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***Research paper***



# The Impact of Fintech and Effective IT Governance on Green Institutional Activities in Saudi Arabia

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**Abstract**

There is an increase in environmental pressures and the digital transformation in the financial sector. This study examines how financial technology (FinTech) and the effectiveness of IT governance (EITG) influence green institution activities (GIA) within various financial institutions of Saudi Arabia. Addressing the critical gap in the emerging markets of Saudi Arabia, a quantitative approach was applied by using Partial Least Squares Structural Equation Modeling (PLS-SEM) on the data collected from 419 respondents within Saudi financial institutions. The findings of the study reveal that FinTech has a weak direct impact on GIA, while it significantly enhances GIA when mediated through effective IT governance, which demonstrates the need to align IT governance frameworks with the deployment of FinTech to enhance environmental performance. The findings highlight the critical role of digital financial innovation in enhancing the sustainability of financial sectors. Furthermore, the study offers key practical implications for financial institutions to integrate ESG objectives into their FinTech deployment strategies to foster a green digital ecosystem through governance and regulatory support. This study reinforces the strategic importance of integrating FinTech with institutional alignment to achieve insights into digital sustainability goals in line with the broader economic diversification agenda of Saudi Arabia, Vision 2030.

***Keywords*** *: FinTech; effectiveness of IT governance; Green Institutional Activities; SEM; Saudi Arabia.*

## 1. Introduction

In recent years, the issue of environmental sustainability has become a strategic and important concern among scholars, practitioners, and policymakers in the field of finance, particularly in the post-pandemic environment (Guang-Wen & Siddik, 2023), where the financial sector plays a critical role in transforming an economy towards a more sustainable future (Park & Kim, 2020). In the current era, as the global world is shifting towards sustainable economic models, green and sustainable finance is gaining greater recognition in the financial services (Mirza et al., 2023). According to Xu et al. (2022), it is a financial activity as it brings the financial industry in line with environmental protection. Green finance integrates environmental practices into the process of financial decisions, determination of risk, and credit allocation frameworks (Mirza et al., 2023; Kemfert & Schmalz, 2019).

FinTech has recently gained impressive growth (Guang-Wen & Siddik, 2023). FinTech and the associated technologies, such as artificial intelligence (AI), Internet of Things (IoT), blockchain, data analytics, machine learning (ML), and other innovations, have fundamentally changed the structure of the modern financial services (Mirza et al., 2023). With the introduction of sustainability, large companies and government bodies are encouraging FinTech activities and using modern technologies (Baldassarre et al., 2020). Such technologies are providing digital infrastructure that can help to coordinate access to finance, increase traceability, and render financial operations less carbon-intensive. As the markets for green products and services keep growing due to social and environmental imperatives, technology is the key to a more inclusive and greener future (Mirza et al., 2023). Fintech is a combination of technology and the field of finance, which has transformed financial service operations through the reduction of the cost of transactions and the improvement of information asymmetry. This renders Fintech a compulsory instrument of green financing, which advances monitoring operations of financing stages and the quality of information disclosure (Wan et al., 2025). The literature confirms that FinTech adoption is a key determinant of improving green financing through the ability to access finance, reduce emissions, and implement and enforce green environmental policies (Yan et al., 2022; Yang et al., 2021; Muganyi et al., 2021). The big data and blockchain technologies can facilitate capital movement towards climate-supportive projects to increase transparency and build accountability (Zeng et al., 2024). Moreover, FinTech-based solutions also offer the facility of a carbon disclosure and help in the process of green transition and financial system resilience. By modeling, these dynamics allow the management to comply with the regulations to minimize the chance of greenwashing and inform policymakers about the use of digital financing to strengthen the ESG performance (Patwardhan et al., 2024; Zioło et al., 2022). Moreover, the fact that FinTech may integrate the standards of ESG into digital solutions also enables financial institutions to address the expectations of new stakeholders, including regulators, investors, and the entire society (Xu, 2024).

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Consequently, IT governance has a great role to play in the alignment of digital innovations to the sustainability goals of a business (Ali & Green, 2005). Additionally, effective IT governance can help to incorporate the aspect of technology, which also bolsters the correlation between the adoption of FinTech and sustainable performance (Almaqtari, 2024).
It provides the procedural and structural mechanisms to ensure the strategic use of FinTech in supporting sustainability goals. Therefore, this paper examines the dual impact of FinTech and effective IT governance for understanding their impact on green institutional activities in the Saudi financial institutions.
The remainder of the paper is structured as follows: Section 2 presents the theoretical background, Section 3 introduces the literature review and development of hypotheses, and Section 4 covers the methodology. In Section 5, we introduce the data and discuss the empirical results, and Section 6 contains the conclusions.

