. Skilled women who can't commit to full-time jobs can use gig work to earn money, supporting their independence and boosting India's economy.

Matching Jobs to the Right People: Machine learning and AI now enable better alignment between skills and job roles, making it easier to identify ideal candidates for specific positions. This technology-driven selection improves organizational productivity by ensuring that the right individuals are placed in roles suited to their strengths.

Enhancing Productivity: The gig economy has transformed the way work is approached, with more organizations embracing innovative practices. Freelancers often bring fresh ideas and unique perspectives, leading to increased ideation, higher productivity, and ultimately greater profitability.

Technology Empowerment: Technological advances are reshaping work dynamics, with urban firms increasingly adopting flexible work arrangements. This shift has led to a rise in freelancers in urban areas as companies adapt to the changing work culture.

Work Life Balance: According to the Business and Technical Women's Foundation, the development of this virtual workforce is being driven by the emerging millennial workforce, which will constitute 75% of the global workforce by 2025.Millennials, as digital natives, favour workplaces that make use of technology to accommodate their work and family lives. This includes the preference for workplaces that allow employees to freelance on projects that best suit them

Challenges in Gig Economy

While the gig economy offers opportunities, it also weakens long-term business and consumer relationships. This growing sector faces social and regulatory challenges, as freelancing and microwork are new trends that significantly impact labor markets.

Lack of Framework and government support: Gig workers face issues like limited job security and lack of government support. The sector is unorganized, with no clear policies or structure, leading to challenges for workers on digital platforms.

Absence of Trade Unions: Gig workers lack trade unions to support their rights or address issues. Without unions, they struggle with work-life balance and resolving grievances, as online platforms focus only on connecting workers and clients.

Lack of Job Safety and Social Security: Gig jobs are usually short-term and offer no social protection or job security. Workers lack traditional benefits like regular salaries and cannot afford private insurance, leading to financial uncertainty and stress.

Independent Contractors: Gig workers are hired temporarily as independent contractors, not employees, and do not receive social security benefits. Traditional 9-to-5 jobs are still seen as more stable compared to gig work.

Inadequate Workplace Quality: Gig workers lack set standards for working hours, minimum wages, or paid leave. Many work from home, which limits organizational connections. Women gig workers often face unequal pay compared to men.

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Unstable Income: Gig workers face income uncertainty as earnings depend on task completion, and the work is temporary. While freelancing offers flexibility, income instability is a significant concern.

Retirement Planning: Gig workers often lack access to employer sponsored retirement plans, such as 401(k) or pension schemes. This can make retirement planning challenging, as gig workers are responsible for setting up and funding their own retirement accounts. The absence of employer contributions and the irregular income characteristic of gig work can hinder long-term financial security in retirement.

No Promotion: Gig employees are short term workers, and they work on flexibility, therefore gig workers will not get any benefit of their work promotion, salary enhancement, work identification benefits, no consideration of experience etc.

Limited Skill Development Opportunities

In the gig economy, workers are hired for specific tasks and must handle their own training, unlike traditional jobs where companies invest in skill development. This limits opportunities for gig workers to improve their skills and stay competitive over time.

Conclusion

The gig economy in India is rapidly transforming the employment landscape, offering diverse, flexible opportunities across multiple industries and skill levels, from freelance creative work to on-demand transportation and household services. It supports financial independence, particularly among women and underserved communities, and contributes significantly to economic growth by promoting entrepreneurship, reducing operational costs for businesses, and increasing workforce participation. However, challenges like lack of job security, social protections, income stability, and organized worker support hinder its sustainability. For inclusive and equitable growth, it is crucial to address these challenges through policy frameworks that ensure fair working conditions, social security, and skill development for Gig workers.

Recommendations

The gig economy is reshaping work, offering opportunities and challenges. Adopting flexible models and supportive policies can help businesses, workers, and governments thrive in this dynamic environment.

Recommendations for Companies:

1. Build supportive HR platforms to engage and integrate gig workers for operational flexibility.
2. Use online talent pools and provide mentoring, counseling, and reskilling for transitioning employees.
3. Offer in-house training programs to help workers re-skill and prepare for gig roles.

Recommendations for Individuals:

1. Embrace lifelong learning through continuous upskilling and reskilling.
2. Explore gig and project-based work for income diversity and flexibility.
3. Use government and employer resources like online courses and certifications to stay competitive.

Recommendations for Government:

1. Simplify labor laws to support gig workers while ensuring fair employment practices.
2. Provide protections like fair wages, health benefits, and social security for gig workers.
3. Partner with institutions to enhance workforce skills and expand programs like “Skill India.”
4. Increase public awareness and improve digital infrastructure to enable participation in online work.

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E-BANKING FRAUD IN INDIA: A CRITICAL ANALYSIS OF LEGAL PROVISIONS

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Abstract

E-banking fraud has emerged as a critical challenge in India's rapidly expanding digital economy. With the increasing reliance on electronic banking, fraudsters are exploiting vulnerabilities in cyber security, legal frameworks, and consumer awareness. The Bhartiya Nyaya Sanhita (BNS) 2023 marks a significant step forward in addressing these issues by providing updated legal provisions to tackle financial cybercrimes effectively. This study explores the rising instances of e-banking fraud in India, examines the key provisions of the BNS 2023 related to combating these crimes, and evaluates its potential impact. Recommendations for strengthening cybersecurity, empowering law enforcement, enhancing consumer education, and fostering public-private partnerships are proposed to ensure a secure and resilient digital banking environment. By integrating legal reforms with technological advancements and institutional accountability, India can mitigate the risks of e-banking fraud and build public trust in its digital financial systems.

Keywords: E-banking fraud, Bhartiya Nyaya Sanhita 2023, Digital Financial Crimes, Cyber security, Legal Provisions, Financial Institutions, Public-Private Partnerships, Consumer Awareness

Introduction

E-banking, also known as electronic banking or online banking, has revolutionized the financial landscape, making banking services more accessible and efficient. However, with the rapid adoption of digital platforms, there has been a significant rise in e-banking fraud across the globe, including India. This surge in fraudulent activities poses a severe threat to both individuals and financial institutions, undermining trust in digital banking systems. One of the primary reasons for the increase in e-banking fraud is the growing reliance on digital transactions. With smart phones and internet access becoming more widespread, millions of users now conduct financial activities online, ranging from fund transfers to bill payments and shopping. While this convenience has made banking seamless, it has also created vulnerabilities that cybercriminals exploit. The lack of awareness among many users about safe online practices often leads to phishing attacks, where fraudsters deceive individuals into sharing sensitive information such as bank account details, passwords, or OTPs (One-Time Passwords).

Another contributing factor is the sophistication of cybercrime techniques. Criminals employ advanced methods such as malware, ransom ware, and hacking to gain unauthorized access to banking systems and personal devices. These malicious programs can steal data, manipulate transactions, or even lock users out of their accounts. Moreover, social engineering tactics have become increasingly common, where fraudsters impersonate bank officials or customer care representatives to trick victims into revealing confidential information. The shift toward digital payment platforms and UPI (Unified Payments Interface) transactions in India has further compounded the issue. While UPI has transformed the way money is transferred, its widespread usage has made it a prime target for fraudsters. Fake UPI payment links, fraudulent apps, and cloning of payment interfaces are some of the tactics used to deceive users. Small and medium-sized businesses that lack robust cyber security measures are also particularly vulnerable to these scams. Financial institutions are also grappling with insider threats, where employees with access to sensitive data misuse it for personal gain or collude with external fraudsters. This internal

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dimension of fraud adds another layer of complexity to the problem. Additionally, while banks and regulators have taken significant steps to strengthen cyber security and establish fraud detection mechanisms, the rapid evolution of technology means that new vulnerabilities constantly emerge, often outpacing preventive measures. The impact of e-banking fraud is far-reaching. For individuals, it results in financial loss, emotional distress, and the potential misuse of their personal data for identity theft. For banks and financial institutions, fraud leads to reputational damage, monetary loss, and a decline in customer confidence. Furthermore, as these incidents become more frequent, there is a growing burden on law enforcement agencies and the judicial system to address complaints, investigate cases, and ensure justice for the victims.

Bhartiya Nyaya Sanhita (BNS) 2023 and its relevance to tackling e-banking fraud

The Bhartiya Nyaya Sanhita (BNS) 2023, a landmark legislation introduced to replace the Indian Penal Code (IPC) of 1860, represents a significant step in modernizing India's criminal justice system. Framed to address contemporary challenges, the BNS seeks to bring clarity, efficiency, and relevance to India's legal framework by incorporating provisions for crimes that have emerged in the digital era, including cybercrimes like e-banking fraud. This new legislation acknowledges the evolving nature of crimes in a technology-driven world and aims to strengthen mechanisms for their prevention, detection, and prosecution.

E-banking fraud, which involves unauthorized access to banking systems, phishing scams, identity theft, and other fraudulent practices, has become a growing concern in India's digital economy. With the increasing reliance on digital transactions, such fraud has not only caused significant financial losses but also eroded public confidence in online banking systems. Recognizing the urgency of this issue, the BNS 2023 introduces specific provisions to address cybercrimes, making it a critical legal tool for combating e-banking fraud. One of the major advancements under the BNS 2023 is the inclusion of provisions that enhance penalties for cybercrimes, including offenses related to financial fraud. The act also focuses on safeguarding personal data and addressing identity theft, which are common tactics used in e-banking fraud. By codifying these offenses with precise definitions and stringent penalties, the BNS provides a stronger deterrent against such crimes.

Furthermore, the BNS emphasizes the use of modern investigative techniques and digital evidence in the prosecution of cybercrimes. This is particularly relevant in tackling e-banking fraud, as digital evidence such as transaction logs, IP addresses, and forensic data plays a crucial role in establishing culpability. The act encourages law enforcement agencies to adopt advanced technologies and collaborate with cyber security experts to ensure effective investigation and prosecution.

In addition to its legal provisions, the BNS 2023 underscores the importance of consumer protection. It emphasizes the need for banks and financial institutions to implement robust security measures and educate their customers about safe banking practices. The legislation also provides a framework for faster resolution of disputes and compensation for victims, thereby addressing the grievances of those affected by e-banking fraud. In essence, the Bhartiya Nyaya Sanhita 2023 serves as a timely and relevant response to the challenges posed by the digital age. Its focus on addressing e-banking fraud through a combination of stringent laws, modern investigative methods, and consumer protection measures makes it a cornerstone in the fight against cybercrimes in India. By aligning legal provisions with the complexities of digital financial transactions, the BNS 2023 aims to create a safer and more secure environment for e-banking in the country.

Bhartiya Nyaya Sanhita 2023: Key Provisions Related to E-Banking Fraud

The Bhartiya Nyaya Sanhita (BNS) 2023 has introduced several key provisions to address the challenges posed by e-banking fraud in the digital age. By modernizing India's legal framework, the BNS strengthens measures to combat cybercrime, enhance consumer protection, and ensure that justice is delivered efficiently in cases involving financial fraud through digital platforms. The Act acknowledges

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the growing sophistication of cybercriminals and provides clear legal mechanisms to deter, investigate, and prosecute such offenses.

Expanded Definition of Fraud and Cybercrime

Under the BNS 2023, the definition of fraud has been broadened to include acts of deception committed through electronic or digital means, specifically targeting online financial systems. E-banking fraud, such as phishing, unauthorized transactions, identity theft, and the use of malware, is explicitly recognized, ensuring that these crimes are addressed within the framework of the law. This clarity reduces ambiguity in prosecuting such offenses.

Stringent Penalties for Digital Financial Fraud

The BNS 2023 introduces stricter penalties for crimes involving e-banking fraud to act as a deterrent. For example:

- Individuals committing fraud through phishing or unauthorized access to banking systems may face extended imprisonment and hefty fines.
- Organized cybercrime syndicates, which often target multiple victims, attract enhanced penalties under the provisions of the Act.
- This stricter stance reflects the government's commitment to combating financial fraud in a rapidly digitizing economy.

Focus on Identity Theft and Data Protection

The BNS emphasizes the protection of individuals' personal data and penalizes identity theft—a prevalent tactic in e-banking fraud. Provisions include punishments for misusing personal information, such as login credentials, banking details, or biometric data, for fraudulent transactions. This aligns with the broader efforts of Indian legislation to enhance data security in the digital ecosystem.

Admissibility of Digital Evidence

the significant advancements under the BNS 2023 is the recognition of digital evidence, such as transaction logs, encrypted communications, and forensic reports, as admissible in courts. By strengthening the role of technology in investigations, the Act enables law enforcement to leverage digital trails for building strong cases against perpetrators. This is crucial in e-banking fraud, where evidence is often intangible and technology-driven.

Provisions for Phishing and Impersonation

Phishing scams and impersonation, where fraudsters pretend to be bank officials or trusted entities to deceive users, are explicitly addressed in the Act. Offenders found guilty of impersonation face severe consequences, including imprisonment and financial penalties. This provision aims to curb the growing menace of such schemes in India.

Accountability of Financial Institutions

The BNS 2023 mandates banks and financial institutions to adopt stricter cyber security measures and report fraud incidents promptly. It places responsibility on institutions to ensure secure banking systems and protect customer data from unauthorized access. Failure to comply with these requirements may result in penalties for negligence, highlighting the role of institutional accountability in preventing e-banking fraud.

Consumer Protection and Compensation

The Act introduces measures to protect victims of e-banking fraud, ensuring they are compensated for their losses. Banks are required to expedite grievance redressal processes and provide

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timely refunds for unauthorized transactions, provided the victim reports the incident within the prescribed time frame. This provision aims to rebuild public confidence in digital banking systems.

Streamlining Investigations and Prosecutions

To expedite justice, the BNS 2023 promotes the establishment of dedicated cybercrime units and specialized courts for handling digital fraud cases. These units are equipped with trained personnel and advanced forensic tools to investigate complex e-banking frauds effectively. This reduces delays in prosecutions and improves the conviction rate for such offenses.

Cross-Border Fraud and Jurisdictional Clarity

E-banking fraud often involves international actors, creating challenges in jurisdiction. The BNS 2023 addresses these concerns by including provisions for cross-border cooperation in cybercrime investigations. It allows Indian authorities to collaborate with foreign agencies and ensures legal jurisdiction in cases involving Indian citizens or institutions.

Enhancing Public Awareness

Although not directly a legal provision, the Act emphasizes the role of public awareness in curbing e-banking fraud. It encourages the government and financial institutions to educate users about safe banking practices, cyber hygiene, and the legal remedies available to victims of fraud.

Impact of BNS 2023 on Combating E-Banking Fraud

The Bhartiya Nyaya Sanhita (BNS) 2023 is a transformative legal framework that seeks to modernize India's approach to crime and justice, particularly in the context of digital and financial offenses. Its impact on combating e-banking fraud is significant, as it addresses the complexities of cybercrime in a rapidly evolving digital economy. By introducing comprehensive provisions, enhanced penalties, and streamlined processes, the BNS 2023 has the potential to curb the rising instances of e-banking fraud in India.

Strengthening Legal Deterrence

One of the primary impacts of the BNS 2023 is the creation of a strong deterrent against e-banking fraud. By enhancing penalties for digital financial crimes, the Act raises the stakes for cybercriminals. Offenses such as phishing, unauthorized access to banking systems, and identity theft now carry severe consequences, including extended imprisonment and significant fines. This shift sends a clear message that digital financial fraud will not be tolerated and is being addressed with the seriousness it deserves.

Comprehensive Coverage of E-Banking Fraud

The BNS 2023 broadens the scope of legal recognition for digital crimes. E-banking fraud, which often involves sophisticated techniques such as phishing scams, malware attacks, and social engineering tactics, is now explicitly defined and addressed in the law. This clarity enables law enforcement and the judiciary to prosecute such offenses more effectively, reducing ambiguity and ensuring justice for victims.

Enhanced Investigation Capabilities

A major challenge in combating e-banking fraud has been the collection and use of digital evidence. The BNS 2023 resolves this by recognizing digital evidence, such as transaction logs, IP addresses, and forensic data, as admissible in court. This strengthens the investigative process, allowing law enforcement agencies to build stronger cases against offenders. Moreover, the Act encourages the use of advanced forensic tools and technologies, enhancing the ability to track, identify, and apprehend cybercriminals.

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Increased Accountability for Financial Institutions

The BNS 2023 places a significant onus on financial institutions to safeguard customer data and maintain secure banking systems. By holding banks accountable for lapses in cyber security, the Act incentivizes them to adopt robust measures to prevent fraud. This includes regular audits, real-time fraud detection systems, and comprehensive consumer education programs. Such measures not only reduce vulnerabilities but also rebuild trust in digital banking platforms.

Streamlined Dispute Resolution for Victims

Victims of e-banking fraud often face delays in resolving disputes or recovering their funds. The BNS 2023 addresses this issue by mandating faster grievance redressal processes. Banks are now required to process complaints and provide refunds for unauthorized transactions within a specified timeframe, provided victims report the fraud promptly. This ensures that affected individuals receive timely relief, minimizing the financial and emotional impact of fraud.

Provisions for Cross-Border Fraud

E-banking fraud often transcends national borders, with international actors targeting Indian users. The BNS 2023 provides mechanisms for cross-border cooperation in cybercrime investigations. By clarifying jurisdictional issues and facilitating collaboration with foreign law enforcement agencies, the Act improves India's ability to tackle global cybercrime networks.

Improved Public Confidence in Digital Banking

The implementation of the BNS 2023 is expected to boost public confidence in digital banking systems. With stringent laws and improved consumer protection measures in place, individuals and businesses can feel more secure in conducting online transactions. This is particularly important as India moves toward becoming a cashless economy, with initiatives such as UPI and digital wallets playing a central role in financial inclusion.

Encouragement for Technological Innovation in Security

The Act's focus on combating e-banking fraud encourages technological advancements in cyber security. Financial institutions and fintech companies are incentivized to invest in cutting-edge technologies such as artificial intelligence (AI), machine learning (ML), and block chain to detect and prevent fraud. This fosters innovation and creates a safer digital ecosystem for consumers.

Raising Awareness about Cybercrime

The BNS 2023 also underscores the importance of public awareness in combating e-banking fraud. It encourages stakeholders to educate users about safe online practices, recognizing that prevention is as critical as prosecution. Awareness campaigns can help individuals identify and avoid scams, reducing the number of potential victims.

Creating a Comprehensive Framework for Digital Crimes

By integrating provisions for digital crimes within the broader criminal justice system, the BNS 2023 establishes a cohesive framework for addressing e-banking fraud. It bridges the gap between traditional legal mechanisms and the demands of the digital age, ensuring that India's legal system evolves in tandem with technological advancements.

Recommendations and Way Forward

As e-banking fraud continues to grow in sophistication, tackling it requires a multi-faceted approach that combines robust legislation, technological advancements, institutional accountability, and public awareness. While the Bhartiya Nyaya Sanhita (BNS) 2023 has laid the foundation for addressing

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digital financial crimes, further measures are essential to ensure its effective implementation and sustained impact. Below are key recommendations and the way forward:

Strengthening Technological Infrastructure

Advanced Fraud Detection Systems: Banks and financial institutions should invest in technologies such as Artificial Intelligence (AI) and Machine Learning (ML) to detect fraudulent transactions in real time. Predictive analytics and behavioural monitoring can identify suspicious activities and prevent fraud before it occurs.

Cyber security Enhancements: Institutions must adopt robust security protocols, including end-to-end encryption, multi-factor authentication, and regular vulnerability assessments, to safeguard e-banking systems against cyber attacks.

Blockchain Technology: Incorporating block chain can enhance transparency and traceability in digital transactions, making it harder for fraudsters to manipulate data.

Capacity Building for Law Enforcement

Training Programs: Law enforcement officials should receive specialized training in digital forensics and cybercrime investigation to stay ahead of rapidly evolving threats.

Dedicated Cybercrime Units: Establishing dedicated units at the state and district levels, equipped with advanced tools and skilled personnel, will streamline investigations and improve response times.

Collaborative Efforts: Strengthen collaboration between law enforcement, financial institutions, and technology experts to share knowledge, tools, and best practices for tackling e-banking fraud.

Enhancing Consumer Awareness

Education Campaigns: Launch nationwide awareness campaigns to educate consumers about common e-banking fraud schemes such as phishing, vishing, and malware attacks.

Bank-Led Initiatives: Financial institutions should proactively inform customers about safe banking practices, secure password management, and the risks of sharing sensitive information.

Reporting Mechanisms: Promote the use of centralized reporting systems, such as the National Cyber Crime Reporting Portal, to ensure victims can report fraud incidents quickly and easily.

Strengthening Institutional Accountability

Mandatory Compliance: Financial institutions must adhere to strict cyber security guidelines and conduct periodic audits to assess vulnerabilities.

Consumer Compensation Mechanisms: Banks should simplify the process for victims of e-banking fraud to claim compensation, ensuring timely refunds for unauthorized transactions.

Proactive Fraud Prevention: Institutions must implement proactive measures, such as transaction monitoring and automated fraud alerts, to prevent fraud.

Judicial and Legal Reforms

Speedy Trials: Establish specialized cybercrime courts to expedite the resolution of cases related to e-banking fraud. Reducing delays in judicial processes will increase public trust in the legal system.

Clearer Jurisdictional Guidelines: In cases of cross-border fraud, clarify jurisdictional challenges and strengthen international cooperation through treaties and agreements.

Periodic Review of Laws: Regularly review and update the provisions of the BNS 2023 to address emerging threats and incorporate technological advancements.

Promoting Public-Private Partnerships (PPPs)

Collaboration with Tech Firms: Encourage partnerships between financial institutions and technology companies to develop innovative fraud detection tools and secure banking platforms.

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Information Sharing Networks: Establish platforms for banks and financial institutions to share real-time data on fraud trends and potential threats, enabling a coordinated response.

Leveraging Global Best Practices

Adopting International Standards: Align India's cyber security framework with global standards, such as the General Data Protection Regulation (GDPR) and ISO 27001, to enhance data security.

Learning from Other Nations: Study successful strategies adopted by other countries in combating e-banking fraud and tailor them to India's unique needs.

The fight against e-banking fraud requires a proactive, collaborative, and dynamic approach. While the Bhartiya Nyaya Sanhita 2023 represents a significant milestone, its success will depend on effective implementation, technological innovation, and sustained public awareness. By building a resilient digital ecosystem, fostering partnerships, and empowering stakeholders, India can create a safer and more secure environment for e-banking, reinforcing trust in its rapidly expanding digital economy.

Conclusion

The rise of e-banking fraud poses significant challenges to India's financial ecosystem, threatening consumer trust and the stability of digital transactions. However, with the introduction of the Bhartiya Nyaya Sanhita (BNS) 2023, the nation has taken a decisive step toward addressing these challenges by modernizing its legal framework to keep pace with evolving cyber threats. The provisions within the BNS 2023, including stringent penalties for digital crimes, recognition of electronic evidence, and mechanisms for cross-border cooperation, demonstrate a commitment to safeguarding the interests of consumers and institutions alike. While the BNS 2023 is a robust foundation, its success hinges on effective implementation, complemented by technological advancements, institutional accountability, and widespread public awareness. Financial institutions must strengthen their cyber security measures, law enforcement must be equipped with the tools and training needed to combat cybercrimes, and consumers must be empowered with the knowledge to protect themselves from fraud. Moving forward, fostering public-private partnerships, leveraging global best practices, and ensuring swift redressal of grievances will be critical in combating e-banking fraud. By addressing these aspects, India can build a secure and resilient digital financial infrastructure, instilling confidence in its journey toward becoming a leading digital economy. The BNS 2023 is not just a legal reform; it is a blueprint for a future where e-banking is safe, inclusive, and trusted by all.

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કોર્પોરેટ ગવર્નન્સનો વિકાસ: 21મી સદીમાં સિદ્ધાંતો, પ્રથાઓ અને પડકારો

રાજપૂત થાનાભાઈ વરજાંગાભાઈ
સંશોધન વિદ્વાન
મોનાર્ક યુનિવર્સિટી, અમદાવાદ

સંશોધન સાર

21મી સદીમાં કોર્પોરેટ ગવર્નન્સનો નોંધપાત્ર વિકાસ થયો છે, જેનું મુખ્ય કારણ વૈશ્વિકરણ, ટેકનોલોજીકલ પ્રગતિ અને નૈતિક અને ટકાઉ વ્યવસાયિક પ્રથાઓ માટેની વધતી અપેક્ષાઓ છે. આ પેપર આધુનિક કોર્પોરેટ ગવર્નન્સને આકાર આપતા સિદ્ધાંતો, પ્રથાઓ અને પડકારોની શોધ કરે છે. તે જવાબદારી, પારદર્શિતા, ન્યાયીપણા અને જવાબદારીના પાયાના સિદ્ધાંતોની તપાસ કરે છે, સાથે સાથે શેરધારકો, ડિરેક્ટર બોર્ડ, મેનેજમેન્ટ અને નિયમનકારી સંસ્થાઓ સહિત હિસ્સેદારોની ભૂમિકા પર પ્રકાશ પાડે છે.

આ અભ્યાસ પર્યાવરણીય, સામાજિક અને શાસન (ESG) એકીકરણ, નેતૃત્વમાં વિવિધતા અને સમાવેશ, અને શાસન માળખા પર ડિજિટલ પરિવર્તનની અસર જેવી સમકાલીન પ્રથાઓનો અભ્યાસ કરે છે. તે સાયબર સુરક્ષા જોખમો, નિયમનકારી પાલન જટિલતાઓ અને લાંબા ગાળાની ટકાઉપણું સાથે નફાના મહત્તમકરણને સંતુલિત કરવા સહિતના ઉભરતા પડકારોનું પણ વિશ્લેષણ કરે છે.

પરિચય

21મી સદીમાં સંસ્થાઓની ટકાઉપણું, જવાબદારી અને પારદર્શિતાને આકાર આપવા માટે કોર્પોરેટ ગવર્નન્સ એક મહત્વપૂર્ણ સ્તંભ તરીકે ઉભરી આવ્યું છે. કંપનીઓને નિર્દેશિત અને નિયંત્રિત કરવાના નિયમો, પ્રથાઓ અને પ્રક્રિયાઓના માળખા તરીકે વ્યાખ્યાયિત, કોર્પોરેટ ગવર્નન્સ સંસ્થાના સંચાલન, તેના ડિરેક્ટર બોર્ડ, શેરધારકો અને અન્ય હિસ્સેદારો વચ્ચેના સંબંધને મૂર્ત બનાવે છે. વધતી જતી વૈશ્વિકરણ અને એકબીજા સાથે જોડાયેલા વિશ્વમાં, મજબૂત કોર્પોરેટ ગવર્નન્સ અનિવાર્ય બની ગયું છે, ફક્ત સંગઠનાત્મક કામગીરી વધારવા માટે જ નહીં પરંતુ ગતિશીલ આર્થિક પરિદૃશ્યમાં હિસ્સેદારોના હિતોનું રક્ષણ કરવા માટે પણ.

કોર્પોરેટ ગવર્નન્સનો વિકાસ આર્થિક કટોકટી, નિયમનકારી સુધારાઓ, ટેકનોલોજીકલ પ્રગતિ અને બદલાતી સામાજિક અપેક્ષાઓ સહિતના પરિબળોના સંગમ દ્વારા પ્રેરિત થયો છે. એનરોન, વર્લ્ડકોમ અને 2008 ના વૈશ્વિક નાણાકીય કટોકટી જેવા સીમાચિહ્નરૂપ કોર્પોરેટ કૌભાંડોએ શાસન નિષ્ફળતાઓના ભયંકર પરિણામો પર ભાર મૂક્યો છે, જેના કારણે વિશ્વભરમાં નિયમનકારી હસ્તક્ષેપોને વેગ મળ્યો છે. તે જ સમયે, પર્યાવરણીય, સામાજિક અને શાસન (ESG) ચિંતાઓના ઉદભવથી નાણાકીય કામગીરી ઉપરાંત કોર્પોરેટ ગવર્નન્સનો વ્યાપ વિસ્તૃત થયો છે, જેમાં ટકાઉપણું અને નૈતિક નિર્ણય લેવા પર ભાર મૂકવામાં આવ્યો છે.

આ પરિચય ડિજિટલ પરિવર્તન, વૈશ્વિકરણ અને આબોહવા પરિવર્તન જેવા સમકાલીન પડકારોનો સામનો કરવામાં કોર્પોરેટ ગવર્નન્સના મહત્વની શોધ કરે છે, સાથે સાથે જવાબદારી અને પારદર્શિતાની સંસ્કૃતિને પ્રોત્સાહન આપે છે. 21મી સદીમાં કોર્પોરેટ ગવર્નન્સના સિદ્ધાંતો, પ્રથાઓ અને પડકારોની તપાસ કરીને, આ અભ્યાસનો ઉદ્દેશ્ય તેના ગતિશીલ ઉત્ક્રાંતિ અને વ્યવસાય અને સમાજના ભવિષ્યને આકાર આપવામાં તેની ભૂમિકા વિશે આંતરદૃષ્ટિ પ્રદાન કરવાનો છે.

