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The moderating role of IT governance on the relationship between FinTech and sustainability performance

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ABSTRACT

The main aim of this study is to investigate the moderating effect of Information Technology governance on the relationship between the use of Financial Technologies and sustainability performance. The study used non-probability convenience and snowballing sampling approaches to collect data. The study collects a sample of 210 respondents targeting bankers in various positions from the Indian commercial banks. The study used structural equation modeling to estimate the results. The findings highlight the complex links between IT governance, FinTech, and sustainability-related concerns, emphasizing the importance of a comprehensive approach to sustainability. Banks can establish more complete strategies for sustainable growth by considering IT governance, FinTech, and ESG factors. The findings reveal that IT governance is critical in shaping banks' strategic planning towards sustainable activities, evolution of Fintech, and technological advancements, which in turn influence significantly and positively sustainability performance. IT governance leads to increased adoption of Fintech and enhances sustainability performance, contributing to the growth of economic sustainability. Banks that strategically utilize IT governance to foster Fintech and sustainability performance improvements likely experience economic gains due to their focus on sustainable and technologically driven practices. The findings emphasize the importance of balancing sustainability efforts and suggest that banks that embrace IT governance while emphasizing ESG factors are more likely to embrace better sustainability performance. The findings offer advice for bankers and policymakers on how to strategically utilize technology to improve sustainability and economic performance while considering potential trade-offs.

1. Introduction

Concerns about sustainability issues in the modern world have sparked a revolutionary surge of technological advancements (Arner et al., 2020; Atayah et al., 2023; Lisha et al., 2023a; Macchiavello and Siri, 2022; Rais et al., 2023). A few technological advancements have been made in recent years to address sustainability issues. On one hand, the emergence of financial technology (FinTech), which has become a disruptive force in the financial sector, is an example of this synergy between technology and sustainable practices (Arner et al., 2020; Atayah et al., 2023; Hammadi and Nobanee, 2019; Rambaud and Pascual, 2023; Vergara and Agudo, 2021). "Fintech" denotes the use of technological advancements to offer financial services to customers (Deng et al., 2019; Dwivedi et al., 2021). On the other hand, a crucial enabler of technology integration, effective IT governance emerges as a critical factor affecting FinTech and sustainability outcomes (Almaqtari, Farhan, Al-Hattami, et al., 2023; Mutamimah and Robiyanto, 2021).

Ryu and Ko (2020) underline how important IT quality is in determining the acceptance and ongoing use of FinTech platforms. Similarly, Deng et al. (2019) argue that IT quality can mediate the connection between fintech and sustainable development. In the same context, Zhao et al. (2019) proposed a hybrid model that prioritizes IT quality to improve service innovation in China's banking business amid the FinTech revolution.

Several challenges may be encountered in the integration between sustainability and financial technology (Fintech). Accordingly, information technology (IT) could be an important aspect that facilitates this integration. According to Anshari et al. (2019), the integration of Fintech and digital marketplaces can greatly improve sustainability. Fintech has the potential to revolutionize sustainability issues by addressing finance challenges and distribution inefficiencies. However, among these enticing prospects, it is critical to recognize potential hazards. The digital divide, data security concerns, and regulatory obstacles cast a pall over the otherwise bright picture. As a result, while the significance

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of Fintech in promoting sustainability is apparent, the feasibility of tackling these difficulties becomes an important concern. Deng et al. (2019) propose an indicator system to examine the interaction between FinTech and sustainability in the context of China's sustainable growth. The concept of a U-shaped relationship between FinTech and sustainable development adds depth to the conversation. However, the geographical differences in influence raise concerns about the relationship's contextual nature. This conclusion reflects the complexities of incorporating FinTech and IT into sustainability efforts in a variety of economies. What appears to be good in one place may not provide equivalent results in another, necessitating a more detailed knowledge of these dynamics. Further, Anshari et al. (2021) and Aysan and Bergigui (2021a) emphasize the need for technology-driven sustainability to be led by practicality and comprehensive approaches. While Anshari et al. (2021) highlight the convergence of IT, sustainability, and Fintech. They suggest that the idea of rewarding sustainable behavior via digital platforms is appealing. Likewise, Aysan and Bergigui (2021a) assert that blockchain's potential in transparent supply chains corresponds with sustainability, although caution is required owing to tool shortages. Thus, technology has the potential to deliver novel answers to sustainability concerns; nevertheless, these solutions must be examined holistically, taking into account practical, ethical, and societal aspects. The intersection of IT, sustainability, and Fintech necessitates a deep knowledge and a commitment to combining advancement with ethical practices. Even though the interaction between IT, sustainability, and Fintech has significant benefits, it is frequently accompanied by problems ranging from digital integration and data security to legal complications and strategic planning. Accordingly, for promoting sustainability across sectors, regions, and levels, an integrative approach that takes into account technology improvements, ethical considerations, regional variances, and environmental effects is required. The convergence of FinTech with sustainability initiatives creates a complicated landscape with potential synergies and conflicts. The purpose of this study is to learn how IT governance affects the relationship between FinTech adoption and sustainability outcomes. It delves into how organizations approach FinTech solutions and sustainability initiatives, the key components of IT governance, how effective IT governance enhances or hinders synergies, and the contexts and conditions under which IT governance plays a more prominent role in shaping the relationship.

The present research seeks to uncover the intricate interrelationship between FinTech adoption, IT governance systems, and sustainability. This study attempts to give insights that enhance strategic decision-making for organizations trying to accomplish both technological innovation and sustainability goals by investigating the processes via which IT governance can either amplify or attenuate the impact of FinTech on sustainability. The complicated interplay between FinTech and sustainability creates a complex web of potential and challenges that must be thoroughly investigated. As more organizations adopt and integrate FinTech solutions, there is a rising need to understand how these technologies can either help or impede sustainability goals. One essential component that emerges from this complex interaction is the role of IT governance. IT governance, which includes the strategies, policies, and structures that drive technology-related decisions, has been identified as a critical predictor of how organizations use technology to achieve strategic and operational goals (Al-Sartawi and Al-Sartawi, 2020; F. Almaqtari, Farhan, Al-Hattami, et al., 2023; Bergeron et al., 2017; Fattah et al., 2021; Khalil et al., 2020; Scalabrin-Bianchi et al., 2021). However, its exact impact on the relationship between FinTech and sustainability is unknown. This study intends to close the gap by exploring the impact of IT governance in shaping the relationship between FinTech adoption and sustainability performance. This study seeks to fill a knowledge gap by investigating how IT governance measures mitigate the influence of FinTech on sustainability. Existing research frequently focuses on the standalone effects of FinTech adoption or sustainability initiatives (Callsen et al., 2021; Chen et al., 2022;

Guang-Wen and Siddik, 2023; Macchiavello and Siri, 2022; Ramamohan et al., 2021, 2021; Vergara and Agudo, 2021; Winarsih et al., 2020; Zhang et al., 2021), ignoring the role of IT governance in this regard. Furthermore, in the context of moderating the relationship between FinTech and sustainability, the function of IT governance, a fundamental component of technology-driven decision-making, remains relatively unexplored. Thus, the present research adds to a comprehensive knowledge of the complicated interaction between FinTech and sustainability, improves strategic decision-making, promotes SDGs, and enables informed policy creation. The findings have the potential to inspire responsible FinTech innovation while also furthering sustainability goals. The paper adds to the scholarly conversation by providing empirically informed insights on the interaction of FinTech and IT governance. FinTech solutions, which can change established business models and improve operational efficiency, are rapidly evolving in the banking sector. However, there is a lack of information on how IT governance affects the relationship between FinTech adoption and long-term outcomes. The findings aim to provide banks with the knowledge they need to negotiate the complexity of FinTech-sustainability integration while keeping IT governance in mind. Banks may use FinTech advances to support sustainable development, adhere to ethical business practices, and contribute to the growth of operational excellence and global sustainability goals by understanding this moderating function.

This study problem examines the existing landscape of FinTech and sustainability in Indian banks, as well as the problems and opportunities these institutions have in harmonizing these elements. It also investigates the IT governance dimensions in Indian banks, the IT governance mediating mechanisms, and the Indian banking setting and IT governance influence. The heterogeneous financial ecosystem of India provides a unique backdrop for investigating how different types of banks combine FinTech and sustainability practices, as well as how IT governance differs across these institutions. India is confronted with enormous sustainability difficulties, such as environmental concerns, social inequities, and the need for financial inclusion. Understanding how information technology governance impacts the relationship between FinTech and sustainability is especially important in the context of providing financial access to underprivileged groups. Furthermore, India's policy environment and regulatory structure influence the application of FinTech and sustainability practices. Investigating the relationship between IT governance, FinTech, and sustainability in Indian banks might yield insights that can be used to drive policy formulation and regulatory decisions. Emerging digital payment systems such as the Unified Payments Interface (UPI), Digital India, FinTech sandbox environments, and startup programs demonstrate India's commitment to digital transformation through Fintech. Finally, the combination of digital payment systems, Fintech initiatives, IT governance frameworks, and sustainable development goals in India seems promising. The linkages across these domains provide the potential to improve financial inclusion, efficiency, creativity, and self-sufficiency while also supporting environmental practices and responsible technology usage. This research can provide insights on how to optimize these convergences for a more sustainable and technologically empowered future. The research findings can help Indian banks embrace FinTech solutions with purpose, supporting sustainable development and integrating their operations with responsible business practices while maximizing the positive impact of IT governance measures.

The present research is organized as follows: section two provides the discussion of the literature review and hypotheses development, section three demonstrates the research methodology, section four estimates the outcomes and interprets the results, and section five concludes, and provides the implications and limitations of the research.

2. Recent trends in Fintech

The fintech industry is undergoing significant changes due to

technological advancements, consumer behavior, regulatory changes, and market demands (World Economic Forum, 2024). The fintech industry has seen significant growth globally, with investments increasing from \$50.8 billion in 2010 to over \$111.8 billion in 2018 (KPMG, 2016). US venture capital investment in fintech has grown significantly, with a total of \$3.6B in 2019 and \$12.8B in 2021, \$13.9B in 2022, and \$2.7B in 2023 (Bank, 2023). The fintech industry has seen significant customer growth post-COVID-19, with an average growth rate of over 50%. Customer growth was strong across all regions, except Sub-Saharan Africa (SSA), which experienced low growth rates. Infrastructure challenges may have intensified during COVID-19. The US, Canada, and MENA regions showed substantial growth due to digitization and regulatory changes (World Economic Forum, 2024).

India's total FinTech funding in 2021 amounted to \$7.8 billion, excluding debt, IPOs, and corporate rounds. A study by EY predicts a 10x growth in the Indian FinTech market over the next decade, aiming to achieve \$1 trillion in Assets Under Management (AUM) and \$200 billion in revenues. As of June 2022, India had over 100 unicorns, with approximately one-fourth of them operating in the FinTech sector (LLP, 2022). The Indian economy is embracing fintech opportunities, with transaction values expected to reach USD 73 billion by 2020. Bengaluru, India's top start-up city, has attracted significant investor interest in the fintech sector, ranking 15th among the world's top start-up cities. The growth of fintech in India is driven by increased investor interest, technological advancements, and a favorable start-up ecosystem (KPMG, 2016). As of June 2022, India boasted over 100 unicorns, with approximately one-fourth of them being FinTech companies. This impressive statistic underscores the rapid growth and potential of the Indian FinTech ecosystem. While India currently contributes around 7% of the global pool of FinTech unicorns, there is still ample room for expansion and further contributions to the global FinTech unicorn landscape (LLP, 2022). In India, the sector has seen significant expansion, with investments increasing from \$247 million in 2014 to over \$1.5 billion in 2015.

The Indian fintech software market is expected to reach \$2.4 billion by 2020, with transaction value reaching \$73 billion, increasing at a 22% CAGR. India's solid environment, supportive investors, and strong IT talent contribute to its potential growth (KPMG, 2016). Fintech investment in India increased significantly from USD 247 million in 2014 to over USD 1.5 billion in 2015. The number of angel investors in India was around 1800 in 2016, compared to 300,000 in the U.S. However, there is increasing interest in start-up funding in India, with the number of angel deals rising from 370 in 2014–691 in 2015. The Indian fintech software market is projected to reach USD 2.4 billion by 2020, up from USD 1.2 billion. The transaction value for the Indian fintech sector was estimated to be approximately USD 33 billion in 2016 and is forecasted to reach USD 73 billion by 2020, growing at a five-year CAGR of 22% (KPMG, 2016).

3. Literature review and hypotheses development

3.1. The impact of FinTech on sustainability

The current sustainability landscape has sparked a wave of revolutionary technological advances and innovation (Arner et al., 2020; Atayah et al., 2023; Lisha et al., 2023a; Macchiavello and Siri, 2022; Rais et al., 2023). Literature has investigated the intersection of Financial Technology (FinTech) and sustainability in this setting, providing a nuanced knowledge of their relationship and ramifications (Bayram et al., 2022; Callsen et al., 2021; Deng et al., 2019, 2019; Guang-Wen and Siddik, 2023; Macchiavello and Siri, 2022; Ramamohan et al., 2021, 2021; Zhang et al., 2021).

