

# Green Innovative Technology Shaping Economic Sustainability through Innovation Performance

Sultan Alateeg

Department of Management Information System, College of Business Administration, Majmaah University, AL-Majmaah 11952, Saudi Arabia, ORCID: 0000-0001-7791-3236, Email: s.alateeg@mu.edu.sa

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## ABSTRACT

This study examines the impact of green innovative technology on innovation performance and economic sustainability in the manufacturing sector of Saudi Arabia. Using a cross-sectional research design, data were collected from employees working in manufacturing organizations through a structured survey. A convenience sampling technique was employed, and responses were recorded using a five-point Likert scale. The study adapts measurement scales from established literature, with three items for green innovative technology, four items for innovation performance, and six items for economic sustainability. Structural equation modeling (SEM) was conducted using SmartPLS version 4 to assess both the measurement and structural models. The results indicate that green innovative technology has a significant positive impact on innovation performance ( $\beta = 0.735$ ,  $p < 0.001$ ) and economic sustainability ( $\beta = 0.509$ ,  $p < 0.001$ ). Additionally, innovation performance strongly influences economic sustainability ( $\beta = 0.848$ ,  $p < 0.001$ ) and mediates the relationship between green innovative technology and economic sustainability ( $\beta = 0.623$ ,  $p < 0.001$ ). The findings provide valuable insights for organizations seeking to integrate sustainability-driven innovations into their business strategies.

**Keywords:** Technology, Performance, Innovation, Sustainability, Economic.

## INTRODUCTION

The growing emphasis on sustainability has driven organizations worldwide to integrate green innovative technology as a strategic approach to enhance performance and long-term economic sustainability (Song et al., 2024). In the manufacturing sector, adopting environmentally friendly technologies has become a necessity to remain competitive and comply with increasing regulatory requirements. Green innovative technology refers to the use of sustainable materials, energy-efficient processes, and eco-friendly designs that minimize environmental impact while fostering innovation (Qing et al., 2024). Organizations that implement these technologies can enhance their competitive advantage by developing products and services that align with sustainability goals, thereby improving their market positioning and long-term profitability.

Innovation performance is a critical factor in an organization's ability to introduce new and improved products and services that drive competitive advantage (Hameed et al., 2023). Companies that actively engage in innovative practices experience increased efficiency, improved customer satisfaction, and stronger brand positioning (Wang et al., 2022). In the context of green innovation, firms that adopt sustainable technologies tend to develop more environmentally responsible products, which can lead to increased customer trust and brand loyalty. Moreover, the ability to rapidly adopt new technologies allows companies to stay ahead of their competitors, further reinforcing their market leadership.

Economic sustainability, another key aspect of this study, focuses on an organization's ability to generate long-term financial benefits while minimizing negative environmental impacts (Raza, 2020; Jie, 2021). Organizations that integrate green innovative technology into their operations often experience reduced production costs through energy savings, resource optimization, and waste reduction (Le, 2022; Zhang et al., 2020). Sustainable business practices, such as investing in corporate social responsibility (CSR) initiatives, further contribute to economic stability by enhancing an organization's reputation and stakeholder trust (Tang et al., 2022). As a result, companies

that prioritize both innovation and sustainability are more likely to achieve sustained profitability and long-term success.

Despite the growing interest in green innovation, limited research has explored the direct and indirect relationships between green innovative technology, innovation performance, and economic sustainability, particularly in the context of Saudi Arabia's manufacturing sector. Given the country's ongoing economic transformation under Vision 2030, understanding how sustainability-driven innovations impact organizational performance is essential for both policymakers and industry leaders. This study aims to examine the influence of green innovative technology on innovation performance and economic sustainability in Saudi Arabia's manufacturing sector. This research investigates the direct impact of green innovative technology on innovation performance and economic sustainability, as well as the mediating role of innovation performance. The findings of this study provide valuable insights for organizations seeking to integrate sustainability-driven innovations into their business strategies, ensuring long-term growth and competitiveness in an increasingly sustainability-conscious market.

## LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

### A. Green Innovative Technology and Innovation Performance

Green innovative technology plays a vital role in enhancing innovation performance within organizations. It involves adopting environmentally friendly practices, materials, and technologies to develop sustainable products and services (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013). Organizations that integrate green technology into their operations can improve their overall innovation capabilities, leading to the development of new and improved products that align with environmental and sustainability goals. By implementing green technological advancements, companies can optimize their production processes, reduce waste, and improve energy efficiency (Alshammari & Alshammari, 2023). These factors collectively contribute to better innovation performance, enabling firms to stay competitive in the market. The adoption of green innovation allows organizations to explore new business opportunities and create sustainable solutions that differentiate them from their competitors (Singh et al., 2020). By leveraging green technology, companies can enhance their research and development activities, leading to the creation of products and services that are both innovative and environmentally responsible. This approach not only improves a firm's market position but also enhances its reputation among stakeholders, customers, and regulatory bodies (Duque-Grisales et al., 2020). Additionally, green technology fosters a culture of continuous improvement, where organizations strive to develop innovative solutions that address environmental concerns while maintaining high-quality standards.