કોર્પોરેટ ગવર્નન્સનો ઐતિહાસિક સંદર્ભ

કોર્પોરેટ ગવર્નન્સનો ઐતિહાસિક સંદર્ભ વેપાર અને વાણિજ્યના પ્રાથમિક મિકેનિઝમથી લઈને આજે પ્રવર્તમાન અત્યાધુનિક સિસ્ટમો સુધીના તેના વિકાસને પ્રતિબિંબિત કરે છે. કોર્પોરેટ ગવર્નન્સનો ઉદ્ભવ 17મી સદીમાં ઇસ્ટ ઇન્ડિયા કંપની જેવી સંયુક્ત-સ્ટોક કંપનીઓની સ્થાપના સાથે શોધી શકાય છે, જેણે શેર કરેલી માલિકી અને સામૂહિક નિર્ણય લેવાની વિભાવના રજૂ કરી હતી. 19મી સદીમાં, ઔદ્યોગિક મૂડીવાદ અને જાહેરમાં વેપાર થતી કોર્પોરેશનોના ઉદયને કારણે માલિકી અને સંચાલન

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વચ્ચે વિભાજન વધ્યું, જે શેરધારકોના હિતોનું રક્ષણ કરવા માટે દેખરેખ પદ્ધતિઓની જરૂરિયાત પર ભાર મૂકે છે. 20મી સદીમાં મહત્વપૂર્ણ સીમાચિહ્નો જોવા મળ્યા, જેમાં 1933 ના યુ.એસ. સિક્યોરિટીઝ એક્ટ અને 1934 ના સિક્યોરિટીઝ એક્સચેન્જ એક્ટ જેવા નિયમનકારી માળખાની સ્થાપનાનો સમાવેશ થાય છે, જેનો હેતુ કોર્પોરેટ ગેરવર્તણૂકને રોકવા અને પારદર્શિતાને પ્રોત્સાહન આપવાનો હતો. 2000 ના દાયકાની શરૂઆતમાં એનરોન અને વર્લ્ડકોમના પતન જેવા કોર્પોરેટ છેતરપિંડીના સીમાચિહ્નરૂપ કિસ્સાઓએ મજબૂત શાસન નીતિઓની મહત્વપૂર્ણ જરૂરિયાત પર ભાર મૂક્યો, જેના પરિણામે 2002 ના સાર્બેન્સ-ઓક્સલી એક્ટ જેવા સુધારા થયા. કોર્પોરેટ શાસનનો ઐતિહાસિક માર્ગ તેના બહુપરીમાણીય પ્રણાલીમાં પરિવર્તનને દર્શાવે છે જે વિકસિત આર્થિક, સામાજિક અને તકનીકી પડકારોને સંબોધે છે.

કોર્પોરેટ ગવર્નન્સનો ઐતિહાસિક વિકાસ આર્થિક અને સામાજિક વિકાસ સાથે ઊંડે સુધી જોડાયેલો છે. શરૂઆતના દિવસોમાં, શાસન અનૌપચારિક હતું, જે વ્યવસાયિક ભાગીદારો વચ્ચે વિશ્વાસ અને વ્યક્તિગત સંબંધો પર આધાર રાખતું હતું. 17મી અને 18મી સદીમાં સંયુક્ત-સ્ટોક કંપનીઓનો ઉદભવ એક વળાંક હતો, કારણ કે વ્યવસાયોએ બહુવિધ રોકાણકારો પાસેથી મૂડી એકઠી કરવાનું શરૂ કર્યું. આ સમયગાળામાં શેરધારકોનું પ્રતિનિધિત્વ કરવા માટે ગવર્નિંગ બોર્ડની રચના પણ જોવા મળી, જેનાથી આધુનિક બોર્ડ માળખા માટે પાયો નાખ્યો. ઔદ્યોગિક ક્રાંતિએ મોટા, જટિલ કોર્પોરેશનોના વિકાસને આગળ ધપાવીને શાસનને વધુ આકાર આપ્યો. આ વિસ્તરણ સાથે માલિકી (શેરધારકો) અને નિયંત્રણ (મેનેજરો) ના વિભાજનનું સંચાલન કરવા માટે ઔપચારિક પ્રણાલીઓની જરૂર પડી.

20મી સદીમાં, અર્થતંત્રો વૈશ્વિકરણ પામતા અને બજારો વધુ એકબીજા સાથે જોડાયેલા બનતા કોર્પોરેટ ગવર્નન્સનો નોંધપાત્ર વિકાસ થયો. 1930ના દાયકાની મહામંદીએ કોર્પોરેટ જવાબદારીમાં નબળાઈઓ ઉજાગર કરી, જેના કારણે જાહેરાત લાગુ કરવા અને રોકાણકારોનું રક્ષણ કરવા માટે યુ.એસ. સિક્યોરિટીઝ એન્ડ એક્સચેન્જ કમિશન (SEC) ની સ્થાપના જેવા સુધારા થયા. બીજા વિશ્વયુદ્ધ પછીના આર્થિક વિકાસે બહુરાષ્ટ્રીય કોર્પોરેશનોના યુગની શરૂઆત કરી, જ્યાં શાસન પ્રણાલીઓ વૈશ્વિક સ્તરે અલગ થવા લાગી. ઉદાહરણ તરીકે, એંગ્લો-અમેરિકન મોડેલે શેરધારકોના મૂલ્યને પ્રાથમિકતા આપી, જ્યારે યુરોપિયન અને જાપાની મોડેલોએ હિસ્સેદારોની સમાવેશકતા પર ભાર મૂક્યો.20મી સદીના અંત સુધીમાં, ટેકનોલોજીકલ નવીનતા અને કોર્પોરેટ સામાજિક જવાબદારી (CSR) પ્રત્યે વધતી જતી જાહેર જાગૃતિ દ્વારા શાસન માળખાને ફરીથી આકાર આપવામાં આવી રહ્યો હતો. એનરોન, પરમાલત અને સત્યમ જેવા હાઇ-પ્રોફાઇલ કોર્પોરેટ કૌભાંડોએ પ્રણાલીગત ખામીઓ જાહેર કરી અને વિશ્વભરમાં કડક નિયમનકારી પગલાં લીધાં, જેમાં યુકેનો સંયુક્ત કોડ અને ભારતના કલમ 49નો સમાવેશ થાય છે. આ ઘટનાઓએ માત્ર આંતરિક નિયંત્રણોને મજબૂત બનાવ્યા નહીં પરંતુ નૈતિક નેતૃત્વ અને જવાબદારી પર પણ ભાર મૂક્યો, જે સામાજિક ભલા માટેના સાધન તરીકે શાસનની વ્યાપક સમજણની શરૂઆત દર્શાવે છે.

21મી સદીમાં, કોર્પોરેટ ગવર્નન્સનો વિકાસ ચાલુ રહ્યો છે, જેમાં વૈશ્વિક શ્રેષ્ઠ પ્રથાઓ, ESG વિચારણાઓ અને તકનીકી પ્રગતિનો સમાવેશ થાય છે. તે ફક્ત જોખમો ઘટાડવાથી આગળ વધીને ટકાઉ વિકાસ અને હિસ્સેદારોના વિશ્વાસનું પ્રેરક બની ગયું છે.

કોર્પોરેટ ગવર્નન્સના મુખ્ય સિદ્ધાંતો

કોર્પોરેટ ગવર્નન્સ ચાર મુખ્ય સિદ્ધાંતો પર આધારિત છે: જવાબદારી, પારદર્શિતા, ન્યાયીતા અને જવાબદારી. જવાબદારી ખાતરી કરે છે કે નિર્ણય લેવાની ભૂમિકામાં રહેલા લોકો હિસ્સેદારો પ્રત્યે જવાબદાર હોય, વિશ્વાસ અને નૈતિક વર્તનને પ્રોત્સાહન આપે. પારદર્શિતામાં હિસ્સેદારોને સંસ્થાના કાર્યો વિશે સચોટ અને સમયસર માહિતી પૂરી પાડવાનો સમાવેશ થાય છે, જાણકાર નિર્ણય લેવાનું સક્ષમ બનાવે છે અને ગેરવર્તણૂકનું જોખમ ઘટાડે છે. નિષ્પક્ષતા બધા હિસ્સેદારો સાથે સમાન વર્તન પર ભાર મૂકે છે, ખાતરી કરે છે કે કોઈ પણ જૂથને અયોગ્ય રીતે તરફેણ કરવામાં ન આવે અથવા હાંસિયામાં ધકેલી દેવામાં ન આવે. અંતે, જવાબદારી નૈતિક નિર્ણય લેવા, કાયદાઓનું પાલન અને ટકાઉ પ્રથાઓના અનુસરણના મહત્વને પ્રકાશિત કરે છે. સાથે મળીને, આ સિદ્ધાંતો એક માળખું બનાવે છે જે વિવિધ હિસ્સેદારોના હિતોનું રક્ષણ કરતી વખતે સંસ્થાઓની લાંબા ગાળાની સફળતા અને સ્થિતિસ્થાપકતાને સમર્થન આપે છે.

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કોર્પોરેટ ગવર્નન્સના મુખ્ય સિદ્ધાંતો સંસ્થાઓના નૈતિક અને અસરકારક સંચાલનનો પાયો બનાવે છે. જવાબદારી એ એક પાયાનો પથ્થર છે, જેના માટે ડિરેક્ટરો અને અધિકારીઓને શેરધારકો અને અન્ય હિસ્સેદારો સમક્ષ તેમના નિર્ણયો અને ક્રિયાઓને ન્યાયી ઠેરવવાની જરૂર પડે છે. આ વિશ્વાસની સંસ્કૃતિને પ્રોત્સાહન આપે છે અને ખાતરી કરે છે કે સત્તાનો દુરુપયોગ ન થાય. પારદર્શિતા સંસ્થાના નાણાકીય સ્વાસ્થ્ય, શાસન નીતિઓ અને વ્યૂહાત્મક દિશા વિશે સ્પષ્ટ, પ્રામાણિક અને સમયસર સંદેશાવ્યવહારને ફરજિયાત કરીને જવાબદારીને પૂરક બનાવે છે. તે ખોટી માહિતી અથવા છેતરપિંડી સાથે સંકળાયેલા જોખમોને ઘટાડવામાં મદદ કરે છે.

ન્યાયીતા એ સુનિશ્ચિત કરે છે કે બધા હિસ્સેદારો – શેરધારકો, કર્મચારીઓ, ગ્રાહકો, સપ્લાયર્સ અને સમુદાય – ના અધિકારો અને હિતોને માન્યતા આપવામાં આવે અને તેમનો આદર કરવામાં આવે. તેમાં ન્યાયી નિર્ણય લેવાની પ્રક્રિયાઓ, હિતોના સંઘર્ષને ટાળવા અને નિષ્પક્ષતાથી ફરિયાદોનું નિરાકરણ કરવાનો સમાવેશ થાય છે. જવાબદારી કાનૂની અને નિયમનકારી માળખાના પાલનથી આગળ વધે છે; તેમાં નૈતિક વર્તન, સક્રિય જોખમ વ્યવસ્થાપન અને ટકાઉ વ્યવસાયિક પ્રથાઓનો સમાવેશ થાય છે જે લાંબા ગાળાના સામાજિક અને પર્યાવરણીય પ્રભાવોને ધ્યાનમાં લે છે.

આ સિદ્ધાંતો પરસ્પર નિર્ભર છે અને સ્થિતિસ્થાપકતા બનાવવા, નવીનતાને પ્રોત્સાહન આપવા અને ટકાઉ વિકાસ પ્રાપ્ત કરવામાં સંસ્થાઓને સામૂહિક રીતે માર્ગદર્શન આપે છે. આ સિદ્ધાંતોને તેમના શાસન માળખામાં સમાવિષ્ટ કરીને, કંપનીઓ હિસ્સેદારોનો વિશ્વાસ વધારી શકે છે, રોકાણ આકર્ષિત કરી શકે છે અને વધુને વધુ જટિલ અને એકબીજા સાથે જોડાયેલા વૈશ્વિક અર્થતંત્રમાં કાર્ય કરવા માટે તેમના સામાજિક લાઇસન્સ જાળવી શકે છે.

વૈશ્વિક માળખા અને શ્રેષ્ઠ પ્રથાઓ

કોર્પોરેટ ગવર્નન્સમાં વૈશ્વિક માળખા અને શ્રેષ્ઠ પ્રથાઓ વ્યવસાયોને નૈતિક, પારદર્શક અને જવાબદાર પ્રણાલીઓ સ્થાપિત કરવા માટે પાયો પૂરો પાડે છે. સૌથી પ્રભાવશાળી પૈકી OECD સિદ્ધાંતો ઓફ કોર્પોરેટ ગવર્નન્સ છે, જે પારદર્શિતા, શેરધારક અધિકારો અને બોર્ડ જવાબદારીઓ માટેના ધોરણોની રૂપરેખા આપે છે, જે વિશ્વભરમાં નીતિ વિકાસ માટે સંદર્ભ તરીકે સેવા આપે છે. કેડબરી રિપોર્ટ (1992), યુકેમાં એક સીમાચિહ્ન દસ્તાવેજ, સ્પષ્ટ બોર્ડ માળખાં અને નાણાકીય રિપોર્ટિંગની જરૂરિયાત પર ભાર મૂકે છે, જે પશ્ચિમી અર્થતંત્રોમાં કોર્પોરેટ ગવર્નન્સ માટે એક માપદંડ સ્થાપિત કરે છે. યુનાઇટેડ સ્ટેટ્સમાં, 2002 ના સાર્બેન્સ-ઓક્સલી એક્ટે કોર્પોરેટ છેતરપિંડી અટકાવવા માટે કડક નિયમનકારી આવશ્યકતાઓ રજૂ કરી, જે શાસન પ્રથાઓને નોંધપાત્ર રીતે અસર કરે છે. ભારત જેવા ઉભરતા બજારોએ જાહેરાત અને જવાબદારી સુધારવા માટે SEBI (સિક્યોરિટીઝ એન્ડ એક્સચેન્જ બોર્ડ ઓફ ઈન્ડિયા) નિયમો જેવા અનન્ય માળખા અપનાવ્યા છે. દરમિયાન, યુરોપિયન યુનિયને શેરહોલ્ડર રાઇટ્સ ડાયરેક્ટિવ લાગુ કર્યું છે, જે મજબૂત રોકાણકારોની ભાગીદારી અને દેખરેખને પ્રોત્સાહન આપે છે. આ માળખા, વૈવિધ્યસભર હોવા છતાં, વૈશ્વિક ધોરણો સાથે શાસન પ્રથાઓને સંરેખિત કરવાના મહત્વ પર સામૂહિક રીતે ભાર મૂકે છે, વ્યવસાયિક કામગીરીમાં વિશ્વાસ અને ટકાઉપણાને પ્રોત્સાહન આપે છે.

૨૧મી સદીમાં પડકારો

21મી સદીમાં કોર્પોરેટ ગવર્નન્સ ઝડપી ટેકનોલોજીકલ, સામાજિક અને ભૂ-રાજકીય પરિવર્તનોને કારણે બહુપક્ષીય પડકારોનો સામનો કરી રહ્યું છે. ટેકનોલોજીકલ વિક્ષેપે તકો અને નબળાઈઓ બંને રજૂ કર્યા છે; કૃત્રિમ બુદ્ધિ, બ્લોકચેન અને મોટા ડેટા જેવી નવીનતાઓએ નિર્ણય લેવાની અને પારદર્શિતામાં ક્રાંતિ લાવી છે પરંતુ સંસ્થાઓને નોંધપાત્ર સાયબર સુરક્ષા જોખમો અને ડેટા ભંગનો પણ સામનો કરવો પડ્યો છે. પર્યાવરણીય, સામાજિક અને શાસન (ESG) પરિબળો પર વધતા ભારને કારણે શાસન વધુ જટિલ બન્યું છે, જેના કારણે કંપનીઓને નફાકારકતા જાળવી રાખીને ટકાઉ અને સામાજિક રીતે જવાબદાર પ્રથાઓને એકીકૃત કરવાની જરૂર પડી છે. દરમિયાન, હિસ્સેદારોની સક્રિયતાએ વેગ પકડ્યો છે, રોકાણકારો, કર્મચારીઓ અને ગ્રાહકો કોર્પોરેશનો પાસેથી વધુ જવાબદારી અને નૈતિક વર્તનની માંગ કરી રહ્યા છે. વેપાર યુદ્ધો, નિયમનકારી ફેરફારો અને COVID-19 રોગચાળા જેવી વૈશ્વિક કટોકટી સહિત ભૌગોલિક રાજકીય અનિશ્ચિતતાઓએ એક અણધારી વ્યવસાયિક વાતાવરણ બનાવ્યું છે, જે

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સંસ્થાઓને ઝડપથી અનુકૂલન કરવા માટે પડકારજનક છે. અંતે, વૈશ્વિક પુરવઠા શૃંખલાઓ અને સરહદ પાર કામગીરીની વધતી જટિલતાએ વિવિધ કાનૂની, **સાંસ્કૃતિક અને આર્થિક વિચારણાઓને સંબોધવા સક્ષમ મજબૂત શાસન માળખાની જરૂરિયાતને** પ્રકાશિત કરી છે. **આ પડકારો આધુનિક યુગની જટિલતાઓને નેવિગેટ કરવા માટે ચપળ**, નવીન અને સમાવિષ્ટ શાસન મોડેલોની આવશ્યકતા પર ભાર મૂકે છે.

21મી સદી કોર્પોરેટ ગવર્નન્સ માટે અભૂતપૂર્વ પડકારો લઈને આવી છે, જેનું મુખ્ય કારણ ઝડપી ટેકનોલોજીકલ પ્રગતિ, બદલાતી સામાજિક અપેક્ષાઓ અને વૈશ્વિક અનિશ્ચિતતાઓ છે. ટેકનોલોજીકલ વિક્ષેપ એ સૌથી મહત્વપૂર્ણ પડકારોમાંનો એક છે, કારણ કે કૃત્રિમ બુદ્ધિ, બ્લોકચેન અને મોટા ડેટા એનાલિટિક્સ વ્યવસાયિક કામગીરીને ફરીથી આકાર આપે છે. જ્યારે આ **નવીનતાઓ પારદર્શિતા અને નિર્ણય લેવાની ક્ષમતામાં સુધારો કરવા માટે તકો પ્રદાન કરે છે**, ત્યારે તેઓ સાયબર સુરક્ષા જોખમો, ડેટા ભંગ અને AI **શાસન સંબંધિત નૈતિક દુવિધાઓ** જેવા જોખમો પણ રજૂ કરે છે. પર્યાવરણીય, સામાજિક અને શાસન (ESG) **માપદંડોનું એકીકરણ** પણ એક પડકાર બની ગયું છે, કારણ કે હિસ્સેદારો માંગ કરે છે કે કોર્પોરેશનો નાણાકીય કામગીરી સાથે સમાધાન કર્યા વિના આબોહવા પરિવર્તન, સામાજિક અસમાનતા અને નૈતિક પ્રથાઓને સંબોધે. આ અપેક્ષાઓને પૂર્ણ કરવા માટે ઘણીવાર નોંધપાત્ર રોકાણો, **કાર્યકારી ફેરફારો અને વિકસતા નિયમનકારી ધોરણોનું પાલન જરૂરી છે.**

બીજો એક મહત્વપૂર્ણ પડકાર હિસ્સેદારોની સક્રિયતા છે, જ્યાં શેરધારકો, કર્મચારીઓ અને ગ્રાહકો વધુને વધુ જવાબદારી, વિવિધતા અને ટકાઉપણાની હિમાયત કરી રહ્યા છે. કંપનીઓ હવે હિસ્સેદારોના હિતો સાથે તેમની વ્યૂહરચનાઓને સંરેખિત કરવા માટે વધુ પડતી ચકાસણી અને દબાણનો સામનો કરે છે, જેના કારણે તેમને ટૂંકા ગાળાના નફા અને લાંબા ગાળાના સામાજિક લક્ષ્યો વચ્ચે સંઘર્ષને પાર કરવાની જરૂર પડે છે. વેપાર યુદ્ધો, સંરક્ષણવાદી નીતિઓ અને COVID-19 રોગચાળા જેવા કટોકટીઓ **વૈશ્વિક પુરવઠા શૃંખલાઓ અને કાર્યકારી સાતત્યને વિક્ષેપિત કરતી હોવાથી**, ભૌગોલિક રાજકીય **અસ્થિરતા શાસનને વધુ જટિલ બનાવે છે.**

વૈશ્વિકરણના ઉદયથી સંસ્થાઓ વિવિધ કાનૂની અને સાંસ્કૃતિક વાતાવરણમાં ખુલી ગઈ છે, જેના કારણે વિવિધ આંતરરાષ્ટ્રીય ધોરણોનું પાલન એક જટિલ કાર્ય બની ગયું છે. તે જ સમયે, ડિજિટલ અર્થતંત્રે પરંપરાગત ઉદ્યોગ સીમાઓને ઝાંખી કરી દીધી છે, જેના કારણે બિન-**પરંપરાગત સ્પર્ધકોનો ઉદભવ થયો છે અને નવીન શાસન વ્યૂહરચનાઓની જરૂર પડી છે.** વધુમાં, કોર્પોરેટ કૌભાંડો અને ઉચ્ચ-પ્રોફાઇલ નિષ્ફળતાઓએ હિસ્સેદારો સાથે વિશ્વાસ પુનઃસ્થાપિત કરવા માટે મજબૂત આંતરિક નિયંત્રણો, **નૈતિક નેતૃત્વ અને પારદર્શક રિપોર્ટિંગની જરૂરિયાત પર ભાર મૂક્યો છે.**

છેલ્લે, **કોર્પોરેટ નેતૃત્વ અને નિર્ણય લેવાની પ્રક્રિયાઓમાં વિવિધતા**, સમાનતા અને સમાવેશ (DEI) પર વધતું ધ્યાન **શાસન પ્રાથમિકતાઓને ફરીથી વ્યાખ્યાયિત કરી રહ્યું છે.** વૈવિધ્યસભર અને એકબીજા સાથે જોડાયેલા વિશ્વની જટિલતાઓને નેવિગેટ કરવા માટે બોર્ડ પાસેથી વધુને વધુ દ્રષ્ટિકોણ, પૃષ્ઠભૂમિ અને કુશળતા પ્રતિબિંબિત થવાની અપેક્ષા રાખવામાં આવે છે. આ પડકારોનો સામનો કરવા માટે ભવિષ્યલક્ષી, ચપળ અને સ્થિતિસ્થાપક શાસન માળખાની જરૂર છે જે સતત પરિવર્તનના યુગમાં લાંબા ગાળાના મૂલ્યનું નિર્માણ કરવા માટે નૈતિક નેતૃત્વ, હિસ્સેદારોની સંલગ્નતા અને ટકાઉપણાને પ્રાથમિકતા આપે છે.

નિષ્કર્ષ

કોર્પોરેટ ગવર્નન્સનો વિકાસ વિવિધ ઐતિહાસિક, આર્થિક અને ટેકનોલોજીકલ પરિબળો દ્વારા આકાર પામ્યો છે, જેમાં પારદર્શિતા, **જવાબદારી અને ટકાઉપણું પર વધુને વધુ ધ્યાન કેન્દ્રિત કરવામાં આવી રહ્યું છે.** જેમ જેમ આપણે 21મી સદીમાં આગળ વધી રહ્યા છીએ, તેમ તેમ સંસ્થાઓને ટેકનોલોજીકલ વિક્ષેપની ઝડપી ગતિ, હિસ્સેદારોની સક્રિયતામાં વધારો અને પર્યાવરણીય, સામાજિક અને શાસન (ESG) પરિબળોનું વધતું મહત્વ જેવા નવા પડકારોનો સામનો કરવો પડી રહ્યો છે. **અસરકારક શાસન માળખાં અનુકૂલનશીલ હોવા જોઈએ, ડિજિટલ સાધનોને અપનાવવા જોઈએ અને એકબીજા સાથે જોડાયેલા વૈશ્વિક અર્થતંત્રમાં મજબૂત જોખમ વ્યવસ્થાપન સુનિશ્ચિત કરવા જોઈએ.** કોર્પોરેટ શાસનનું ભવિષ્ય નફા-કમાણીને નૈતિક વિચારણાઓ સાથે સંતુલિત કરવાની ક્ષમતામાં રહેલું છે, જે તમામ હિસ્સેદારો માટે લાંબા ગાળાના મૂલ્ય નિર્માણને પ્રોત્સાહન આપે છે. પારદર્શિતા, **ન્યાયીતા અને જવાબદારીને પ્રાથમિકતા આપીને, વ્યવસાયો માત્ર નિયમનકારી ધોરણોને પૂર્ણ કરી શકતા**

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નથી પરંતુ ઝડપથી બદલાતી દુનિયામાં વિશ્વાસ અને સ્થિતિસ્થાપકતા પણ બનાવી શકે છે.જેમ જેમ કોર્પોરેટ ગવર્નન્સનો વિકાસ થતો રહે છે, તેમ તેમ તે સંસ્થાઓમાં વિશ્વાસ, સ્થિરતા અને લાંબા ગાળાની સફળતાને પ્રોત્સાહન આપવા માટે એક મહત્વપૂર્ણ પરિબળ તરીકે વધુને વધુ ઓળખાય છે. વૈશ્વિકરણ, તકનીકી નવીનતા અને બદલાતી સામાજિક અપેક્ષાઓનો સામનો કરીને, શાસન માળખા વધુ લવચીક અને આગળ વિચારશીલ બનવા જોઈએ. પર્યાવરણીય, સામાજિક અને શાસન (ESG) વિચારણાઓનું એકીકરણ હવે વૈકલ્પિક નથી પરંતુ વધુ સભાન વૈશ્વિક બજારની માંગણીઓને પૂર્ણ કરતી વખતે સ્પર્ધાત્મક રહેવા માંગતા સંગઠનો માટે આવશ્યક છે. વધુમાં, ડિજિટલ તકનીકોના ઉદય સાથે, કંપનીઓને તકો અને જોખમો બંનેનો સામનો કરવો પડે છે જેને નેવિગેટ કરવા માટે અત્યાધુનિક શાસન પદ્ધતિઓની જરૂર પડે છે, જેમાં સાયબર સુરક્ષા, ડેટા ગોપનીયતા અને અલ્ગોરિધમિક જવાબદારીનો સમાવેશ થાય છે.

આખરે, કોર્પોરેટ ગવર્નન્સનું ભવિષ્ય ઝડપથી બદલાતી દુનિયામાં અનુકૂલન સાધવાની તેની ક્ષમતા પર નિર્ભર રહેશે. નવી ટેકનોલોજી અપનાવીને, નિયમનકારી માળખાને વધારીને અને જવાબદારી અને ન્યાયીપણાની સંસ્કૃતિને પ્રોત્સાહન આપીને, સંસ્થાઓ વધુ ટકાઉ અને સમાવિષ્ટ વૈશ્વિક વ્યવસાય વાતાવરણ માટે માર્ગ મોકળો કરી શકે છે. જેમ જેમ શાસન પ્રથાઓ પરિપક્વ થતી જાય છે, તેમ તેમ લાંબા ગાળાના મૂલ્ય નિર્માણ, હિસ્સેદારોની ભાગીદારી અને નૈતિક નેતૃત્વને પ્રાથમિકતા આપતા વ્યવસાયો 21મી સદીની જટિલતાઓમાં ખીલવા માટે શ્રેષ્ઠ સ્થિતિમાં રહેશે.

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ROADS TO RUIN OR PATHS TO PROGRESS: RETHINKING TRANSPORTATION IN INDIAN CITIES

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Abstract

Transportation systems in India's metropolitan areas face significant challenges such as traffic congestion, air and noise pollution, crowding, and irrational use of space. Bangalore is the second most traffic-congested city globally, with commuting times for 5 km being nearly 19 minutes during peak hours. Motor vehicles are responsible for 40-51% of air pollution in Indian cities. The working population is also exposed to high noise pollution, particularly in Moradabad and Kolkata. Car-dominated thinking has hindered the development of efficient transport measures, leading to negative impacts such as traffic congestion, poor citizens' health, ineffective land use, and urban flooding.

Most of the Indian cities are constrained by traffic jam issues and pollution. The complicating attributes of urban transportation include pollution, land utilization, and road safety hazards discussed in this paper. This study also synthesizes present patterns and assesses global role models to suggest a strategic framework for the refashioning of transportation systems. Much importance is given to the reduction of car usage, promoting the use of green public transport, increasing density within cities, and the application of new models of resource-fit cities like the “15-minute city”concept. Cities like Paris, Singapore, and Glasgow have implemented policies that show the transition towards sustainable transport is possible.

A change in decision-making is also advocated in the article, with a focus on group mobility. Indian cities may reduce traffic and pollution and enhance living standards by imagining new transportation systems and walking-centric settings. In India's future cities, a shift to sustainable transportation is crucial for both social advancement and long-term economic growth.