Anshari et al. (2019) demonstrate the potential of FinTech and digital marketplaces in enhancing agricultural sustainability. They highlight FinTech's transformational role in tackling financial issues and distribution inefficiencies. In the same context, Merello et al. (2022)

investigate the sustainability profiles of FinTech companies, discovering subtle correlations between CSR reports, sustainability indices, company size, board size, and market value. They also demonstrate complicated dynamics associated with the influence of green certificates. Rambaud and Gázquez (2022) examine FinTech's regulatory issues for a just and sustainable society, emphasizing the importance of legal personal data protection. Vergara and Agudo (2021) emphasized the relevance of regulatory frameworks, notably consumer protection, in fostering green finance and financial sustainability.

Deng et al. (2019) indicate a U-shaped relationship between FinTech and sustainable development, which is influenced by economic growth patterns. Yan and Jia (2022) report that the COVID-19 epidemic has had an influence on both the banking and FinTech industries, reshaping the competitive landscape. Further, Yan et al. (2022) investigate the impact of green finance and innovation in mediating the relationship between FinTech adoption and sustainability performance, emphasizing the significance of combining technology, innovation, and financing methods for long-term economic development. Moreover, Ruzita et al. (2022) suggest that consumer sentiment is critical in optimizing advantages and hazards in the integration of FinTech and sustainable development. Deng et al. (2019) offered evidence from the international context that the interweaving impact of financial technology (FinTech) on sustainable development appears as a critical issue that requires investigation. As nations throughout the world attempt to accomplish the Sustainable Development Goals (SDGs), knowing how FinTech intersects with these goals becomes critical. Nonetheless, research in this area is limited, and agreement on the best indicator system for sustainable development is hard.

Udeagha and Ngepah (2023) assessed the potential of green finance and Fintech in BRICS countries to achieve environmental sustainability. They report that green finance, fintech, and energy innovation enhance environmental sustainability, but natural resource rent and economic expansion negatively impact it. In the same context, Lisha et al. (2023b) investigated the influence of sustainability, green innovation, financial technology, financial development, and natural resources on environmental sustainability in BRICS economies from 2000 to 2019. Results revealed that FinTech and natural resources negatively affect sustainability. Green technologies and financial development boost sustainability, while economic expansion increases emissions. In another quest, Atayah et al. (2023) analyzed 1672 US company-year observations from 2010 to 2019 and found that Non-FinTech enterprises outperformed FinTech firms in sustainability and stock performance, indicating that enhanced ESG disclosure can mitigate agency issues and protect shareholders' interests.

Finally, the literature on FinTech and sustainable development offers a mosaic of perspectives that highlight the complicated interplay between technical breakthroughs, societal requirements, and economic sustainability. As academics explore further numerous variables ranging from sector-specific dynamics to mediating factors, the conversation highlights the need for a comprehensive approach that connects technology with sustainable practices, regulatory frameworks, and societal ambitions (Arner et al., 2020; Rambaud and Pascual, 2023). Thus, based on this background, the following hypothesis is formulated:

H₀1. : There is a significant influence of Fintech on sustainability performance.

3.2. The impact of information technology governance on sustainability

Several studies have been conducted to investigate the complex relationship between information technology adoption and sustainability (Arner et al., 2020; Atayah et al., 2023; Lisha et al., 2023a; Macchiavello and Siri, 2022; Rais et al., 2023). This debate focuses on major findings from this research while also critically assessing the implications of information technology for sustainability. Studies highlight the necessity for the integration of sustainability with Information

Technology such as Geographic Information Systems (GIS) (Jurjević et al., 2019), FinTech (Battisti et al., 2023b; Callsen et al., 2021; Eskiev, 2021; Ramamohan et al., 2021, 2021; Zhang et al., 2021), Blockchain technology (Mercuri et al., 2021), and ICT (Aguboshim et al., 2019; Ahmed et al., 2020; Al-Rahmi et al., 2020; Nizam et al., 2020; P. Sahoo et al., 2022). Nizam et al. (2020) examine the intricate relationship between ICT penetration, economic growth, and carbon emissions. While ICT can enhance energy efficiency and reduce emissions, potential rebound effects must be considered. According to Sahoo et al. (2022), a nuanced strategy is required to maximize ICT's positive benefits to sustainability while minimizing its unintended repercussions. Thus, IT governance plays a crucial role in strategic setting, value delivery, and performance management. It also positively impacts project performance, emphasizing the importance of alignment (Sirisomboonsuk et al., 2018).

While FinTech provides exciting answers, it is critical to consider the potential downsides. Data security, unequal access to technology, and regulatory challenges can all stymie FinTech's capacity to fully realize its contributions to sustainability. This necessitates a multifaceted approach that takes into account not just technology innovation but also its equal distribution and regulatory framework (Arner et al., 2020). Effective integration of ICT, blockchain technology, and Fintech is required for efficient sustainability performance. To achieve this integration, IT governance is effective and crucial for successful technology implementation and integration (Al-Sartawi and Al-Sartawi, 2020; Almaqtari, Farhan, Al-Hattami, et al., 2023; Fattah et al., 2021; Khalil et al., 2020, 2020; Menekşe and Akdağ, 2021; Wilkin and Chenhall, 2019, 2019). Research by Karim and Purwanto (2020) emphasizes the role of IT governance mechanisms in managing risks associated with FinTech adoption. Lacity et al. (2020) discuss the importance of aligning IT governance with strategic goals when integrating FinTech solutions, highlighting its impact on innovation and competitive advantage.

IT governance plays a pivotal role in shaping an organization's sustainability initiatives (Aguboshim et al., 2019; Downes et al., 2020; Haron et al., 2022; Mutamimah and Robiyanto, 2021; Romanelli, 2020; Sabbaghi and Vaidyanathan, 2012). Literature suggests that IT governance structures influence environmental sustainability practices, such as energy efficiency and carbon footprint reduction (Harris et al., 2017). Effective IT governance contributes to sustainable business processes and reporting (Lucas et al., 2021). Additionally, IT governance mechanisms can aid in monitoring and achieving sustainability targets (Kurnia et al., 2019). Research on the relationship between information, technology, and environmental governance in the Information Age has grown, but many theoretical, empirical, and normative questions remain unexplored. Information has changed over time as dominant environmental management approaches have evolved. What rapid advancements in new information technologies, data, and information networks may imply for environmental politics and governance in non-democratic contexts is even more opaque (Kostka et al., 2020). Despite many efforts made by governments and some international organizations (Huang et al., 2010; Patón-Romero et al., 2019; Smallwood, 2019), there are no clear standards that may contribute to the link between IT governance and sustainability. For example, the International Organization for Standardization (ISO) has created standards like ISO 14000 to help organizations achieve sustainable development. However, these standards are broad and do not cover critical areas like information technology. The Green IT ideology has become a top concern for organizations, and implementing Green IT projects is essential for raising environmental consciousness (Patón-Romero et al., 2019). To this end, the following hypothesis is hypothesized:

H₀₂ : There is a significant influence of IT governance on sustainability performance.

3.3. The relationship between IT governance, FinTech, and sustainability

FinTech innovations, driven by digitalization, have the potential to transform various aspects of financial services, affecting sustainability outcomes (Callsen et al., 2021; Eskiev, 2021; Guang-Wen and Siddik, 2023; Macchiavello and Siri, 2022). Studies suggest that FinTech lending platforms can facilitate access to credit for environmentally sustainable projects (Bouri et al., 2021). Studies have illuminated the potential of FinTech to drive financial inclusion (Arner et al., 2020; Bayram et al., 2022), reduce carbon emissions (Deng et al., 2019; Guang-Wen and Siddik, 2023; Vergara and Agudo, 2021), and promote renewable energy utilization (Bayram et al., 2022; Deng et al., 2019). Vergara and Agudo (2021) advocate the potential for FinTech to promote green finance. Arner et al. (2020) reveal that FinTech has a role in supporting the United Nations Sustainable Development Goals (SDGs) through the enhancement of digital financial infrastructure. Deng et al. (2019) found a U-shaped relationship between FinTech and sustainable development. Vergara and Agudo (2021) highlight how digital payment systems can enhance financial inclusion, contributing to socioeconomic sustainability. Putra et al. (2022) study finds data quality analytics, business ethics, and cyber risk management positively influence operational performance and corporate sustainability in Fintech P2P lending companies.

Fintech is a new financial business model that combines traditional financial institutions with internet enterprises with big data. Companies like Amazon, Google, Alibaba, and Tencent, with large market value and advanced technologies, have the potential to significantly contribute to sustainable development goals (Zhang et al., 2021). Fintech firms are utilizing big data, NLP, IoT, satellite imagery, blockchain, and robo-advisory to gain a competitive advantage in the sustainable finance sector. Key areas include crowdfunding, tokens, DLT, AI, and big data (Macpherson et al., 2021). Integrating sustainability and financial technology (Fintech) presents challenges, but IT can facilitate this integration. According to Anshari et al. (2019), the integration of Fintech and digital marketplaces can greatly improve sustainability. However, FinTech faces challenges like the digital divide, data security concerns, and regulatory obstacles. Anshari et al. (2021) and Aysan and Bergigui (2021) emphasize the need for technology-driven sustainability, driven by practicality and comprehensive approaches. Rewarding sustainable behavior via digital platforms is appealing, but solutions must be holistically examined, considering practical, ethical, and societal aspects. Accordingly, an integrative approach considering technology, ethical considerations, regional variances, and environmental effects is needed. Thus, effective IT governance is crucial for technology integration, affecting FinTech and sustainability outcomes (Almaqtari, Farhan, Al-Hattami, et al., 2023; Nurullah et al., 2023).

The relationship between IT governance and sustainability is crucial, as it must align with ESG goals. IT governance can mitigate sustainability risks but requires a comprehensive approach that considers ESG considerations and promotes a culture of sustainability. IT governance influences the alignment between FinTech strategies and sustainability objectives, and it moderates the impact of FinTech innovations on sustainability, such as digital payments' resource efficiency. Studies emphasize the importance of integrating sustainability with Information Technology (IT) such as GIS, FinTech, Blockchain, and ICT. IT governance is crucial for successful technology implementation and integration (Al-Sartawi and Al-Sartawi, 2020; Almaqtari, Farhan, Al-Hattami, et al., 2023; Fattah et al., 2021; Khalil et al., 2020, 2020; Menekşe and Akdağ, 2021; Wilkin and Chenhall, 2019, 2019). Research by Karim and Purwanto (2020) highlights the role of IT governance mechanisms in managing risks associated with FinTech adoption. Aligning IT governance with strategic goals is crucial for integrating FinTech solutions, impacting innovation and competitive advantage (Lacity et al., 2020). Accordingly, the following hypothesis is proposed:

H₀₂ : IT governance moderates significantly the association between

FinTech and sustainability performance.

4. Research design

4.1. Conceptual framework

The research model explores the moderating effect of IT governance on the relationship between FinTech and sustainability performance in India. FinTech is considered an independent variable that influences the outcome variable which is sustainability performance. Sustainability performance is measured using three dimensions, which are the economic dimension, the environmental dimension, and the social dimension. The governance dimension, however, was excluded as a sustainability measure because IT governance is a part of this dimension and accordingly avoids any indigeneity and misleading estimation. Finally, IT governance is used as a moderating variable in the relationship between FinTech and sustainability performance. Following is Figure 1 that demonstrates the research design:

4.2. Operational definition of the variables

The present research investigates how IT governance strategies mediate the relationship between Fintech and sustainability performance. To explore this relationship, the variables of the study are measured using the 5 Liker Scale. Each variable is defined by a synthesized literature from prior studies. Following is Table (1) that provides the measurement scales along with the operational definition of the variables:

4.3. Data collection and the research instrument

The study utilized an online questionnaire survey targeting bankers in Indian banks in positions such as board members, CFOs, senior

executives, customer service representatives, loan officers, financial advisors, operations officers, and credit officers. The questionnaire consisted of twenty-five items and was structured into five constructs. The study used non-probability convenience and snowballing sampling approaches to collect data. Convenience and snowball sampling are popular research methods that are used by prior research (Almaqtari et al., 2022; Guang-Wen and Siddik, 2023; Samagaio and Diogo, 2022) due to their accessibility, cost-effectiveness, time efficiency, and potential for exploring hidden populations. Convenience sampling allows researchers to recruit easily accessible individuals, making it more efficient for distant or difficult-to-reach populations (Raza et al., 2020). Snowball sampling is particularly useful for reaching hidden populations, such as stigmatized conditions or marginalized communities, by exploiting existing social networks (Almaqtari et al., 2020; Wang et al., 2019). These methods offer diverse perspectives, enriching data and providing a comprehensive understanding of the target population.

The minimum sample size was determined using a sample size calculator and G-Power software, with 139 and 175 respondents, respectively. However, the study ultimately gathered 210 surveys through an online questionnaire distributed via Google Docs. The survey was disseminated through various social media platforms, with mandatory questions and respondent-friendly statements used for close-ended questions. A concise letter was distributed through distribution platforms, emphasizing brevity, resulting in a 20% increase in response rates. Almost half of the respondents are in lower-level administrative roles such as customer service representatives, loan officers, financial advisors, operations officers, and credit officers, compared to 17% in high-level positions that include board members and CEOs and 34% middle administration positions that consisted of branch managers, senior executives, and consultants.