## 2. Theoretical Background

The theory of financial innovation forms the basis for explaining the role of green financing in Fintech. Financial innovation can lead to better allocation of capital and access to it in less developed markets, which is also one of the factors of lower transaction costs and operational inefficiency (Beck et al., 2016). These cost reductions are essential to allocate funds to sustainable growth initiatives. Financial products like carbon credit derivatives related to ESG, sustainability-linked loans, and green bonds are the most notable examples of innovations that enable the introduction of environmental objectives into the financial domain (Flammer, 2021). This aligns with the theory of innovation as developed by Schumpeter, which states that economic development is driven by continuous institutional, technological, and product-based innovations. According to Schumpeter's processes, FinTech acts as a change agent to alter the range of financial instruments and the channels through which they are delivered, thereby facilitating the prompt and intentional distribution of green capital (Mooslechner & National Bank, 2016).
This framework is further confirmed by the financial intermediation theory, which explains why FinTech has been effective in improving the efficiency of financial intermediaries. These platforms reduce the information asymmetry, which in the past hampered access to green finance and the frictional cost of matching lenders and borrowers (Allen & Santomero, 1997). Through this, Gomber et al. (2018) suggest that FinTech enhances the efficiency of the intermediation process, which introduces a digitalized process of risk assessment, compliance automation, and enhanced efficiency of the steps involved in decision making, all of which are required in the funding of climate-aligned projects.
The theory of diffusion of innovation (Rogers, 2003) provides some insights into how FinTech enhances the adoption of sustainable finance solutions. By differentiating itself and offering accessible, affordable, and user-friendly financial systems for investing in green financial products, FinTech can also encourage high rates of sustainable investment practices (Dai et al., 2025). P2P lending and robo-advisor services powered by artificial intelligence are a good illustration of how an environmentally conscious investor can be approached to strengthen the size and scope of green finance systems. Artificial intelligence-powered robo-advisor services and peer-to-peer lending are excellent examples of how to increase the size and reach of green finance systems by catering to environmentally aware investors.
The Triple Bottom Line (TBL) framework (Elkington, 1998) indicates that business strategy includes a mixture of social, environmental, and economic performance. FinTech does not contradict this value, as it enables conducting business in an eco-friendly manner (e.g., the absence of paper during the banking process), financial inclusion, and reduces the carbon footprint by operating on digital platforms.
Moreover, the G20 Green Finance Theory concludes that FinTech could be used to remove the obstacles to sustainable finance, which include the absence of standardization and the elevated costs of due diligence by digitizing green disclosures, standardizing environmental data, and strengthening investor confidence in green products (G20 Green Finance Study Group, 2016)
Transaction cost economics (TCE) also provides valuable insights. The use of FinTech around green finance minimizes the administrative burden involved by automating environmental checks, trusting the contracting carbon data, and contractually enforcing obligations without a third party (Zeng et al., 2024). Similarly, the Fintech-enabled digital agriculture finance systems minimize the expense and risk of funding smallholder farmers in climate-exposed fields (Wan & Cui, 2024). Some of the products that have been developed through innovation are weather-indexed insurance products and climate-risk hedging tools; these reduce transaction and monitoring costs and can improve creditworthiness in the green sectors (Hansen et al., 2007).
The information asymmetry theory posits that unequal access to information between parties can result in adverse selection and moral hazard. In this context, FinTech plays a crucial role in enhancing data transparency and environmental traceability, thereby reducing uncertainty for green investors and lenders (Zhu & Huang, 2025). FinTech applications such as satellite imaging, AI-powered ESG scoring, and open banking APIs provide richer datasets, enabling more accurate credit risk assessments and improved capital allocation toward sustainable ventures.
As the stakeholder theory suggests, the position of various stakeholders other than shareholders should be addressed, including regulators, communities, and the environment. The fact that FinTech companies adopt data-driven and customer-centric business models makes them especially fit to be responsive to environmental and social issues. Their flexibility helps to incorporate the ESG metrics in their product and interface design, reporting structures and processes, thus enhancing the adaptation to sustainable development targets (Ziegler et al., 2007; Du et al., 2022).
The theoretical importance of IT governance is more evident when considered as a mediating or enabling mechanism in the context of IT governance. Effective IT governance guarantees that the technological investments and technologies are strategically positioned within the perspective of sustainability and consequently, strengthens the effectiveness of the FinTech solutions. As an example, organizations that have a well-developed system of IT governance can take better advantage of the carbon disclosure systems and use them in response to the demands of green innovation and regulatory compliance thresholds (Chao et al., 2025). The frameworks of IT governance can also be used to implement the standards in green lending, digital data security, and sustainability performance tracking (Yang et al., 2025).
The institutional theory further secures why external pressure exerted by the regulatory institution, global ESG practices, and stakeholder demands force companies to adopt successful governance models of IT aligned to green financing strategies (Zhang et al., 2024). Along with this, the agency theory implies that governance rules minimize principal-agent problems by ensuring authentic and factual ESG reporting that not only boosts investor confidence but also improves the credibility of green financial activities (Jensen & Meckling, 1976). FinTech firms can address the problem of greenwashing and misreporting using robust governance mechanisms that help them become more legitimate in the eyes of the capital providers.