Keywords: The 15-Minute City Concept, Road Diets and Urban Greening, Public Transport Expansion, Car-Free Zones, Air Pollution, Noise Pollution.

Introduction

Day-to-day issues in Indian cities are traffic congestion, noise pollution, air pollution, overcrowding, and vehicle emissions constitute the primary contributors. The TomTom Traffic Index 2022 puts Bangalore in the second position of most traffic-congested cities in the world, thus illustrating the situation more prevailing across urban centers of the country. Cars, though a status symbol for many, take more space in roads, strongly contribute towards pollution and, therefore, degrade liveability in cities. While electric cars resolve the problem of exhaust emissions, they still cannot solve particulate pollution through tire wear and brake dust. Solutions include car-free zones, encouraging public transport, and the "15-minute city" idea—where most essential services can be reached within walking distance—offering a sustainable alternative. Examples from Paris, Glasgow, and Singapore show the possibilities of changing urban spaces into pedestrian, cycling, and green-friendly zones. These changes in Indian cities would bring about a great deal of improvement in the quality of life, reduce pollution, and control urban flooding caused by over-concretization. However, this is accompanied by the need to have efficient public transport systems; the cultural shift towards sustainable mobility is also equally important for creating more livable cities. Change is resisted by some, but the benefits of such systems cannot be

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ignored. People tend to underestimate the positive impact that these developments can have on urban life because they provide not only convenience but also contribute to environmental well-being.

Urbanization in India has led to significant changes in the landscape of its cities, but one persistent challenge remains: transportation. Mass ownership of automobiles, a lack of efficient public transport systems, and uncontrolled urban expansion have been identified as some of the factors augmenting traffic congestion, poor air quality, and standards of living. Therefore, this paper aims to discuss several current transportation practices and their impact and provide possible and plausible solutions for those issues.

Review of literatures

ARAI and TERI

According to a 2018 study by ARAI and TERI, motor vehicles are the main source of pollutants in Delhi, accounting for almost 40% of PM 2.5 emissions, which are a major cause of the poisonous air in the city. Road dust accounts for 4% of air pollution, while road construction activities account for 7% - according to the CSE's 2022 research. These have an indirect connection to cars as well. Roads are the cause of road dust. There is a lot of highway and road construction going on. For other Indian cities, the same tale is now much more true, such as Kolkata, Bangalore, and Mumbai, where there is no problem with stubble burning.In Haryana and Punjab, stubble burning is frequently held accountable while discussing Delhi. The fields are affected by the fires. Without a doubt, this is a significant contributor to air pollution. However, a 2022 study by the Centre for Science and Environment found that, out of all the local sources, vehicle emissionscontribute the most. Vehicle smoke is the primary source of 51% of Delhi's air pollution. Approximately 1.5 lakh individuals lose their lives on Indian roads each year, according to NCRB 2021. This equates, on average, to 47 accidents and 18 fatalities per hour or 1130 accidents and 422 fatalities per day. This could be due to a variety of factors. Driving while intoxicated distracted, or exceeding the speed limit are all caused by automobiles. According to Gaon connection "Transport sector is the most significant contributor to air pollution in Mumbai."People have been talking about plans and ideas on how to make the cities more green and the eco-friendly solution seems to be focusing on more transport and better planning of the area. A very amusing topic called the '15-minute city' is being taken up in discussion by some city planners and big thinkers. It is mostly about having tiny regions where you could just stroll around the corner to get to the shops or schools, so no one needs to drive a lot. Paris and some other cities are trying to test it out and see what happens. Then, we have cities like Singapore and Poland saying that 'no more cars here' with their car-free zones and limits on the number of cars allowed.

According to National Family Health Survey 5 was conducted between 2019 and 2021. Only 8% of Indian families own cars and the traffic is this bad already. Imagine if this number reaches 50-60% instead of a mere 8%, then how many more cars will see in our cities? How many more roads will have to build for them? How bad will the overcrowding, traffic, and air pollution be? As per this survey, more than 50% of households in our country own a cycle, and more than 50% own a motorcycle or two-wheeler. This is good news from this perspective because cycles and motorcycles don't take up that much space.

The problem of flooding

In the rainy seasons, the roads of our cities often get converted into rivers. A big reason behind this is that there is no proper drainage system. But apart from this, there is another big reason in the cities, the areas for water to flow out, keep on disappearing. The more concrete is laid on the ground, the more roads are laid, the more water will not be able to flow into the ground. Rainwater will only go into the ground when there is soil, grass, or any natural landscape above the ground. So this means that building big roads, highways, and flyovers in cities will always increase the chances of flooding.

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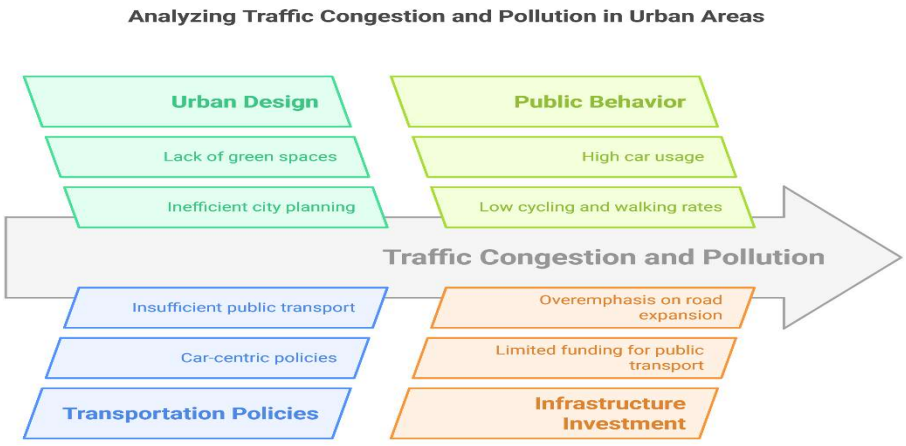
Objectives

1. Address Urban Issues: Examine how pollution, traffic jams, and overcrowding affect Indian cities.
2. Encourage Sustainable Solutions: To make cities more liveable, investigate options including walking, bicycling, public transportation, and car-free zones.
3. Suggestions for Policies: Recommend ways to improve green, sustainable city development and lessen reliance on cars.

Methodology

The theoretical article is mostly based on secondary data that was gathered from many websites, databases, journals, and other accessible sources. Evaluated traffic congestion, pollutant levels, and their underlying causes using reports and studies from reliable sources such as the TomTom Traffic Index, the Centre for Science and Environment (CSE), ARAI, and TERI. studied the effective application of sustainable urban design, car-free zones, and traffic-reduction techniques in cities throughout the world, including Paris, Singapore, and Glasgow. examined city policies, infrastructure spending, and the impact of induced demand on traffic and pollution in Indian cities, supplemented by surveys and national-level data from the NFHS and NCRB. Evaluated alternative transport solutions (e.g., public transport, cycling, walking) and the "15-minute city" concept to address urban challenges. Highlighted real-world outcomes from initiatives in cities during the COVID-19 lockdown, showcasing how reduced vehicular activity impacts pollution and urban quality of life.

What is traffic? Traffic is made up of trucks, buses, motorbikes, and cars. Of all of them, traffic is mostly caused by cars. Cars take up a lot of road space. How broad will the roadways have to be? How many additional roads will need to be created merely to accommodate cars? And in Indian cities, where population density is already high, these challenges become much more pressing since space is so valuable. Should we use city land to create public spaces such as parks, gardens, and walking paths? Or should we build highways for automobiles in that area? The rationale is simple: instead of vehicles, if people in cities utilize buses, metros, cycles, or even walk more, the traffic will be reduced in our cities. And the more people use cars, the more roads will need to be built and less space will be left for our things.



15-minute city concept: Most individuals utilize their automobiles to get from home to work, school, or retail centers, marketplaces, and movie theatres in 95% of situations. What if these few items were within walking distance of our house? Markets, retail centers, schools, and offices are all within walking distance. One could just take a ten-minute stroll. The 15-minute city concept is the name given to this idea. Today, cities like Paris are attempting to put it into practice. It's a rather simple method of getting rid of vehicles in a city. Almost everything in a city is accessible to everyone within a 15-minute walking radius. It is accessible by bicycle or foot. Automobile use will inevitably decrease.In the name of

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modernization, we have constructed cities such that people must utilize vehicles to go around and complete their everyday tasks. Paris, the capital of France, has devised a new plan to construct schools for kids in every neighborhood. To create parks and gardens, parking will be eliminated and roads will be cleaned. Every city dweller should have access to parks, playgrounds, and schools in the vicinity of their home. Consider how stunning a city would appear if this were to occur.

Theoretical Overview

Traffic congestion, air pollution, noise pollution, and urban floods are all interconnected challenges affecting densely populated Indian cities such as Bangalore, Delhi, and Mumbai. In addition to contributing to time loss, inefficiencies in city planning, and environmental damage, vehicular emissions account for more than half of Delhi's air pollution. Even though just 8% of Indian families own a car, traffic is overwhelming, and bigger roads encourage greater automobile use while not reducing congestion. Solutions such as automobile-free zones, public transportation improvements, and the "15-minute city" idea showcase sustainable urban design strategies that prioritize less car reliance for greener, more liveable cities.

Findings

When discussing noise pollution: last year, the United Nations Environment Program published a report on the world's noisiest cities. Moradabad, Kolkata, Asansol, Delhi, and Jaipur are among the noisiest cities in the world.

Top five noisiest cities in the world.

Sr. no.	City	Country	Noise pollution
1	Dhaka	Bangladesh	119 dB
2	Moradabad	India	114 dB
3	Islamabad	Pakistan	105 dB
4	Rajshahi	Bangladesh	103 dB
5	Ibadan	Nigeria	101 dB

Another report states that motor vehicles are the number one source of noise pollution in cities. One can also observe this personally the amount of honking noise we hear in Indian subcontinent cities is not heard in any other region of the world. So there is no doubt about this, whether it is air pollution or noise pollution, the biggest contribution here is motor vehicles and cars.

According to the 2023 UK study (The Guardian): In nations such as the United Kingdom, smoke from exhaust pipes is no longer the primary source of air pollution. Tire dust is the primary source. Tire and brake wear is the cause of 52% of the tiny particle pollution brought on by road transportation. Air pollution is caused by tiny particles that are created on the road by friction when an automobile is driven. Following this comes the smoke released from the exhaust, which contributes just 15% to air pollution.This implies that just 15% of pollution will be decreased if we use electric vehicles. Road abrasion, brake wear, and tire dust will all continue to contribute to air pollution. This explains why the air in many cities was cleaner during the epidemic and lockdowns than it had been in previous decades. After a few decades, residents of Kathmandu, Nepal, were able to see Mount Everest from the city. The Philippines' Manila experiences the same situation. On the horizon was a well-known peak. Wild boars were spotted wandering the streets of Barcelona, Spain. Coyotes were spotted in Francisco. What caused all of this? Since automobiles had vanished from urban areas. During the lockdown, PM 2.5 levels in Indian cities decreased by over 50%.

Recommendation OR Solutions

The genuine solution should be implemented step by step. There are several such stages. To improve and make our cities more livable, let's talk about each of these options individually. Finding the busiest and most populated places and banning cars from them is the first step. Specifically, automobiles

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must be prohibited from particular regions. A common illustration of this would be any crowded market that receives a lot of high traffic, which causes the inside to become extremely packed.

The second stage is to find routes in a city where automobiles are rarely seen. Cars should be banned from certain specific roads. Additionally, bicycles and pedestrians should be allowed on certain roadways.

This is an issue that some industrialized countries have previously acknowledged and are striving to solve. The following are a few global examples. Cars were permitted in Poland in 2013, but by 2022, it was designated for walkers and bicycles exclusively, and by 2023, trees had been planted, and the route had become a pleasant walking area. Another example is Glasgow in 2016, which had 3-4 automobile lanes. Following the closure of two lanes, a lane was dedicated for bicycles, and trees were planted. By making the road smaller, there was more space in the city to plant trees.

The third option, which may seem counterintuitive given our belief that we should enlarge the roadways, is to make them smaller. There will be more greenery in the city, more room for trees to thrive, and more walking space for people if the roads are made narrower for cars.

There were a lot of vehicles on Spanish highways in 1980. The state of the roads in Spain was the same as it is today in India. The metamorphosis that occurred in Spain in 2020 demonstrates how lovely a city begins to seem when vehicles are outlawed.

People would be less likely to drive if there were more vegetation and space for public walks and bicycles on the roadways. It would encourage more people to walk or use bicycles. Roads are formerly surrounded by greenery. As a result, there will be less traffic and automobile noise. Walking to every location at all times is not feasible in every circumstance. That's accurate, which brings us to the fourth solution: the government should invest more in public transportation and less in constructing highways for private vehicles. Although it will take time to accomplish this medium- to long-term strategy, the government should plan to do so.

Opinion

Cars fit in places with a smaller population. But in cities where the population density is very high, buses, trains, metros, trams, cycles, walking, and taxes should be allowed.

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A CONCEPTUAL STUDY ON IMPLICATIONS OF GREEN FINANCE IN INDIA

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Abstract

Green financing plays a crucial role in combating climate change by reducing its risks and impacts. It channels investments into environmentally sustainable businesses and infrastructure, fostering long-term growth and ecological resilience. Instruments such as green bonds, indexed insurance products, and institutional investments support the shift toward a low-carbon economy. This study explores the strategic significance of green finance in India's real estate and construction sectors, emphasizing its potential to align with global sustainability standards. Additionally, the research examines strategies to encourage green finance adoption while addressing challenges like greenwashing and regulatory uncertainty.

Keywords: Green Finance, Sustainable Development, Environmental Implications

Introduction

Green finance refers to investments that support environmentally friendly initiatives, such as renewable energy projects and energy-efficient buildings. It promotes environmental sustainability while driving economic growth, generating a "green multiplier effect" that benefits both businesses and society. This essay examines the impact of green financing on India's evolving economic and environmental landscape.

Problem Statement

Invest Green financing goes beyond conventional financial models by prioritizing investments aligned with environmental sustainability. In India, this transition is essential to tackling the growing challenges of urbanization, resource depletion, and climate change. The construction and real estate industries, in particular, need innovative approaches to integrate green funding effectively.

Green financing is a strategic approach to capital allocation, not merely a financial concept. This strategy will allocate funding to programs and projects that mitigate the adverse impacts of climate change while promoting environmental sustainability. The primary goal of green financing is to ensure that every financial investment contributes to an environmentally conscious and more sustainable future. In the current context, where environmental awareness is crucial, the building and real estate sectors stand at a turning point. With growing concerns about climate change and the rising demand for sustainable living environments, India will proactively employ green finance as a transformative strategy to drive ecologically conscious enterprises. A key aspect of this transformation will be the commitment to environmental stewardship.

Literature Review

(Payal, 2023) Focusing on energy efficiency, this study examines the potential of green finance in reducing carbon emissions in India. Utilizing provincial data from 2017–2022, it applies the STIRPAT model, a chain multiple mediation effect model, and a panel threshold model. The findings indicate that green finance significantly lowers carbon emissions, particularly in northern, high-emission, and energy-abundant regions. The study identifies three key mechanisms: green technology innovation, industrial

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ecological transformation, and their combined effect. While all three factors contribute in energy-rich areas, green innovation emerges as the primary driver in energy-deficient regions.

(S. Bhatnagar, 2022)The development of Green Finance (GF) and its increasing importance in sustainable financial systems are examined in this paper. It analyzes GF's academic growth using bibliometric analysis of Scopus data (1997–2021) and pinpoints important facilitators in ten areas, such as financial policies, investment climate, technology, and regulatory frameworks. The results add to the body of knowledge about GF and point up areas that require more investigation.

(Gagan Sharma, 2022)The development of Green Finance (GF) and its expanding significance in sustainable financial systems are examined in this study. It evaluates GF's academic development and identifies important facilitators in eleven domains, such as financial policies, investment climate, technology, and laws, using bibliometric analysis of Scopus data (1997–2021). The results identify areas for more investigation and add to the body of knowledge about GF.

(Anna Geddes, 2018) Addressing climate change requires the rapid adoption of low-carbon energy technologies, but a significant funding gap remains. Policymakers worry that large-scale investments may be too slow. State investment banks (SIBs) can help bridge this gap by leveraging private finance. This study, based on 52 interviews, examines how three SIBs—the GIB (UK), KfW (Germany), and CEFC (Australia)—overcome financing challenges. Beyond funding and risk reduction, SIBs foster financial sector learning, build trust, and play a key role in establishing project credibility.

Ecological Integration

Green finance accelerates India's transition to a low-carbon economy through investments in:

1. The Essence of Green Financing
   Green financing is more than a buzzword; it serves as a strategic financial approach that allocates capital to projects promoting environmental sustainability and mitigating the adverse effects of climate change. By directing funds to environmentally beneficial projects, green financing plays a crucial role in fostering sustainable and eco-conscious living environments.
   This approach is critical for India as it actively reduces its carbon footprint and aligns with international standards on environmental responsibility.
2. Providing Energy-Efficient Buildings
   Investing in energy-efficient buildings is a core element of green financing. These buildings are designed to use minimal energy while ensuring optimal living spaces. India's real estate and construction sectors recognize the importance of energy-efficient buildings and actively incorporate modern HVAC systems, effective lighting designs, and advanced insulation materials. These investments not only lower energy consumption but also reduce utility costs for residents, making them an attractive option for homeowners. By reducing carbon emissions, energy-efficient buildings contribute to environmental preservation and help India achieve its energy efficiency goals outlined in national and international sustainability initiatives. Green finance simplifies resource allocation for investors and developers to support these projects.
3. Engaging in Renewable Energy Projects:
   Renewable energy leads the green financing revolution. India is making remarkable strides toward achieving energy sustainability by harnessing solar and wind power. Green financing is essential in providing the funds necessary for developing renewable energy projects such as solar and wind installations. These initiatives are central to combating climate change by reducing greenhouse gas emissions and decreasing reliance on fossil fuels. Beyond environmental benefits, renewable energy projects generate economic growth and create job opportunities, particularly in rural areas where many installations are located.
4. Fostering Sustainable Urban Development:
   With rapid urbanization, India's building and real estate sectors are embracing sustainable urban development. Green financing drives this transition by funding initiatives that promote eco-friendly, efficient, and socially inclusive urban environments. These projects include green

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spaces, energy-efficient infrastructure, and integrated public transit networks. Sustainable urban development reduces traffic, pollution, and resource consumption while enhancing livability. Green financing ensures the design and development of these sustainable urban projects, aiding their successful implementation.

5. Minimizing the Carbon Footprint:
   India faces growing external pressure to reduce carbon emissions and address climate change. Through green financing, India takes proactive steps to minimize its carbon footprint by prioritizing energy-efficient construction, renewable energy projects, and sustainable urban development. These efforts collectively reduce emissions and ensure the availability of funds for eco-friendly initiatives. Green financing enables India to meet its commitments under global agreements like the Paris Accord, paving the way for a sustainable and environmentally responsible future. This approach is not only about emission reduction but also about shaping a sustainable and eco-sensitive nation.

Challenges in Developing Green Finance

Key obstacles include:

- Awareness and Education: Limited knowledge about green finance and its benefits.
- Data and Reporting: Inconsistent sustainability metrics hinder informed decision-making.
- Market Size and Liquidity: Green finance markets remain underdeveloped, increasing costs and risks.
- Regulatory Uncertainty: Evolving policies create unpredictability for investors.
- Greenwashing: Misrepresentation of projects as sustainable undermines trust.

Raising green finance, which funds socially and environmentally responsible and sustainable projects, faces several obstacles:

- Lack of Education and Awareness: Many financial institutions and investors remain unaware of the benefits of sustainable investing and the concept of green finance. Educating stakeholders and raising awareness about the societal and environmental impacts of investment decisions is essential.
- Data and Reporting: Evaluating the societal and environmental effects of investments and initiatives is challenging due to inconsistent availability and quality of sustainability data. Standardized reporting frameworks like the Sustainability Accounting Standards Board (SASB) and the Global Reporting Initiative (GRI) address this issue to some extent.
- Risk Assessment and Market Size and Liquidity: Green projects face unique risks such as regulatory changes, technological obsolescence, and reputational hazards, making risk assessment complex, particularly for innovative projects. Green finance markets, being smaller and less liquid than conventional ones, limit investor flexibility and increase transaction costs. Efforts to expand and deepen these markets are ongoing.
- Policy and Regulatory Uncertainty: Green finance is susceptible to an unpredictable regulatory environment. Changes in laws or regulations affecting the profitability of green investments can deter investors.
- Greenwashing: Some businesses or projects exaggerate their environmental or social responsibility to attract green funding. This makes it difficult for investors to differentiate genuine green investments from greenwashing practices.
- Capital Accessibility and Long-Term Commitment: Smaller enterprises, especially in emerging economies, often face limited access to green funding. Bridging this gap is critical to achieving broader environmental goals. Additionally, renewable energy and other green infrastructure projects require long payback periods, which may discourage investors seeking short-term returns.

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- Market Volatility and Diversification: The green finance market is vulnerable to external factors like energy price fluctuations, natural disasters, or geopolitical events, making portfolios more volatile. Limited availability of green assets further complicates the creation of well-diversified green investment portfolios, increasing the risk of asset concentration for investors.

Strategies to Promote Green Finance

Enhancing green finance adoption requires:

- Policy Alignment: Implementing principles such as the Green Bond Principles (GBP).
- Robust Business Cases: Highlighting profitability alongside environmental benefits.
- Public-Private Partnerships: Leveraging government incentives and collaborations.
- Transparency: Standardized reporting on environmental and financial impacts.
- Innovative Financing Tools: Introducing green bonds, loans, and impact investments.

Green finance focuses on allocating capital and financial resources to initiatives that benefit the environment and address climate change and other environmental challenges. It employs a wide range of financial tools and strategies designed to promote sustainability and minimize the environmental impact of economic activities. The key strategies for increasing green finance include:

Recognize the Fundamentals of Green Finance: Understand the rules and principles governing green finance, such as the Sustainable Banking Principles and the Green Bond Principles (GBP). Familiarity with these frameworks helps align projects with industry standards.

Create a Clearly Defined Green Strategy and Assess Environmental Impact: Define the project's goals, implications, and environmental benefits clearly. Lenders and investors seek detailed green strategies that demonstrate the project's contribution to sustainability objectives. Conduct comprehensive environmental impact assessments to measure the project's positive outcomes and present these findings to potential stakeholders.

Construct a Robust Business Case: Build a strong financial foundation for the initiative. Highlight the potential for profitability, cost savings, and revenue generation while maintaining a focus on sustainability.

Certifications and Standards: Obtain relevant certifications and adhere to sustainability standards, such as ISO 14001 for environmental management systems or LEED certification for buildings. These accreditations enhance the project's credibility.

Engage with ESG Investors: Explore investment opportunities with a focus on environmental, social, and governance (ESG) criteria. Many investors are increasingly drawn to projects aligned with ESG standards. Customize pitches to highlight the project’s adherence to these values.

Green Bonds and Loans: Consider issuing or applying for green bonds and loans, specifically designed to fund eco-friendly projects. These financial instruments attract investors seeking sustainable investment options.

Collaborations, Partnerships, Public Grants, and Incentive Programs: Collaborate with NGOs, governmental entities, and other organizations that share environmental goals. Partnerships provide access to funding and enhance project credibility. Explore government grants, subsidies, and incentives for sustainable projects to secure additional financial support.

Impact Investors and Funds: Identify funds and investors dedicated to supporting environmentally focused initiatives. These investors prioritize projects with a clear and measurable environmental impact.

Collaborate with Green Banks: Partner with specialized financial institutions, or "green banks," in various countries that are dedicated to funding sustainable projects

Reporting and Transparency: Maintain transparency in financial and environmental reporting. Regularly update lenders and investors on the project’s financial performance and environmental impact. Emphasize the project’s resilience and long-term sustainability to gain trust and support.

Stakeholder Engagement: Involve key stakeholders, such as local communities and environmental advocacy groups, in the project. Their support boosts the project’s legitimacy and enhances its societal license to operate.

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Risk Mitigation: Address potential financial and environmental risks associated with the project. Demonstrate to investors that the organization has robust strategies for effectively managing and mitigating these risks.

Green Finance and Innovation

Green finance catalyzes advancements in:

- Sustainable Materials: Using recycled steel and low-impact concrete.
- Energy-Efficient Designs: Integrating renewable energy sources in buildings.
- Workforce Development: Training professionals in green technologies and practices.

Green finance is a dynamic method that provides a strong financial resiliency plan while addressing environmental issues. The building and real estate industries in India undergo a transformation due to green financing, which offers a calculated approach to reduce long-term financial risks arising from climatic disasters and regulatory adjustments. This article examines how green financing bolsters financial stability and transforms the sector to align with global sustainability objectives.

A. The Financial Perspective

Green finance represents a paradigm shift in how investments are allocated, going beyond a simple commitment to environmental responsibility. It refers to a financial strategy in which funds are deliberately distributed to undertakings and projects that support environmental sustainability while reducing the negative consequences of climate change. This strategy ensures that every financial investment contributes to a more sustainable, environmentally conscious future while cutting carbon emissions. Financial resilience is a crucial component of the modern economic environment that green financing addresses. Given the increasing frequency of climate disasters and impending regulatory changes, the construction and real estate sectors face significant long-term financial risks.

B. Increasing Intensity and Economic Effect

Extreme weather, flooding, and wildfires, for example, are climate phenomena that increase in frequency and severity. These catastrophes expose the building and real estate industries to substantial financial risks. Investments in real estate and infrastructure are vulnerable to loss and damage, raising the cost of restoration and repair. Events of this nature also cause delays in construction and increase operating costs. To mitigate these risks, green financing adopts a proactive approach. Green funding reduces vulnerability to climate events by directing funds toward sustainable and climate-resilient initiatives.

C. Amendments to Legislation

The regulatory landscape is changing to address environmental issues and advance sustainability. Emerging rules and compliance specifications affect the real estate and construction sectors. These legislative modifications impact environmental compliance, building rules, and construction standards, potentially raising costs for developers and property owners. Green finance supports projects that comply with these evolving requirements, aligning with the changing regulatory environment. By funding environmentally conscious projects, the industry can proactively comply with rules, reducing the risk of fines and compliance expenses. Green finance enables the sector to stay ahead of new sustainability regulations and adapt to changes in the regulatory landscape.

D. Building Resilience via Sustainable Initiatives

Green funding for sustainable projects contributes significantly to financial resilience in multiple ways:

1. Lower Operational Costs: Energy-efficient construction and development projects reduce utility costs for renters and owners due to their more energy-efficient design. This design leads to lower long-term operating expenses, promoting financial stability.

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2. Greater Property Value: Green-certified properties often have higher resale values because they appeal to environmentally-conscious buyers and investors. The increased value of the property provides financial security against market fluctuations.
3. Insurance Savings: Resilient, sustainable buildings are less vulnerable to damage from climatic catastrophes and may qualify for insurance premium reductions or other financial incentives.
4. Long-Term Investment Returns: Sustainable projects tend to be more resilient to environmental hazards and fluctuations in financial markets, leading to more stable and potentially better long-term investment returns.
5. Mitigating Liability: Stakeholders can reduce the financial and legal implications of non-compliance by funding initiatives that minimize negative environmental effects and comply with regulations.

E. Aid from Government

The Indian government plays a crucial role in fostering financial resilience through green funding. It recognizes the importance of green finance and actively promotes it with a range of incentives.

These incentives include policies that support sustainability, tax breaks, and subsidies. Financial institutions, companies, and investors can confidently engage in green financing with government backing.

By ensuring that green financing becomes a fundamental component of India's financial system, this support helps the real estate and construction sectors adjust to regulatory changes and climate-related events. Government incentives promote resilience by reducing vulnerabilities, encouraging investments in climate-resilient initiatives, and ultimately safeguarding financial interests.

I. Innovation On Green Financing

The goal of sustainability is now a need rather than a choice in the modern world. India is among the nations that reassess their industrial and economic plans due to the effects of climate change and the depletion of natural resources. This revolutionary process is largely propelled by the concept of "green financing." India's real estate and construction sectors are changing and aligning with global sustainability objectives thanks to this innovative approach to financing. The creation of a green workforce and the promotion of innovation are two remarkable outcomes of this shift.