Research has explored the benefits and drawbacks of PLS estimation, a widely used method for estimating relationships between latent variables and indicators (Almaqtari, Elsheikh, et al., 2023; Rostamzadeh

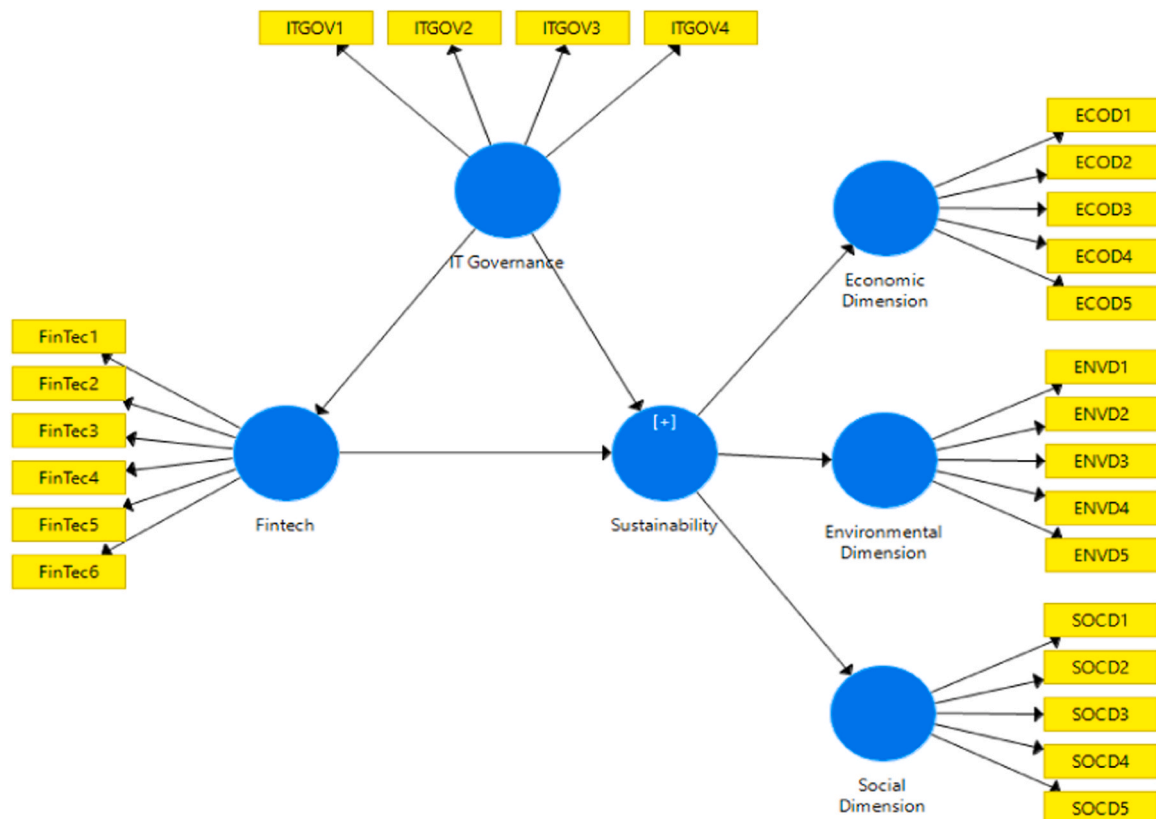


Fig. 1. The Research Design.

Table 1
Operational definition of the variables.

Nature	Variable	Acronym	Scale	Items	Evidence
FinTech	FinTech	FinTech	1:6	Using Fintech service makes it easier to do my online purchasing If I have access to Fintech services, I want to use them as much as possible. Fintech service is the first choice to pay for the future. Fintech services are better than traditional services in terms of their contributing to sustainability Our management gives priority to Fintech channels rather than traditional channels.	(Le, 2021)
IT Governance	IT Governance	ITGOVE	1:4	Fintech suits green financing operations and sustainability issues Our business has an ERP system that facilitates the accessibility of data Information and data are stored in a way that can be recovered, accessed, and operated from anywhere at any point in time Our business uses cloud computing to facilitate system operating Our business has a well-written and developed strategy of IT governance to deal with green finance and branchless operations that promote sustainability issues	(Almaqtari, et al., 2021)
Sustainability Performance	Economic Dimension	ECOD	1:5	Green finance activities generate additional economic benefits (economic value added) Branchless banking improves the economic performance of the stakeholders. Branchless banking follows a comprehensive tax policy imposed by the government. Green financing activities help save investment and other costs Green financing activities help reduce overall risk	(Zheng, et al., 2021; Akter et al., 2017; Raihan, 2019)
	Environmental Dimension	ENVVD	1:5	Using environmentally sustainable services will help reduce pollution due to less usage of paper and energy Using environmentally sustainable services will help protect the environment Using sustainable technology-based services has more environmental benefits as compared to traditional banking services Our business undertook actions for environmental audit, public disclosure, employee training, and immunity Branchless banking relies on and invests in clean technologies	(Jaiswal and Kant, 2018; Kumar et al., 2017; Taneja and Ali, 2021)
	Social Dimension	SOCDD	1:5	Green financing significantly improves the revenue and market share of our business. Green financing significantly decreases the operational expenditure of our business. Green financing significantly reduces paper usage and energy consumption in our business. Green financing improves our business's compliance with environmental standards. Green financing improves the reputation and image of the business. Green financing improves the relationship between the community and stakeholders.	(Zheng, et al., 2021; Akter et al., 2017; Raihan, 2019; Zahid et al., 2021)

et al., 2021; Shanmugapriya and Subramanian, 2016). PLS path modeling, which uses ordinary least squares regressions, is particularly useful in complex models with large latent and manifest variables and small indicators per latent variable (Hair et al., 2013; Henseler and Sarstedt, 2013). However, when incorrect or non-convergent results are likely, PLS path modeling is preferred over covariance-based structural equation modeling. SEM-PLS is a useful technique for assessing complex models to anticipate correlations between research variables (Memon et al., 2017). It can forecast, explain, and identify essential target components. Reasons for using PLS-SEM include small sample sizes and non-normal data (Hair et al., 2019). PLS-SEM is superior to regression analysis for assessing mediation and should be used with a two-stage approach for moderator analysis. Following prior research, the current research utilizes Smart PLS to estimate the results (Almaqtari et al., 2022; Dwivedi et al., 2021; Guang-Wen and Siddik, 2023; Samagaio and Diogo, 2022). The estimated results include confirmatory factor analysis, reliability and validity, and structural equation modeling for hypothesis testing.

5. Empirical results

5.1. Confirmatory factor analysis

Table 2 displays the confirmatory factor analysis (CFA) results for the

constructs of the study. Factor loadings represent the strength of association between each item and its corresponding construct. Factor loadings greater than 0.7 are considered adequate, while those greater than 0.8 are considered high. Most factor loadings are acceptable or strong. The factor loading for the items ranges from 0.699 for SOCDD1 to 0.836 for FinTec2, indicating that CFA results indicate that most items are good estimators of their related constructs. Figure 2 also demonstrates the factor loading of the items.

Table 2 also includes construct reliability (CA), rho_A values, and composite reliability (CR) scores for each construct in the study. The results of CR are greater than 0.7. CA of 0.7 or higher is generally regarded as satisfactory, suggesting that all of the constructs have good internal consistency. The rho_A values are likewise more than 0.7, indicating a high level of internal consistency. CR shows that all constructions have values greater than 0.7, which is regarded as satisfactory. Overall, this indicates that CFA results are appropriate for estimating the results using Structural Equation Modelling (SEM).

The results in Table 3 demonstrate Discriminant validity values. The values indicate that the items used to measure each construct are proper to measure the same construct not any other construct. The self-correlation of each construct is greater than the correlation values with other constructs, suggesting a good fit for discriminant validity.

Table 2
CFA Factor Loadings.

Variables	Items	Fintech	IT GOV	ECOD	ENVD	SOCD	CA	rho_A	CR	AVE
Fintech	FinTec1	0.826					0.906	0.908	0.906	0.616
	FinTec2	0.836								
	FinTec3	0.737								
	FinTec4	0.797								
	FinTec5	0.719								
	FinTec6	0.788								
IT Governance (ITGOV)	ITGOV1		0.779				0.857	0.858	0.857	0.600
	ITGOV2		0.797							
	ITGOV3		0.723							
	ITGOV4		0.795							
Economic Dimension (ECOD)	ECOD1			0.724			0.871	0.873	0.871	0.576
	ECOD2			0.740						
	ECOD3			0.753						
	ECOD4			0.811						
	ECOD5			0.763						
Environmental Dimension (ENVD)	ENVD1				0.813		0.875	0.877	0.875	0.585
	ENVD2				0.749					
	ENVD3				0.779					
	ENVD4				0.728					
	ENVD5				0.751					
Social Dimension (SOCD)	SOCD1					0.699	0.874	0.876	0.874	0.582
	SOCD2					0.789				
	SOCD3					0.739				
	SOCD4					0.782				
	SOCD5					0.799				

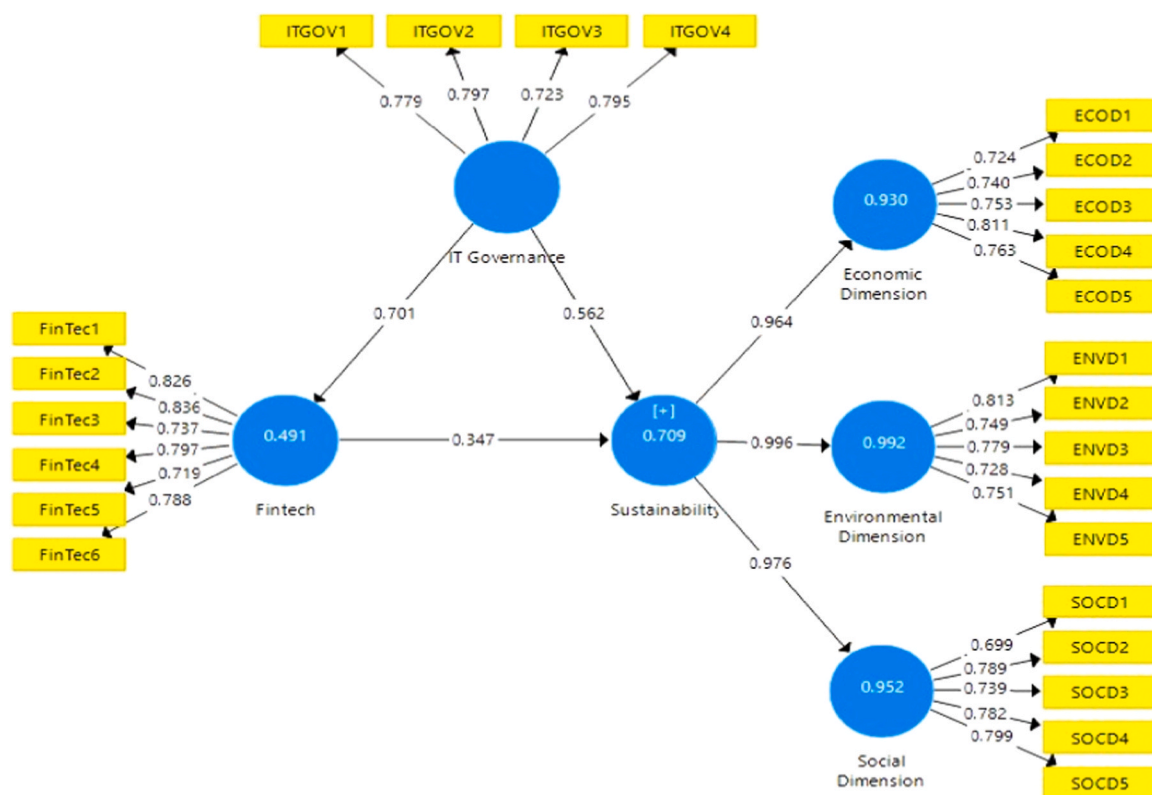


Fig. 2. Confirmatory Factor Analysis.

5.2. Results and discussion

5.2.1. The direct effect model

The results in Table 4 and Figure 3 provide an estimation of the direct and indirect effect of the path relationships of the variables. The results reveal that Fintech has a significant positive impact on sustainability performance ($\beta = +0.347, p = 0.000 \leq \alpha = 0.01$). The statistically significant effect suggests that as banks incorporate Fintech, their

sustainability performance tends to improve. This result aligns with the growing emphasis on technological innovation to enhance sustainability practices and corporate governance. This is consistent with (Battisti et al., 2023a; Rais et al., 2023; Udeagha and Muchapondwa, 2023) who conclude that Fintech affects positively and significantly sustainability. Similarly, Vergara and Agudo (2021) explored the relationship between Fintech and sustainability, focusing on collaboration and examples of current technological platforms.

Table 3
Discriminant validity.