Furthermore, companies that invest in green technology often experience increased collaboration with industry partners, research institutions, and government agencies (Ullah et al., 2024). These collaborations can facilitate knowledge sharing and resource optimization, further enhancing innovation performance. The ability to develop sustainable and innovative products allows firms to capture new market segments, attract environmentally conscious consumers, and strengthen customer loyalty (Khan et al., 2024). Organizations that integrate green technology into their innovation strategies can gain long-term competitive advantages, ensuring sustained business growth and profitability (Abbas, 2024). Given these factors, green innovative technology is expected to positively influence innovation performance. Therefore, the following hypothesis is proposed:

H1: Green innovative technology influences on innovation performance

### B. Green Innovative Technology and Economic Sustainability

Economic sustainability refers to an organization's ability to achieve long-term financial stability while minimizing environmental risks and resource depletion. Green innovative technology plays a crucial role in achieving economic sustainability by promoting efficient resource utilization, cost reduction, and environmentally responsible business practices (Wang, 2019). Companies that invest in green innovation can improve their financial performance by optimizing production processes, reducing material waste, and enhancing operational efficiency. These factors contribute to cost savings and increased profitability, ultimately supporting economic sustainability. Organizations that adopt green technology can benefit from lower production costs due to improved energy efficiency and reduced waste (Qamruzzaman & Karim, 2024). By implementing sustainable practices, firms can minimize their reliance on non-renewable resources, leading to long-term cost reductions and financial stability. Additionally, green innovation enhances supply chain resilience by encouraging sustainable sourcing and resource management (Awwad Al-

Shammari et al., 2022). Companies that prioritize environmentally friendly practices can mitigate risks associated with resource scarcity, regulatory compliance, and changing consumer preferences, further strengthening their economic sustainability.

Green innovative technology also contributes to economic sustainability by creating new business opportunities and revenue streams (Lv et al., 2021). Companies that develop sustainable products and services can attract a growing market of environmentally conscious consumers who prioritize sustainability in their purchasing decisions. By positioning themselves as leaders in green innovation, firms can gain a competitive edge, enhance brand reputation, and increase market share (Rauter et al., 2019). Moreover, businesses that invest in green technology can access financial incentives, tax benefits, and government support programs designed to promote sustainable development, further enhancing their economic sustainability.

Another key aspect of economic sustainability is long-term investment in corporate social responsibility (CSR) initiatives (Akhtar et al., 2024). Organizations that integrate green technology into their operations can enhance their CSR efforts by demonstrating a commitment to environmental responsibility. These initiatives can improve stakeholder relationships, build consumer trust, and strengthen investor confidence, all of which contribute to long-term financial stability (Hossain et al., 2024). Therefore, green innovative technology is expected to positively influence economic sustainability. Therefore, the following hypothesis is proposed:

H2: Green innovative technology influences on economic sustainability

### **C. Innovation Performance and Economic Sustainability**

Innovation performance is a critical driver of economic sustainability, as it enables organizations to develop new products, services, and business models that contribute to long-term financial success. Firms that consistently innovate can enhance their market competitiveness, increase revenue generation, and ensure sustainable growth (Fernando et al., 2019). Innovation allows businesses to adapt to changing market demands, technological advancements, and regulatory requirements, ensuring that they remain financially viable in a dynamic business environment (Wang et al., 2022; Le, 2022).

One of the primary ways innovation performance contributes to economic sustainability is through the development of cost-effective and efficient production methods (Alayed & Alateeg, 2024). Companies that invest in innovation can optimize their processes, reduce production costs, and improve operational efficiency (Qing et al., 2024). This, in turn, leads to higher profit margins and financial stability. Additionally, innovation-driven organizations can leverage technological advancements to create value-added products and services that attract consumers and generate long-term revenue streams. Innovation performance also enables firms to capitalize on emerging market opportunities and expand their business reach (Hameed et al., 2023). By continuously developing innovative solutions, companies can diversify their product offerings, enter new markets, and strengthen customer loyalty. This approach enhances economic sustainability by ensuring a steady flow of revenue and reducing reliance on traditional business models (Zhang et al., 2020). Moreover, organizations that prioritize innovation can respond proactively to industry disruptions, economic fluctuations, and competitive pressures, further safeguarding their financial stability.