Green financing is a financial tool used to fund eco-friendly initiatives and projects. In this context, innovation takes many forms, such as the development of novel building materials, the design of energy-efficient structures, and the incorporation of renewable energy sources. For example, in India, green funding sparks research and development in the construction industry to find new materials that reduce carbon emissions associated with traditional building techniques. Sustainable materials, such as recycled steel, bamboo, and low-impact concrete, are gaining popularity due to their environmentally friendly properties compared to traditional building materials. Similarly, cutting-edge architectural designs are now synonymous with energy efficiency. Architects and engineers are required to include passive design elements like natural ventilation and sun orientation to maximize energy efficiency. These improvements reduce the environmental impact of buildings while significantly lowering operating costs. Green finance also encourages real estate projects to incorporate renewable energy sources. Building rooftops now frequently feature solar panels, wind turbines, and other green energy technologies, helping India meet its ambitious renewable energy targets while reducing dependence on fossil fuels. Developer investment in these sustainable energy solutions is now financially viable thanks to green finance incentives and supportive policies. This innovation extends beyond technology to include processes and practices in the real estate and construction sectors. Green building certifications, such as GRIHA (Green Rating for Integrated Habitat Assessment) and LEED (Leadership in Energy and Environmental Design), have become industry standards. These certifications ensure that recipients of green financing are committed to environmental responsibility by requiring strict adherence to sustainable construction

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practices. This, in turn, fosters innovation in construction techniques and project management, leading to a more sustainable approach.

Such innovation extends beyond the construction site. Creating, implementing, and maintaining sustainable technology and practices requires a skilled workforce. This is where the story of green financing intersects with the rise of the green workforce. Green funding creates job opportunities in the green sector. Professionals skilled in renewable energy systems, environmental assessments, and sustainable construction methods are in greater demand as sustainability gains traction in India's real estate and construction sectors. In response, rising demand pushes educational and training institutions to develop curricula that address this new industry.

Academic institutions are implementing specialized courses and training programs in sustainability and environmental sciences to meet the demand for a green workforce. These courses provide participants with the knowledge and skills needed to plan and manage environmentally friendly projects. As a result, a new cohort of experts is joining the workforce, prepared to contribute to India's sustainable development goals. Furthermore, the green financing approach promotes retraining and upskilling of current employees in the real estate and construction sectors. Workers in the traditional construction industry become more flexible and adaptable to the changing needs of the industry by learning to use sustainable materials and technologies. Additionally, by promoting a sustainable culture, the presence of a green workforce enhances India's human capital. Professionals with expertise in sustainable practices carry this knowledge into their personal lives and communities, becoming sustainability ambassadors who encourage environmentally friendly decisions.

In conclusion, green financing is a game-changer for India's real estate and construction sectors, helping align them with international sustainability objectives. This strategy opens the door for the development of a green workforce while also encouraging innovation in environmentally friendly activities and technologies. These elements work together to create a win-win situation where environmental stewardship and economic prosperity coexist. India's sustainable future is brightened by the convergence of the green workforce, green finance, and innovation. Green finance plays a critical role in reducing climate change, conserving natural resources, and ultimately achieving global sustainability goals by promoting the adoption of sustainable technologies and practices. It demonstrates the power of financial innovation to create a more sustainable and better world for future generations.

Global Context and Policy Implications

India’s commitment to green finance aligns with international agreements like the Paris Accord. By fostering eco-friendly urbanization, India strengthens its global position as a responsible environmental steward.

India's building and real estate sectors stand at a turning point in the global effort to address climate change and promote sustainable development.

Green financing serves as a powerful tool for adhering to international norms and regulations that prioritize environmental responsibility.

India's commitment to green financing is a constructive contribution to the global sustainability movement, not a solo endeavour. It reflects the recognition of the interdependence of the world’s problems and India’s role in this interconnected framework. Most importantly, green finance is not a standalone concept; it is firmly rooted in global agreements, demonstrating a commitment to reducing carbon emissions and promoting environmentally friendly behaviours.

Rooted in international agreements, green financing reflects a commitment to reducing carbon emissions and advancing sustainable practices. India’s construction and real estate industries align with these global goals by directing investments to projects that reduce carbon emissions, enhance energy efficiency, and foster sustainable urban development.

There is an urgent need to confront climate change, which transcends national boundaries. As the second most populous country in the world, India’s urbanization and real estate development policies have significant global implications.

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Green finance holds promise, offering a viable path forward and showcasing India's readiness to meet its global commitments. The real estate and construction sectors have often faced criticism for their environmental impact, particularly in relation to resource-intensive practices and high energy consumption.

To address this challenge, green finance steps in, providing essential support as the industry transitions to more environmentally friendly practices. These investments facilitate the integration of renewable energy sources, the development of energy-efficient buildings, and the preservation of green spaces in urban areas.

By aligning with global sustainability objectives and taking action to combat climate change, green financing positions India as a responsible global citizen. The incorporation of green finance into India's building and real estate sectors represents not just a local transformation but also a global shift that aligns with international norms and expectations.

Conclusion

Green finance is transforming India's real estate and construction sectors by embedding sustainability into core business practices. This shift supports environmental resilience, economic growth, and global sustainability goals. Collaborative efforts among stakeholders, including policymakers, financial institutions, and investors, are critical to realizing India's green finance potential. In conclusion, green finance is steering India's real estate and construction sectors toward a more sustainable and responsible future by balancing economic growth with environmental preservation. It has become a key driver of change, promoting energy efficiency, carbon footprint reduction, and green building practices. By attracting eco-conscious investments, green finance not only reduces environmental impact but also boosts long-term profitability and aligns India with global sustainability goals. Government incentives and evolving regulations further encourage eco-friendly choices, making sustainable housing more accessible to a wider population. India's real estate sector is undergoing a transformation, and with continued commitment to sustainability, the country has the potential to lead global responsible development.

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A STUDY ON CHALLENGES AND OPPORTUNITIES IN IMPLEMENTING GREEN FINANCE IN INDIA

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Abstract

Green finance plays a pivotal role in addressing climate change and promoting sustainable development by channeling investments into environmentally friendly projects. In the context of India, a country facing rapid urbanization and industrialization, green finance is critical to achieving its commitments under the Paris Agreement and Sustainable Development Goals (SDGs). This paper explores the challenges and opportunities in implementing green finance in India. It examines policy frameworks, financial instruments, and the role of stakeholders while identifying key barriers to its growth. Recommendations to overcome these challenges are provided to ensure a robust green finance ecosystem in India.

Keywords: Green finance, renewable energy, climate resilience, green bonds, green washing, Sustainable Development Goals (SDGs).

Introduction

India's economic growth, coupled with increasing environmental concerns, necessitates a transition toward sustainable development. Green finance, which refers to financial investments directed toward projects that mitigate climate risks and conserve natural resources, has emerged as a cornerstone for achieving India's sustainability goals. This study investigates the challenges and opportunities in integrating green finance into India's economic landscape, focusing on the regulatory environment, market mechanisms, and stakeholder involvement.

Literature Review

Green finance has been a key subject of research in the global context, with studies emphasizing its role in achieving climate mitigation targets and Sustainable Development Goals (SDGs). According to Ghosh and Ghosh (2020), green finance is essential for developing countries like India to meet their Nationally Determined Contributions (NDCs) under the Paris Agreement. Research by Gupta et al. (2021) highlights the potential of green bonds and renewable energy investments in driving sustainable growth in India.

Green finance has garnered global attention as an essential tool to combat climate change and promote sustainability. International studies highlight the critical role of financial mechanisms in transitioning to a low-carbon economy. For instance, Buchner et al. (2019) identify that while global climate finance flows have increased significantly, they still fall short of the $4.13 trillion annual investment required to meet global climate goals.

In the Indian context, green finance is relatively nascent but growing rapidly. Dasgupta and Ghosh (2021) emphasize that India's commitment to achieving 500 GW of renewable energy capacity by 2030 necessitates substantial investment in green infrastructure. Chaturvedi et al. (2020) argue that the green bond market in India has immense potential but is hindered by the lack of standardization and investor confidence.

Furthermore, Sarkar and Singh (2022) note that despite several policy initiatives, such as the National Action Plan on Climate Change (NAPCC), India lacks a unified green finance policy framework. Bhattacharya et al. (2023) highlight the role of public-private partnerships (PPPs) in mobilizing resources for green projects and suggest that India can benefit from international best practices.

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Research by Kumar et al. (2022) examines the role of financial institutions in fostering green finance and reveals that 65% of Indian banks still prioritize conventional loans over green projects due to higher perceived risks. Similarly, Roy and Banerjee (2021) underscore the importance of capacity building and awareness campaigns to encourage green investments among small and medium enterprises (SMEs).

The role of international organizations, such as the Green Climate Fund (GCF) and the World Bank, has also been explored extensively. Narula (2022) highlights that India has received $2.5 billion in funding from the GCF between 2015 and 2023, yet there remains a gap in mobilizing private sector investment. Verma et al. (2020) emphasize the need for leveraging global partnerships and adopting innovative financial mechanisms like blended finance to scale up green investments in India.

However, multiple barriers to the growth of green finance have been noted. Bhattacharya and Patel (2022) underline the lack of financial literacy among stakeholders and limited access to funding as significant obstacles. Meanwhile, studies such as those by Kumar and Mehta (2023) point to policy inconsistencies and the absence of robust risk-sharing mechanisms as critical challenges.

In the Indian context, previous studies have focused on specific sectors, such as renewable energy (Sharma, 2021) and infrastructure development (Singh & Roy, 2022), but comprehensive research examining the challenges and opportunities across all sectors remains limited.

While existing literature provides valuable insights into the potential and barriers of green finance, there is a need for comprehensive research that combines sector-specific data, policy analysis, and stakeholder perspectives to identify actionable strategies. This study aims to bridge this gap and contribute to the growing body of knowledge on green finance in India.

Statement of the Problem

Despite India's ambitious sustainability goals and growing interest in green investments, the implementation of green finance remains suboptimal. Issues such as inadequate policy frameworks, lack of awareness, and limited access to innovative financial instruments hinder its growth. Furthermore, the high perceived risks and costs of green projects deter private sector participation. This raises critical questions:

- How can India overcome these challenges to strengthen its green finance ecosystem?
- What strategies and opportunities exist to make green finance a key driver of sustainable development in India?

This study addresses these questions to provide actionable insights and recommendations for stakeholders.

Objectives of the Study

The main objectives of this study are as follows:

1. To analyze the current status of green finance in India.
2. To identify the challenges faced in implementing green finance.
3. To explore the opportunities for expanding green finance initiatives in India.
4. To propose recommendations to overcome the barriers and foster the growth of green finance.

Research Methodology

Research Design

- Qualitative Analysis: A review of secondary data, including policy documents, government reports, journal articles, and case studies related to green finance in India.
- Quantitative Analysis: Data on green finance investments, green bond issuances, and renewable energy projects are analyzed to understand trends and growth patterns.

Data Collection

- Primary Data: Interviews with key stakeholders, including policymakers, financial institutions, and private investors, to gather insights on challenges and opportunities.

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- Secondary Data: Data from government agencies (e.g., RBI, SEBI), international organizations (e.g., World Bank, IMF), and industry reports.

Data Analysis

- A thematic analysis is conducted to identify recurring challenges and opportunities in implementing green finance.
- Quantitative data is analyzed using statistical tools to assess investment trends and the impact of existing green finance initiatives.

Scope and Limitations

- Scope: The study focuses on the Indian context, with an emphasis on renewable energy, sustainable infrastructure, and agriculture.
- Limitations: Limited availability of recent data and potential biases in stakeholder interviews may affect the findings.

The Need for Green Finance in India

India's sustainability commitments under the Paris Agreement necessitate an annual investment of approximately $170 billion in green projects by 2030. However, as of 2023, only $19 billion was mobilized, reflecting a significant financing gap. The renewable energy sector alone requires $223 billion to meet its target of 500 GW installed capacity by 2030 (Source: International Energy Agency, 2023). Additionally, India's waste management and sustainable agriculture sectors require substantial funding to transition to sustainable practices.

Challenges in Implementing Green Finance

Lack of Awareness and Capacity: A 2022 survey by the Federation of Indian Chambers of Commerce and Industry (FICCI) found that over 60% of small and medium enterprises (SMEs) were unaware of green finance and its benefits.

Regulatory and Policy Gaps: India's green bond market lacks standardized regulations, which has hindered investor confidence. In 2022, only 0.7% of India's corporate bond market was represented by green bonds, far below the global average of 2.5% (Source: SEBI).

High Costs and Risks: Green projects often face high upfront costs. For instance, solar energy projects require significant capital investment, with average costs ranging between ₹45 million and ₹50 million per megawatt.

Limited Private Sector Participation: Private sector participation in green finance was only 20% of the total green investment in 2023, compared to the global average of 45% (Source: World Bank, 2023).

Inadequate Financial Instruments and Mechanisms: India's green bond issuance in 2023 was $6.2 billion, significantly lower than China's $120 billion, reflecting the need for more robust financial instruments (Source: Climate Bonds Initiative, 2023).

Opportunities in Green Finance Implementation

India, with its increasing emphasis on sustainability and environmental responsibility, offers a burgeoning array of green financing opportunities for impact investors. The landscape for green financing in India presents substantial prospects, merging sustainability with financial returns. The Indian government is demonstrating strong commitments to green initiatives by making considerable strides towards its updated targets.

Policy Support and International Commitments: India received $1.5 billion from the Green Climate Fund (GCF) between 2020 and 2023 to support sustainable projects. This international funding highlights the growing interest in India's green finance ecosystem.

Emergence of Green Bonds: The State Bank of India (SBI) issued a green bond worth $650 million in 2022, marking a major step toward mobilizing funds for renewable energy projects.

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Renewable Energy Growth: As of 2023, India achieved 175 GW of renewable energy capacity, accounting for nearly 42% of the total installed energy capacity, showcasing the potential for further investment.

Technological Advancements: In 2023, blockchain technology was successfully piloted for tracking green bond proceeds by the Indian Renewable Energy Development Agency (IREDA).

Potential for Public-Private Partnerships (PPPs): The Delhi Metro Rail Corporation (DMRC) is a successful example of a PPP in green infrastructure, reducing over 700,000 tons of CO2 annually through its energy-efficient practices.

Assessment of Current Green Financial Instruments: India has seen a growing interest in green financial instruments over the last decade. These instruments, which are designed to mobilize resources for sustainable and environmentally friendly projects, have the potential to drive significant change. The following assessment evaluates the key green financial instruments in India:

Green Bonds: Green bonds are one of the most widely used instruments for financing sustainable projects in India. Since the first issuance of green bonds by Yes Bank in 2015, the market has grown significantly.

- Current Status: As of 2023, India had issued approximately $25 billion in green bonds, with sectors such as renewable energy, transportation, and sustainable agriculture being the primary beneficiaries (Source: Climate Bonds Initiative, 2023).
- Key Examples:
  - In 2022, the State Bank of India (SBI) issued a $650 million green bond, focusing on renewable energy projects.
  - The Indian Renewable Energy Development Agency (IREDA) has also been a key player, issuing green bonds worth $300 million in 2021.
- Challenges: The lack of standardized guidelines and inadequate verification mechanisms for green projects remain significant issues.

Sustainable Equity Funds

Sustainable equity funds invest in companies that meet environmental, social, and governance (ESG) criteria.

- Current Status: India has witnessed a 35% growth in ESG funds between 2020 and 2023, with assets under management (AUM) reaching ₹12,000 crore. (Source: Morningstar India, 2023).
- Key Players: Funds like SBI Magnum ESG Fund and Axis ESG Equity Fund are prominent players in this segment.
- Opportunities: With growing awareness among retail investors, sustainable equity funds are expected to attract significant investments in the coming years.

Green Loans

Green loans are provided specifically for projects that offer environmental benefits, such as renewable energy installations and pollution control systems.

- Current Status: Several public and private sector banks in India have introduced green loan schemes. For example, HDFC Bank and ICICI Bank offer preferential rates for solar rooftop installations and energy-efficient appliances.
- Challenges: Limited awareness and higher perceived risks make green loans less attractive to many borrowers.

Blended Finance Mechanisms

Blended finance involves combining concessional funding from public sources with commercial financing to reduce investment risks.

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Current Status: The Indian government, in collaboration with international organizations like the World Bank and the Green Climate Fund (GCF), has implemented blended finance projects for renewable energy and waste management sectors.

- Examples: The World Bank's Solar Energy Program in India has leveraged blended finance to deploy solar energy projects across rural areas.

Carbon Credit Trading

Carbon credit trading allows businesses to trade emission allowances, incentivizing lower carbon footprints.

- Current Status: The Indian Energy Exchange (IEX) launched a carbon trading platform in 2022, marking a significant milestone in market-based climate action.
- Opportunities: India's growing renewable energy capacity provides an opportunity to scale carbon trading initiatives.

Municipal Green Bonds

Municipalities in India have started issuing green bonds to finance sustainable urban projects.

- Key Example: Pune Municipal Corporation raised ₹200 crores through a green bond in 2017 to fund its wastewater management project.
- Challenges: Limited technical expertise and governance issues often restrict the success of municipal green bonds.

Green Insurance Products

Green insurance products provide coverage for environmental risks and support the development of sustainable projects.

- Current Status: Insurance companies in India, such as ICICI Lombard, have started offering coverage for renewable energy projects.

Recommendations

Policy Reforms

- Introduce standardized guidelines for green bonds to boost investor confidence.
- Expand fiscal incentives such as tax exemptions for green investments.

Capacity Building

- Conduct nationwide awareness campaigns for SMEs and investors.
- Establish training programs for financial institutions to assess green projects.

Market Development

- Incentivize the private sector through risk-sharing mechanisms and guarantees.
- Establish a centralized platform to monitor green finance initiatives.

Fostering Collaboration

- Strengthen public-private partnerships to address funding gaps.
- Facilitate international partnerships for technology transfer and investment.

Risk Mitigation Mechanisms

- Develop green insurance products to protect investors against potential losses.
- Create a dedicated Green Fund to finance early-stage green projects.

Conclusion

The implementation of green finance in India presents both significant challenges and opportunities. While regulatory gaps, high costs, and limited awareness pose barriers, the growing demand for sustainable investments, technological advancements, and international support create a favorable environment for green finance growth. By addressing these challenges through targeted policy

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reforms, capacity building, and stakeholder collaboration, India can unlock the potential of green finance to drive sustainable development and climate resilience.

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A DESCRIPTIVE STUDY OF ONLINE FOOD DELIVERY WORKERS IN THE GIG ECONOMY: EMPLOYMENT CONDITIONS, CHALLENGES, AND POLICY IMPLICATIONS FOR SUSTAINABLE GROWTH

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Abstract

This paper presents a secondary analysis of online food delivery workers in India's gig economy, focusing on their employment conditions, challenges, and the effectiveness of existing policies. Utilizing secondary data from NITI Aayog reports, Fair work India studies, and industry surveys, the research highlights critical issues such as low wages, job instability, and lack of social security. It also explores mental health concerns, including stress and burnout, and health risks associated with the demanding nature of gig work. Furthermore, the study evaluates government initiatives, such as the Social Security Code, and platform-level policies, noting their limitations in addressing workers' needs.

The analysis concludes with actionable policy recommendations aimed at improving working conditions, such as the introduction of minimum wage standards, enhanced safety measures, and better mental health support systems. These measures are essential to ensure the sustainable growth of the gig economy while protecting the rights and well-being of its workforce.

Keywords: Gig economy, food delivery workers, employment conditions, social security, mental health, policy recommendations, India

Introduction

The gig economy has emerged as a significant employment sector globally, characterized by flexible, short-term, and task-based jobs. Online food delivery services represent a vital component of this economy, especially in rapidly urbanizing countries like India. Companies such as Zomato, Swiggy, and UberEats have revolutionized food logistics, creating new employment opportunities while addressing urban mobility challenges.The popularity of online food delivery platforms stems from their ability to bridge consumer demand for convenience with technological advancements. By leveraging digital platforms, these companies have streamlined food ordering and delivery processes, creating a lucrative business model that simultaneously drives urban employment. As cities grow and consumer behaviour evolves, the dependency on such platforms increases, further cementing the role of food delivery services within the gig economy.

However, while these platforms promote flexible working arrangements, they often fail to safeguard worker rights and security. For many, the promise of autonomy associated with gig work is overshadowed by precarious employment conditions. Gig workers, particularly food delivery personnel, frequently face income instability due to performance-based pay structures that fluctuate with demand. This financial unpredictability forces workers to endure long hours in hopes of earning a liveable income. Additionally, the lack of social security exacerbates their vulnerability, leaving them without critical benefits such as health insurance, retirement savings, or paid leave.

Health and safety risks present another pressing concern within the gig economy. Food delivery workers often navigate challenging urban environments, braving traffic congestion and adverse weather conditions. The physical demands of the job, coupled with insufficient safety measures, contribute to higher incidences of work-related injuries. Furthermore, many workers report experiencing physical

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exhaustion due to extended hours of riding motorcycles or bicycles, which take a toll on their well-being over time.

Beyond physical challenges, mental health concerns are prevalent among gig workers. The isolation inherent in their work structure, coupled with the pressure to meet delivery targets, results in high levels of stress and anxiety. This is exacerbated by the lack of workplace community and minimal access to mental health resources. As platforms prioritize customer satisfaction and operational efficiency, workers are left with minimal recourse to address these psychological burdens.

The regulatory landscape further compounds these challenges. The gig economy, by its nature, operates outside the purview of traditional labor laws, leaving gig workers with limited protections. In India, efforts such as the Social Security Code (2020) mark a step toward inclusivity by proposing social benefits for gig and platform workers. However, the implementation of these policies has been slow, and their scope remains inadequate to address the complex realities faced by food delivery workers.

This study aims to analyze these employment conditions comprehensively. By focusing on the experiences of food delivery workers in India's gig economy, it seeks to identify systemic challenges and evaluate the effectiveness of existing policies. Using secondary data from reports, surveys, and industry studies, this paper provides actionable insights for policy reforms and platform interventions. The ultimate goal is to promote equitable working conditions and sustainable growth within this evolving employment sector.

Review of Literature

The gig economy, particularly in the online food delivery sector, has experienced significant growth in India over recent years. This expansion has brought to light various employment conditions and challenges faced by delivery workers. Recent studies have delved into these aspects, providing a comprehensive understanding of the current landscape.

A 2023 report by the National Council of Applied Economic Research (NCAER) highlighted a decline in the real income of food delivery workers. The study found that between 2019 and 2022, the average real monthly income for long-shift workers decreased by 11.1%, from ₹13,470 to ₹11,963. This decline is attributed to factors such as inflation and rising fuel costs, which have eroded the purchasing power of these workers.

The Hindu reported in 2021 that food delivery workers often endure poor wages, long working hours, and a lack of labor rights. Many workers are required to pay for their uniforms and equipment, incurring additional costs that further reduce their net earnings. The demanding nature of the job, combined with the pressure to meet delivery targets, contributes to physical and mental fatigue among workers.

A 2023 article from The Hindu highlighted the dual challenges faced by food delivery partners: decreasing income levels and rising fuel costs. The report emphasized that while the real monthly income of these workers fell from ₹13,500 in 2019 to ₹12,000 in 2022, the proportion of their income spent on fuel increased from 28.7% to 37.5% during the same period. This situation has exacerbated the financial strain on delivery workers, making it increasingly difficult for them to sustain their livelihoods.

In 2023, NewsClick reported that the real income of food delivery agents working 11-hour shifts declined by 11% over three years. The study also noted that these workers often lack social security benefits, leaving them vulnerable to financial instability and health-related expenses. The absence of employer-provided social welfare and job security further exacerbates their precarious situation.

A 2024 Reuters article discussed Zomato's projection of a 30% annual growth rate for its food delivery business over the next five years. Despite this optimistic outlook, the company faces challenges such as high attrition rates among delivery drivers. To address these issues, Zomato is working on enhancing benefits and providing greater flexibility to attract and retain gig workers.

A study published in the Journal of Ravishankar University in 2025 examined the socioeconomic status of gig workers in Raipur, Chhattisgarh. The research highlighted that despite the growth

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opportunities in the gig economy, workers face job insecurity and daily challenges, including income instability and lack of social security.

In 2024, the International Journal of Research Publication and Reviews published a study focusing on the challenges faced by gig workers in India's online food delivery sector. The research identified issues such as precarious working conditions, income instability, safety concerns, and technological barriers. The study emphasized the need

A 2021 study in Work Organisation, Labour & Globalisation explored work precarity in the platform economy from the perspective of food delivery workers in India. The research highlighted low wages, absence of welfare measures, and digital controls contributing to the precarious nature of gig work. The COVID-19 pandemic further aggravated these issues, leading to job losses, increased health risks, and occupational distress among workers.

A 2024 study titled "Addressing Policy Gaps for Gig Workers in India: A Focus on Food Delivery Service Providers" investigated the experiences of food delivery partners in Delhi affiliated with Swiggy and Zomato. The findings revealed significant policy gaps, as current policies fail to adequately address the social security and welfare needs of food delivery partners. The study called for comprehensive policies to provide adequate social security, fair compensation, and safe working conditions for gig workers.

Collectively, these studies underscore the multifaceted challenges faced by food delivery workers in India's gig economy. Issues such as declining real incomes, rising operational costs, lack of social security, and demanding working conditions highlight the need for comprehensive policy interventions and platform-level initiatives to improve the livelihoods of these workers.

Research Gaps and Future Directions

Despite the growing body of literature on the gig economy, particularly in the food delivery sector, several research gaps remain, leading to the three key research objectives of this study.

1. Limited Empirical Analysis on Employment Conditions: While studies highlight wage volatility, excessive working hours, and the illusion of flexibility, there is a lack of detailed empirical research that quantifies these conditions in the Indian gig economy.
2. Inadequate Focus on Social Security and Health Risks: Most research focuses on financial instability but does not extensively cover the long-term impact of the lack of social security, job instability, and health risks.
3. Weak Evaluation of Policy Effectiveness: While policies such as the Social Security Code of 2020 exist, their implementation and impact remain insufficiently studied.

Research Objectives

1. To analyze the employment conditions of online food delivery workers in India, including wages, working hours, and flexibility.
2. To identify the challenges faced by food delivery workers, including social security issues, job instability, and health risks.
3. To evaluate the effectiveness of existing government and platform-level policies in improving the working conditions of food delivery workers.

Research Methodology

This study employs a secondary data analysis approach to evaluate employment conditions, challenges, and policy effectiveness in India’s online food delivery sector. A qualitative and descriptive analysis of existing literature, industry reports, and policy documents is conducted to identify trends and systemic challenges faced by gig workers. Key sources include academic studies, government reports (e.g., NCAER, NITI Aayog), media articles, and platform-specific policy documents.

Data Collection

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- Sources: The study reviews secondary data from credible sources such as The Hindu, Reuters, NewsClick, and journals like the International Journal of Research Publication and Reviews.
- Time Frame: The literature analyzed covers studies from 2020-2025, ensuring relevance to current labor market conditions.
- Thematic Analysis: Data is categorized into themes based on employment conditions, challenges, and policy evaluations.
- Triangulation: Multiple sources are cross-referenced to ensure validity and reliability of findings.

Data Analysis

- Objective 1 (Employment Conditions): Analysis of wage trends, working hours, and flexibility using government reports and labor studies.
- Objective 2 (Challenges Faced): Identification of issues related to job security, social protection gaps, and worker health risks.
- Objective 3 (Policy Evaluation): Examination of government policies and platform-level initiatives to assess their effectiveness in improving working conditions.

Findings

Wage Volatility

Food delivery workers experience substantial income fluctuations due to per-delivery payment models. The National Council of Applied Economic Research (NCAER, 2023) found that real monthly incomes declined by 11.1% from 2019 to 2022, falling from ₹13,470 to ₹11,963. Rising fuel prices and inflation further diminish earnings, compelling workers to work longer hours to maintain a livable income. The incentive-based model disproportionately benefits top performers while leaving the majority with unstable wages, especially during low-demand periods. Additionally, many workers are required to cover expenses such as fuel, maintenance, and mobile data, further reducing their actual earnings.

Working Hours and Flexibility

Despite the gig economy's promise of flexibility, many food delivery workers regularly work long hours. Reports from The Hindu (2023) indicate that daily working hours often exceed 10-12 hours, contradicting the flexible work narrative. Algorithmic management systems prioritize high-performing workers, discouraging breaks and pressuring workers to accept continuous deliveries, leading to both physical and mental exhaustion. Additionally, workers often find themselves trapped in a cycle where declining orders results in reduced opportunities, leading to even longer working hours to compensate for lost income.

Social Security Issues

A lack of access to essential social security measures such as health insurance, pensions, and paid leave leaves workers financially vulnerable. A study by NewsClick (2023) highlighted that food delivery workers frequently experience economic distress during medical emergencies or unexpected periods of low demand. The independent contractor classification deprives workers of traditional labor protections, reinforcing long-term job insecurity. Without access to formalized employment benefits, workers are left without financial stability during periods of illness or market downturns.

Job Instability

The reliance on performance-based ratings introduces significant job insecurity. Workers are evaluated based on customer feedback, delivery times, and order acceptance rates, often for factors beyond their control, such as traffic congestion or restaurant delays. Negative ratings can lead to a reduction in order assignments or platform deactivation, making job stability highly uncertain. With increasing competition and fluctuating demand, workers often struggle to maintain consistent earnings

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and face potential deactivation if they fail to meet arbitrary performance benchmarks.