## 3. Literature Review and Hypotheses Development

Early empirical evidence on the environmental effects of FinTech indicates an increasing contribution to facilitating access to green finance and enhancing the level of environmental performance. Yang et al. (2021) explored the relationship between FinTech and green finance as an addition to economic structure and efficiency, along with boosting environmental protection. They argued that FinTech enhances the efficiency of green finance through the digitalization of financial intermediation to reduce the costs of transactions and improve market access. Similarly, Guang-Wen and Siddik (2023) established that FinTech implementation presents a positive linkage in enhancing green innovation and environmental sustainability performances, especially in the presence of active regulatory authorities. FinTech solutions, such as smart contracts and automated due diligence processes, enable financial institutions to build environmental criteria into lending and other decision-making processes, strengthening the greening of capital allocation. Within the frame of firm-level transformation, Zhu and Huang (2025) pointed out that FinTech enhances green practices by improving financial constraints and increasing innovation abilities. These results are consistent with the argument made at the macro level that FinTech has been promoting institutional readiness for climate-related investments through financial inclusion achieved via digital channels. Wan et al. (2025) also confirmed this by demonstrating that innovative mechanisms of credit risk assessment using FinTech minimize the risk of default in green sectors and maximize the efficiency of funds in pre- and post-lending processes. Saeedi and Ashraf (2024) further argued that AI and IoT, as FinTech applications, play an important role in creating green financial assets and controlling environmental risks. Such innovations decrease the chances of greenwashing due to their higher traceability and accountability in reporting projects. Furthermore, Kwong et al. (2023), using bibliometric analysis, documented the increasing number of scholarly publications related to the role of FinTech in environmental finance, underlining the necessity of combining technological and institutional factors. Such findings are supported by more recent contributions. For instance, Alkhateeb et al. (2018) studied the financial sector in Saudi Arabia and affirmed that FinTech and financial innovation have a great impact on improving sustainability performance by environmental finance. Similarly, Al-Matari et al. (2022) demonstrated that the Saudi bank governance structures, including board independence and oversight, enhance FinTech adoption and its ESG alignment. Recently, Alrsheedi and Iskandar (2025) confirmed that the connection between green finance and sustainable performance is significantly enhanced by digital transformation and the adoption of FinTech, especially in Saudi Arabia, with IT infrastructure and regulatory reforms being additional enabling conditions. Accordingly, the first hypothesis is formulated as follows:

$H_1$: FinTech has a significant impact on green institutional activities.

FinTech enables the technological possibility of green financial transformation, although the institutional aspect, especially IT governance, determines whether this opportunity results in actual environmental implications. IT governance is defined as the frameworks and procedures through which organizations align their information technology infrastructure with strategic and sustainability goals (Almaqtari, 2024). According to Molla et al. (2011), effective IT governance enhances the sustainability of environmental practices by reducing carbon footprint, improving energy efficiency, and promoting sustainable reporting. Almaqtari (2024) also demonstrates that effective IT governance can moderately influence FinTech's environmental performance by integrating ESG factors into major IT processes, including compliance automation, data security, and system transparency. Furthermore, Rajpal et al. (2025) revealed that organizations with effective IT governance frameworks attract green investment due to increased stakeholder trust and reduced reputational risks. Such firms also demonstrate higher ESG disclosure quality, stronger internal controls, and better alignment between technological and sustainability objectives. Alreemy et al. (2016) added that effective IT governance enhances sustainability outcomes by aligning IT capabilities with environmental goals. This includes digitized resource management procedures that trace and reduce emissions, contributing to institutional accountability. Aramonte and Packer (2022) also suggested that IT governance facilitates cross-sectoral collaboration and climate-risk analytics, expanding financial institutions' ability to manage sustainability-linked portfolios. In the case of Saudi Arabia, these forces are supported by strict regulatory controls. In Vision 2040, the Capital Market Authority (CMA) and the Saudi Central Bank (SAMA) have provided open banking models, regulatory sandboxes, and disclosure policies of ESG. The study Al-Matari et al. (2022) argues that such reforms of governance enhance confidence in FinTech platforms and promote green investments. Therefore, IT governance serves as an essential facilitator of the sustainability performance of the Kingdom in the long term. Therefore, the proposed hypothesis is as follows:

$H_2$: Effective IT governance has a significant impact on green institutional activities.