Constructs	Economic Dimension	Environmental Dimension	Fintech	IT Governance	Social Dimension
Economic Dimension	0.759				
Environmental Dimension	0.770	0.865			
Fintech	0.694	0.750	0.785		
IT Governance	0.704	0.853	0.701	0.774	
Social Dimension	0.739	0.805	0.582	0.642	0.763

Table 4
SEM- Direct Effect Model.

Path	β	STDV	T – Stat	p Values
Fintech -> Sustainability	0.347	0.085	4.097	0.000
IT Governance -> Fintech	0.701	0.063	11.148	0.000
IT Governance -> Sustainability	0.562	0.086	6.552	0.000
Sustainability -> Economic Dimension	0.964	0.037	26.301	0.000
Sustainability -> Environmental Dimension	0.996	0.016	61.733	0.000
Sustainability -> Social Dimension	0.976	0.021	46.291	0.000
Total Indirect Effects				
	β	stdv	t – stat	p Values
Fintech -> Economic Dimension	0.334	0.084	3.987	0.000
Fintech -> Environmental Dimension	0.345	0.084	4.125	0.000
Fintech -> Social Dimension	0.338	0.083	4.076	0.000
IT Governance -> Economic Dimension	0.776	0.049	15.919	0.000
IT Governance -> Environmental Dimension	0.802	0.044	18.248	0.000
IT Governance -> Social Dimension	0.785	0.044	17.712	0.000
IT Governance -> Sustainability	0.243	0.064	3.779	0.000
Specific Indirect Effects				
	β	stdv	t – stat	p Values
IT Governance -> Fintech -> Sustainability -> Economic Dimension	0.234	0.064	3.685	0.000
IT Governance -> Sustainability -> Economic Dimension	0.542	0.084	6.432	0.000
IT Governance -> Fintech -> Sustainability -> Environmental Dimension	0.242	0.064	3.791	0.000
IT Governance -> Sustainability -> Environmental Dimension	0.560	0.087	6.397	0.000
IT Governance -> Fintech -> Sustainability -> Social Dimension	0.237	0.063	3.746	0.000
IT Governance -> Sustainability -> Social Dimension	0.548	0.085	6.443	0.000

The study suggests that Fintech can enhance financial enterprises' sustainability by supporting green finance. Consistently, several studies also conclude that FinTech is a key driver of sustainability (Aysan and Bergigui, 2021b; Merello et al., 2022; Rambaud and Gázquez, 2022; Siddik et al., 2023; Vergara and Agudo, 2021). The results also indicate that IT exhibits a significant positive effect on FinTech ($\beta = +0.701, p = 0.000 \leq \alpha = 0.01$). This is consistent with the view that advancements in information technology have significantly impacted the financial sector, leading to the growth of FinTech- (Al-Sartawi and Al-Sartawi, 2020; Downes et al., 2020; Khan et al., 2020; Macchiavello and Siri, 2022; M. Sahoo et al., 2021). These advancements have improved the technological infrastructure, enabling seamless integration of financial technologies and spurring innovation in fields like artificial intelligence, blockchain, and data analytics (Aysan and Bergigui, 2021; Aysan and Bergigui, 2021b, 2021a; Macpherson et al., 2021; Yan et al., 2022, 2022). Additionally, information technology has improved cybersecurity safeguards, ensuring the security and integrity of financial transactions on FinTech platforms (Najaf et al., 2021).

This result highlights that advancements in IT governance significantly drive the adoption and growth of Fintech, suggesting that IT governance plays a pivotal role in shaping the evolution of Fintech. In the same context, the results demonstrate a positive relationship be-

tween IT and sustainability performance ($\beta = +0.562, p = 0.000 \leq \alpha = 0.01$). This result consists with (Aguboshim et al., 2019; Arner et al., 2020; Guang-Wen and Siddik, 2023; Sabbaghi and Vaidyanathan, 2012; Zhang et al., 2021; Zhao et al., 2019) who conclude that IT advancements have a significant influence on improving sustainability performance, suggesting that IT contributes to better sustainability performance.

In terms of the influence on sustainability measurements, the findings show a highly significant positive association between sustainability performance and its three pillars: economic, environmental, and social ($p = 0.000 \leq \alpha = 0.01$). This signifies that robust sustainability performance practices contribute significantly to the growth and stability of economic sustainability, suggesting that strong sustainability performance is a valuable driver of economic success, underlining the crucial role of sustainability performance in addressing environmental concerns, and reinforcing the idea that strong sustainability performance practices are closely linked to responsible bank behavior (Arner et al., 2020; Deng et al., 2019; Macpherson et al., 2021; Zhao et al., 2019).

The indirect relationship between Fintech and the three pillars of sustainability is positive and significant. In the economic dimension, it exhibits a positive effect of FinTech on the economic dimension. This means that as Fintech increases, there is a corresponding positive impact on the economic dimension ($\beta = +0.334, p = 0.000 \leq \alpha = 0.01$), suggesting that FinTech plays a role in enhancing the bank's economic sustainability. Similarly, this relationship suggests a positive impact of FinTech on environmental sustainability ($\beta = +0.345, p = 0.000 \leq \alpha = 0.01$). As Fintech increases, there is a corresponding increase in environmental sustainability levels, indicating that FinTech might contribute to higher environmental performance. Likewise, the association between FinTech and social sustainability implies a positive effect of FinTech on social sustainability ($\beta = +0.338, p = 0.000 \leq \alpha = 0.01$). This means that banks using Fintech are associated with higher levels of CSR activities. This consists with the finding that Fintech can enhance economic sustainability by increasing financial inclusion, simplifying procedures, and offering alternative funding options for startups and small enterprises (Arner et al., 2020). Platforms like crowdfunding and peer-to-peer lending provide alternative funding options, boosting economic activity and encouraging entrepreneurship (Arner et al., 2020; Macpherson et al., 2021; Zhao et al., 2019). FinTech also promotes social sustainability by making financial services more accessible, enabling people from all socioeconomic situations to gain financial literacy and empowerment (Guang-Wen and Siddik, 2023; Vergara and Agudo, 2021; Winarsih et al., 2020; Zhang et al., 2021).

Examining the relationship between IT governance and the three dimensions of sustainability exhibits a significant and positive effect. While it has a significant positive effect on economic sustainability ($\beta = +0.776, p = 0.000 \leq \alpha = 0.01$), it is also significant in the case of environmental sustainability ($\beta = +0.802, p = 0.000 \leq \alpha = 0.01$), and social sustainability ($\beta = +0.785, p = 0.000 \leq \alpha = 0.01$). This implies that as IT governance advances, there is a significant growth in sustainability performance. This suggests the vital role of IT governance in driving economic success and that IT development might be associated with higher environmental performance and better responsible bank behavior. This is consistent with (Mohapi and Njenga, 2012; Mushtaque et al., 2014).

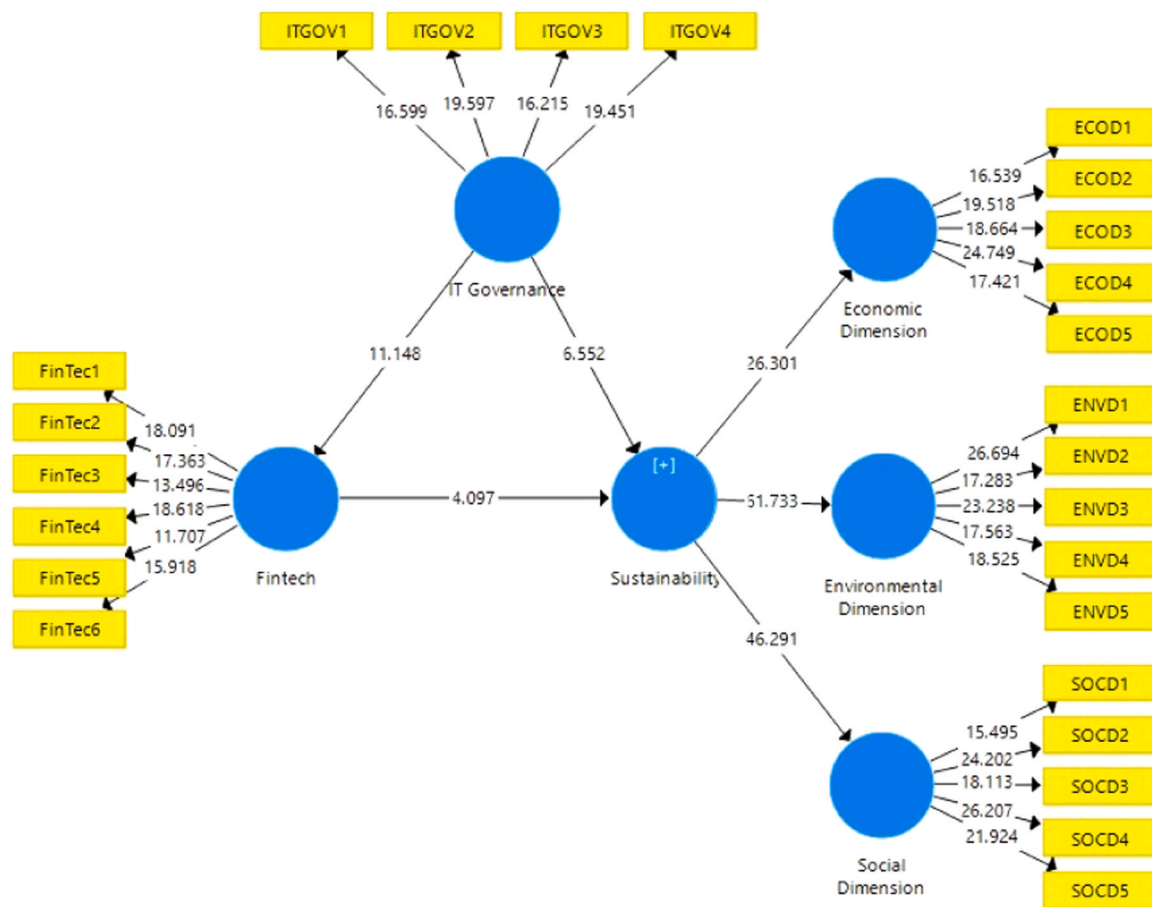


Fig. 3. Structural Equation Model- Direct Effect.

The path for *IT governance* → *Fintech* → *sustainability performance* signifies a positive effect on the economic dimension ($\beta = +0.234, p = 0.000 \leq \alpha = 0.01$). This implies that advancements in IT governance lead to increased adoption of Fintech, subsequently enhancing sustainability performance, which then contributes to the growth of economic sustainability. Banks that strategically utilize technological advancements to foster Fintech and sustainability performance improvements likely experience economic gains due to their focus on sustainable and technologically driven practices (Dwivedi et al., 2021; Guang-Wen and Siddik, 2023; Jnr et al., 2017; Zhang et al., 2021). The results are in line with prior studies that indicate the adoption of technological advancements enhances sustainability performance (Aguboshim et al., 2019; Macchiavello and Siri, 2022, 2022; Macpherson et al., 2021; Mata et al., 1995).

The results also show that the sequential path for *IT governance* → *sustainability performance* → *economic dimension* is positive and significant ($\beta = +0.542, p = 0.000 \leq \alpha = 0.01$). The relationship between IT governance and sustainability performance is significant, indicating that a synergy between IT governance and improved sustainability performance significantly drives economic sustainability growth. This is consistent with the view that banks that prioritize sustainability performance alongside technological advancements are likely to experience improved economic outcomes (Guang-Wen and Siddik, 2023; Macchiavello and Siri, 2022; Macpherson et al., 2021; Zhang et al., 2021). Further, the path *IT Governance* → *Fintech* → *sustainability performance* → *environmental dimension* indicates a positive influence of the IT governance, FinTech, and sustainability performance on environmental sustainability ($\beta = +0.242, p = 0.000 \leq \alpha = 0.01$). This suggests that banks that adopt IT governance, incorporate Fintech, and enhance sustainability performance practices might have implications for

environmental issues. This aligns with prior studies (Arner et al., 2020; Bayram et al., 2022; Khuntia et al., 2018; Macpherson et al., 2021; Wijayanti and Setiawan, 2023) that indicate that FinTech encourages digital transactions, reducing physical documents and paperwork, promoting environmental sustainability by reducing energy usage, and lowering carbon footprint.

The results also show that the relationship between *IT governance* → *sustainability performance* → *environmental dimension* is positive and significant ($\beta = +0.560, p = 0.000 \leq \alpha = 0.01$). This implies that the combined influence of IT governance and sustainability performance practices might be associated with higher environmental performance. This result emphasizes the complexity of interactions between IT adoption, sustainable practices, and their environmental implications. In the same context, the path *IT governance* → *Fintech* → *sustainability performance* → *social dimension* suggests a positive impact ($\beta = +0.237, p = 0.000 \leq \alpha = 0.01$). This indicates that banks leveraging IT and Fintech to improve sustainability performance are more likely to engage in CSR initiatives (Guang-Wen and Siddik, 2023; Samagaio and Diogo, 2022; Vergara and Agudo, 2021). This result underscores the role of integrated strategies in promoting responsible bank behavior. Finally, the path for *IT governance* → *sustainability performance* → *social dimension* reveals a significant positive association of IT → sustainability performance on CSR activities ($\beta = +0.548, p = 0.000 \leq \alpha = 0.01$). This positive effect highlights that IT-driven advancements contribute to elevated CSR engagement. Banks that embrace technological progress and prioritize sustainability performance factors are more likely to demonstrate a commitment to responsible business practices (Cao et al., 2021; Guang-Wen and Siddik, 2023; Zhao et al., 2019).