Health Risks

Long hours and exposure to harsh weather conditions pose serious health risks for food delivery workers. Musculoskeletal disorders, chronic fatigue, and road accidents are prevalent. Fuel price hikes, reported in The Hindu (2023), have increased operational costs, forcing workers to take on additional orders at the expense of their well-being. The demanding nature of the job significantly impacts their overall health and quality of life. The lack of employer-provided health insurance further exacerbates their vulnerabilities, leaving them unprotected against workplace injuries and occupational hazards.

Recommendations

1. Implementation of Minimum Wage Standards: Establishing a fair baseline wage can mitigate income instability and prevent worker exploitation. Wages should be regularly adjusted to reflect inflation and cost-of-living changes.
2. Mandatory Social Security Contributions: Platforms should be required to contribute to workers' social security, including health insurance, pensions, and emergency financial support.
3. Worker Safety Enhancements: Providing workers with safety gear, accident insurance, and road safety training can reduce occupational hazards and ensure worker well-being.
4. Transparent Payment Systems: Platforms must adopt clear, fair compensation models and disclose earnings calculations to workers. Ensuring transparency in incentive structures and deductions will build worker trust.
5. Mental Health Support Initiatives: Platforms should integrate accessible mental health support services, including counseling programs, stress management resources, and peer support networks.
6. Government-Industry Collaboration: Policymakers and platform leaders must collaborate to develop sustainable gig economy regulations that balance business growth with worker rights and protections.

By implementing these recommendations, policymakers and industry stakeholders can work towards a fairer and more sustainable gig economy, ensuring that food delivery workers in India receive the protections and benefits they deserve.

Conclusion

The rapid expansion of the gig economy has reshaped urban employment patterns in India, particularly in the food delivery sector. While these platforms offer job opportunities, they also expose workers to economic instability, job insecurity, and health risks. The promise of flexibility is often misleading, as workers endure long hours with unpredictable earnings. The lack of social security and inadequate labor protections further exacerbate these challenges.

Despite the introduction of policies like the Social Security Code of 2020, implementation failures have left gig workers without meaningful protections. Platform-level initiatives have been inconsistent, failing to address fundamental issues such as fair wages and worker safety. Urgent reforms, including stronger regulatory enforcement and minimum wage standards, are necessary to create a sustainable and equitable gig economy.

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GREENING THE HOUSING FINANCE INDUSTRY: A ROADMAP FOR INDIAN COMPANIES

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Abstract

The transition towards sustainable development has necessitated the adoption of green finance in the housing sector. This study explores the concept of green finance, its role in housing finance companies, and the strategies required for effective implementation in India. By analysing global best practices, technological innovations, policy frameworks, and financial incentives, the study provides a comprehensive roadmap for integrating environmental, social, and governance (ESG) principles into the housing finance industry. Key challenges, including financial barriers, lack of awareness, and regulatory constraints, are also discussed. The research concludes with strategic recommendations for stakeholders and directions for future research to enhance the adoption of green finance in India's housing sector.

Keywords: Green Finance, HFCs, ESG Integration

Introduction

The Need for Greening the Housing Finance Industry

The housing sector is vital for economic growth but significantly impacts the environment through high energy consumption and emissions. In India, rapid urbanization worsens this challenge. Greening the housing finance industry involves integrating ESG principles to promote energy efficiency, resource conservation, and carbon footprint reduction in residential buildings. Financial institutions, particularly housing finance companies (HFCs), play a key role by introducing green financial products like green mortgages and bonds. This shift supports global climate goals, enhances competitiveness, and aligns with sustainability trends, making it both an environmental necessity and a strategic opportunity.

Scope of Green Finance in Housing

Green finance in housing supports eco-friendly and energy-efficient residential developments through tools like green mortgages, green bonds, and energy-efficient upgrades. These initiatives fund sustainable homes, retrofitting projects, renewable energy, and smart technologies. In India, where urbanization and housing demand are growing, green finance offers a valuable solution. Government initiatives like "Housing for All" and "Smart Cities Mission" promote sustainable housing, while international partnerships can expand the impact of green finance in the country.

Literature Review

Rachana Nagar (2016) Studies on India’s housing finance sector identify challenges such as fund shortages, weak mortgage laws, and market competition. However, research highlights its vast growth potential driven by urbanisation and policy support.

Luijten, Annekeet al., (2005) studies on higher education internationalisation in Western Europe show continued economic-driven policies and broader reforms beyond mobility. While global trends influence policies, their impact varies across countries.

Benzidia, Smail, Makaoui, and Bentahar (2020) examine the impact of big data analytics and artificial intelligence on healthcare supply chains and environmental performance. Their study, published in Technological Forecasting and Social Change, uses Organizational Information Processing Theory to analyze green supply chain integration in hospitals. This research contributes to the growing literature on sustainability in healthcare and the circular economy.

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Research Objectives

1. To examine existing green finance practices in the housing sector.
2. To analyse the effectiveness of tools such as green mortgages, green bonds, and ESG-focused investments.
3. To identify the barriers housing finance companies face in adopting green finance practices.
4. To Provide Strategic Recommendations for developing a roadmap to integrate sustainability into the operations of housing finance companies.

Conceptual Framework of Green Finance

Definition and Key Principles of Green Finance

Green finance focuses on investments that promote sustainability, reduce carbon emissions, conserve resources, and support renewable energy and energy-efficient projects. It encourages environmentally friendly practices to mitigate environmental risks and foster sustainable development.. Key principles of green finance include:

1. Environmental Sustainability: Investments must prioritize long-term ecological health.
2. Transparency: Clear and accountable processes ensure the effective utilization of funds.
3. Inclusivity: All stakeholders, including governments, private sectors, and communities, must collaborate in implementing green finance.
4. Risk Mitigation: Mechanisms must be in place to address environmental and financial risks.
5. Impact Measurement: Continuous monitoring and evaluation to assess environmental outcomes.

Evolution of Green Finance: Global and Indian Context

Timeline	Global Evolution	Indian Evolution
1992	Earth Summit in Rio de Janeiro emphasizes sustainable development.	—
1997	Kyoto Protocol establishes legally binding carbon reduction targets.	—
2008	—	India launches the National Action Plan on Climate Change (NAPCC).
2010	Green Climate Fund (GCF) is established to support climate action in developing nations.	—
2015	Paris Agreement strengthens global commitments to reduce carbon emissions.	India pledges to reduce carbon intensity under the Paris Agreement.
2020	Growing global issuance of green bonds for sustainable projects.	India increases issuance of green bonds to finance renewable energy projects.
2021	Several nations announce ambitious net-zero targets.	India commits to achieving net-zero emissions by 2070.
Ongoing	Global financial institutions integrate ESG principles into investments.	The Reserve Bank of India (RBI) promotes green lending, including priority sector lending for renewable energy.

Role of Green Finance in Housing Development

Green finance is crucial for transforming the housing sector into a sustainable industry. It enables:

1. Development of Green Buildings: Financing for eco-friendly construction materials, energy-efficient designs, and renewable energy integration.
2. Retrofitting Existing Structures: Supporting upgrades for older buildings to meet modern sustainability standards.
3. Affordable Green Housing: Ensuring low-income households access sustainable living spaces.
4. Innovation and Technology Adoption: Encouraging the use of advanced technologies like smart home systems.

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By aligning housing development with environmental objectives, green finance contributes to reducing the sector's carbon footprint and enhancing energy efficiency.

Differentiating Green Finance from Traditional Housing Finance

Aspect	Green Finance	Traditional Housing Finance
Objective	Environmental sustainability	Maximizing financial returns
Instruments	Green bonds, carbon credits	Standard loans, mortgages
Eligibility Criteria	Energy-efficient, eco-friendly projects	Conventional construction projects
Impact	Reduced carbon footprint, resource conservation	Economic growth without environmental focus

The Housing Finance Industry in India

Overview of the Housing Finance Sector in India

India's housing finance sector has grown rapidly, driven by urbanization, rising incomes, and initiatives like PMAY. Key features include diverse lenders, a strong focus on affordable housing, and technological integration, enhancing loan accessibility and efficiency through digital platforms. HFCs, public, and private banks play a vital role in financing.

Regulatory Environment Governing HFCs

The regulatory framework for HFCs in India is overseen by the Reserve Bank of India (RBI) and includes:

1. Registration and Licensing: Mandatory registration with RBI to operate as an HFC.
2. Capital Adequacy Requirements: Ensuring financial stability through minimum capital standards.
3. Priority Sector Lending: Mandating a portion of lending towards affordable housing and renewable energy.
4. Disclosure Norms: Enhancing transparency through regular reporting and audits.

These regulations aim to ensure the financial soundness of HFCs while promoting inclusive and sustainable growth.

Market Dynamics and Key Stakeholders

India's housing finance market is influenced by several key dynamics:
Growing Demand: Urbanization and demographic shifts are driving the need for housing finance.
Government Support: Subsidies, tax incentives, and interest rate subventions enhance affordability.
Innovative Products: Introduction of green mortgages and other sustainable finance options.

Key Stakeholders:

- Government Agencies: Formulate policies and provide incentives.
- Financial Institutions: Offer loans and investment products.
- Developers: Construct housing projects.
- Consumers: Individuals and families seeking home ownership.

Challenges Faced by the Housing Finance Industry

Despite its growth, the housing finance sector faces several challenges:

1. Access to Credit: Limited access for low-income and rural populations.
2. High Interest Rates: Impacting affordability, especially for economically weaker sections.
3. Regulatory Hurdles: Compliance with stringent norms can be resource-intensive.
4. Lack of Awareness: Low consumer awareness about green finance options.
5. Environmental Concerns: Integrating sustainability into housing finance remains a challenge.

Addressing these challenges requires a collaborative approach involving policymakers, financial institutions, and other stakeholders to ensure the sector's sustainability and inclusivity.

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Green Investment Strategies for Housing Finance Companies

Green Mortgage Products and Their Implementation

Green mortgage products are designed to support environmentally sustainable housing by offering:
Lower Interest Rates: Incentives for buyers of energy-efficient homes.
Flexible Terms: Longer repayment periods for green investments.
Implementation:

- Partnering with developers to promote green-certified projects.
- Offering financial literacy programs to educate buyers about green mortgages.
- Leveraging technology for efficient loan disbursement and monitoring.

Financing Energy-Efficient and Sustainable Housing Projects

Housing finance companies (HFCs) support energy-efficient housing by providing green loans for sustainable projects, funding retrofitting initiatives to upgrade older homes with green technology, and promoting certifications like LEED and GRIHA for eco-friendly construction.

Role of Green Bonds in Housing Finance

Green bonds are debt instruments used to raise capital for environmentally sustainable projects.

- Attracting Global Investors: Enhancing the inflow of capital for green housing.
- Reducing Borrowing Costs: Providing affordable financing for developers and buyers.
- Boosting Credibility: Enhancing the reputation of HFCs as sustainable entities.

Integration of ESG Criteria in Housing Finance Investments

ESG criteria are increasingly shaping investment decisions in housing finance. HFCs can integrate ESG by:

- Assessing Environmental Impact: Evaluating the sustainability of financed projects.
- Social Inclusion: Prioritizing affordable housing for marginalized groups.
- Governance Standards: Ensuring ethical practices in lending and development.

Partnerships with Renewable Energy Companies

Collaborating with renewable energy companies can amplify the impact of green finance. HFCs can:

- Co-Finance Projects: Supporting solar and wind energy integration in housing projects.
- Offer Bundled Solutions: Combining green mortgages with renewable energy installations.
- Drive Innovation: Encouraging the adoption of cutting-edge renewable technologies.

Policy Frameworks and Incentives

Government Policies Supporting Green Housing Finance in India

The Indian government has introduced several policies to promote sustainability in the housing finance sector, including:

- National Housing Policy: This policy incorporates sustainability as a key focus area, aiming to increase green housing availability.
- Energy Conservation Building Code (ECBC): Mandates energy efficiency standards for new constructions, reducing energy consumption in housing projects.
- Pradhan Mantri Awas Yojana (PMAY): Encourages green construction under its affordable housing initiatives.
- Renewable Energy Incentives: Promotes the integration of solar panels and other renewable energy solutions into housing developments.
- National Action Plan on Climate Change (NAPCC): Includes missions like the National Solar Mission, which indirectly supports green housing finance by promoting renewable energy integration.

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Tax Benefits and Subsidies for Green Housing Projects

To incentivize green housing, the government offers various tax benefits and subsidies:

- Income Tax Deductions: Individuals investing in energy-efficient homes can claim deductions under Sections 80EE and 80EEA of the Income Tax Act.
- Reduced GST Rates: Green-certified projects attract lower GST rates, making them more affordable.
- Subsidies for Green Technologies: Financial assistance is provided for installing solar panels, rainwater harvesting systems, and other sustainable technologies.
- Incentives for Developers: Tax holidays and fast-tracking approvals for green-certified projects.

These measures make green housing financially attractive for buyers and developers, encouraging adoption at scale.

International Guidelines and Their Implications for Indian Companies

Global frameworks and guidelines significantly influence India's green housing finance policies:

- United Nations Sustainable Development Goals (SDGs): Goals like affordable and clean energy (SDG 7) and sustainable cities and communities (SDG 11) shape India's green housing policies.
- Principles for Responsible Investment (PRI): Encourages Indian housing finance companies to integrate ESG considerations into their investment decisions.
- Green Bond Principles (GBP): Provides guidelines for issuing green bonds, a major source of funding for green housing projects.
- Paris Agreement Commitments: India's pledge to reduce emissions has led to increased emphasis on sustainable housing development.

Adhering to these guidelines enhances Indian companies' access to global funding and strengthens their credibility in the international market.

Challenges in Greening Housing Finance

Financial Barriers and Risk Perception

The high initial costs of green housing projects and a lack of understanding of long-term benefits create financial challenges:

- High Capital Costs: Green construction materials and technologies are more expensive than traditional ones.
- Limited Financing Options: Banks and HFCs are often hesitant to finance green projects due to perceived risks and unfamiliarity.
- Return on Investment (ROI) Uncertainty: Developers and investors are sceptical about the profitability of green projects.

Lack of Awareness among Stakeholders

Awareness gaps hinder the adoption of green finance practices:

- Consumers: Many buyers are unaware of green mortgages and the benefits of energy-efficient homes.
- Developers: Builders often lack knowledge about sustainable construction practices.
- Financial Institutions: Limited training on green finance instruments and their potential benefits.

Addressing these gaps through education campaigns and capacity-building programs is essential.

Technological Challenges in Green Construction

Technological limitations also act as barriers to greening housing finance:

- Availability of Materials: Limited access to certified green construction materials and technologies.
- Skilled Workforce: Lack of trained professionals in sustainable construction methods.

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- Integration of Renewable Energy: Challenges in incorporating solar and wind energy systems into housing projects.

Investments in research and development (R&D) and technical training can mitigate these challenges.

Regulatory and Market Challenges

The regulatory environment and market dynamics pose significant hurdles:

- Complex Approval Processes: Green projects often face delays due to stringent regulatory requirements.
- Market Resistance: Resistance from stakeholders accustomed to traditional finance and construction practices.
- Inconsistent Policies: Variability in state and national policies creates uncertainty for investors and developers.

Streamlining regulations, providing consistent incentives, and promoting stakeholder collaboration can overcome barriers to green finance. Addressing these challenges will help India fully unlock the potential of green finance in creating a sustainable and inclusive housing sector.

Technology and Innovation in Green Housing Finance

Digital Tools for Promoting Green Investments

Online Platforms: Connect investors with green housing projects, simplifying investment processes.
Mobile Applications: Enable borrowers to apply for green mortgages and track progress in real-time.
Block chain Technology: Ensures transparency in green bond issuance and fund utilization.
Smart Contracts: Automate financing agreements, reducing administrative costs and improving efficiency.
Energy Monitoring Tools: Track energy consumption and savings in green-certified homes for performance assessments.
These tools streamline green investments, enhance accountability, and encourage wider adoption.

Role of FinTech in Enabling Green Finance

FinTech bridges sustainability and finance by offering innovative solutions:
Crowd funding Platforms: Allow small investors to fund green housing projects.
Digital Lending: Speeds up green loan disbursement for developers and homeowners.
AI-Powered Risk Assessment: Improves decision-making by evaluating risks in green projects.
Robo-Advisors: Offer personalized investment guidance for green finance opportunities.
Mobile Wallets: Simplify transactions related to green investments, making them more accessible.
FinTech innovations democratize green finance, making it more inclusive and efficient.

Use of Big Data and AI for Sustainable Investment Decision-Making

Big Data and AI enhance investment decisions in the green housing sector:
Data Analytics: Identifies market trends to pinpoint green investment opportunities.
Predictive Modelling: Forecasts long-term risks and benefits of green projects.
Sustainability Scoring: Assesses environmental impact to guide responsible investments.
Fraud Detection: Identifies discrepancies in green certifications and fund allocations.
Real-Time Monitoring: Uses sensors and IoT devices to track energy consumption and performance.
These technologies improve precision, reduce risks, and enhance transparency in green finance.

Green Building Certifications and Their Impact

Green building certifications promote sustainability in housing finance:
LEED (Leadership in Energy and Environmental Design): Enhances energy efficiency and increases market value.
IGBC (Indian Green Building Council) Certification: Supports sustainable construction in India, attracting investors.

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BREEAM (Building Research Establishment Environmental Assessment Method): Evaluates environmental impact to encourage green standards.
EDGE (Excellence in Design for Greater Efficiencies): Focuses on cost-effective, resource-efficient building solutions.
Impact on Financing: Green-certified projects receive preferential financing, such as lower interest rates and faster approvals.
These certifications boost project credibility, attract investors, and drive environmental benefits.By leveraging technology, FinTech, AI, and green certifications; the green housing finance industry is set for significant growth, contributing to a more sustainable future.

Global Best Practices and Lessons for India
Case Studies of Successful Green Housing Finance Models Worldwide
Germany: KfW Development Bank offers low-interest loans and grants for energy-efficient housing.
United States: Fannie Mae's Green Financing program incentivizes energy-efficient multifamily housing.
China: Green Credit Policy mandates banks to prioritize loans for sustainable housing.
Netherlands: Rabobank provides interest rate discounts for energy-efficient homes.

Comparative Analysis of Policies and Practices in Other Countries
Key policy comparisons highlight areas where India can learn:
Regulatory Frameworks: Germany and China enforce strict green finance regulations, ensuring compliance and accountability.
Tax Incentives: The U.S. provides significant tax credits for energy-efficient housing, motivating developers and investors.
Public Awareness Campaigns: European nations actively promote green housing benefits, increasing consumer demand.
Integration of Technology: Developed nations use AI and IoT to enhance energy efficiency in housing projects.
These practices emphasize the role of strong policies and innovation in scaling green finance initiatives.

Adapting Global Practices to the Indian Context
India must customize global strategies to address local challenges:
Policy Customization: Implement subsidies and tax benefits suited to India's socio-economic conditions.
Financial Inclusion: Develop microfinance solutions to make green housing accessible to low-income groups.
Capacity Building: Train developers and financiers in sustainable housing practices.
Incentivizing Developers: Offer benefits like expedited approvals and lower interest rates for green-certified projects.
Public-Private Partnerships: Encourage collaboration between government, private sector, and international organizations for expertise sharing.
By localizing proven strategies, India can accelerate its shift toward sustainable housing finance.

Strategic Roadmap for Indian Housing Finance Companies
Developing Sustainable Finance Frameworks
To ensure a structured approach to green housing finance, Indian housing finance companies must:
Policy Formulation: Incorporate green finance principles into corporate policies.
Standardized Metrics: Develop clear metrics to assess the environmental impact of projects.
Green Loan Portfolios: Allocate a portion of lending to energy-efficient housing projects.
Compliance Monitoring: Implement systems to ensure adherence to sustainability standards.

Strengthening ESG Integration in Business Models

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ESG factors must be embedded into housing finance:
Risk Management: Integrate ESG risks into credit assessments.
Sustainable Investments: Prioritize funding for projects meeting ESG criteria.
Transparency: Disclose ESG initiatives and performance regularly.
Stakeholder Collaboration: Work with investors, developers, and policymakers to align ESG goals.
Effective ESG integration enhances credibility and attracts impact-focused investors.

Enhancing Stakeholder Engagement and Awareness
Increasing awareness among stakeholders drives green finance adoption:
Educational Campaigns: Conduct workshops and seminars on green finance benefits.
Customer Incentives: Provide discounts or rewards for sustainable housing investments.
Collaborative Platforms: Facilitate knowledge-sharing forums among stakeholders.
Media Outreach: Use social media and traditional media to promote green initiatives.
Engaging stakeholders fosters greater participation in sustainable housing projects.

Promoting Innovation in Product Offerings and Services
Innovative financial products can expand green finance accessibility:
Green Mortgages: Offer specialized home loans for energy-efficient properties.
Renewable Energy Loans: Finance solar panels and sustainable energy systems.
Energy Performance Guarantees: Partner with developers to ensure efficiency targets.
Flexible Repayment Plans: Link repayment schedules to energy cost savings.
Innovative solutions attract a broader customer base while advancing sustainability.

Collaboration with Government and International Organizations
Public and international partnerships enhance the effectiveness of green finance:
Policy Advocacy: Influence government policies that support green housing finance.
International Funding: Access global green funds for project financing.
Technical Assistance: Leverage international expertise for sustainable practices.
PPP Models: Foster Public-Private Partnerships for large-scale sustainable projects.
Strategic collaborations amplify the impact and scalability of green housing finance.

A sustainable housing finance roadmap includes ESG integration, stakeholder engagement, innovative financial products, and government collaboration, ensuring long-term environmental and financial viability.

Conclusion and Recommendations

12.1 Roadmap for Green Housing Finance in India

- Establishing a Sustainable Finance Framework
- Develop policies integrating green finance principles.
- Standardize metrics for evaluating environmental impact.
- Allocate a portion of loan portfolios to sustainable housing projects.
- Implement compliance and monitoring systems.

12.2 Integrating ESG into Business Operations

- Embed ESG risk management into lending practices.
- Prioritize funding for projects meeting sustainability criteria.
- Enhance transparency through regular ESG disclosures.
- Foster collaboration among stakeholders to align ESG goals.

12.3 Strengthening Stakeholder Engagement

- Conduct educational campaigns on green finance benefits.
- Offer incentives to consumers adopting eco-friendly housing.

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- Develop platforms for sharing best practices and innovations.
- Leverage media channels to increase awareness.

12.4 Innovating Financial Products & Services

- Introduce green mortgages and renewable energy loans.
- Partner with developers to implement energy performance guarantees.
- Design flexible repayment plans linked to energy savings.
- Expand digital tools for financing and monitoring sustainability metrics.

12.5 Enhancing Government and International Collaboration

- Advocate for policy reforms supporting green housing finance.
- Access global green funds and sustainable investment grants.
- Work with international organizations for technical assistance.
- Establish public-private partnerships to scale green housing initiatives.

Green finance plays a vital role in promoting sustainable housing in India by addressing environmental concerns while ensuring financial viability. The adoption of advanced technology, global best practices, and policy reforms is essential for accelerating green housing finance. However, challenges such as financial barriers, regulatory gaps, and limited awareness must be tackled through strategic collaboration among the government, housing finance companies (HFCs), investors, and consumers. A proactive policy framework, coupled with innovative financial products and enhanced stakeholder engagement, will be instrumental in driving India's transition toward a sustainable and eco-friendly housing finance ecosystem.

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COMMERCE AND MANAGEMENT: TOWARDS A "VIKSIT BHARAT"

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Abstract

India, with its diverse economy, population, and rich cultural heritage, has embarked on a path of modernization and economic growth. This paper explores the role of commerce and management in realizing the vision of a "Viksit Bharat" (Developed India). The study delves into key areas such as economic policies, digital transformation, sustainable business practices, entrepreneurship, and management strategies that can help India achieve its goal of becoming a developed nation. It also highlights challenges and opportunities in the context of Indian commerce and management, and the way forward.

Introduction

"Viksit Bharat" or a "Developed India" is a national dream that seeks to elevate India to the ranks of the world's most economically advanced and socially equitable nations. The realization of this vision involves multifaceted reforms in governance, industry, education, infrastructure, and, importantly, commerce and management. As India evolves, the business environment and management practices need to align with the nation's development goals.

Commerce and management serve as the backbone of economic growth and development, which is why it is crucial to examine how they can contribute to India's progress. By adopting modern practices in these fields, India can enhance its global competitiveness, stimulate job creation, increase production efficiency, and boost domestic and international trade.

Literature Review

A literature review of Commerce and Management: Towards a "Viksit Bharat" explores the role of commerce and management practices in contributing to the vision of a "Viksit Bharat" (Developed India). The review addresses the significance of commerce and management in India's growth trajectory, challenges faced by businesses, and emerging trends in the global and local business landscape.

1. India's integration into global trade networks has increased its economic competitiveness. The government has introduced initiatives such as "Make in India" and "Atmanirbhar Bharat" (self-reliant India), which encourage businesses to grow, innovate, and expand globally. Scholars such as Chakravarty (2019) highlight that India's trade policies are designed to promote sustainable growth and reduce dependence on imports, fostering indigenous industry growth.
2. With the advent of technology, e-commerce has become a central component of India's commerce landscape. According to Bose & Mukherjee (2021), the rise of platforms like Amazon, Flipkart, and Paytm has revolutionized consumer behavior, offering new avenues for businesses. E-commerce's role is not only to drive economic activity but also to empower rural and underserved populations by providing them access to national and international markets.
3. Financial inclusion is integral to India's commerce strategy. The Pradhan Mantri Jan Dhan Yojana (PMJDY) and the Digital India initiative aim to bring more individuals and businesses into the formal financial ecosystem, as noted by Kumar & Deshmukh (2020). The adoption of digital payment systems like UPI has simplified transactions and helped increase transparency, promoting trust and inclusivity in commerce.

The Role of Commerce in a Viksit Bharat:

1. Economic Policies and Governance:

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Commerce in India is heavily influenced by the country's economic policies. Government initiatives like "Make in India," "Atmanirbhar Bharat" (Self-reliant India), and "Digital India" are geared towards enhancing India's industrial capacity, boosting exports, and encouraging technological advancements. These initiatives aim to create a favorable business environment for domestic and foreign investments.

- **Trade Reforms**: As a global trading partner, India has significantly benefited from trade liberalization, reducing barriers to imports and exports. Further reforms in tariff structures and trade agreements can provide a boost to Indian commerce and bring it closer to global standards.
- **Taxation System**: The introduction of the Goods and Services Tax (GST) in 2017 has simplified indirect taxation, enhancing business efficiency and ensuring smoother inter-state commerce.

Digital Transformation in Commerce:

The digitization of commerce is one of the major drivers for economic development in India. Digital payment systems, e-commerce platforms, and fintech innovations have made commerce more accessible to a wider population. The rise of online retail, digital marketing, and financial services has resulted in economic inclusion, particularly in rural and remote areas.

- **E-commerce Growth**: The boom in e-commerce, facilitated by platforms like Amazon, Flipkart, and others, has transformed the retail landscape in India, providing opportunities for small businesses to reach global markets.
- **Financial Inclusion**: The Digital India mission has brought about significant advancements in banking and financial services, ensuring that a larger portion of the population can access and participate in the formal economy.

Sustainability and Green Commerce:

A Viksit Bharat would require a robust commitment to sustainability. India's commerce sector, in particular, must incorporate green practices into business strategies, such as reducing waste, conserving energy, and promoting sustainable supply chains.

- Sustainable Business Practices: Companies should adopt Corporate Social Responsibility (CSR) initiatives and environmentally friendly business practices, balancing profitability with environmental conservation.
- Green Technologies and Innovation:The promotion of green technologies in areas like renewable energy, electric vehicles, and sustainable agriculture will play a crucial role in driving both economic growth and environmental protection.

The Role of Management in a Viksit Bharat:

Human Resource Development:

Effective management practices are vital for harnessing the potential of India's workforce. A "Viksit Bharat" requires skilled labor, innovative leaders, and efficient managers to navigate the global economic landscape. Investments in education and skill development, both at the technical and managerial levels, are critical to enhancing productivity and competitiveness.

- Skill Development Programs: Government initiatives like Skill India aim to provide the workforce with the technical skills required for modern industries. These programs can reduce unemployment and provide a pool of talent for various sectors.
- Leadership and Innovation: In the context of management, encouraging innovation and creativity in leadership will empower Indian managers to tackle complex business challenges and expand the reach of Indian companies globally.

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Entrepreneurship and Startups:

Entrepreneurship is a significant contributor to economic development, especially in a developing economy. A "Viksit Bharat" envisions fostering an ecosystem of innovation and enterprise. India has seen a surge in startups in various sectors, including technology, healthcare, agriculture, and education.

- Government Support: The government's Startup India program and initiatives like tax exemptions, funding, and incubation centers aim to foster entrepreneurial spirit among young Indians.
- Access to Capital: The availability of venture capital and angel funding has enabled many startups to scale quickly, making a significant contribution to the Indian economy.