Several researchers have examined the role of IT governance in mediating the relationship between FinTech and green financing. As noted by Almaqtari (2024), effective IT governance serves as a strategic bridge, ensuring that innovations in FinTech are implemented consistently with environmental priorities. For example, IT governance policies that regulate energy consumption are essential in reducing the carbon footprint of blockchain technology during the issuance of green bonds. Kassetty et al. (2024) suggest that the combination of FinTech and IT governance enhances the reliability of AI-based ESG scoring models by standardizing data inputs and ensuring algorithmic accountability. This is particularly relevant in green finance, where verifiability and transparency are prerequisites for investor confidence. Rajpal et al. (2025) further observed that effective IT governance increases stakeholder participation and confidence in FinTech, resulting in more sustainable portfolios. Saudi-specific research by Alrsheefi and Iskandar (2025) further supports this mediation and highlights that Saudi Arabian models of IT governance endure the alignment of FinTech with ESG reporting standards, which are set by Tadawul to reduce greenwashing risk. The study also notes that the organizations with strong IT governance are better positioned for the integration of FinTech with green financing, ultimately enhancing the disclosure quality and increasing investor confidence. Collectively, these findings support the hypothesis that effective IT governance mediates the relationship between FinTech and green activities. Hence, the third hypothesis is:

$H_3$: Effective IT governance significantly mediates the relationship between FinTech and green institutional activities.

In sum, this study combines both basic as well as the most recent empirical evidence (e.g., Babar & Wu, 2025; Zhu & Huang, 2025), thus contributing to the emerging literature on FinTech and sustainability while at the same time filling an important gap with respect to the Saudi Arabian context. While most of the existing research focuses on global or regional dynamics, relatively little research has been conducted on how FinTech is helped by effective governance in IT to create green institutional activities in the Saudi market (Alrsheedi & Iskandar, 2025). Accordingly, this paper makes both theoretical and practical contributions by placing Saudi Arabia in the context of the frontier of emerging FinTech-sustainability research, which provides insights of both regional relevance as well as wider comparative significance.

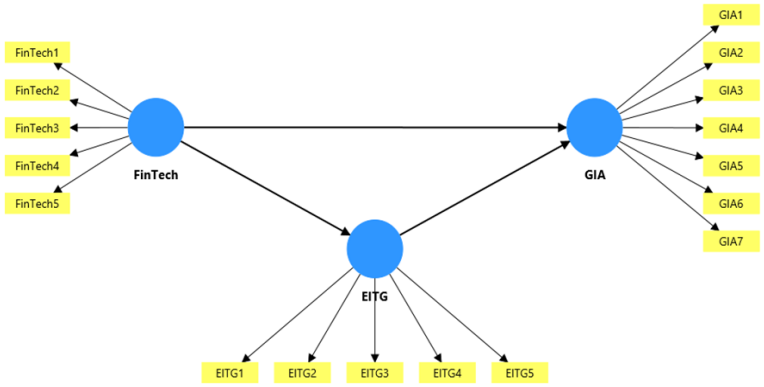



**Fig. 1:** Conceptual Model.

# 4. Methodology

## 4.1. Research design

The primary objective of this research is to examine the impact of FinTech and Effective IT Governance on Green Institutional Activities. This research uses a quantitative cross-sectional survey design and utilizes the structured questionnaire as the main instrument for the collection of data, which targets executives and managers of financial institutions based in Saudi Arabia. The questionnaire is divided into four sections based on information related to demographic factors, adoption of FinTech measured using five items, effectiveness of IT governance measured using five items, and green finance activities measured using seven items. The demographic factors include the gender, age group, job role, level of education, and experience of respondents. While the questions are designed to assess the experiences and perceptions of respondents regarding FinTech, Green Institutional Activities (GIA), and Effectiveness of IT Governance (EITG) by using a 5-point Likert scale, where 1 indicates strong agreement and 5 refers to strong disagreement.

## 4.2. Research sample

This study employs a random sampling method for data collection across financial institutions in Saudi Arabia. To enhance the representatives, a total of 419 responses were collected from participants of diverse backgrounds, such as age, gender, level of education, job position, and years of professional experience, between July 2024 and May 2025. To determine the required sample size, a commonly applied guideline is the "10-times rule" proposed by Hair et al. (2017), which suggests that the sample size should be at least ten times the highest number of structural paths (outer model links) directed toward any latent construct in the model. In this study, a total of 17 outer model links were identified, indicating a minimum sample size requirement of 170 respondents (12 × 10 = 170). This approach provides valuable insights from individuals who are positioned at different levels within the organization to strengthen the generalizability of the findings of the study.