5.2.2. The moderating effect model

The structural equation modeling for the moderating effect is estimated in Table 5 and Figure 4. FinTech and the Economic Dimension of Sustainability were found to have a significant positive association ($\beta = 0.331$, $T = 4.139$, $p = 0.000$). These findings suggest that as FinTech use grows, it has a positive impact on the Economic Dimension of Sustainability, potentially leading to economic development and better financial inclusion. This is consistent with Arner et al. (2020) who suggest that Technology enables the rethinking of existing systems to balance market integrity, financial inclusion, and economic growth while adhering to international financial norms. Likewise, the results show a highly significant positive association between IT Governance, Sustainability, and the Economic Dimension ($\beta = 0.538$, $T = 6.583$, $p = 0.000$). This highlights the significance of strong IT governance in promoting long-term economic practices within financial organizations. This consists with (Joshi et al., 2013) who indicate that there are several economic benefits from the communication and reporting of IT financial matters.

The results also revealed a statistically significant positive link between IT Governance, FinTech, Sustainability, and the Economic Dimension ($\beta = 0.232$, $T = 3.956$, $p = 0.000$). This indicates that the combined effect of effective IT Governance with FinTech solutions contributes positively to economic sustainability. However, IT Governance had an insignificant and negative moderating effect on the relationship between Sustainability and the Economic Dimension ($\beta = -0.017$, $T = 0.488$, $p = 0.626$). This reveals that although IT Governance exhibits a direct positive influence on Economic Sustainability, it demonstrates an insignificant influence on the association between Sustainability and FinTech. This shows that although IT Governance and FinTech both provide unique contributions to sustainability, their alignment does not necessarily change the way that FinTech and sustainability are directly related.

Additionally, it was found that FinTech and Environmental Sustainability had a statistically significant positive connection ($\beta = 0.342$, $T = 4.241$, $p = 0.000$). This implies that FinTech enhances environmental sustainability. Furthermore, a highly significant positive connection ($\beta = 0.556$, $T = 6.707$, $p = 0.000$) was found between IT

Governance, Sustainability, and the Environmental Dimension. This emphasizes the need for IT Governance in promoting environmentally responsible behaviors. This consists with (Fiksel et al., 2021) who indicate that Technological advances reduce environmental resource strain and give novel solutions to utilize materials and industrial waste.

Moreover, the research found a significant positive association ($\beta = 0.239$, $T = 4.028$, $p = 0.000$) between IT Governance, FinTech, Sustainability, and the Environmental Dimension. This indicates that good IT Governance procedures, in conjunction with FinTech activities, contribute to environmental sustainability. This is also consistent with prior studies that indicate that technological solutions enhance sustainability performance (Anshari et al., 2021; Arner et al., 2020; Khuntia et al., 2018; Tamasiga et al., 2022; Vergara and Agudo, 2021; Zhang et al., 2021). Surprisingly, IT Governance had no statistically significant moderating influence on the connection between Sustainability and the Environmental Dimension ($\beta = -0.017$, $T = 0.490$, $p = 0.624$). Although IT Governance appears to have a direct positive impact on the Environmental Dimension of Sustainability, it does not influence the link between Sustainability and FinTech. This highlights a practical problem in financial institutions regarding the alignment of IT governance practices with FinTech solutions to promote sustainability practices over the long run.

Concerning the social dimension, the findings show that FinTech and the Social Dimension of Sustainability have a statistically significant positive association ($\beta = 0.335$, $T = 4.200$, $p = 0.000$). This suggests that FinTech activities contribute to societal sustainability. Similarly, a highly significant positive connection ($\beta = 0.544$, $T = 6.751$, $p = 0.000$) was found between IT Governance, Sustainability, and the Social Dimension. This demonstrates how IT governance contributes to social sustainability. The results also report a highly significant positive relationship between IT Governance, FinTech, Sustainability, and the Social Dimension ($\beta = 0.235$, $T = 3.988$, $p = 0.000$). The relationship between sustainability and the social dimension, however, was not statistically significantly moderated by IT governance ($\beta = -0.017$, $T = 0.491$, $p = 0.624$). IT Governance directly affects Social Sustainability, although it has an insignificant effect bearing on how FinTech and Sustainability are related.

Table 5
Results Estimation.

Path	β	STDV	T – Stat	p Values
Fintech -> Sustainability -> Economic Dimension	0.331	0.080	4.139	0.000
IT Governance -> Fintech -> Sustainability -> Economic Dimension	0.232	0.059	3.956	0.000
IT Governance -> Sustainability -> Economic Dimension	0.538	0.082	6.583	0.000
Moderating Effect_of IT Governance -> Sustainability -> Economic Dimension	-0.017	0.035	0.488	0.626
Fintech -> Sustainability -> Environmental Dimension	0.342	0.081	4.241	0.000
IT Governance -> Fintech -> Sustainability -> Environmental Dimension	0.239	0.059	4.028	0.000
IT Governance -> Sustainability -> Environmental Dimension	0.556	0.083	6.707	0.000
Moderating Effect_of IT Governance -> Sustainability -> Environmental Dimension	-0.017	0.036	0.490	0.624
Fintech -> Sustainability -> Social Dimension	0.335	0.080	4.200	0.000
IT Governance -> Fintech -> Sustainability -> Social Dimension	0.235	0.059	3.988	0.000
IT Governance -> Sustainability -> Social Dimension	0.544	0.081	6.751	0.000
Moderating Effect_of IT Governance -> Sustainability -> Social Dimension	-0.017	0.035	0.491	0.624
IT Governance -> Fintech -> Sustainability	0.240	0.060	4.028	0.000

6. Implications

6.1. Implications for banks and other financial institutions

The research highlights the importance of strategic IT governance in promoting sustainable practices in financial institutions. It emphasizes the need for banks to improve their governance structures to integrate financial innovations and promote sustainability. Green finance practices should align business strategies with environmental and social responsibility (Vergara and Agudo, 2021, 2021). Prioritizing risk management and strong IT governance standards ensures responsible financial technology implementation (Al-Sartawi and Al-Sartawi, 2020, 2020; Fattah et al., 2021; Khalil et al., 2020). A proactive commitment to sustainable practices can provide a competitive advantage, positioning banks as ethical enterprises that attract environmentally sensitive customers and investors (Jnr et al., 2017; Meiling et al., 2021, 2021; Simmonds and Bhattacharjee, 2012). Financial institutions should invest in technology-driven solutions consistent with ESG objectives and build internal capabilities to negotiate IT governance and green financing challenges (A. Aysan and Bergigui, 2021; Bayram et al., 2022; Leaniz and Ruiz, 2018; Zhao et al., 2019). The study suggests that Indian banks can improve their financial technology strategy by implementing IT governance measures that align with regulatory expectations. The study also emphasizes green finance and sustainability performance, highlighting the importance of implementing technology-driven solutions that consider environmental and social concerns. IT governance is crucial for managing risks associated with financial technologies (Awwad and El Khoury, 2021; Teixeira and Tavares-Lehamann, 2022;

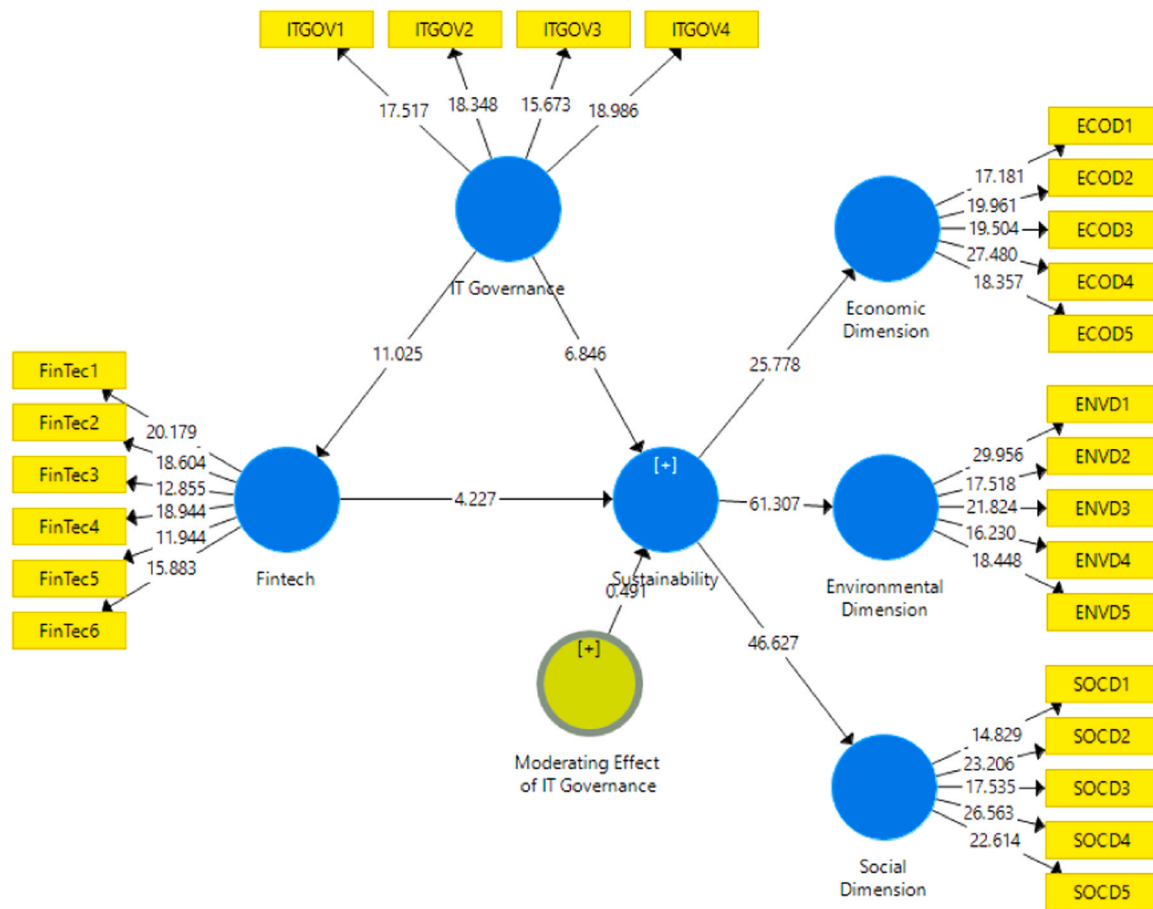


Fig. 4. Structural Equation Model- Moderating Effect.

Vejseli et al., 2018; Xue et al., 2008). Indian consumers are increasingly interested in sustainable banking, and banks can adapt their service offerings to include green finance concepts. The Indian government’s National Action Plan on Climate Change promotes sustainability, and banks can align their practices with green finance initiatives to contribute to national sustainability goals. Technology-driven financial inclusion can be supported by expanding services to rural and unbanked regions, investing in internal capabilities, and collaborating with fintech startups, government agencies, and non-profit organizations to address environmental and social issues while increasing financial inclusion.

6.2. Implications for policymakers and regulators

The study provides a framework for sustainable finance policies, emphasizing the positive impact of financial technology and strong IT governance on sustainability performance. Regulators can encourage financial institutions to adopt good IT governance policies by providing regulatory advantages, certifications, or preferential treatment for those following sustainable standards (Almaqtari, Farhan, Yahya, et al., 2023). The study also suggests that regulators can enhance reporting standards by pushing financial firms to publish both financial and environmental performance data (Samagaio and Diogo, 2022; Vergara and Agudo, 2021; Zhao et al., 2019). This shift towards integrated reporting aligns with global trends and allows for a more comprehensive examination of a financial institution’s impact on sustainability (Aktas et al., 2013; Hussain et al., 2018; Lu and Wang, 2021). Further, capacity development and training programs are also suggested as a way to mitigate risks associated with financial technologies (Macpherson et al., 2021). Collaboration between regulatory organizations and financial institutions is vital for sharing information, exchanging best practices,

and working together on sustainable finance initiatives (Macpherson et al., 2021; Nasiri et al., 2021; Tok and Yesuf, 2022). The study also emphasizes the importance of financial inclusion and suggests that policymakers should develop policies that promote inclusive financial technologies, enabling underprivileged groups to access financial services and contribute to socioeconomic development goals (Guang-Wen and Siddik, 2023; Macpherson et al., 2021; Samagaio and Diogo, 2022). A flexible regulatory framework is also recommended to allow for technology improvements and innovation.