Corporate Governance and Ethical Management:

Good governance and ethical management practices are vital for fostering investor confidence, ensuring transparency, and building sustainable businesses. In a developing nation like India, the need for strong corporate governance practices is imperative for long-term business growth and societal well-being.

- Transparency and Accountability: The introduction of regulations such as the Companies Act and Securities and Exchange Board of India (SEBI) guidelines ensures greater accountability in corporate management, minimizing corruption and encouraging ethical decision-making.
- Inclusive Management Practices: Companies must also adopt inclusive management practices that promote gender equality, diversity, and employee welfare.

Challenges and Opportunities of Commerce and Management in Viksit Bharat (Developed India)

India's vision of becoming a "Viksit Bharat" (Developed India) hinges on a transformation in various sectors, including commerce and management. As India strives to position itself as a global economic powerhouse, it faces numerous challenges and opportunities in both areas that need to be addressed to achieve sustainable growth and development.

Challenges of Commerce and Management in Viksit Bharat:

Bureaucratic and Regulatory Hurdles:

Despite significant reforms like the Goods and Services Tax (GST) and the "Ease of Doing Business" initiative, India still faces challenges related to cumbersome bureaucracy, outdated regulatory frameworks, and inefficiencies in implementation. These issues create delays, increase transaction costs, and hinder both domestic and foreign investment.

- Impact: This can slow down business expansion, discourage entrepreneurship, and impact investor confidence, making it harder for India to compete with global counterparts.

Infrastructure Deficiencies:

Inadequate infrastructure—be it in transportation, logistics, energy, or digital connectivity—remains a key challenge for commerce in India. While major projects like Smart Cities and the Bharatmala initiative aim to improve infrastructure, the existing gaps still create barriers for businesses, especially small and medium-sized enterprises (SMEs), in reaching global markets efficiently.

- Impact:Poor infrastructure limits the smooth flow of goods and services, increases operational costs, and reduces India's competitiveness in the global economy.

Labor Skill Mismatch and Unemployment:

India faces a critical challenge in developing and retaining a skilled workforce. Despite having a large young population, many sectors experience a gap between the skills possessed by workers and those demanded by industries, especially in technology, healthcare, and manufacturing sectors.

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- Impact: A mismatch of skills leads to higher unemployment rates and hampers productivity. The lack of sufficient management and technical training also affects innovation and efficiency in both small and large businesses.

Income Inequality and Social Disparities:

While India's GDP growth has been impressive, income inequality remains a significant issue. Many parts of the country, especially rural areas, continue to face poverty, lack of access to education, and poor healthcare. These social disparities present a challenge for equitable commerce and inclusive management practices.

- Impact: A significant portion of India's population remains marginalized, which limits their participation in the formal economy and hinders the full utilization of the country's human capital.

Environmental Sustainability:

Rapid industrialization and urbanization have led to environmental degradation in India. The challenge lies in balancing economic growth with sustainability. Industries continue to face criticism for their environmental impact, especially in sectors such as manufacturing, construction, and agriculture.

- Impact: The lack of sustainable practices can result in long-term ecological damage, loss of biodiversity, and global climate change risks, affecting both India's economic growth and its global reputation.

Corruption and Ethical Issues in Business:

Corruption continues to be a significant obstacle in India's business environment, affecting government policies, public sector dealings, and private-sector growth. This issue often results in unfair business practices, such as bribery and favoritism, undermining trust in the system.

- Impact: Corruption hampers transparency, increases costs for businesses, and dissuades foreign investment, while ethical lapses can lead to legal issues, reputational damage, and operational inefficiencies.

Opportunities in Commerce and Management in Viksit Bharat:

Digital Transformation and E-commerce Growth:

The digital revolution offers significant opportunities for commerce in India. With a growing internet user base, e-commerce, fintech, and digital platforms have become key drivers of economic growth. This trend is expected to continue with increased investments in AI, data analytics, and block chain technologies, which can help businesses innovate and become more efficient.

- Impact: The expansion of digital infrastructure creates vast opportunities for entrepreneurs, businesses, and consumers, ensuring greater economic inclusion and access to global markets.

Global Trade and Market Expansion:

India's increasing participation in global trade through initiatives such as "Atmanirbhar Bharat" and trade agreements with various countries presents tremendous opportunities. India's geographical location and large consumer base make it an attractive market for foreign direct investment (FDI) and a valuable partner in international trade.

- Impact: By capitalizing on global trade opportunities, India can boost exports, attract FDI, and build robust supply chains that integrate Indian businesses into global markets.

Entrepreneurship and Startup Ecosystem:

India has witnessed a boom in startups, with a rapidly growing ecosystem supported by initiatives like "Startup India" and a burgeoning venture capital industry. With sectors such as technology,

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healthcare, fintech, and agritech showing tremendous potential, the country is poised to become a global leader in innovation and entrepreneurship.

- Impact: A thriving startup culture promotes job creation, fosters innovation, and diversifies the economy, driving economic growth in both urban and rural areas.

Sustainability and Green Business Practices:

The growing focus on sustainability presents an opportunity for Indian businesses to lead in environmentally conscious industries. Government policies promoting clean energy, electric vehicles, and sustainable agriculture align with global trends towards sustainability.

- Impact: Businesses that embrace green technologies and practices can gain a competitive advantage in both domestic and international markets, while also contributing to India's environmental goals.

Human Resource Development and Skill India:

India's young workforce is one of its greatest assets. Initiatives such as "Skill India" aim to equip millions of Indians with relevant technical and managerial skills. By investing in education, vocational training, and management development, India can create a workforce capable of driving high-performance organizations.

- Impact: A skilled workforce will increase productivity, foster innovation, and help Indian businesses adapt to rapidly changing global markets.

Corporate Governance and Ethical Management:

As India becomes more integrated into the global economy, the importance of strong corporate governance and ethical management practices increases. Investors and stakeholders are increasingly seeking transparency, accountability, and corporate responsibility.

- Impact: Companies that adopt ethical management practices and adhere to international standards of corporate governance can attract global investors, enhance their reputation, and build long-term success.

Financial Sector Growth and Innovation:

India's financial sector, driven by innovation in digital banking, insurance, and financial technology, presents immense opportunities. The growth of fintech platforms, mobile banking, and financial literacy programs can bring millions of unbanked people into the financial fold.

- Impact: This will lead to greater financial inclusion, empower consumers, and facilitate easier access to capital for businesses, especially SMEs, which are critical to India's economy.

The challenges and opportunities in commerce and management are intrinsically linked in India's journey towards becoming a "Viksit Bharat." Overcoming the barriers posed by infrastructure deficits, skill mismatches, and bureaucratic inefficiencies will require comprehensive reforms, technological innovation, and greater focus on sustainable growth. On the other hand, the emerging digital economy, a thriving startup ecosystem, and opportunities in global trade and sustainable business practices provide a solid foundation for India's economic transformation.

By addressing these challenges and capitalizing on the available opportunities, India can build a robust, competitive, and inclusive economy that leads to a "Viksit Bharat" in the near future.

Conclusion

The path to a "Viksit Bharat" requires concerted efforts from both the government and the private sector. By fostering a favorable business environment, promoting sustainable and ethical management practices, encouraging innovation, and investing in human capital, India can accelerate its journey towards becoming a developed nation. Commerce and management will play central roles in shaping this

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future, ensuring that the economy grows in a way that is both competitive on the global stage and inclusive for its diverse population.

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A COMPARATIVE STUDY ON DIRECT AND INDIRECT TAX REFORMS IN INDIA

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Abstract

This study presents a comparative investigation of direct and indirect tax reforms in India over the past few years. The study examines the evolution, impact, and effectiveness of these reforms in shaping India's economic landscape. By exploring key policies, challenges, and outcomes associated with both tax systems, the study provides insights into how tax reforms have influenced economic growth, revenue generation, and fiscal policies. The comparative approach objects to assess the strengths and weaknesses of direct and indirect taxation in promotion economic growth, equity, and administrative efficiency. This inclusive analysis contributes to a deeper understanding of the dynamics of tax reform in India and its broader implications for the economy.After a decade-long journey, India's Goods and Services Tax (GST) finally has been implemented, effective July 1, 2017. The GST, which is essentially a destination/consumption-based tax, replaces of the world's most complicated origin-based indirect tax systems. India's legacy system was plagued by a complex tangle of national and state taxes, including a central excise duty, a service tax, a countervailing custom duty, and a special additional duty as part of the customs tax structure, as well as value added tax at the state level and state luxury taxes among numerous others. This complexity often resulted in a cascading effect of tax upon tax.

Introduction

Tax system the world over have undergone significant changes during the last twenty years as many countries across the ideological range and with changing levels of extension have undertaken reforms. In many developing countries, the immediate cause for tax reforms has been the need necessity of a market economy to ensure international competitiveness. There have been major changes in Tax systems of countries with a wide variety of economic systems and levels of development. The stimulation for these reforms has diverse from one country to another and the trust of reforms has differed from time to time depending on growth strategy and philosophy of the times.

Being the Biggest tax reform in India, GST will allow the real GDP growth of the Indian economy to hit 6.40 per cent in this fiscal year with expectations of 6.50 to 6.80 per cent real GDP growth in the year 2024-25.

SMEs and small taxpayers have benefitted from the GST system with a number of relaxations. This tax reform will lead to creation of a single national market, common tax base and common tax laws for the Centre and States. Another very significant feature of GST will be that input tax credit will be available at every stage of supply for the tax paid at the prior stage of supply. This feature would moderate pouring or double taxation in a major way. This tax reform will be supported by wide use of Information Technology through Goods and Services Tax Network (GSTN), which will lead to greater simplicity in tax burden, accountability of the tax administrations of the Centre and the States and also improve compliance levels at abridged cost of compliance for taxpayers. Studies indicate that introduction of GST would instantly spur economic growth.

Keywords: Tax Reforms, Revenue Generation, Administrative Efficiency, Economy Growth

Statement of the Problem

Every major Reform in India trends to be historic when it comes to be. The focus this year is on long term Capital Gains Tax. There is the argument that the combination of lower interest rates and Capital Gain Tax basis investment and growth. Goods and Services Tax (GST) replacing multiple taxes

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the stage is now open for similar move on direct taxes. In direct taxes, corporate tax and Income tax account for 51% of the total Revenue. The chance of interest rate reduction is now remote with inflation edging beyond tax reduction will encourage higher investment.

Objectives

The present study is carried out with the following objectives:

1. To study various aspects of Tax Reforms system in India and to analyze the aspects of Tax Reforms in developed countries.
2. To examine response from the experts regarding implementation and administration of Tax Reforms
3. To analyze the current Tax Reforms and its impact of administration of Direct Tax and Indirect Tax.
4. To study the Problems and Prospects of administration of the Proposed Tax Reforms in the years to come.

Scope of the Study

The Present study analyses the Impact of Direct and Indirect Tax Reforms in India. The study gives some value able information to India tax system that they can help to improve Economic Development as well Growth of India. Review of Literature Das Gupta eta (1995) reported that collection of income taxes is very low during the years 1979-1990 covering about 2.2% of GDP with an average per capita income below 35 dollars. He also analyzed empirically the compliance development over time and found that compliance declined. Over the period 1970-1990 controversy to the positive trend of the income tax revenue. An increase in the average tax rate reduced tax compliance on the other hand, tax cuts done in 1975 and 1985 went I line with a higher compliance. Interestingly they found the prosecution activities are ineffective for increasing compliance. Nagma Shadab (2011) the study mainly focused in Goods and Services Tax (GST) is a broad based and a single comprehensive tax. In this tax levied of various level of products. This tax contributing chain of product is applicable. Khalid Mohmodlodhietal (2013) examine this study impact of capital gains tax on stocks investment in Pakistan. Whenever there is an increase the value of capital asset realized over its cost it is termed to as capital gain and tax imposed these off is call capital gain tax.

The study find out that levy of capital gain tax results in lower volume of stock investment and lesser growth in assets and securities whereas the revenues have also declined as more investments have declined due to the fears of documentation of small investors by the tax authorities. Jai prakash (2014) in this study focused on augmentation over the existing union excise duty at the central level and over the sale tax at the state level while GST is a further enhancement over the existing VAT which is yet to be implemented most probably in the coming financial year as promise made by our union finance minister. The new GST will ensure the greater uniformity in the tax rates throughout the country and will end the cascading effects. The objective this paper is to trace the growth of India's tax reforms from and origin-based CST to a proposed destination based GST.

Monika Shearwater (2015) this study examine GST is one of the most crucial tax reforms in India. Which has been long pending. It was supposed to be implemented from April 2010, but due to political issues and conflicting interest of various stakeholders it is still pending. It is a comprehensive tax system that will subsume all indirect taxes of states and central government and unified countries economy into a seamless national market. It is expected to iron out wrinkles of existing indirect tax system and a vital role in growth of India. This paper present an overview of GST Concept, explains its features along with its time line of implementation in India.

Reforms of Direct Exemptions

High rates are a recipe for low tax compliance. A lower rate for lower incomes and high rates for higher incomes will ensure better balance. The doorstep for income tax needs to be revised

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periodically to counter the effects of inflation. An overabundance of exemptions and deductions, adding to lawsuit on these, needs to be removed. · For individuals, there should be simple formula for net income taxation. Assuming gross income from all sources is Rs.1000; allow 35% for savings, 32.5% of the remaining for consumption. As a result, only Rs 325 of the gross income should be taxable. · For corporate, the calculation is as follows. For Rs 1000 of profit before tax, add book depreciation of 10%. Limit 35% for investments in assets for future business growth. Hence income chargeable to tax is 71.5%. · For individuals, those earning less thanRs 5 lakh need not be taxed. Those between this floor and Rs 10 lakh should be taxed at 5%, while income between Rs 10 lakh and Rs 1 core should be taxed at 10%. The next slab till Rs 10 core should see 15% tax. Anything above that would be taxed at 20%. · For corporate, rate should be 10% up to Rs 100 core of chargeable income and 15% between that floor and Rs 500 core. The next slab up to Rs 1,000 core should be taxed 20%. Those above 1,000 cores should be taxed at 25%.

Standards tax authorities should not have any discretion to review the basis of accounting. This will ensure avoidance of unnecessary legal disputes. Multi-stage There are multiple change-of-hands an item goes through along its supply chain: from manufacture to final sale to the consumer.

Components of Goods and Services Tax (GST)

There are 3 taxes applicable under this system: CGST, SGST & IGST.

(a) CGST: Collected by the Central Government on an intra-state sale (Egg: transaction happening within Gujarat)

(b) SGST: Collected by the State Government on an intra-state sale (Eg: transaction happening within Gujarat)

(c) IGST: Collected by the Central Government for inter-state sale (Egg: Rajasthan to Gujarat).

Destination-Based Consider goods manufactured in Rajasthan and are sold to the final consumer in Gujarat. Since Goods & Service Tax is levied at the point of consumption.

Benefits of Tax Reforms

1. One of the most immediate benefits business owners will notice the new tax code is a code is decrease in the corporate tax rate from 35 % to 21%, which came into effect on January 1 2018.
2. 2 As any business owner knows, the costs of starting a new business can be astronomical, so it should come as a great relief that this burden will be somewhat mitigated in the nest fiscal year.
3. Other changes that business can take advantage of involve expenses that they can write off in order to save even more money on taxes. This includes the full cost of law equipment, interest paid on loans and charitable contributions. Tax cuts and jobs act increases the amount of money than can be written off for these expenses and protects these write offs from being rescinded in the future.

Delimitations of Tax Reforms:

1. The Most pressing piece of bad news that comes with this tax cut is an increase in the government deficit according to the tax foundation, fully implementation these changes to the tax code will result in a loss of approximately decade.
2. While optimists believe that his loss of revenue will be offset by increased economic grow is based on conjecture and may be subject to change what won't change is the loss in revenue,
3. This exact scenario was observed during the financial crisis after 2007. When the housing bubble burst. Over the subsequent three years, bank loans to businesses decreased at a rate disporporatinace to all firms by around 10%.
4. A lot of link has been spilled about the tax cuts and jobs act, with some praising the legislation and many others condemning it. Only time will tell whether this decision was good or bad. The best course of action for business looking to reap the benefits of this tax reforms is to excide

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confidence. Confidence is the number once driver of Economic Growth with a confident government working well with confident. Business to increase confidence in consumers.

5. Hoping and planning for the best seems to be the best way to make the most out of this exciting and polarizing event.

Recommendation

The Direct and Indirect Taxes are mainly income generating source of every country. One country focusing on Tax is proper manner that country is Economically Developed. Tax Evasion and avoid also reduce to be support to tax administration. Goods and Services Tax (GST) is the benefit to micro, small and medium enterprise are now less dependent on tax experts when compared to the earlier regime, due to a simplified return on filling system in place. This Tax Reform will lead to creation of a single market or common market tax laws, for the central and states. Technology is main supported by extensive use of Tax Reforms of India. It is lead to greater transparency in tax burden, accountability of tax administration to improve compliance levels at reduce cost of compliance of Tax payers automatically increase of Economic and also improve the GDP growth.

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MAPPING THE INITIAL PUBLIC OFFERINGS RESEARCH USING BIBLIOMETRIC ANALYSIS

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Abstract

This study presents a comprehensive bibliometric analysis of Initial Public Offerings (IPOs) research, mapping the intellectual structure and evolution of the field. IPOs are a critical mechanism for corporate fundraising and economic development, influencing capital markets, investor behavior, and regulatory frameworks. The study utilizes bibliometric techniques to analyze 200 Scopus-indexed research papers, identifying key trends, influential authors, top-cited papers, and thematic clusters. Data were sourced from Scopus and analyzed using Publish or Perish and VOS Viewer. The findings highlight dominant research themes such as IPO underpricing, long-term performance, investor sentiment, and regulatory impact. Citation analysis ranks leading scholars, including T. Loughran and J. Ritter, and seminal papers that have significantly shaped the discourse. The study also maps keyword frequency, author collaborations, and institutional contributions, providing insights into research gaps and future directions. The results underscore the importance of bibliometric studies in synthesizing IPO research, aiding academicians, policymakers, and investors in understanding market trends and decision-making frameworks. This bibliometric approach offers a structured synthesis, ensuring a deeper understanding of IPO dynamics and their implications in financial markets.

Keywords: IPO, Investments, Pricing, Bibliometric, Performance, Themes

Introduction

What is an Initial Public Offering (IPO)?

An Initial Public Offering (IPO) is the process through which a private company offers its shares to the public for the first time, transitioning into a publicly traded company. IPOs enable companies to raise capital from public investors by listing their shares on stock exchanges such as the New York Stock Exchange (NYSE), NASDAQ, Bombay Stock Exchange (BSE), or National Stock Exchange (NSE). The process involves various stages, including regulatory approvals, valuation, pricing, marketing (roadshows), and the actual listing. Once the shares are listed, they can be freely traded in the secondary market.

IPO issuance is governed by financial regulators such as the Securities and Exchange Commission (SEC) in the U.S., the Securities and Exchange Board of India (SEBI) in India, and other regional regulatory bodies. These organizations ensure transparency, compliance, and fair market practices during the IPO process.Need for Bibliometric Analysis in IPO Research

Why Companies opt for an IPO?

Companies opt for an Initial Public Offering (IPO) for various strategic and financial reasons. One of the primary motivations is raising substantial capital for business expansion, research and development, acquisitions, and infrastructure growth. Unlike debt financing, IPO proceeds do not create liabilities, reducing financial burdens and improving the company's creditworthiness. Additionally, an IPO enhances corporate visibility and brand recognition, increasing credibility in the market and attracting potential customers, business partners, and investors. It also provides liquidity to early

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investors, venture capitalists, private equity firms, and company founders, allowing them to partially or fully exit their investment and monetize their holdings. Furthermore, companies use IPOs as a tool for employee compensation through stock-based incentives such as Employee Stock Ownership Plans (ESOPs), aligning employee interests with company performance and fostering long-term commitment. Going public also enables better access to mergers and acquisitions, as listed companies can use their stock as a currency for acquiring other firms. Finally, an IPO strengthens corporate governance and regulatory compliance by requiring companies to adhere to stringent financial transparency and accountability standards, making them more attractive to institutional investors and improving overall operational efficiency.

Importance of IPOs for Corporates and the Economy

IPOs play a significant role in corporate growth and economic development by strengthening capital markets, increasing liquidity, and creating investment opportunities. By channeling resources into productive industries and innovative business ventures, IPOs contribute to economic expansion. They also attract foreign institutional investors (FIIs) and foreign direct investment (FDI), bringing in global capital that enhances a company's valuation and credibility while strengthening the country's financial ecosystem. Additionally, an IPO establishes a market-driven valuation based on investor demand, financial performance, and future growth potential, which aids in future fundraising efforts and strategic decision-making. Public companies are required to disclose financial reports and comply with regulatory filings, which enhances corporate governance, improves financial discipline, and ensures efficient resource allocation. Moreover, IPOs enable wealth creation by allowing retail and institutional investors to participate in a company's growth. If the company performs well post-IPO, shareholders benefit from capital appreciation and dividends, further contributing to market confidence and economic prosperity.

The Need for Bibliometric Analysis of IPO Research

Given the critical role of IPOs in corporate finance, capital markets, and economic growth, research on IPOs has expanded across various disciplines, including finance, economics, accounting, and management. To systematically examine and map the intellectual structure of IPO research, bibliometric analysis becomes essential. It helps in understanding research trends and evolution by tracking the development of themes such as IPO pricing, underpricing, long-term performance, investor behavior, regulatory impact, and market efficiency over time. Additionally, it identifies influential scholars, institutions, and journals by analyzing citation networks, author collaborations, and publication sources, which assists researchers in locating key literature and potential collaborations. Bibliometric analysis also evaluates theoretical and methodological contributions, categorizing the diverse frameworks and approaches used in IPO studies, including event studies, regression analysis, machine learning models, and behavioral finance theories. Furthermore, it maps co-authorship and international collaboration, shedding light on cross-border research linkages and institutional ties. Despite extensive literature, research gaps persist in areas like the impact of artificial intelligence on IPO pricing, sustainability-linked IPOs, and post-IPO governance issues. Bibliometric analysis helps in identifying these gaps and suggesting future research opportunities. Moreover, it enhances practical implications for policymakers and investors by providing insights into IPO performance patterns, regulatory challenges, and market efficiency issues, aiding in better decision-making. Ultimately, IPOs serve as a vital mechanism for business growth, financial market development, and wealth creation. However, the growing volume of IPO research necessitates systematic synthesis for extracting meaningful insights. A bibliometric study offers a structured approach to mapping IPO research, identifying key trends, and shaping future research directions, ensuring informed decision-making in capital markets.

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Research Methodology

Objectives

This study aims to analyze emerging trends in IPO research by identifying influential authors, journals, and research papers, ranking them based on citations, determining key terms and their interrelationships, and categorizing major research themes using bibliometric analysis.

Research Design

A systematic bibliometric analysis integrating quantitative and qualitative thematic clustering ensures the credibility and reproducibility of results.

Sampling Design

A total of 200 Scopus-indexed research papers were selected using Publish or Perish software. Authors with more than three publications were shortlisted, leading to the selection of eight authors. The top ten authors, research papers, journals, and years based on citations were identified.

Period of Study

The study covers multiple years till 2024, incorporating both historical and recent influential research papers.

Sources of Data

Data were sourced from Scopus, with citation analysis performed using Publish or Perish, and network visualization conducted using VOS Viewer.

Statistical Analysis

1. Keyword and Term Frequency Analysis: 17 frequently occurring terms (minimum four occurrences) were identified.
2. Author and Term Relationship Mapping: VOS Viewer was used to analyze relationships between key terms and authors.
3. Cluster and Theme Identification: Four major clusters were identified, reflecting key research themes.
4. Citation-Based Ranking: Top research works, journals, and authors were ranked by citation count.

Discussion and Analysis

Table 1: Top Ten Authors based on Citations

Sr No.	Row Labels	Sum of Cites
1	T. LOUGHRAN	4907
2	J. RITTER	2117
3	T.E. Stuart	2071
4	R. Beatty	1813
5	S.H. Teoh	1677
6	K. Rock	1537
7	R. CARTER	1509
8	A. Brav	1469
9	W.L. MEGGINSON	1468
10	S.T. Certo	1280

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The citation analysis of the top ten authors in IPO research reveals that T. Loughran leads with 4,907 citations, indicating significant influence in the field. J. Ritter follows with 2,117 citations, reflecting his substantial contributions, particularly in IPO underpricing and market efficiency. T.E. Stuart (2,071) and R. Beatty (1,813) also hold prominent positions, showcasing their impact on IPO-related studies. Other key contributors, including S.H. Teoh, K. Rock, and R. Carter, have amassed over 1,500 citations each, highlighting their research's widespread recognition. A. Brav, W.L. Megginson, and S.T. Certo round out the list, emphasizing the diverse perspectives shaping IPO literature. The high citation counts underscore these authors' pivotal roles in advancing IPO research and influencing financial market studies.

Table 2: Top Ten Research Papers based on Citations

SN	Research Papers	Sum of Cites
1	The Long-Run Performance of initial Public Offerings	1935
2	The New Issues Puzzle	1821
3	Interorganizational endorsements and the performance of entrepreneurial ventures	1802
4	Why new issues are underpriced	1537
5	Investment banking, reputation, and the underpricing of initial public offerings	1512
6	Initial Public Offerings and Underwriter Reputation	1509
7	Venture Capitalist Certification in Initial Public Offerings	1468
8	Why has IPO underpricing changed over time?	1333
9	Earnings management and the long-run market performance of initial public offerings	1271
10	Organizational endowments and the performance of university start-ups	941

The citation analysis of the top ten research papers on IPOs highlights the dominance of studies on IPO performance, underpricing, and investment banking reputation. The Long-Run Performance of Initial Public Offerings leads with 1,935 citations, emphasizing the importance of post-IPO performance. The New Issues Puzzle (1,821 citations) and Interorganizational Endorsements and the Performance of Entrepreneurial Ventures (1,802 citations) further illustrate the significance of IPO anomalies and venture performance. Research on underpricing, such as Why New Issues Are Underpriced (1,537) and Why Has IPO Underpricing Changed Over Time? (1,333), underscores persistent inefficiencies in IPO pricing. Additionally, studies on earnings management, venture capital certification, and university start-ups reflect the evolving dimensions of IPO research. The high citation counts of these papers indicate their fundamental role in shaping academic discourse and guiding market participants.

Table 3: Top Ten Years Publications based on Citation

SN	**Years**	**Sum of Cites**
1	2003	7302
2	2002	4106
3	1998	4019
4	1986	3880
5	1999	3405
6	1991	3403
7	2004	3301
8	1995	3221
9	2005	2955
10	2006	2943

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The citation analysis of IPO research by publication year reveals that 2003 had the highest impact, with 7,302 citations, indicating significant contributions to IPO literature during this period. Other highly cited years, such as 2002 (4,106 citations) and 1998 (4,019 citations), suggest that foundational studies on IPO pricing, long-term performance, and market anomalies were published during these years. The presence of older years like 1986 (3,880 citations) and 1991 (3,403 citations) highlights the enduring influence of early IPO research. Meanwhile, the consistent citations from the late 1990s and early 2000s suggest a period of intense scholarly focus, likely driven by major market developments and evolving IPO regulations. This trend underscores the long-term relevance and impact of key IPO studies in shaping academic and practical insights.

Table 4: Top Ten Publishers based on Citations

	Journal	Sum of Cites
1	Journal of Financial Economics	16692
2	The Journal of Finance	8767
3	Journal of Finance	6581
4	Strategic Management Journal	4669
5	Academy of Management Journal	3934
6	Journal of Business Venturing	3454
7	Review of Financial Studies	2620
8	Administrative Science Quarterly	2071
9	Management Science	1366
10	Journal of Accounting and Economics	1349

The analysis of top publishers based on citations highlights the dominance of finance and management journals in IPO research. The Journal of Financial Economics leads with 16,692 citations, followed by The Journal of Finance (8,767 citations) and Journal of Finance (6,581 citations), indicating their significant role in shaping IPO literature. Strategic Management Journal (4,669 citations) and Academy of Management Journal (3,934 citations) suggest that IPO research extends beyond finance to strategic and managerial perspectives. The presence of Journal of Business Venturing (3,454 citations) underscores the relevance of IPOs in entrepreneurship studies. Additionally, journals like Review of Financial Studies (2,620 citations), Administrative Science Quarterly (2,071 citations), Management Science (1,366 citations), and Journal of Accounting and Economics (1,349 citations) highlight the interdisciplinary nature of IPO research, covering areas such as corporate governance, financial reporting, and market efficiency.