# 5. Results

## 5.1. Descriptive statistics

The demographic profile of the respondents is presented in Table 1, which offers valuable insights into the characteristics of the financial professionals surveyed. Out of a total of 419 participants, the majority (69.93%) reported that their financial institutions are listed on the Saudi Exchange Market (Tadawul), while 28.16% are from unlisted institutions, and 1.91% did not respond to this question. In terms of gender distribution, 79.95% of the respondents were male, and 20.05% were female, reflecting a male-dominated sample and highlighting the persistent gender gap in senior roles within Saudi financial institutions.

Regarding age, the largest segment of respondents, 40.57% aged 20–30, followed by 46.06% fell within the 31–40 age bracket, 12.17% aged 41–50, and only 1.19% aged 51 and above. The data on educational qualifications indicate that most respondents held a Bachelor's degree (52.98%), followed by those with a diploma (34.13%), Master's degrees (9.31%), high school education (3.10%), and a small proportion with PhDs (0.48%) which is support that education palys a significant role in adopting FinTech servieces (Wang et al., 2024).

In terms of professional experience, 38.42% of respondents had 5–10 years of work experience, while 32.70% had less than 5 years of experience. Additionally, 15.99% had 11–15 years of experience, and 12.89% had more than 16 years. A previous study found that leaders' education, work experience, and eagerness for self-employment are key factors promoting the performance of the FinTech firms (Poon et al., 2024). These statistics provide a well-rounded view of the demographic and organizational characteristics of the survey participants, reflecting a relatively young, well-educated, and professionally active sample from the Saudi financial sector.

**Table 1:** Demographic Profile of Respondents

| Variables | | Frequency | Percentages (%) |
|---|---|---|---|
| listed financial institution | Yes | 293 | 69.93 |
| | No | 118 | 28.16 |
| Gender | female | 84 | 20.05 |
| | male | 335 | 79.95 |
| Age | 20-30 | 170 | 40.57 |
| | 31-40 | 193 | 46.06 |
| | 41-50 | 51 | 12.17 |
| | 51 - above | 5 | 1.19 |
| Highest Level of Education | Bachelor | 222 | 52.98 |
| | diploma | 143 | 34.13 |

| | | | |
|---|---|---|---|
| | high school | 13 | 3.10 |
| | Master | 39 | 9.31 |
| | PhD | 2 | 0.48 |
| | 11-15 | 67 | 15.99 |
| Years of Experience | 16 - above | 54 | 12.89 |
| | 5-10 | 161 | 38.42 |
| | Lower than 5 years | 137 | 32.70 |

## 5.2. Correlation

Table 2 presents the Pearson correlation coefficients of the study's constructs, including FinTech, EITG, and GIA. All correlations are statistically significant at the level of 0.01 (2-tailed) and indicate a meaningful association between these constructs. The results indicate that FinTech is strongly correlated with GIA (r = 0.852), which suggests that the increasing adoption of FinTech enhances green institutional activities. Moreover, the correlation of FinTech with EITG is stronger than with GIA, with a correlation coefficient of 0.940, indicating that financial technologies are closely associated with the effectiveness of IT governance due to increased automation and better alignment between IT systems and the objectives of the organization. In the same way, the correlation between EITG and GIA is 0.894, which further fortifies the notion that the governance structure may be instrumental in changing the viability of financial institutions. Overall, the findings provide preliminary empirical evidence relating to the model developed in the present study and additional rationale for the analysis with the help of structural equation modeling.

**Table 2:** Correlation Analysis

| | Fintech | GIA | EITG |
|---|---|---|---|
| Fintech | 1 | | |
| GIA | 0.852** | 1 | |
| EITG | 0.940** | 0.894** | 1 |

**. Correlation is significant at the 0.01 level (2-tailed).

## 5.3. Reliability and validity

The measurement model is evaluated to confirm the validity and reliability of constructs using major constructs like factor loading, average variance extracted (AVE), and composite reliability (CR).

Table **3** presents the findings of these indicators. The findings show that all the items' loadings are well above the minimum suggested value of 0.708 by Hair et al. (2021), with indicators: FinTech (0.924), EITG (0.903), and GIA (0.829) demonstrating that all constructs are highly reliable and the indicators explain more than 50 percent of their variation.