The study highlights the importance of digital financial inclusion in Indian institutions, especially in rural and disadvantaged areas. It suggests that regulators can use data to increase fintech adoption, focusing on strong IT governance procedures (Arner et al., 2020; Bayram et al., 2022; Samagaio and Diogo, 2022; Zhang et al., 2021). The Reserve Bank of India (RBI) can also strengthen existing fintech adoption standards by emphasizing IT governance practices. The study also emphasizes the need for IT governance to reduce cybersecurity risks associated with fintech adoption (Al-Sartawi and Al-Sartawi, 2020, 2020; Samagaio and Diogo, 2022). Policymakers can prioritize cybersecurity standards, such as secure digital payment system installation and cyber threat protection. Improving data privacy legislation and implementing standardized monitoring and reporting procedures for sustainable finance practices can increase customer trust (Chaouali et al., 2016; Frățilă et al., 2013; Giovanis et al., 2012). The study can help Indian banks connect their sustainability operations with global norms, promoting the incorporation of green finance ideas into lending and investment procedures (Arner et al., 2020; Bayram et al., 2022; Callsen et al., 2021). Collaboration with government efforts like the Digital India campaign can help fintech companies integrate solutions that contribute to digitization, reduce cash dependence, and promote transaction transparency.

7. Conclusion

This study investigates the moderating effect of Information Technology governance on the relationship between Financial Technologies (FinTech) and sustainability performance in India. The research model explores the relationship between FinTech and sustainability performance using three dimensions: economic, environmental, and social. The study used an online questionnaire survey targeting bankers in various positions, including board members, CFOs, senior executives, customer service representatives, loan officers, financial advisors, operations officers, and credit officers. Non-probability convenience and snowballing sampling methods were utilized to gather the data required for the current study. The study collected a final sample size of 210 respondents from the Indian commercial banks. The survey was circulated through Google Docs and different social media sites, including mandatory questions and respondent-friendly statements for closed-ended questions.

The findings of the research indicate that Fintech significantly and positively influences sustainability performance. The results indicate that banks incorporating Fintech tend to have better economic growth and increased social and environmental sustainability performance. This is consistent with the increased emphasis on technical innovations and technological advancements to improve sustainability and corporate governance. The results also reveal that IT governance is critical in shaping banks' strategic planning towards sustainable activities, evolution of Fintech, and technological advancements, which in turn influence significantly and positively sustainability performance. As FinTech grows in popularity, so does its sustainability performance including its three dimensions: economic, environmental, and social sustainability. This shows that strong sustainability performance practices contribute greatly to economic sustainability's growth and stability. This association indicates that FinTech may lead to improved environmental performance and that banks that use Fintech have greater levels of CSR activities. Further, the results declare that the relationship between IT governance and the three dimensions of sustainability is also significant, with IT governance leading to increased adoption of Fintech and enhancing sustainability performance, contributing to the growth of economic sustainability. Banks that strategically utilize IT governance to foster Fintech and sustainability performance improvements likely experience economic gains due to their focus on sustainable and technologically driven practices.

The study found significant positive associations between FinTech and the Economic Dimension of Sustainability, suggesting that as FinTech use grows, it has a positive impact on economic development and better financial inclusion. IT Governance plays a crucial role in promoting long-term economic practices within financial organizations. The combined effect of effective IT governance with FinTech solutions contributes positively to economic sustainability. However, IT Governance has an insignificant and negative moderating effect on the relationship between Sustainability and the Economic Dimension, indicating that while FinTech and Sustainability provide unique contributions to sustainability, their alignment does not necessarily change the way they are directly related.

FinTech and the Social Dimension of Sustainability have a positive association, indicating that FinTech activities contribute to societal sustainability. IT Governance directly affects social sustainability, although it has an insignificant effect on how FinTech and Sustainability are related. Overall, the results indicate significant positive relationships between IT governance and sustainability across the three sustainability dimensions. However, IT Governance does not significantly moderate these connections, suggesting that each financial institution may have a different IT governance approach for FinTech and sustainability depending on its objectives, convictions, and operational setting. Financial institutions can use the study findings to continuously improve their IT Governance and increase FinTech's beneficial impact on sustainability outcomes.

The study has several contributions to the strand literature. The study explores the impact of information technology governance on the relationship between financial technologies (FinTech) and economic, environmental, and sustainability performance. It expands our understanding of FinTech's consequences beyond financial measurements and uses IT governance as a moderator. The findings have practical implications for decision-makers, policymakers, and practitioners in both financial and IT realms. Understanding how IT governance mitigates FinTech's impact can influence strategic decisions about technology adoption and governance policies. The holistic sustainability approach incorporates environmental and sustainability performance, demonstrating an increasing emphasis on sustainability across sectors. The study may provide recommendations for improving IT governance procedures to maximize FinTech's benefits while limiting potential dangers. If successful, it could support global efforts to achieve the Sustainable Development Goals. The analysis may identify areas for further investigation, contributing to knowledge expansion, practical insights, decision-making assistance, and influencing academic and industrial perspectives on the intersection between FinTech, IT governance, and organizational success.

The study explores the relationship between financial technologies (FinTech) and environmental, social, and governance (ESG) factors, focusing on the moderating role of information technology governance. It provides industry-specific insights on FinTech adoption and its impact on ESG performance in the heavily regulated banking sector, particularly in emerging economies like India. The findings could have immediate policy implications for regulators and policymakers in these countries, as understanding the role of information technology governance is crucial in building regulatory frameworks that balance innovation and sustainability concerns. The study may also help identify risk mitigation techniques for banks considering adopting FinTech, advising them to create robust governance systems to handle potential hazards. The study's scope extends to organizations and areas other than banking, aligning with the growing interest in sustainable finance and responsible banking practices.

This study sheds light on the complex links that exist between IT governance, FinTech, and sustainability-related concerns (economic, social, and environmental). It helps to understand how technical improvements affect sustainability practices and economic outcomes. The findings emphasize the significance of a comprehensive approach to sustainability. Banks can establish more complete plans for attaining sustainable growth by taking IT governance, FinTech, and ESG into account. This highlights the importance of technology in promoting economic progress and sustainability. According to the research, while IT and ESG may have a positive impact in various areas, they may also have consequences for enhanced environmental sustainability. This conclusion emphasizes the importance of banks properly balancing their sustainability efforts. According to the findings, institutions that embrace IT governance while emphasizing ESG factors are more likely to participate in CSR projects. This helps to clarify how technology adoption might support responsible bank behavior. The findings have ramifications for business leaders and policymakers alike. They offer advice on how banks can utilize technology strategically to improve sustainability and economic performance while being mindful of potential trade-offs. The findings pave the way for additional research into the complex linkages between technology, sustainability, and corporate performance. It encourages future research into the processes behind these relationships. Despite the important findings of the current study, it has certain limitations. First, the study is limited to the Indian commercial banks thus, future research could consider other sectors and conduct comparisons across several industries. Second, the study is limited to primary data based on a questionnaire survey, which may limit the generalizability of the findings to broader contexts such as industries and other jurisdictions. Accordingly, future research could investigate this issue using content analysis or secondary data to capture the current practices of FinTech, IT governance, and sustainability

issues. Third, the investigation of sustainability in the context of technological advancements needs to consider some other internal and external factors that may affect this relationship. The study is limited to the relationship between FinTech, IT governance, and sustainability hence, another possible stream for future research is considering the internal and external factors. Finally, the study is limited to a cross-section estimation with convenience and snowballing samples that may limit the generalizability of the results to a wider population. Future research could utilize longitudinal data to estimate the development and trends of these issues over a few years.

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Ethical Statement

The research presented in this article is original and has not been previously published, in part or in full, in any other academic or research publication. The author has made significant contributions to the research and writing of the manuscript, and they have reviewed and approved the final version of the paper. The manuscript does not contain any form of plagiarism. All sources and contributions from other researchers have been properly cited and referenced. The research presented in this manuscript complies with all relevant ethical guidelines and regulations. The submitted manuscript adheres to the ethical standards and guidelines outlined by the target journal for publication.

CRedit authorship contribution statement

Faozi A. Almaqtari: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare no conflict of interest. We, the author of this manuscript, declare that we have no conflicts of interest to disclose. We confirm that there are no financial, professional, or personal relationships that could be perceived as potentially influencing the research work or its interpretation. The author has reviewed and agreed to this conflict of interest statement. We are committed to upholding the principles of fairness, objectivity, and impartiality in our research and publication process.

References

- Aguboshim, F.C., Ezeasomba, I.N., Ezeife, J.E., 2019. Sustainable information and communication technology (ICT) for Sustainable data governance in Nigeria: a narrative review. *J. Inf. Eng. Appl.* <https://doi.org/10.7176/jiea/9-5-02>.
- Ahmed, Z., Nathaniel, S.P., Shahbaz, M., 2020. The criticality of information and communication technology and human capital in environmental sustainability: evidence from Latin American and Caribbean countries. *J. Clean. Prod.* <https://doi.org/10.1016/j.jclepro.2020.125529>.
- Aktas, R., Kayalidere, K., Kargin, M., 2013. Corporate sustainability reporting and analysis of sustainability reports in Turkey. *Int. J. Econ. Financ.* 5 (3), 113–125. <https://doi.org/10.5539/ijef.v5n3p113>.
- Akter, N., Siddik, A.B., Mondal, M.S. Al, 2017. Sustainability reporting on green financing: a study of listed private sustainability. *J. Bus. Technol.* XVII (July–December), 14–27.
- Almaqtari, F., Al-hattami, H., Al-nuzaili, K., Al-bukhrani, M., 2020. Corporate governance in India: A systematic review and synthesis for future research Corporate governance in India: A systematic review and synthesis for future research. *Cogent Bus. Manag.* 7 (1) <https://doi.org/10.1080/23311975.2020.1803579>.
- Almaqtari, F., Elsheikh, T., Al-Hattami, H.M., Mishra, N., 2023. The impact of board characteristics on environmentally friendly production: a cross country study in Asia and Europe. *J. Clean. Prod.* 392, 136257 <https://doi.org/10.1016/j.jclepro.2023.136257>.
- Almaqtari, F., Farhan, N.H.S., Al-Hattami, H.M., Elsheikh, T., 2023. The moderating role of information technology governance in the relationship between board