Table 5: Author with more than 3 Documents

id	Author	documents
2	a. brav	3
38	d.l. deeds	3
78	k. hanley	4
108	p. gompers	3
113	r. aggarwal	4
142	s.t.certo	3
145	t. loughran	5
149	t.g. pollock	3

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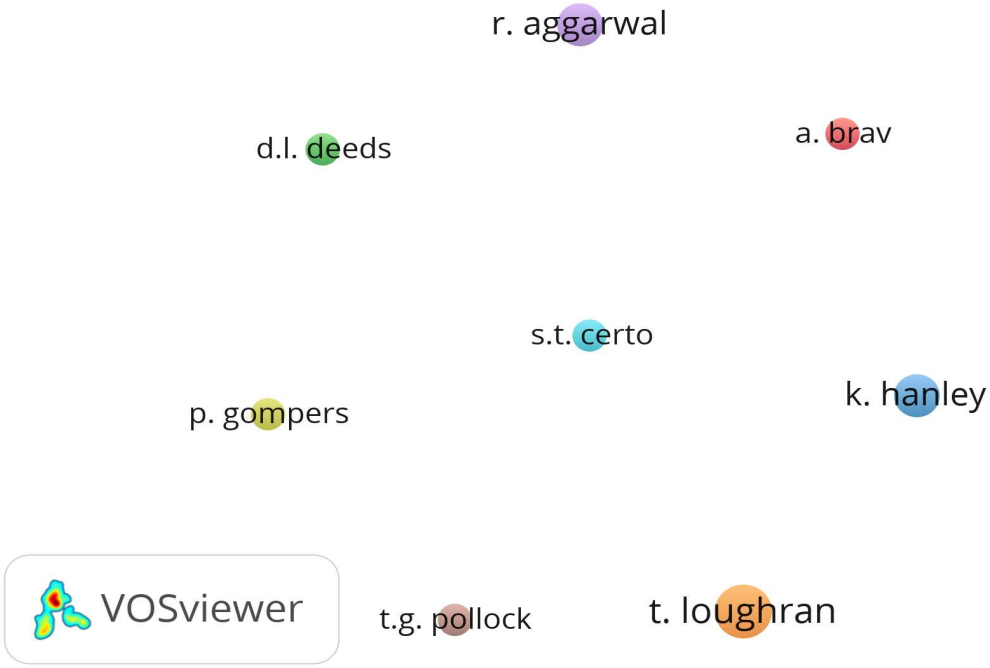
Diagram 2: Network Diagram of Author Coauthor Relationship



The analysis of authors with more than three published documents in IPO research highlights key contributors to the field. T. Loughran leads with five publications, reinforcing his strong influence on IPO literature. K. Hanley and R. Aggarwal follow with four documents each, indicating their significant contributions to IPO-related studies. Other notable scholars, including A. Brav, D.L. Deeds, P. Gompers, S.T. Certo, and T.G. Pollock, have each published three papers, reflecting their active engagement in IPO research. These authors have contributed to various aspects of IPO studies, such as underpricing, long-term performance, and market dynamics, shaping the academic discourse in the field.

Table 6: Selected Terms from Documents

id	term	occurrences	relevance score
1	capital	8	0.3594
2	earnings management	5	1.5186
3	earnings quality	4	2.5962
4	effect	15	0.4204
5	empirical analysis	5	2.7113
6	evidence	21	0.4414
7	firm	20	0.6379
8	impact	9	0.4136
9	initial public offering	38	0.5068
10	initial public offerings	6	1.1062
11	ipo firm	5	1.0087
12	ownership	6	0.3784
13	performance	26	0.4527
14	theory	5	0.3653
15	underpricing	16	0.5604
16	venture capital	4	2.4916
17	venture capitalist	4	1.031

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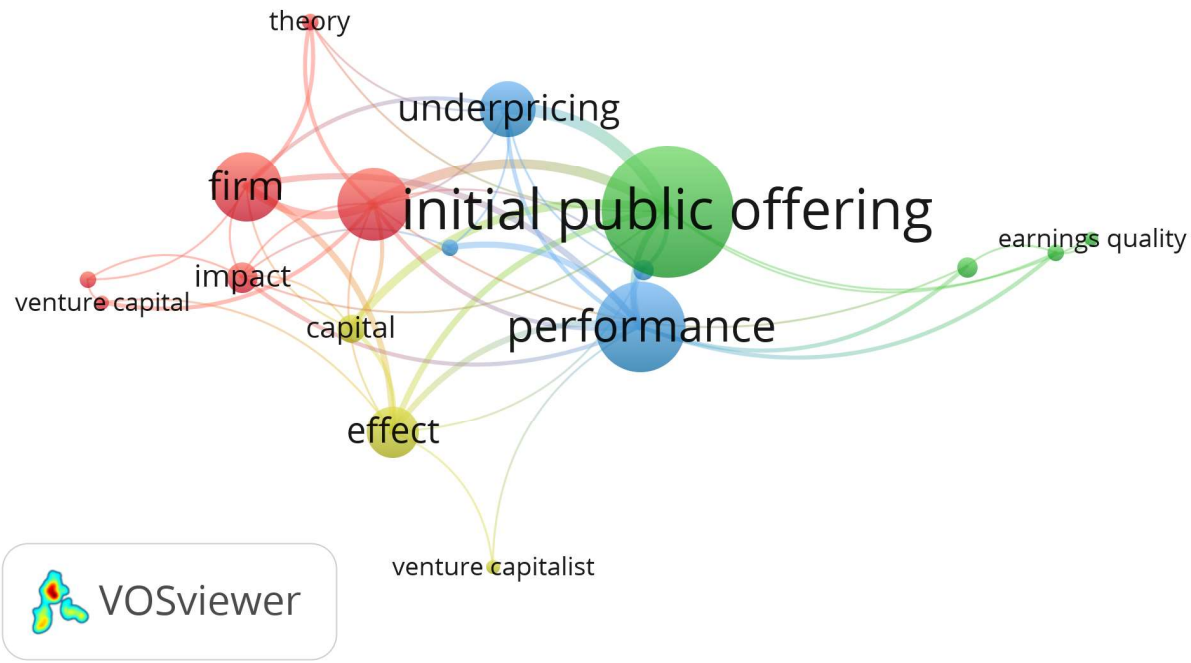
Diagram 2: Selected Terms Network Diagram



The selected terms from IPO research documents highlight key themes and focus areas in the literature. "Initial public offering" (38 occurrences) and "performance" (26 occurrences) are among the most frequently mentioned terms, indicating strong research interest in IPO success factors. "Underpricing" (16 occurrences) and "earnings management" (5 occurrences, 1.5186 relevance score) suggest significant attention to pricing anomalies and financial reporting practices in IPOs. Terms like "venture capital" (4 occurrences, 2.4916 relevance score) and "ownership" (6 occurrences) highlight the role of investors and governance structures in IPO performance. Additionally, high relevance scores for "empirical analysis" (2.7113) and "earnings quality" (2.5962) indicate a methodological focus on data-driven financial assessments. This analysis underscores the diverse dimensions of IPO research, from valuation and financial performance to investor behavior and market effects.

Table 7: Identified Clusters and Themes

Themes	Terms
Cluster 1	Empirical Analysis
	Evidence
	Firm
	Impact
	Theory
	Venture Capital
Cluster 2	Eaarnings Management
	Earnings Quality
	Initial Public Offering
	Initial Public Offerings
Cluster 3	IPO Firm
	Ownership
	Performance
	Underpricing
Cluster 4	Capital
	Effect
	Venture Capitalist

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Cluster 1 – Empirical Foundations of IPOs
(Empirical Analysis, Evidence, Firm, Impact, Theory, Venture Capital)
This cluster focuses on data-driven research exploring IPO dynamics, firm performance, and theoretical models.

Cluster 2 – Financial Reporting and IPO Integrity
(Earnings Management, Earnings Quality, Initial Public Offering, Initial Public Offerings)
This cluster examines how financial reporting practices, earnings management, and transparency affect IPO valuation and market reception.

Cluster 3 – IPO Market Behavior and Pricing Strategies
(IPO Firm, Ownership, Performance, Underpricing)
This cluster delves into corporate ownership structures, post-IPO performance, and pricing anomalies such as underpricing.

Cluster 4 – Capital Structure and Investment Dynamics
(Capital, Effect, Venture Capitalist)
This cluster explores capital formation, investment trends, and the influence of venture capitalists on IPO outcomes.

The identified clusters in IPO research highlight distinct yet interconnected dimensions of the field. Cluster 1 – Empirical Foundations of IPOs underscores the role of data-driven analysis in understanding IPO dynamics, firm behavior, and theoretical advancements. This cluster forms the backbone of IPO research by offering empirical validation of various financial and economic models. Cluster 2 – Financial Reporting and IPO Integrity shifts the focus to the quality of financial disclosures, emphasizing how earnings management and transparency influence investor confidence and market reception. This theme is particularly relevant in regulatory discussions and governance frameworks. Cluster 3 – IPO Market Behavior and Pricing Strategies explores market anomalies such as underpricing, ownership structures, and long-term performance, providing insights into investor sentiment and strategic corporate decisions. Finally, Cluster 4 – Capital Structure and Investment Dynamics highlights the interplay between capital allocation, investment effects, and the role of venture capitalists in shaping IPO outcomes. Together, these clusters offer a structured perspective on IPO research, aiding scholars and practitioners in identifying critical research areas and future directions.

Conclusion

The bibliometric analysis of IPO research reveals distinct but interconnected dimensions, offering valuable insights into the field's evolution. The study categorizes IPO research into four key clusters: Empirical Foundations of IPOs, which emphasizes data-driven analysis and theoretical advancements; Financial Reporting and IPO Integrity, focusing on transparency, earnings management, and regulatory implications; IPO Market Behavior and Pricing Strategies, which explores underpricing, ownership structures, and long-term performance; and Capital Structure and Investment Dynamics, highlighting the role of venture capitalists and capital allocation in IPO success.

The findings underscore the dominance of research on IPO underpricing, post-IPO performance, and the role of financial intermediaries such as investment banks and venture capitalists. Recent trends indicate a growing interest in advanced analytical techniques, including machine learning, behavioral finance, and AI-driven models for IPO forecasting and investor sentiment analysis. The citation analysis further highlights the significant academic contributions and collaborative nature of IPO research, with scholars across institutions and regions shaping the discourse

Despite extensive studies, research gaps persist in areas such as sustainability-linked IPOs, ESG considerations, post-IPO governance, and AI-driven financial modeling. Addressing these gaps can offer fresh perspectives and improve IPO market efficiency. Policymakers, investors, and corporate leaders can leverage these insights to optimize IPO strategies, enhance regulatory frameworks, and foster investor confidence.

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Overall, this study provides a structured roadmap for scholars and practitioners by systematically analyzing IPO research trends, thematic clusters, and academic contributions. By identifying key research areas and emerging trends, this bibliometric analysis serves as a foundation for future exploration in IPO dynamics and capital markets.

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ANALYZING THE PILOT PHASE OF INDIA'S CBDC (DIGITAL RUPEE): IMPLICATIONS FOR FINANCIAL INCLUSION AND SUSTAINABLE DEVELOPMENT

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Abstract

With the November 2022 launch of its Digital Rupee pilot, India is leading the way in the worldwide evolution of Central Bank Digital Currencies (CBDCs). This paper examines India's CBDC pilot program in light of the Sustainable Development Goals (SDGs), illustrating how it might encourage financial inclusion, economic expansion, and lessen inequality. The study adopts a secondary research methodology, leveraging data from credible news outlets such as Economic Times, as well as official reports from the Reserve Bank of India (RBI), publications by the Bank for International Settlements (BIS), and other research articles and columns. Key findings indicate that as of mid-2024, there were 4 million merchants and over 4.3 million retail users of The Digital Rupee. It aligns with the SDGs and addresses issues such as lack of internet knowledge, privacy issues, and infrastructure deficiencies, particularly in remote places. By offering a sophisticated examination of India's initiatives and their consequences for international monetary systems, this study adds to the expanding conversation on CBDCs.

Keywords: Central Bank Digital Currency, Digital Rupee, Sustainable Development, Financial Inclusion, Indian CBDC Pilot

Introduction

Global Landscape of CBDCs

The Central Bank Digital currencies (CBDCs) are digital representations of a nation's fiat money that are issued and controlled by central banks. As a safe and secure means of exchange, CBDCs are state-backed, in contrast to cryptocurrencies, which function on decentralised networks. 134 nations and currency unions, which account for 98% of the world's GDP, are exploring a CBDC. As of May 2020, it was just 35. Presently, 66 nations are at the advanced stage of exploration, which includes piloting, launching, and development.

The Bahamas' Sand Dollar was the first CBDC to be introduced in October 2020 with the goal of enhancing financial inclusion among its many islands. Nigeria then launched the eNaira in October 2021, making it the first country in Africa to do so. At least eleven nations have formally introduced digital currencies by the mid of 2024, including Jamaica, where JAM-DEX was made legal currency in June 2022 and several nations in the Eastern Caribbean Currency Union (ECCU) with the crossborder CBDC called DCash.

Two main categories may be used to classify CBDCs:

1. Retail CBDCs: These may be used for regular transactions and are meant for the general population. Jamaica's JAM-DEX and China's e-CNY are two examples.
2. Wholesale CBDCs: These currencies, which are intended for financial institutions, make interbank payments and transactions easier. India's Digital Rupee pilot consists both wholesale and retail elements.

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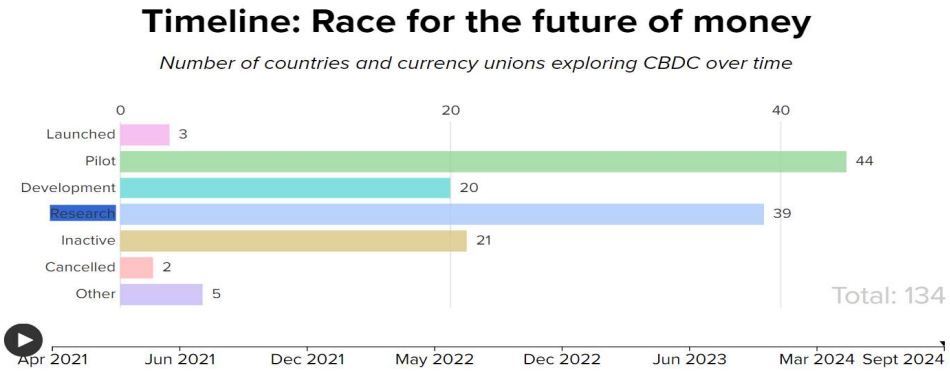

Source: CBDC Tracker, Atlantic Council

CBDC Types

Digital Rupee Pilot Project

The Reserve Bank of India (RBI) introduced the Digital Rupee plan in November 2022, aiming to modernise India's financial system. Divided into Retail and Wholesale Digital Rupees, it focuses on consumer transactions and government securities settlement. Selected banks and a closed user group of consumers and merchants participated in the e₹-W and e₹-R trial phases, which started on November 1, 2022, and December 1, 2022, respectively.

With properties like security, programmability, and accessibility, the Digital Rupee functions as a digital token that is comparable to actual money. Both pilots have made considerable progress as of early 2024, and expansion plans are dependent on user input. In addition to improving financial inclusion and transaction efficiency, this effort establishes India as a pioneer in the worldwide transition to digital currencies.

Intersection of CBDC and SDGs

CBDCs can significantly contribute to the SDGs by improving financial inclusion, empowering marginalised populations, and supporting sustainable economic growth. By providing access to digital financial services, CBDCs can simplify payment processes and reduce transaction costs, aligning with SDGs 1 (No Poverty) and 8 (Decent Work and Economic Growth). Additionally, CBDCs can offer innovative financing options for clean energy projects, aligning with SDGs 7 (Affordable and Clean Energy) and 12 (Responsible Consumption and Production).

CBDCs can enhance environmental sustainability by tracking climate action expenditure trends (SDG 13) and funding biodiversity conservation initiatives (SDG 15), thereby promoting equitable economic development and sustainable design.

Literature Review

Payment processes are more convenient and secure through CBDCs. The robustness of payment infrastructures may be improved and transaction costs can be decreased with a well-designed CBDC.CBDCs help maintain monetary sovereignty amidst new private digital currencies by providing minimally intrusive and easily interoperable technology with existing banking systems.0

CBDCs, a popular and risk-free digital currency, can enhance financial inclusion, particularly for those without reliable internet connectivity, by providing offline access.0CBDCs can reduce poverty by providing formal banking services to underserved groups, but their efforts should be integrated into national development objectives.**Error! Reference source not found.**

CBDCs can unlock funds for the 2030 Agenda for Sustainable Development by improving payment efficiency and access to finance, accelerating economic growth and poverty alleviation.CBDCs

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offer India's economy benefits like improved financial inclusion, reduced cash management costs, and more efficient payment methods, benefiting both individuals and the nation.

Sweden's e-Krona initiative enhances financial resilience, Nigeria's e-Naira boosts online transactions, Jamaica's JAM-DEX simplifies cashless transactions, and The Bahamas' The Sand Dollar boosts financial inclusion, particularly in remote areas.

Research Objectives

1. To evaluate the CBDC pilot phase's development and effects on the financial system, taking into account both wholesale and retail use cases.
2. To evaluate how CBDCs contribute to financial inclusion by improving accessibility, lowering transaction costs, and bringing marginalised groups into the formal economy.
3. To assess how CBDCs would affect financial stability, monetary policy, and India's shift to a digitally driven economy.
4. To investigate how CBDCs relate to the Sustainable Development Goals (SDGs) by looking at how they support digital financial infrastructure, economic development, and inequality reduction.
5. To determine the main obstacles and policy suggestions for the successful deployment of India's Digital Rupee while guaranteeing security, scalability, and adherence to regulations.

Research Methodology

Using a descriptive and analytical methodology, this study employs a qualitative research design. To examine India's Central Bank Digital Currency (CBDC) pilot program, its effects on financial inclusion, and its connection with the Sustainable Development Goals (SDGs), the study mostly uses secondary data sources.

The data was gathered from authoritative sources, including reports from the RBI on the pilot phases of the Digital Rupee, policy papers from the Ministry of Finance, Government of India, and publications by the NITI Aayog on digital payments; articles peer review from databases like Google Scholar, Springer, Elsevier, and JSTOR; working papers from World Bank, BIS, and IMF; reports on CBDCs from consulting firms like McKinsey, PwC, and EY; and global adoption of CBDC trends by the Atlantic Council and BIS.

Overview of India's CBDC Pilot Phase

Use Cases:

Digital Rupee at Wholesale (e₹-W):

The pilot phase introduced on November 1, 2022, involved nine banks including HDFC Bank, ICICI Bank, and the State Bank of India, increasing to sixteen, focusing on settling secondary market transactions involving government securities, reducing transaction costs and improving interbank efficiency.

Digital Rupee for Retail (e₹-R):

The e₹-R trial, launched on December 1, 2022, initially introduced in four cities (Mumbai, Bengaluru, New Delhi, and Bhubaneswar), simulates currency characteristics for P2P and P2M transactions. Distributed using digital wallets at partner banks, it now integrates with India's digital payment infrastructure, increasing UPI QR code compatibility and expanding to rural areas.

As of November 2024, 13 Indian banks are participating in India's Retail CBDC project, Digital Rupee (e₹-R). These banks offer a proprietary digital wallet for e₹-R transactions, allowing users to transact in person-to-person and person-to-merchant transactions. These digital tokens mirror the denominations of physical currency, facilitating transactions in the digital currency system.

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Digital Banknotes and Coins
Source: Wikipedia

Technology and Infrastructure

India's Digital Rupee pilot uses Distributed Ledger Technology (DLT) and blockchain to ensure secure, transparent transactions. The Reserve Bank of India regulates the digital rupee, a digital token similar to currency. This technology enhances payment system effectiveness by enabling instantaneous settlement. The pilot supports token-based and account-based models for retail and wholesale transactions. The RBI plans to incorporate programmability for specific locations, times, and purposes, potentially affecting travel, healthcare, and education.

Partners

The pilot initiative involving big banks and financial organizations, including State Bank of India, Bank of Baroda, Union Bank of India, HDFC Bank, ICICI Bank, Kotak Mahindra Bank, Yes Bank, and IDFC First Bank, aims to enable P2P and P2M transactions through the use of QR codes or cellphone numbers. The banks initially participated in the Wholesale Digital Rupee experiment, testing the digital currency among a small group of consumers in Mumbai, New Delhi, Bengaluru, and Bhubaneswar. Partnerships with Fintech companies like PayNearby and Bankit aim to integrate the Digital Rupee into NPCI's payment platforms, ensuring robust backend infrastructure for seamless transactions.

Progress

The adoption and growth of the digital rupee (e₹) in India have significantly improved after its initial launch in November 2022. To increase financial inclusion, especially in places with inadequate internet access, the Reserve Bank of India (RBI) is introducing features including offline functioning and programmability. In an effort to improve efficiency and transparency, the RBI is also researching the role that CBDC plays in cross-border payments. With rising interest in P2M and P2P transactions, the e₹ is being incorporated into India's digital economy. India's aspirations for a modernised financial system are supported by the e₹.

Sustainable Development Implications

By promoting economic development, improving digital financial infrastructure, and lowering inequality, the implementation of Central Bank Digital Currencies (CBDCs) can significantly contribute to the advancement of three Sustainable Development Goals (SDGs).

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IMPLICATIONS	CASE	BENEFIT FOR INDIA
1. SDG 8: Economic Growth		
CBDCs enhance transaction efficiency and economic production by promoting transparency, reducing settlement costs, and timeframes, particularly in India, where high costs and payment delays hinder business expansion.	The eNaira in Nigeria has significantly improved company financial operations by facilitating faster payments in the formal sector and fostering increased trust in the formal economy.	India's informal economy faces challenges in using official banking services, but Digital Payments Centres (CBDCs) like Digital Rupee can integrate unorganized workers into the financial system.
2. SDG 9: Digital Financial Infrastructure		
CBDCs can enhance system security, efficiency, and ecosystem of digital payments by seamlessly connecting with existing payment systems like UPI, promoting Fintech innovation.	The Bahamas' Sand Dollar, a government-backed digital currency, has enhanced infrastructure for digital payments, facilitating access to digital banking services and mobile payments for small enterprises and rural communities.	Likewise, India's e₹ will promote fintech innovation in credit services, mobile banking, and digital wallets.
3. SDG 10: Reducing Inequalities		
CBDCs can reduce economic inequities by providing better access to banking services for rural and isolated populations, promoting social and economic mobility through investment, borrowing, and savings.	The JamDex CBDC in Jamaica has significantly improved financial inclusion in rural areas by providing digital wallets connected to cellphones, enabling those without conventional bank accounts to access the IJCRT financial system.	With its offline features, the e₹ trial in India can get around rural connectivity issues and provide financial services like credit, insurance, and savings to those who didn't have access to them before.

SDG-Aligned Benefits of CBDCs

- SDG 8 (Economic Growth): CBDCs encourage economic activity and growth, particularly in the unorganised sector, by simplifying transactions and enhancing transparency.
- SDG 9 (Digital Infrastructure): CBDCs promote the development of contemporary, inclusive digital infrastructure by bolstering digital payment systems and fostering fintech innovation.
- SDG 10 (Reducing Inequalities): CBDCs contribute to the improvement of financial inclusion by giving marginalised groups access to safe, affordable digital financing.

To sum up, CBDCs are an effective instrument for promoting sustainable development via innovation, financial inclusion, and economic growth.

Financial Inclusion Implications

Access to Banking

CBDCs offer a risk-free digital platform for underserved individuals to access the formal banking system, bypassing middlemen and geographic restrictions, addressing global banking access issues. For eg: The Sand Dollar, introduced in October 2020, aims to alleviate financial isolation in over 700 islands by enabling safe, cashless transactions through digital wallets.

Lower Transaction Expenses

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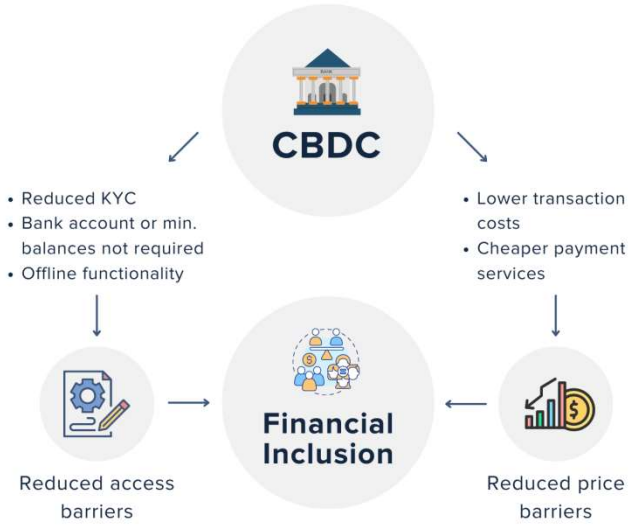
The Reserve Bank of India (RBI) plans to implement the Digital Rupee to combat inefficiencies and counterfeit risks associated with over-reliance on cash in India. For eg: China's e-CNY, which completed over 750 million transactions, demonstrated widespread use in urban and rural areas, showcasing increased financial involvement.

Reaching Rural Areas Can Be Challenging

India's rural and underprivileged regions face challenges like low digital literacy, erratic internet access, and inadequate infrastructure, requiring targeted digital infrastructure and literacy initiatives. For eg: Eight island governments participated in the DCash program,demonstrating the potential of offline and mobile payment methods to overcome digital infrastructure limitations.



Challenges Observed in Pilot Project

Resistance to Digital Adoption (SDG 8 and 10)

Nigeria's e-Naira adoption rate was slower than expected, with less than 0.5% active as of late 2023. Small merchants and rural consumers in India resisted adopting the Digital Rupee due to fear of fraud and lack of familiarity with digital wallets.

Concerns about Cyber security and Privacy (SDG 9)

Privacy and security concerns hinder CBDC adoption, with fear of financial activity surveillance and cyber-attack vulnerability. Digital Euro debates and India's e₹ framework face digital payment fraud and lack of offline audit trails.

Rural Area Infrastructure Gaps (SDG 9 and 10)

CBDC adoption in rural areas is hindered by infrastructure issues like erratic internet access, low smartphone usage, and financial knowledge. DCash in Eastern Caribbean and India also face challenges, with 60% of rural households lacking stable internet connections and limited financial literacy.

Recommendations

1. Targeted Awareness Campaigns: National awareness campaigns for rural and semi-urban regions about the Digital Rupee, like financial literacy drives, grassroots campaigns, interactive tutorials, success stories, can help dispel concerns about digital fraud.
2. Enhancing Cyber security: Strengthen the Digital Rupee's cyber security infrastructure with measures like Biometric Authentication, Dynamic QR Codes, Regular Audit, Helpline, and End-to-End Encryption to boost public confidence and trust.

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3. Infrastructure Investments: Invest in rural digital infrastructure to ensure equitable access to digital technologies, improve internet connectivity, and incorporate features like solar powered offline, cross-platform compatibility, and affordable devices.

Conclusion

India's Central Bank Digital Currency project, promoting sustainable development and financial inclusion, has seen positive adoption with more than 5 million retail customers, particularly for low-value transactions, enhancing efficiency and reducing cash needs. SDG 8 (Economic Growth), SDG 9 (Infrastructure Innovation), and SDG 10 (Reduced Inequalities) are among the Sustainable Development Goals that the CBDC supports by lowering transaction costs, improving transparency, and promoting digital financial ecosystems.

The pilot study in India reveals the need to tackle reluctance to adopt digital technology, improve rural infrastructure, and protect privacy and cyber security to boost public confidence. The study aims to adapt global lessons to India's unique financial and digital literacy levels. Persistent research and pilot monitoring are crucial for effective CBDC execution, promoting financial inclusion, economic progress, risk reduction, and flexible policymaking. India can lead by developing a research-driven CBDC framework, exemplifying sustainable development.

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SUSTAINABLE FINANCE IN INDIA: RECENT DEVELOPMENT AND CHALLENGES WITH SPECIAL REFERENCE TO GREEN BONDS

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Abstract

his paper attempts to examine the state of sustainable finance in India and its recent development with reference to green bonds as a product. Over the period, the government along with the Reserve Bank of India have taken up several initiatives and policy designs to meet the sustainable finance in the economy through various instruments, including green bonds, green investments, identification of green projects among others to meet the sustainability goals in the country. The study has compiled various data from reports generated by Commissions at global level, RBI various reports on climate changes and environmental sustainability, as well as bank wise data on ESG models from time to time. From the study it is observed that there is a significant progress in the green finance initiatives with particular reference green bonds in India in terms of volumes and values as validated by bank level and industry specific data, including data provided at global level by Statista, UNEP, World Bank and Climate Policy Initiatives at global levels.

Keywords: Sustainable Finance, Green Bonds, Green Projects, Green Investments.

Introduction

Sustainable finance aims to create economic prosperity while protecting the environment, society, and governance, in contrast to traditional finance, which was primarily concerned with short-term profits and economic expansion. According to the European Commission, sustainable finance is the process of giving environmental, social, and governance (ESG) factors adequate weight when financial sector investment decisions are being made. This results in a rise of longer-term investments in sustainable economic activities and projects.