While in composite reliability (CR), a higher value indicates a higher level of reliability. CR values between 0.70 and 0.90 are considered "satisfactory to good," while values above 0.90 may indicate redundancy of the indicator (Diamantopoulos et al., 2012). The results show that FinTech has a CR value of 0.980, EITG reports 0.973, and GIA shows 0.967, and demonstrate that the internal consistency remains high across all constructs. Moreover, the value of average variance extracted (AVE) supports convergent validity, with FinTech standing at 0.924, EITG at 0.903, and GIA at 0.829. These values exceed the threshold value of 0.50, which is recommended by Hair et al. (2022), indicating that each construct explains more than 50% of the variance in its observed value and suggests a low level of measurement error in the model.

In conclusion, the results confirm that each construct in the model is measured with a high degree of convergent validity and reliability. The issue of redundant indicators due to high R value can be addressed through the refinement of items in future studies. However, the current model demonstrates strong assessment properties, which justify the progression of structural model evaluation.

**Table 3:** Reliability and Validity of the Constructs

| | Loadings | AVE | CR | Items |
|---|---|---|---|---|
| Fintech | | 0.924 | 0.980 | 5 |
| FT1 | 0.954 | | | |
| FT2 | 0.969 | | | |
| FT3 | 0.961 | | | |
| FT4 | 0.957 | | | |
| FT5 | 0.966 | | | |
| Effectiveness of IT Governance | | 0.903 | 0.973 | 5 |
| EITG1 | 0.951 | | | |
| EITG2 | 0.948 | | | |
| EITG3 | 0.949 | | | |
| EITG4 | 0.951 | | | |
| EITG5 | 0.952 | | | |
| Green Institutional Activities | | 0.829 | 0.967 | 7 |
| GIA1 | 0.922 | | | |
| GIA2 | 0.903 | | | |
| GIA3 | 0.911 | | | |
| GIA4 | 0.911 | | | |
| GIA5 | 0.915 | | | |
| GIA6 | 0.910 | | | |
| GIA7 | 0.901 | | | |

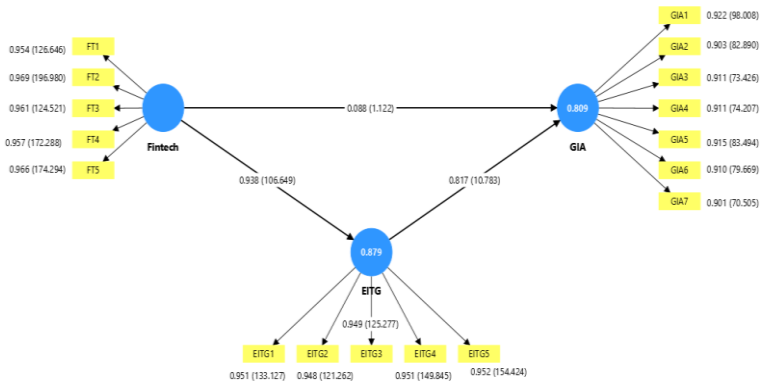



**Fig. 2:** Measurement Model.

## 5.4. Discriminant validity

### 5.4.1. Fornell-Larcker criteria

Discriminant validity is first assessed by using the Fornell–Larcker (1981) criterion, in which discriminant validity is confirmed when the square root of the AVE for each construct, such as FinTech, EITG, and GIA, exceeds their inter-construct correlation.
Table **4** presents the results of the Fornell-Larcker criterion, which depicts that the square root of AVE for FinTech (0.961), EITG (0.950), and GIA (0.910) is greater than their respective correlations with other constructs, which suggests that each construct in the model shares more variance with its indicators than with other constructs.

**Table 4:** Results of Fornell–Larcker Criteria

| | EITG | Fintech | GIA |
|---|---|---|---|
| EITG | 0.95 | | |
| Fintech | 0.938 | 0.961 | |
| GIA | 0.899 | 0.854 | 0.91 |

### 5.4.2. Heterotrait–monotrait ratio (HTMT)

Discriminant validity is further investigated by using the HTMT ratio with a threshold of 0.90 (Gold et al., 2001). The results, as displayed in
Table **5** show the values of 0.96 of FinTech-EITG, 0.925 of EITG-GIA, and 0.874 of FinTech-GIA. From the results, it is seen that two constructs have a score above 0.90. These high HTMTs raise questions as to the discriminant validity, especially between FinTech and EITG (HTMT = 0.96), indicating a large measure of conceptual overlap and possibly undermining the distinctiveness of these constructs. While this overlap may be a representation of the intimate interdependence of FinTech adoption and IT governance mechanisms in practice, it nonetheless highlights challenges of measurement. To enhance construct differentiation, future research could take a number of approaches, such as refining or rewording survey items to reflect more nuanced aspects of each construct, conducting confirmatory factor analysis (CFA) to reassess cross-loadings, or creating context-specific indicators to better isolate the distinct aspects of FinTech and EITG. Another possible way is to model FinTech and EITG as higher-order or second-order constructs, thus capturing their theoretical interconnectedness and yet maintaining conceptual clarity. These refinements will go a long way to ensure that the constructs are empirically distinguishable and theoretically useful in future research.