- characteristics and continuity management during the Covid-19 pandemic in an emerging economy. *Humanit. Soc. Sci. Commun.* <https://doi.org/10.1057/s41599-023-01552-x>.
- Almaqtari, F.A., Farhan, N.H.S., Yahya, A.T., Al-Dalaiei, B.O.A., Shamim, M., 2022. The mediating effect of (IT) governance between corporate governance mechanisms, business continuity, and transparency \& disclosure: An empirical study of Covid-19 Pandemic in Jordan. *Inf. Secur. J.: A Glob. Perspect.* 1–19.
- Almaqtari, F., Farhan, N., Yahya, A., Al-Dalaiei, B., Shamim, M., 2023. The mediating effect of IT governance between corporate governance mechanisms, business continuity, and transparency \& disclosure: An empirical study of Covid-19 Pandemic in Jordan. *Inf. Secur. J.: A Glob. Perspect.* 32 (1), 39–57.
- Al-Rahmi, W.M., Alzahrani, A.I., Yahaya, N., Alalwan, N., Kamin, Y., 2020. Digital communication: information and communication technology (ICT) usage for education sustainability. *Sustainability.* <https://doi.org/10.3390/su12125052>.
- Al-Sartawi, A.M.A.M., Al-Sartawi, A.M.A.M., 2020. Information technology governance and cybersecurity at the board level. *Int. J. Crit. Infrastruct.* <https://doi.org/10.1504/ijcis.2020.10029173>.
- Anshari, M., Almunawar, M.N., Masri, M., Hamdan, M., 2019. Digital marketplace and FinTech to support agriculture sustainability. *Energy Procedia.* <https://doi.org/10.1016/j.egypro.2018.11.134>.
- Anshari, M., Almunawar, M.N., Masri, M., Hamdan, M., Fithriyah, M., Fitri, A., 2021. Digital Wallet in Supporting Green FinTech Sustainability. 2021 Third Int. Sustain. Resil. Conf.: Clim. Change 10.1109/ieecconf53624.2021.9667957..
- Arner, D.W., Buckley, R.P., Zetsche, D.A., Veidt, R., 2020. Sustainability, FinTech and Financial inclusion. *Eur. Bus. Organ. Law Rev.* <https://doi.org/10.2139/ssrn.3387359>.
- Atayah, O.F., Najaf, K., Ali, M.H., Marashdeh, H., 2023. Sustainability, market performance and FinTech firms. *Meditari Account. Res.* 32 (2), 317–345. <https://doi.org/10.1108/medar-08-2021-1405>.
- Awwad, B., El Khoury, R., 2021. Information technology governance and bank performance: evidence from Palestine. *J. Decis. Syst.* 00 (00), 1–24. <https://doi.org/10.1080/12460125.2021.2005860>.
- Aysan, A., Bergigui, F., 2021. Sustainability, Trust and Blockchain Applications: Best Practices and Fintech Prospects. *Soc. Sci. Res. Netw.* <https://doi.org/10.2139/ssrn.3936398>.
- Aysan, A.F., Bergigui, F., 2021b. Sustainability, trust, and blockchain applications in islamic finance and circular economy: best practices and fintech prospects. *Gulf Stud.* https://doi.org/10.1007/978-981-16-6061-0_9.
- Aysan, A.F., Bergigui, F., 2021a. Sustainability, trust, and blockchain applications in islamic finance and circular economy: best practices and fintech prospects. *Gulf Stud.* 141–167. https://doi.org/10.1007/978-981-16-6061-0_9.
- Bank, S.V., 2023. Future of Fintech. *Fam. Court Rev.* <https://doi.org/10.1111/fcre.12758>.
- Battisti, E., Nirino, N., Cristofì, M., 2023a. Financial innovation (FinTech) and sustainability: new tools for sustainable achievements. *Qual. Res. Financ. Mark.* <https://doi.org/10.1108/qrfm-08-2023-236>.
- Battisti, E., Nirino, N., Cristofì, M., 2023b. Guest editorial: financial innovation (FinTech) and sustainability: new tools for sustainable achievements. *Qual. Res. Financ. Mark.* <https://doi.org/10.1108/qrfm-08-2023-236>.
- Bayram, O., Talay, I., Feridun, M., 2022. Can Fintech promote sustainable finance? Policy lessons from the case of Turkey. *Sustainability* 14 (19). <https://doi.org/10.3390/su141912414>.
- Bergeron, F., Croteau, A.-M., Uwizeyemungu, S., Raymond, L., Raymond, L., 2017. A framework for research on information technology governance in SMEs. *Start-Ups. SMEs.* <https://doi.org/10.4018/978-1-5225-0861-8.ch003>.
- Callsen, G., Guillaumin, V., Utermarck, S., Varrall, R., & Altun, O. (2021). *FinTech and sustainable bond markets.* (<https://www.semanticscholar.org/paper/f8217c2943846c486ac7a2da3c54899b394c2ad1>).
- Cao, G., Duan, Y., Edwards, J.S., Dwivedi, Y.K., 2021. Understanding managers' attitudes and behavioral intentions towards using artificial intelligence for organizational decision-making. *Technovation* 106, 102312. <https://doi.org/10.1016/j.technovation.2021.102312>.
- Chaouali, W., Ben Yahia, I., Souden, N., 2016. The interplay of counter-conformity motivation, social influence, and trust in customers' intention to adopt Internet banking services: the case of an emerging country. *J. Retail. Consum. Serv.* 28, 209–218. <https://doi.org/10.1016/j.jretconser.2015.10.007>.
- Chen, B., Yang, X., Ma, Z., 2022. Fintech and financial risks of systemically important commercial banks in China: an inverted U-shaped relationship. *Sustainability.* <https://doi.org/10.3390/su14105912>.
- Deng, X., Huang, Z., Cheng, X., 2019. FinTech and sustainable development: evidence from China based on P2P data. *Sustainability.* <https://doi.org/10.3390/su11226434>.
- Downes, L., Reed, C., Reed, C., & Reed, C. (2020). *Distributed Ledger Technology for Governance of Sustainability Transparency in the Global Energy Value Chain.* <https://doi.org/10.3366/gels.2020.0006>.
- Dwivedi, P., Alabdooli, J.I., Dwivedi, R., 2021. Role of FinTech Adoption for competitiveness and performance of the bank: a study of banking industry in UAE. *Int. J. Glob. Bus. Compét.* 16 (2), 130–138. <https://doi.org/10.1007/s42943-021-00033-9>.
- Eskiev, M.A., 2021. Fintech and crowdfunding as tools for financing the reproduction process in agricultural activities. *Вестник Университета* <https://doi.org/10.26425/1816-4277-2021-10-155-160>.
- Fattah, A., Saragih, H., Saragih, H., Setyadi, R., 2021. Determinants effectiveness of information technology governance and IT performance in higher education institution (HED): a conceptual framework. *Int. J. Sci. Technol. Manag.* <https://doi.org/10.46729/ijstm.v2i1.135>.

- Fiksel, J., Sanjay, P., Raman, K., 2021. Steps toward a resilient circular economy in India. *Clean. Technol. Environ. Policy* Vol. 23, 203–218.
- Frățilă, L.A., Zota, R.D., Constantinescu, R., 2013. An analysis of the Romanian internet banking market from the perspective of cloud computing services. *Procedia Econ. Financ.* 6 (13), 770–775. [https://doi.org/10.1016/s2212-5671\(13\)00201-3](https://doi.org/10.1016/s2212-5671(13)00201-3).
- Giovanis, A.N., Biniotis, S., Polychronopoulos, G., 2012. An extension of TAM model with IDT and security/privacy risk in the adoption of internet banking services in Greece. *Eur. J. Bus.* 7 (1), 24–53. <https://doi.org/10.1108/14502191211225365>.
- Guang-Wen, Z., Siddik, A.B., 2023. The effect of Fintech adoption on green finance and environmental performance of banking institutions during the COVID-19 pandemic: the role of green innovation. *Environ. Sci. Pollut. Res.* 30 (10), 25959–25971. <https://doi.org/10.1007/s11356-022-23956-z>.
- Hair, J.F., Ringle, C.M., Sarstedt, M., 2013. Partial Least Squares Structural Equation Modeling: Rigorous Applications, Better Results and Higher Acceptance. *Long. Range Plan.* 46 (1–2), 1–12. <https://doi.org/10.1016/j.lrp.2013.01.001>.
- Hair, J.F., Sarstedt, M., Ringle, C.M., 2019. Rethinking some of the rethinking of partial least squares. *Eur. J. Mark.* 53 (4), 566–584. <https://doi.org/10.1108/EJM-10-2018-0665>.
- Hammadi, T.A.I., & Nobanee, H. (2019). FinTech and Sustainability: A Mini-Review. *Social Science Research Network*. (<https://doi.org/10.2139/ssrn.3500873>).
- Haron, H., So, I.G., Gui, A., Sari, S.A., Ramli, N.M., Jamil, N.N., 2022. The relationship between Islamic corporate governance, human governance, usage of information technology and sustainability reporting: comparison of shariah compliant companies in Malaysia and Indonesia. *Int. J. Bus. Soc.* <https://doi.org/10.33736/ijbs.5174.2022>.
- Henseler, J., Sarstedt, M., 2013. Goodness-of-fit indices for partial least squares path modeling. *Comput. Stat.* 28 (2), 565–580. <https://doi.org/10.1007/s00180-012-0317-1>.
- Huang, R., Zmud, R.W., Price, R.L., 2010. Influencing the effectiveness of IT governance practices through steering committees and communication policies. *Eur. J. Inf. Syst.* 19 (3), 288–302. <https://doi.org/10.1057/ejis.2010.16>.
- Hussain, N., Rigoni, U., Orij, R.P., 2018. Corporate governance and sustainability performance: analysis of triple bottom line performance. *J. Bus. Ethics* 149 (2), 411–432. <https://doi.org/10.1007/s10551-016-3099-5>.
- Jaiswal, D., Kant, R., 2018. Green purchasing behaviour: a conceptual framework and empirical investigation of Indian consumers. *J. Retail. Consum. Serv.* 41 (December 2017), 60–69. <https://doi.org/10.1016/j.jretconser.2017.11.008>.
- Jnr, B.A., Anthony, B., Majid, M.A., Romli, A., 2017. Green information technology system practice for sustainable collaborative enterprise: a structural literature review. *Int. J. Sustain. Soc.* <https://doi.org/10.1504/ijssoc.2017.10009300>.
- Joshi, A., Bollen, L., Hassink, H., 2013. An Empirical Assessment of IT Governance Transparency: Evidence from Commercial Banking. *Inf. Syst. Manag.* 30 (2), 116–136. <https://doi.org/10.1080/10580530.2013.773805>.
- Karim, A., Purwanto, A., 2020. Relatsh. Good Corp. Gov. Perform. Most Liq. Stocks Indones. 11 (1), 137–142. <https://doi.org/10.5430/rwv.1n1p137>.
- Khalil, S., Khalil, S., Khalil, S., Belitski, M., 2020. Dynamic capabilities for firm performance under the information technology governance framework. *Eur. Bus. Rev.* <https://doi.org/10.1108/ebv-05-2018-0102>.
- Khan, F., Sana, A., Arif, U., 2020. Information and communication technology (ICT) and environmental sustainability: a panel data analysis. *Environ. Sci. Pollut. Res.* <https://doi.org/10.1007/s11356-020-09704-1>.
- Khuntia, J., Saldanha, T., Mithas, S., Sambamurthy, V., 2018. Information technology and sustainability: evidence from an emerging economy. *Prod. Oper. Manag.* <https://doi.org/10.1111/poms.12822>.
- Kostka, G., Zhang, X., Shin, K., 2020. Information, technology, and digitalization in China's environmental governance. *J. Environ. Plan. Manag.* 63 (1), 1–13. <https://doi.org/10.1080/09640568.2019.1681386>.
- KPMG. (2016). Fintech in India - A global growth story. In *Kpmg* (Issue June). (<https://assets.kpmg.com/content/dam/kpmg/pdf/2016/06/FinTech-new.pdf>).
- Kumar, B., Manrai, A.K., Manrai, L.A., 2017. Purchasing behaviour for environmentally sustainable products: A conceptual framework and empirical study. *J. Retail. Consum. Serv.* 34 (September 2016), 1–9. <https://doi.org/10.1016/j.jretconser.2016.09.004>.
- Le, M.T.H., 2021. Examining factors that boost intention and loyalty to use Fintech post-COVID-19 lockdown as a new normal behavior. *Heliyon* 7 (8), e07821. <https://doi.org/10.1016/j.heliyon.2021.e07821>.
- Leaniz, P.M.G. de, Ruiz, M.E.G., 2018. Integrating Sustainability and CSR in the Value Chain of the Information Technology Sector. *Adv. Public Policy Adm.* (<https://doi.org/10.4018/978-1-5225-2255-3.ch277>).
- Lisha, L., Mousa, S., Arnone, G., Muda, I., Huerta-Soto, R., Shiming, Z., 2023b. Natural resources, green innovation, fintech, and sustainability: A fresh insight from BRICS. *Resour. Policy* 80 (2023), 1–19. <https://doi.org/10.1016/j.resourpol.2022.103119>.
- Lisha, L., Mousa, S., Arnone, G., Muda, I., Huerta-Soto, R., Shiming, Z., 2023a. Natural resources, green innovation, fintech, and sustainability: A fresh insight from BRICS. *Resour. Policy*. <https://doi.org/10.1016/j.resourpol.2022.103119>.
- LLP, E. (2022). *The winds of change Trends shaping India's Fintech Sector: edition II* (Issue September). (https://assets.ey.com/content/dam/ey-sites/ey-com/en_in/topics/con_sulting/2022/ey-winds-of-change-india-fintech-report-2022.pdf?download).
- Lu, J., Wang, J., 2021. Corporate governance, law, culture, environmental performance and CSR disclosure: A global perspective. *J. Int. Financ. Mark., Inst. Money* 70, 101264. <https://doi.org/10.1016/j.intfin.2020.101264>.
- Macchiavello, E., Siri, M., 2022. Sustainable Finance and Fintech: Can Technology Contribute to Achieving Environmental Goals? A Preliminary Assessment of 'Green Fintech' and 'Sustainable Digital Finance'. *Eur. Co. Financ. Law Rev.* <https://doi.org/10.1515/ecfr-2022-0005>.
- Macpherson, M., Gasperini, A., Bosco, M., 2021. Artificial Intelligence and FinTech Technologies for ESG Data and Analysis. *SSRN Electron. J.* 1–5. <https://doi.org/10.2139/ssrn.3790774>.
- Mata, F.J., Fuerst, W.L., Barney, J.B., 1995. Information technology and sustained competitive advantage: a resource-based analysis. *Manag. Inf. Syst. Q.* <https://doi.org/10.2307/249630>.
- Meiling, L., Yahya, F., Waqas, M., Waqas, M., Shaohua, Z., Ali, S.A., Hania, A., 2021. Boosting Sustainability in Healthcare Sector through Fintech: Analyzing the Moderating Role of Financial and ICT Development. *Inq.: A J. Med. Care Organ., Provis. Financ.* <https://doi.org/10.1177/00469580211028174>.
- Memon, M.A., Ting, H., Ramayah, T., Chuah, F., Cheah, J.-H., 2017. A Review of the methodological misconceptions and guidelines related to the application of structural equation modeling: a Malaysian scenario. *J. Appl. Struct. Equ. Model.* 1 (June), i–xiii. [https://doi.org/10.47263/jasem.1\(1\)01](https://doi.org/10.47263/jasem.1(1)01).
- Menekci, A., Akdag, H.C., 2021. Information technology governance evaluation using spherical fuzzy AHP ELECTRE. *Intell. Fuzzy Tech. Emerg. Cond. Digit. Transform.* https://doi.org/10.1007/978-3-030-85577-2_89.
- Mercuri, F., Mercuri, F., Mercuri, F., Corte, G., Della, Ricci, F., Ricci, F., 2021. Blockchain Technology and Sustainable Business Models: A Case Study of Devoleum. *Sustainability*. <https://doi.org/10.3390/su13105619>.
- Merello, P., Barberá, A., Poza, E.D. la, 2022. Is the sustainability profile of FinTech companies a key driver of their value. *Technol. Forecast. Soc. Change.* (<https://doi.org/10.1016/j.techfore.2021.121290>).
- Mohapi, M., Njenga, K., 2012. Conceptualising the effect of the black economic empowerment score-card on IT governance. *Electron. J. Inf. Syst. Dev. Ctries.* 54 (1), 1–44. <https://doi.org/10.1002/j.1681-4835.2012.tb00385.x>.
- Mushtaque, K., Ahsan, K., Umer, A., 2014. IT GOVERNANCE IN BANKING SECTOR: VAL IT AND RISK. *Sci. Int(Lahore)* 26 (3), 1259–1264.
- Mutamimah, Robiyanto, R., 2021. E-integrated corporate governance model at the peer to peer lending fintech corporation for sustainability performance. *Kasetsart J. Soc. Sci.* 42 (2), 239–244. (<https://doi.org/10.34044/j.kjss.2021.42.2.03>).
- Najaf, K., Najaf, K., Najaf, K., Mostafiz, I., Najaf, R., & Najaf, R. (2021). *Fintech firms and banks sustainability: Why cybersecurity risk matters?* <https://doi.org/10.1142/s2424786321500195>.
- Nasiri, M., Saunila, M., Rantala, T., Ukko, J., 2021. Sustainable innovation among small businesses: The role of digital orientation, the external environment, and company characteristics (October). *Sustain. Dev.* 1–10. <https://doi.org/10.1002/sd.2267>.
- Nizam, H.A., Zaman, K., Zaman, K., Khan, K.B., Batool, R., Khurshid, M.A., Khurshid, M., Shoukry, A.M., Sharkawy, M.A., Aldeek, F., Khader, J., Gani, S., 2020. Achieving environmental sustainability through information technology: "Digital Pakistan" initiative for green development. *Environ. Sci. Pollut. Res.* <https://doi.org/10.1007/s11356-020-07683-x>.
- Nurullah, M., Mishra, N., Almaqari, F.A., 2023. The determinants of forward-looking narrative reporting in annual reports of emerging countries: Evidence from India. *Corporate Narrative Reporting*. Routledge, pp. 132–150.
- Patón-Romero, J.D., Baldassarre, M.T., Rodríguez, M., Piattini, M., 2019. Application of ISO 14000 to Information Technology Governance and Management. *Comput. Stand. Interfaces* 65 (April), 180–202. <https://doi.org/10.1016/j.csi.2019.03.007>.
- Putra, R.D., Mulyani, S., Poulus, S., Sukmadilaga, C., 2022. Data quality analytics, business ethics, and cyber risk management on operational performance and fintech sustainability. *Int. J. Data Netw. Sci.* <https://doi.org/10.5267/j.ijdns.2022.4.008>.
- Raihan, M.Z., 2019. Sustainable Finance for Growth and Development of Banking Industry in Bangladesh: An Equity Perspective. *MIST J. Sci. Technol.* 7 (1), 41–51.
- Rais, M., Napoleon, G., Noerlina, G., 2023. Systematic literature review of Fintech: Implementation to create sustainability in enterprise of developing countries. *1ST Int. Conf. Achiev. Sustain. Dev. GOALS*. (<https://doi.org/10.1063/5.0113919>).
- Ramamohan, M., Mehta, M., & Sunitha, B.K. (2021). *FinTech and Sustainable Development: A Comparative Study of Indian and Chinese FinTech Ecosystems*. (<https://doi.org/10.4018/978-1-7998-6643-5.ch018>).
- Rambaud, S.C., Gázquez, A.E., 2022. A RegTech Approach to Fintech Sustainability: The Case of Spain. *Eur. J. Risk Regul.* <https://doi.org/10.1017/err.2021.62>.
- Rambaud, S.C., Pascual, J.L., 2023. Insurtech, Proptech, and Fintech Environment: Sustainability, Global Trends and Opportunities. *Sustainability*. <https://doi.org/10.3390/su15129574>.
- Raza, S.A., Umer, A., Qureshi, M.A., Dahri, A.S., 2020. Internet banking service quality, e-customer satisfaction and loyalty: the modified e-SERVQUAL model. *TQM J.* 32 (6), 1443–1466. <https://doi.org/10.1108/TQM-02-2020-0019>.
- Romanelli, M., 2020. Analysing the role of information technology towards sustainable cities living. *Kybernetes*. <https://doi.org/10.1108/k-07-2019-0516>.
- Rostamzadeh, S., Saremi, M., Vosoughi, S., Bradtmiller, B., Janani, L., Farshad, A.A., Taheri, F., 2021. Analysis of hand-formed anthropometric components in assessing handgrip and pinch strengths of school-aged children and adolescents: a partial least squares (PLS) approach. *BMC Pediatr.* 21 (1), 1–12. <https://doi.org/10.1186/s12887-020-02468-0>.
- Ryu, H.S., Ko, K.S., 2020. Sustainable development of Fintech: Focused on uncertainty and perceived quality issues. *Sustain. (Switz.)* 12 (18). <https://doi.org/10.3390/su12187669>.
- Sabbaghi, A., & Vaidyanathan, G. (2012). *Green Information Technology and Sustainability: A Conceptual Taxonomy*. (https://doi.org/10.48009/2_iiis_2012_26-32).
- Sahoo, M., Gupta, M., Srivastava, P., 2021. Does information and communication technology and financial development lead to environmental sustainability in India? An empirical insight. *Telemat. Inform.* <https://doi.org/10.1016/j.tele.2021.101598>.
- Sahoo, P., Saraf, P.K., Uchil, R., 2022. Identification of critical success factors for leveraging Industry 4.0 technology and research agenda: a systematic literature review using PRISMA protocol. *Asia-Pac. J. Bus. Adm.* <https://doi.org/10.1108/APJBA-03-2022-0105>.