During the 1992 Rio Earth Summit, the Banking Initiative was established and the United Nations Environment Program Statement by Banks on the Environment and Sustainable Development was introduced in New York. This signalled the start of the United Nations Environment Programme Finance Initiative (UNEP FI), a collaboration between UN Environment and the international financial industry to modify previously used financing criteria. A voluntary standard for business environmental management systems, ISO 14001 was formally accepted in 1996. The first worldwide Sustainability World Index was introduced by DOW JONES in 1999 to help investors find successful businesses that adhere to sustainable development principles. An international independent standards organization, the Global Reporting Initiative (Collaborating Organization UNEP) was founded in 2000 to assist governments, corporations, and other organizations in comprehending and communicating their effects on issues like corruption, human rights, and climate change.

Through the supply of data, analytical work, instrument design, and technical assistance to help investors and regulators in its client nations "green" their financial systems, the World Bank Group long-term finance section has been at the forefront of promoting sustainable finance globally. Among the significant programs conducted are the following:

Box 1: World Bank Group Programmes on Sustainable Finance	
Name of the Programme	**Details of the Programme**
Global Program on Sustainability	It operates on 3 pillars: Pillar 1: Information-improving global measurements of natural capital and ecosystem services Pillar 2: Building countries capacity to produce and use natural capital

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	accounting for policy and planning decisions. Pillar 3: Incentives- Promoting research on how environmental Factors impact risk and financial return in fixed income markets.
The Sovereign ESG Data Portal	Aims to provide governments and investors with information and tools that improve their understanding of sustainability criteria, including through natural capital accounting.
Climate Support Facility	Manages funding provided under a Green Recovery Initiative aimed at helping countries building a low-carbon, climate-resilient recovery from COVID 19.
International Finance Corporation EDGE	Excellence in Design for Greater Efficiencies brings speed, market intelligence and an investment focus to the next generation of green building certification in more than 170 countries.
Joint Capital Market Program (J-CAP)	Support for green bond issuance and market development, as well as green regulatory frameworks are a core part of the program.

Source: www.worldbank.org

In the 2021 Germanwatch Global Climate Risk Index, India ranked seventh globally in terms of weather-related losses and climate risks, and more than 80% of its population lives in districts that are extremely vulnerable to extreme hydrometeorological disasters (CEEW, 2021a). As a result, climate change is already slowing down India's development and endangering future economic growth (RBI 2023). So, there is an increased need for sustainable financing in India to reduce the impact of climate change by adopting renewable sources of energy. In order to adopt these sources of energy a shift or transition is required from traditional infrastructure to green infrastructure(solar rooftop, electric vehicle, green buildings, wind energy, hydro energy etcetera) for which a good amount of finance is required and so the concept of Green Finance was introduced.Green Finance using different debt instruments like Green Bonds or Sustainability Linked Bonds will be able to finance this transition. Green Finance which is a subset of sustainable financing has been classified as a catalyst for pacing up decarbonisation (reducing impact of climate change) by giving importance to the need of increasing flow of capital from national and private entities to establish green infrastructure.

Green bonds are debt products used to raise money for projects related to the environment or climate change. Green Bonds are specifically designated for financing or refinancing environmental projects that have a positive impact on the environment or climate, such as the use of renewable energy, energy-efficient transportation, clean energy, sustainable water management, and the reduction of greenhouse gas emissions.Green Bonds are different from conventional bonds, even though they both have fixed or variable interest rates. They are issued by international development banks, corporations, or the government.

Box 2: Green Initiative by the RBI

Period	**Initiatives**
December (2007)	The Reserve Bank made "Corporate Social Responsibility, Sustainable Development and Non-financial Reporting – Role of Banks" compulsory, emphasizing the significance of climate change and global warming in relation to sustainable development.
March (2015)	Expansion of Priority Sector Lending sectors by including loans for generation of renewable energy and public utilities run on non-conventional energy
April (2021)	In order to take advantage of and support the best practices in climate risk management and green finance, RBI joined the Network for Greening the Financial System (NGFS).
January (2022)	To evaluate the state of climate risk and sustainable finance in top scheduled commercial banks, the RBI carried out a survey on the topics.
January-February (2023)	To raise funds for the government's green infrastructure projects, the RBI issued sovereign green bonds in two tranches totalling US $2.2 billion (₹16,000 crore).
April (2023)	RBI introduced a “Framework for Acceptance of Green Deposits” from June 01, 2023

Source:www.rbi.org.in/

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A brief review of Literature

This section gives a brief review of literature on the issues of green finance across countries that has developed over the period.

Reddy et al., (2024) examined the driver and barriers of green bonds in India and recommended that policy interventions focused on standardization, cost reduction, and investor education to harness the full potential of green bonds in India, thereby contributing to the nation's sustainable development goals and international climate action efforts.

Bansal et al., (2022) studied a comprehensive insight into the challenges restricting the growth of the green bond market and develops a detailed understanding of the different strategies to overcome the challenges of green bond markets in India. It was found that lack of clear risk profiling and legislative support involved in green bonds are the most crucial challenges for the Indian green bond market, followed by lack of market knowledge and lack of demand among investors for green bonds.

Kumar et al., (2024) explored the influence of green bonds on sustainable development through low carbon financing mobilization based on 700 respondents in northern region of India. The result shows that green bond issuance is having statistically significant impact on government policy formulation and investors' sentiment is having statistically significant impact on sustainable development.

Patidar (2023) studied green bonds and sustainable finance in India as a key strategy for financing sustainable development and environmental stewardship. It was observed that financial instruments are not only viable but also a catalyst for investments in projects that yield environmental benefits without compromising on financial returns. Further, the Indian market has demonstrated its ability to innovate and adapt to global sustainability challenges, marking a significant step towards ecological and economic resilience.

Dhoot and Awate (2021) in their study observed that Indian green Finance market is at an emerging stage and it has not been able to attract ample number of investors, requiring proper framework for making these green finance products more attractive to the investors. Above these, current market practices, regulations monitoring the market and financial incentives are becoming a great hurdle in the success of financial instruments. And, it is suggested that Awareness among Investors and consumers about the green finance is essential for the sustainability of the economy.

Biju et al., (2024) attempts to determine how green finance affects sustainable development in India. It was suggested that through the use of green financing, the country's economy could grow more robust to the repercussions of climate change. Despite, with the alarming rise in the amount of pollution in India, it is imperative to use the untapped potential of green finance to finance green activities or investments. In order to bring down the total expense of investing for private-sector investors, blended financing is necessary.

According to report of RBI (2021), there have been improvements in public awareness about green finance and its various financing options in India, a reduction in asymmetric information through better information management systems and increased coordination amongst stakeholders could lead towards a greener and sustainable long term economic growth. High borrowing cost has been perhaps the most important challenge and our analysis indicates that it could be due to the asymmetric information. Therefore, developing a better information management system in India may help in reducing maturity mismatches, borrowing costs and lead to efficient resource allocation in this segment.

Dikau, S., and Volz, U. (2018) Climate and other environmental risks have increasingly become important topics for central banks and financial regulators. It is now largely accepted that environmental risks can have material impact on financial and macroeconomic stability, and an increasing number of central banks have started to develop micro- and macro-prudential frameworks that incorporate risks related to climate change and the environment.

RBI (2019), report stated that central banks can use several policy tools for climate change mitigation including disclosure requirements relating to all climate-related financial risks, green macro-prudential regulation such as higher risk-weights for carbon-intensive sectors; differentiated capital and

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reserve requirements for banks with higher green lending; and green credit policy instruments in the form of subsidized loan rates for priority sectors (UN Environment, 2017).

Study by Geddes et al. (2018) by performing 3 interviews, empirical evidence to address the barriers to financing low carbon energy projects. It highlights the various financial instruments offered by State Investment banks in UK, Germany and Australia. The main findings indicate that SIB have a huge role in catalyzing private investments into low carbon investments including enabling financial sector learning, etc. besides its capital provision along with de-risking. These are some of the literatures cited in the present study and formed the base and framework.

An Overview of Green Bonds

There emerged different types and categories of green bonds that developed in cross section of countries across time and space. Some of the common green bonds are given in the following paragraphs. Debt instruments intended to fund initiatives that have a positive impact on the environment and/or climate are known as "green bonds." These connections are intended to encourage the shift to a climate-resilient and low-carbon economy. There are several types of green bonds, such as:

BOX 3: Types of Green Bonds

Sr. No.	Name of Green Bond	Purpose
1.	Climate Change Bonds	These bonds are offered to finance climate change mitigation projects. For instance, energy efficiency and renewable energy initiatives.
2.	Renewable Energy Bonds	The purpose of these bonds is to fund initiatives that produce and/or utilize renewable energy sources. such as hydroelectric, solar, and wind power.
3.	Energy Efficiency Bonds	These bonds are offered to fund initiatives that lower energy usage and improve energy efficiency. For instance, constructing appliance and equipment upgrades and retrofits.
4.	Social or Sustainable Development Bonds	These bonds are offered to fund initiatives that support sustainable growth, like those that increase employment, lower poverty, and enhance public health. For instance, reasonably priced housing, healthcare, and education.
5.	Green Infrastructure Bonds	These bonds are offered to fund initiatives that support green infrastructure, like those that save ecosystems and natural resources. For instance, water conservation initiatives, reforestation, and urban green spaces.
6.	Natural Resources Bonds	These bonds are offered to fund initiatives that support sustainable resource use and conservation. For instance, reforestation, mining rehabilitation, sustainable forestry management, and the creation of clean energy projects.
7.	Project-linked bonds	These bonds are connected to certain initiatives, like building a wind farm or creating a public transit network. For instance, a rapid transportation system for buses or light rail.
8.	Asset-linked bonds	These bonds are connected to a collection of assets, including a fleet of electric buses, wind turbines, electric vehicle charging stations, or the development of a green building.
9.	Corporate green bonds	Companies issue these bonds to refinance current projects or to fund their own green initiatives. For instance, bonds issued by a significant automaker to fund the research and manufacturing of electric cars (EVs) and associated infrastructure.
10.	Sovereign Green bonds	The National Government is issuing these bonds to fund environmentally friendly initiatives like climate change adaptation, sustainable infrastructure, and renewable energy.
11.	Green bond funds	These funds allow investors to obtain exposure to the green bond market without having to purchase individual bonds by investing in a diverse portfolio of green bonds. For instance, a fund that mostly invests in bonds issued by businesses involved in renewable energy, including wind and solar power companies.

Source: Bank Quest - The Journal of Indian Institute of Banking & Finance

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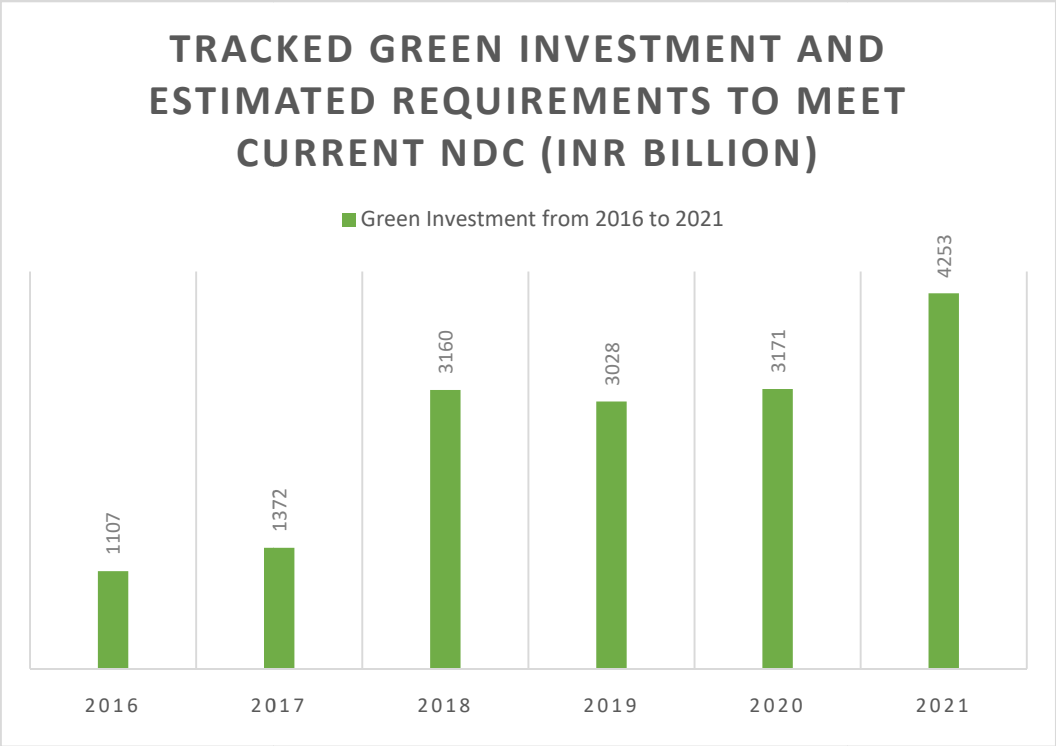
Green Finance in India - Discussions and Deliberations:

According to the Government of India's preliminary projections in Nationally Determined Contributions (NDC) submitted at United Nations Framework Convention on Climate Change, India will require INR 11 trillion (USD 170 billion) a year, or INR 162.5 trillion (USD 2.5 trillion), by 2030 in order to meet its (NDC) (GoI 2015). About 30% of the total funds required to satisfy the nation's NDC are represented by the most recent monitored green funding for mitigation in India (GoI 2015).



Source: Climate Policy Initiative: Report on Landscape of Green Finance in India (2024)

Domestic sources accounted for over 83% of India's total green money for mitigation. Sixty-six percent of domestic mitigation funding (INR 2,048 billion/USD 28 billion) came from the private sector. Central and state government budgetary expenditures accounted for INR 596 billion (USD 8 billion) in 2021–2022, up from INR 574 billion in 2019–20, of the 34% (INR 1,045 billion/USD 14 billion) that came from public sources. The remaining 43% came from contributions made by public sector undertakings (PSUs).

From about 15% in 2019–20 to 17% (INR 620 billion/USD 8.3 billion) of India's overall mitigation flows in 2021–2022, foreign finance has grown. Interestingly, private investment increased from 40% in 2019–20 to 63% (INR 390 billion/USD 5.2 billion) of overall worldwide mitigation flows in 2021/22. Foreign direct investment (27%) and commercial financial institutions (FIs), which contributed 55%, were the main drivers of this increase. This suggests that the market for specific industries or subindustries, like solar energy, has grown more developed. The remaining 37% of international mitigation financing, or INR 230 billion or USD 3.1 billion, came from official sources such as official development aid and other official flows.

India increased its climate commitments in November 2021 when it announced intentions to: 1) Reduce the economy's carbon intensity by 45% by 2030 (up from its prior objective of 33–35%). 2) Raise its installed capacity26 for renewable energy to 50% of its total capacity, which should reach 500GWby2030. 3) Between then and 2030, cut the total estimated absolute carbon emissions by one billiontonnes(PIB,2022a). The Government of India can play a significant role in funding the shift to a low-carbon pathway and encouraging the private sector to increase green investment through robust financial assistance and prompt policy initiatives.

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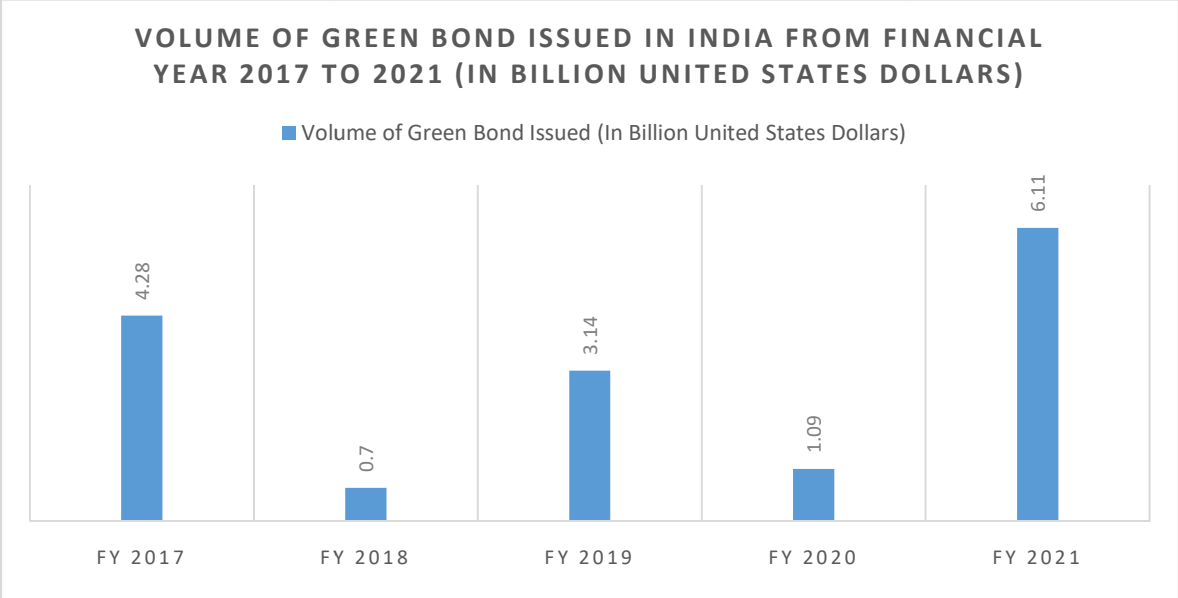
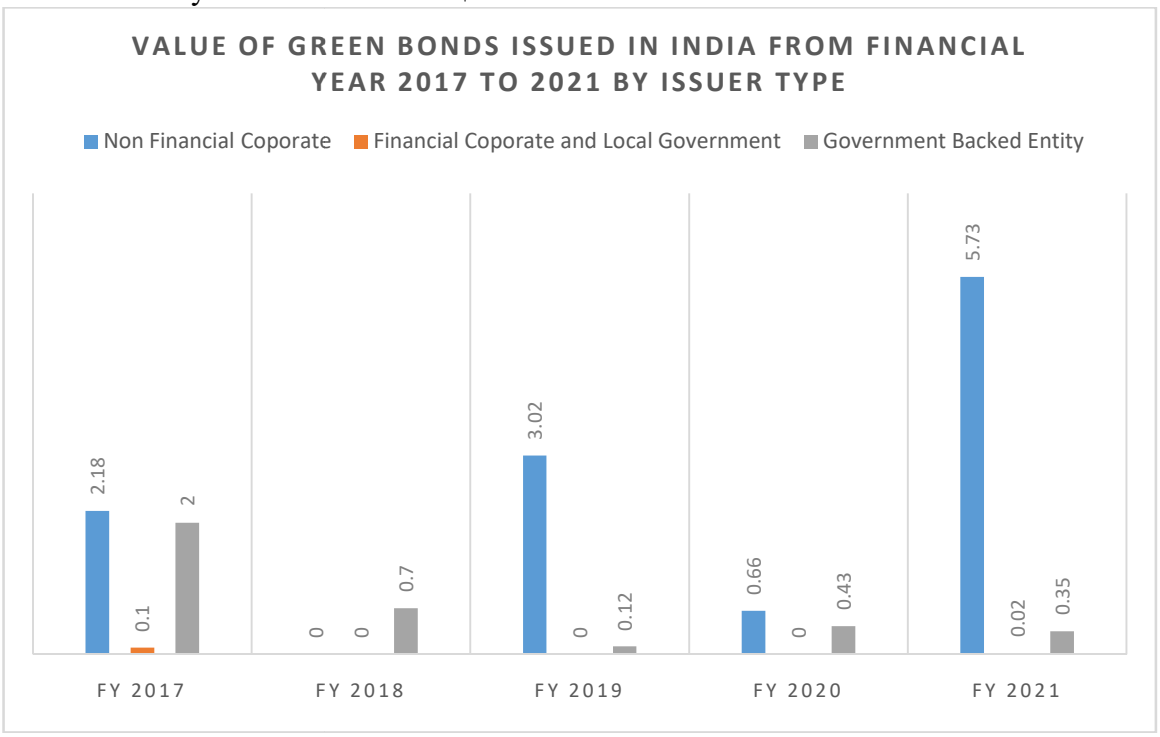


Source:www.statista.com (2021)

From the aforesaid chart it is evident it is clearly evident that slowly and gradually demand for investment in green bonds is increasing and so as a result in the financial year 2021 highest amount of green bonds were issued which is US $6.11 Billion in worth which is almost 460% more than the bonds issued in the financial year 2020 worth US $1.09 Billion.



Source:www.statista.com (2021)

In the aforesaid chart we can conclude that Non-Financial Corporate are the maximum issuer of green bonds in India in comparison to other financial corporate and local government as well as other government backed entity for the financial year 2017, 2019, 2020 and 2021. During the FY 2018 green bonds were issued by government backed entity only.

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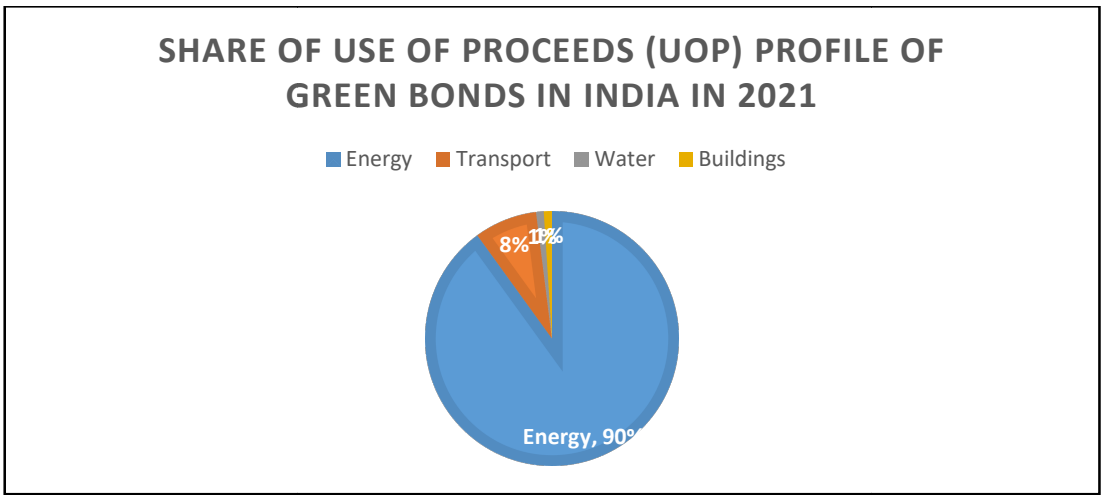
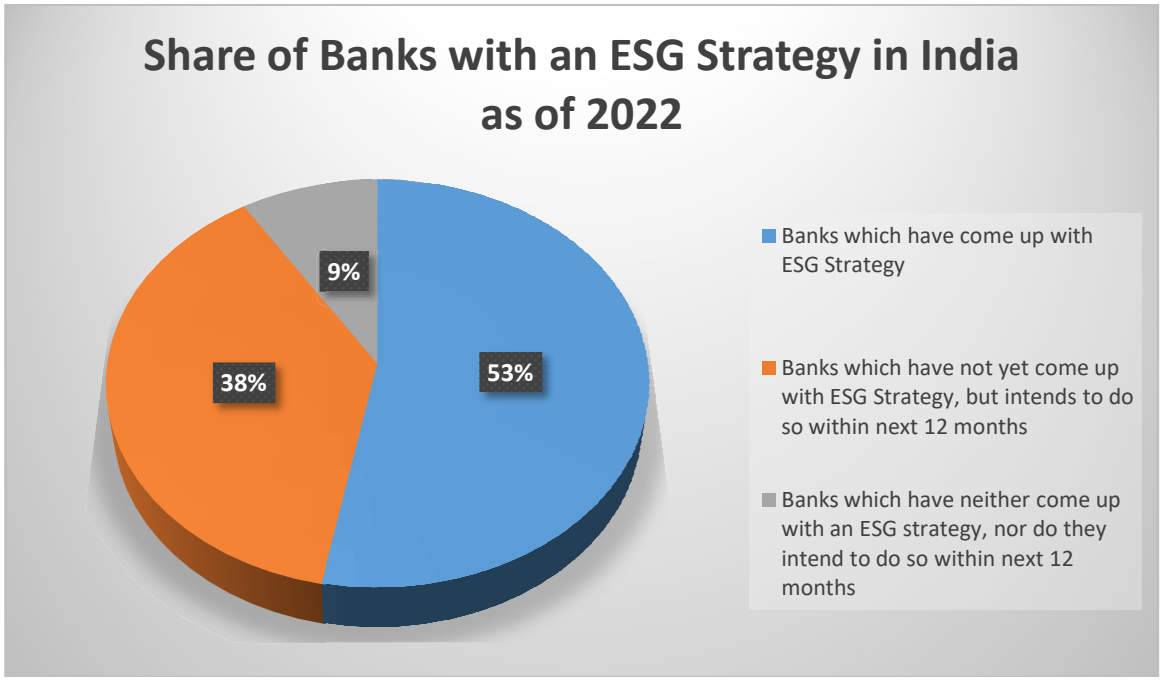


Source: RBI Report of the Survey on Climate Risk and Sustainable Finance (2021)

In the aforesaid chart most of the proceeds collected from green bonds are consumed in the sector of energy generation sector which is 90% of the total proceeds. In the sector of clean transport, water and green buildings proceeds consumed were 8%, 1% and 1% respectively.



Source:RBI Report of the Survey on Climate Risk and Sustainable Finance (2022)

In the aforesaid chart showing share of banks with an ESG strategy in India as of 2022, there are 53% of total banks that have already came up with ESG strategy. Still there are 38% banks who have yet not come up with ESG strategy but intends to do within next 12 months. However, 9% of the banks which have neither come up with an ESG strategy nor do they intend to do so within the next 12 months.

Future Prospects & Challenges for Green Bonds in India:

Future Growth Opportunities:

Growth of the Green Bond Market: India could emerge as a significant force in the global green bond market. By offering tax breaks, establishing a regulatory framework that is favorable, and

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promoting public-private partnerships, the government may foster an atmosphere that will support the expansion of green bonds.

Finance for Renewable Energy Projects: Green bonds can be used to finance renewable energy projects in India because of the country's sizable renewable energy sector. India also intends to expand its capacity for renewable energy. These projects can be financed with green bonds, which will assist the nation in reaching its renewable energy goals.

Funding Sustainable Projects: India is now constructing a significant number of infrastructure projects, including those related to agriculture, transportation, water, waste management, and forestry. These projects can be funded with green bonds, which will assist the nation in achieving its sustainability objectives.

Challenges for Green Bonds in India:

Increasing Investor Awareness: Although green bonds are becoming more and more popular in India, investors are still not fully aware of the advantages of making green bond investments. This is because there is a dearth of knowledge and awareness regarding green bonds in India, where they are still relatively new.

Creating a Sturdy Regulatory Framework: To encourage green bonds, the Indian government has established a green bond exchange and offered tax breaks for them. To guarantee that green bonds are issued in an open and accountable manner, a stronger regulatory framework is still required.

Enhancing Capital Access: Obtaining capital is still difficult in India. This is because investors find it challenging to trade and invest in green bonds because they are still relatively new and the market lacks liquidity and tax incentives.

Increasing Transparency: Investors find it challenging to evaluate the environmental impact of the projects they are funding due to the lack of transparency in the green bond market.

For green bonds to be successful in India, transparency is crucial. Giving investors precise and understandable information on the projects being financed by green bonds is part of this. Another major issue is "greenwashing," often known as "green sheen." It describes a type of marketing spin or advertising wherein green marketing is utilized to falsely convince the public that a company's goals, policies, and goods are environmentally beneficial.

Conclusion

The paper attempts to examine the recent developments of green bonds in India as an instrument of sustainable finance. We arrived conclusions based on various reports of Committees, initiatives taken up by global organizations and Reserve Bank of India initiatives so far as Indian economy is concerned over the period. During the course of study, it was seen that though India received 30% of its Nationally Determined Contribution, but 83% of it came from domestic sources. Further, USD 6.11 Billion green bonds were issued in FY21 of which USD 5.73 billion came from Non-Financial Corporate and only USD 0.35 billion came from Government. Proceeds of the bonds received were unevenly distributed as 90% went to energy sector while green building and water sector received on 2%. Also, it is found that significant development has taken place so far green finance, green bonds and green investments is concerned as a part of sustainable finance. Positive development at bank levels and RBI guidelines on green lending and green deposits were also introduced emphasizing the progressive tasks towards green and sustainable finance programme in India. However, given the constraints in terms of costs of adoption, implementation and execute as a tool to a bank or financial institution, lack of awareness programmes about the impact on environment, social and governance has remained a space that need to bring about for successful implementation in a developing country like India. Further, there is lack of good governance and lack of social responsibility towards each stakeholder when delivering or accessing different products and services so far towards bringing sustainable finance in India.

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