**Table 5:** Results of HTMT

| | EITG | Fintech | GIA |
|---|---|---|---|
| EITG | | | |
| Fintech | 0.96 | | |
| GIA | 0.925 | 0.874 | |

## 5.5. Partial least squares structural equation modeling (PLS-SEM)

Table **6** presents the results of the analysis of the structural model, which was conducted by the Partial Least Squares (PLS) algorithm and bootstrapping procedures to assess whether the path coefficients are statistically significant and the hypothesized relationships are aligned with the expected directions.
The findings show a significant positive association between EITG and GIA ($\beta = 0.817$, $t = 10.783$, and $p < 0.001$). This supports $H_2$, which posits that EITG has a significant direct effect on GIA. In line with Molla et al. (2011), this result determines the critical role of the governance structure of IT in facilitating sustainable environmental practices in the financial sector.
Furthermore, the empirical analysis indicates that FinTech exerts a strong direct impact on EITG ($\beta = 0.938$, $t = 106.649$, $p < 0.001$). These findings affirm that digital financial technologies transform governance structure and underscore strategic integration of FinTech solutions, including automated compliance tools, digital payments, etc., in governance mechanisms, and improve accountability and operational efficiency. The outcomes of $H_1$ are not supported ($\beta = 0.088$, $t = 1.122$, $p = 0.262$), which means that FinTech has a weak but statistically insignificant direct effect on GIA. This indicates that FinTech adoption, alone, may not be effective to drive environmental practices but rather needs the reinforcement of governance mechanisms to translate digital innovation into achieving sustainable benefits. A potential reason is that in the Saudi environment, the regulatory frameworks regarding green financing are yet to be developed, and the financial market remains maturing to successfully incorporate FinTech-based sustainability solutions. Furthermore, cultural and institutional interests are more likely to focus on financial performance against ESG concerns, which also constrains the direct influence of FinTech in the development of green investment practices. These results align with previous research emphasizing the necessity of a supplementary institutional and governance framework to achieve the sustainability advantages of technological innovation (Khan & Khan, 2024).

Therefore, even though FinTech brings efficiency and accessibility, its environmental consequences seem to be conditional on robust IT governance frameworks capable of balancing technological development with the wider ESG goals. This finding reinforces the significance of the mediated pathway where FinTech contributes indirectly to GIA through EITG (Zaid et al., 2025). The results provide strong support for $H_3$ and demonstrate a significant mediating effect of FinTech on GIA ($\beta = 0.766$, $t = 11.037$, $p < 0.001$) in line with Almaqtari (2024). This confirms that the influence of FinTech on GIA is substantially strengthened through the effectiveness of IT governance.

These findings contribute to both theoretical understanding and practical application. The results affirm that effective IT governance serves as a critical mediating mechanism linking digital innovation (FinTech) to environmental transformation (green institutional practices). While FinTech adoption alone shows a limited direct effect on green institutional activities, its impact becomes substantial when channeled through effective IT governance structures. This underscores that technology-driven sustainability cannot be achieved in isolation; rather, it requires alignment with robust internal governance frameworks. The strong path coefficients and high levels of statistical significance further validate the strength and reliability of the proposed model, which highlights the indirect pathways through which digital capabilities contribute to sustainable outcomes. Collectively, the results provide empirical support for a dual-pathway model, wherein FinTech primarily enhances green initiatives indirectly via governance mechanisms. This insight provides a valuable extension to the FinTech–sustainability literature, offering practical implications for financial institutions and policymakers, particularly in emerging economies like Saudi Arabia. It emphasizes the need for integrated digital and governance strategies to achieve measurable environmental goals.

**Table 6:** Results of PLS-SEM

| Hypothesis | Path Coefficient | Standard deviation | t-statistics | p-values | 2.50% | 97.50% | Support |
|---|---|---|---|---|---|---|---|
| EITG -> GIA | 0.817 | 0.076 | 10.783 | 0.000 | 0.662 | 0.955 | Supported |
| FinTech -> EITG | 0.938 | 0.009 | 106.649 | 0.000 | 0.918 | 0.953 | Supported |
| FinTech -> GIA | 0.088 | 0.078 | 1.122 | 0.262 | -0.06 | 0.243 | Not Supported |
| FinTech -> EITG -> GIA | 0.766 | 0.069 | 11.037 | 0.000 | 0.625 | 0.895 | Supported |

### 5.6. R2 and Q2

To examine the predictive accuracy, strength, and quality of the structural mode, the test recommended by Peng and Lai (2012) is employed. Table 7 shows the values of $R^2$ of the endogenous constructs, which imply a significant percentage of explained variance. The value of $R^2$ for EITG is 0.879, and GIA is 0.809. These values imply that the model explains about 87.9% and 80.9% of the variance of both EITG and GIA constructs, respectively, and shows high explanatory power of the variables.