- Samagaio, A., Diogo, T.A., 2022. Effect of Computer Assisted Audit Tools on Corporate Sustainability. *Sustain. (Switz.)* 14 (2). <https://doi.org/10.3390/su14020705>.
- Scalabrin-Bianchi, I., Bianchi, I.S., Bianchi, I.S., Sousa, R.D., Pereira, R., 2021. Information Technology Governance for Higher Education Institutions: A Multi-Country Study. *Informatics*. <https://doi.org/10.3390/informatics8020026>.
- Shanmugapriya, S., Subramanian, K., 2016. Developing a PLS path model to investigate the factors influencing safety performance improvement in construction organizations. *KSCCE J. Civ. Eng.* 20 (4), 1138–1150. <https://doi.org/10.1007/s12205-015-0442-9>.
- Siddik, A., Yong, L., Rahman, M.N., 2023. The role of Fintech in circular economy practices to improve sustainability performance: a two-staged SEM-ANN approach. *Environ. Sci. Pollut. Res. Int.* <https://doi.org/10.1007/s11356-023-25576-7>.
- Simmonds, D., Bhattacharjee, A., 2012. Environmental Sustainability in Organizations: The Information Technology Role. *Am. Conf. Inf. Syst.* (<https://www.semanticscholar.org/paper/ee7d0726e9718cf8a0886b11f74189468503f6ac>).
- Sirisomboonsuk, P., Gu, V.C., Cao, R.Q., Burns, J.R., 2018. Relationships between project performance and information technology governance and their impact on project performance. *Int. J. Proj. Manag.* 36 (2), 287–300. <https://doi.org/10.1016/j.ijproman.2017.10.003>.
- Smallwood, R.F., 2019. Information Governance, IT Governance, Data Governance. *Inf. Gov.* 19–28. <https://doi.org/10.1002/9781119491422.ch2>.
- Tamasiga, P., Onyeaka, H., Ouassou, E., houssin, 2022. Unlocking the Green Economy in African Countries: An Integrated Framework of FinTech as an Enabler of the Transition to Sustainability. *Energies*. <https://doi.org/10.3390/en15228658>.
- Taneja, S., Ali, L., 2021. Determinants of customers' intentions towards environmentally sustainable banking: Testing the structural model. *J. Retail. Consum. Serv.* 59 (December 2020), 102418 <https://doi.org/10.1016/j.jretconser.2020.102418>.
- Teixeira, J.E., Tavares-Lehamann, A.T., 2022. Industry 4.0: the future of manufacturing from the perspective of business and economics – a bibliometric literature review. *Compét. Rev.* <https://doi.org/10.1108/CR-07-2022-0091>.
- Tok, E., Yesuf, A.J., 2022. Embedding Value-Based Principles in the Culture of Islamic Banks to Enhance Their Sustainability, Resilience, and Social Impact. *Sustain. (Switz.)* 14 (2). <https://doi.org/10.3390/su14020916>.
- Udeagha, M.C., Muchapondwa, E., 2023. Green finance, fintech, and environmental sustainability: fresh policy insights from the BRICS nations. *Int. J. Sustain. Dev. amp; World Ecol.* <https://doi.org/10.1080/13504509.2023.2183526>.
- Udeagha, M.C., Ngepah, N., 2023. The drivers of environmental sustainability in BRICS economies: Do green finance and fintech matter? *World Dev. Sustain.* <https://doi.org/10.1016/j.wds.2023.100096>.
- Vejseli, S., Proba, D., Rossmann, A., Reinhard, J., 2018. The agile strategies in IT governance: towards a framework of agile IT governance in the banking industry. *Twenty-Sixth Eur. Conf. Inf. Syst. (ECIS2018)*, Portsm.,UK 1–17 https://doi.org/https://aisel.aisnet.org/ecis2018_rp/148 Download 324 DOWNLOADS Since November 28, 2018 PLUMX METRICS SHARE.
- Vergara, C.C., Agudo, L.F., 2021. Fintech and sustainability: do they affect each other? *Sustain. (Switz.)* Vol. 13 (Issue 13). <https://doi.org/10.3390/su13137012>.
- Wang, S., Shang, G., Zhang, S., 2019. Corporate governance and evolution of trust in entrepreneurial networks: A case study of NVC Lighting Holding Ltd. *Chin. Manag. Stud.* 13 (4), 939–966. <https://doi.org/10.1108/CMS-07-2018-0620>.
- Wijayanti, R., Setiawan, D., 2023. The role of the board of directors and the sharia supervisory board on sustainability reports. *J. Open Innov.: Technol. Mark. Complex.* 9 (3), 100083 <https://doi.org/10.1016/J.JOITMC.2023.100083>.
- Wilkin, C., Chenhall, R.H., 2019. Information technology governance: reflections on the past and future directions. *J. Inf. Syst.* <https://doi.org/10.2308/isys-52632>.
- Winarsih, W., Mutoharoh, M., Tahar, E., Aziz, I., 2020. The Role of Fintech and Financial Literacy on SMEs Sustainability. *Proc. 1st Int. Conf. Islam. Civiliz., ICIC 2020*, 27th August 2020, Semara, Indones. 10.4108/eai.27-8-2020.2303270..
- World Economic Forum. (2024). *The Future of Global Fintech: Towards Resilient and Inclusive Growth* (Issue January). (https://www3.weforum.org/docs/WEF_The_Future_of_Global_Fintech_2024.pdf).
- Xue, Y., Liang, H., Boulton, W.R., 2008. Information technology governance in information technology investment decision processes: the impact of investment characteristics, external environment, and internal context. *MIS Q.: Manag. Inf. Syst.* 32 (1), 67–96. <https://doi.org/10.2307/25148829>.
- Yan, J., Jia, P., 2022. The impact of COVID-19 on bank sector traditional business model sustainability in China: bank branch versus fintech. *Front. Phys.* <https://doi.org/10.3389/fphy.2022.820646>.
- Yan, C., Siddik, A.B., Yong, L., Dong, Q., Zheng, G.-W., Rahman, M.N., 2022. A Two-Stage SEM-artificial neural network approach to analyze the impact of fintech adoption on the sustainability performance of banking firms: the mediating effect of green finance and innovation. *Systems*. <https://doi.org/10.3390/systems10050148>.
- Zahid, M., Rahman, H.U., Ullah, Z., Muhammad, A., 2021. Sustainability and branchless banking: The development and validation of a distinct measurement scale. *Technol. Soc.* 67 (April), 101764 <https://doi.org/10.1016/j.techsoc.2021.101764>.
- Zhang, Y., Chen, J., Han, Y., Qian, M., Guo, X., Chen, R., Xu, D., Chen, Y., 2021. The contribution of Fintech to sustainable development in the digital age: Ant forest and land restoration in China. *Land Use Policy* 103 (August 2020), 1–9. <https://doi.org/10.1016/j.landusepol.2021.105306>.
- Zhao, Q., Tsai, P.H., Wang, J.L., 2019. Improving financial service innovation strategies for enhancing China's banking industry competitive advantage during the fintech revolution: A hybrid MCDM model. *Sustainability* 11 (5), 1–29. <https://doi.org/10.3390/su11051419>.
- Zheng, G.W., Siddik, A.B., Masukujjaman, M., Fatema, N., 2021. Factors affecting the sustainability performance of financial institutions in Bangladesh: the role of green finance. *Sustainability* 13 (18), 1–27. <https://doi.org/10.3390/su131810165>.