Moreover, the values of Stone–Geisser's $Q^2$ are utilized to identify the predictive relevance of the model used and exceed the suggested threshold of 0. $Q^2$ of EITG and GIA is more than zero, e.g., 0.879 and 0.727, respectively. These values guarantee that the model has a high capacity to forecast the endogenous constructs, since the values are considerably higher than 0 and lower than 1 (Lita et al., 2019).

The findings conclude that the structural model is a powerful predictive and explanatory model that supports its theoretical stability and credibility in measuring the association between FinTech, EITG, and GIA.

**Table 7:** Results of $R^2$ and $Q^2$

| Endogeneous Constructs | R-square | $Q^2$ |
|---|---|---|
| EITG | 0.879 | 0.879 |
| GIA | 0.809 | 0.727 |

## 6. Conclusion

This research offers deep empirical evidence on the influence of FinTech and successful IT governance (EITG) on the green institutional activities (GIA) of Saudi Arabian financial institutions. The findings discussed in this paper rely on a strong theoretical foundation that encompasses financial intermediation theory, diffusion of innovation theory, the triple bottom line (TBL) framework, the theory of information asymmetry, stakeholder theory, and institutional theory, and highlight the strategic importance of a digital transformation and governance to achieve environmental sustainability. The results show that the direct impact of sole adoption of FinTech on GIA is weak. The contextual aspect in Saudi Arabia can explain this weak outcome, as market preparation regarding FinTech-based sustainability solutions is still in its preliminary stages, and the cultural aspects are oriented more towards financial benefits than environmental purpose. In comparison, the impact of FinTech is further enhanced through EITG structures. The model of structure concludes that not only does EITG have a direct influence on GIA, but it also serves as a channel through which FinTech can be used to enhance sustainable financial practices. It is the outcome that justifies the significance of internal government processes in converting technological advancement into beneficial environmental performance. The study also provides a high level of reliability, convergent and discriminant validity of all constructs, and ensures the reliability of the modeling measurement framework. The large values of $R^2$ and $Q^2$ also strengthen the explanatory power and predictive relevance of the model. These results collectively affirm the dual-pathway conceptual framework proposed in the study: FinTech enhances green finance primarily through the alignment and enablement provided by IT governance. From a practical standpoint, the findings provide useful insights to policymakers, financial regulators, and institutional leaders on the emerging economies. Investing in digital technologies is not enough, but strategic focus should also be provided on enhancing IT governance structures to make sure that these technologies address wider ESG and sustainability objectives. This is particularly relevant in the context of Saudi Arabia, where digital transformation and sustainable development are the core pillars of Vision 2030. In this respect, the policy implications can be further enriched by highlighting how the concrete governance mechanisms, including mandatory sustainability reporting, regulatory guidelines of standardized IT compliance, and digital finance, could be implemented to further align FinTech adoption with environmental priorities. However, practical challenges persist, such as data governance uncertainty in the form of regulation and ethical issues (Nagesh & Murugan, 2025). These can be addressed through the creation of stronger coordination between regulators and industry players, enhancing institutional capacity to monitor compliance, and establishing transparent data protection standards. Furthermore, incorporating sustainability and ethical criteria into the policies of digital finance would contribute to promoting FinTech innovations to long-term societal goals. Although the present analysis is placed in the context of Saudi Arabia, future research can expand its range by conducting comparative research with other members of the Gulf Cooperation Council (GCC) or other developing economies, where the use of digital financial transformation, institutional capacity, governance mechanisms, and cultural attitudes regarding sustainability may show dissimilar trends. These cross-national investigations would help to increase the external validity of the current results, clarify the contextual specifics in the FinTech-governance-sustainability nexus, and provide more detailed policy guidance. Besides, future studies must address the discriminant

validity challenges that were observed in this study, most notably, the overlap of FinTech and EITG constructs. These concerns may require modification of measurement items, deletion of redundancy, or use of other modelling techniques (e.g., second-order constructs) to obtain more discrete conceptual differentiations. Taken together, these results emphasize that the development path toward sustainable finance in the developing economies is not simply the implementation of technology, but rather requires a strong governance system, active support of the regulator, and a sustained learning process across countries. Efforts to specifically address these dimensions in the future can unlock the transformational promise of FinTech more efficiently to create meaningful and measurable sustainability impacts.

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