Another significant aspect of innovation performance is its role in fostering organizational resilience. Companies that embrace innovation can develop adaptive strategies to navigate market uncertainties, regulatory changes, and environmental challenges (Song et al., 2024). By integrating innovation into their business practices, firms can build sustainable business models that balance profitability with social and environmental responsibility. This holistic approach to innovation enhances economic sustainability by ensuring long-term financial viability and reducing business risks. Additionally, innovation performance plays a crucial role in fostering collaboration and knowledge sharing within the industry. Organizations that actively engage in innovation initiatives can establish strategic partnerships with research institutions, technology providers, and industry experts (Tang et al., 2022). These collaborations facilitate access to cutting-edge technologies, market insights, and funding opportunities, all of which contribute to sustained economic growth. Given these factors, innovation performance is expected to positively influence economic sustainability. Innovation performance also strengthens the link between green technology and economic sustainability by fostering continuous improvement and adaptation (Alshammari & Alshammari, 2023; Khan et al., 2024). Organizations that prioritize innovation can refine their sustainability initiatives, optimize resource utilization, and develop scalable solutions that contribute to long-term financial success (Ullah et al., 2024).

By leveraging innovation as a strategic asset, firms can sustain their competitive advantage, attract investors, and enhance their overall market positioning. Therefore, the following hypothesis are proposed:

H3: Innovation performance influences on economic sustainability

H4: Innovation performance mediates between green innovative technology and economic sustainability

Figure 1 presents the research model.

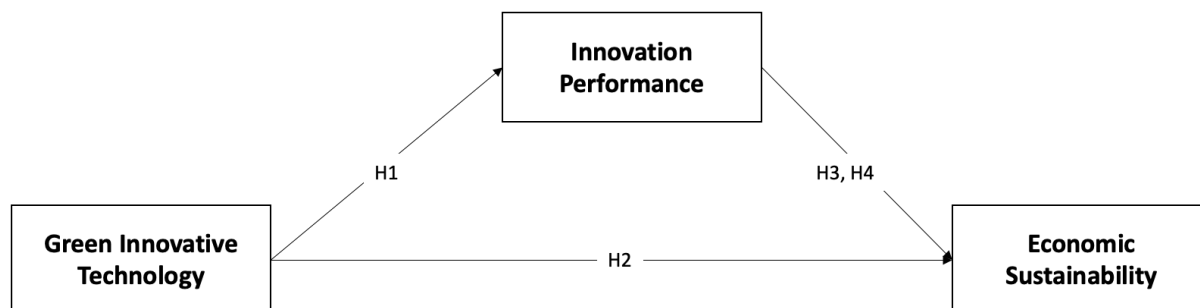


Figure 1. Research Model

## METHODS

This study employs a cross-sectional research design to examine the relationship between green innovative technology, innovation performance, and economic sustainability in the manufacturing sector. A cross-sectional approach was chosen because it enables data collection at a single point in time, providing a snapshot of current organizational practices and their impact on performance and sustainability outcomes. Given the evolving nature of green innovation and sustainability practices, this design effectively captures existing trends and relationships among key constructs, making it suitable for analyzing how organizations integrate sustainability-driven innovation into their business strategies.

The study focuses on employees working in manufacturing sector organizations in Saudi Arabia. The manufacturing sector was selected due to its significant role in the country's economic transformation, where sustainability and innovation are becoming key drivers of competitiveness. Employees from this sector are directly involved in decision-making and operational processes related to green technology adoption, making them the most relevant respondents for this study. A convenience sampling technique was used to collect data, as it allows for efficient access to professionals within the sector. Convenience sampling is particularly useful when targeted access to industry professionals is required, and time and resource constraints limit the use of probability sampling techniques. By using this method, the study ensures a sufficient sample size to conduct reliable statistical analyses. The data were collected in February 2025.

A structured questionnaire was developed to measure key constructs, using a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The Likert scale was chosen for its ability to capture varying degrees of agreement, providing detailed insights into respondent attitudes and perceptions regarding green innovation, innovation performance, and economic sustainability. The study adapts well-established measurement scales from prior research to ensure validity and reliability. Three items for green innovative technology were adapted from Song and Yu (2018), assessing firms' integration of environmentally friendly materials, resource efficiency, and recyclability in product design. Four items for innovation performance were adapted from Maletič et al. (2014), evaluating firms' ability to introduce innovative products, adopt new technologies, and gain a competitive advantage. Six items for economic sustainability were adapted from Rai et al. (2021), measuring firms' sustainable financial practices, such as waste reduction, responsible resource consumption, and corporate social responsibility (CSR) investments.

Data analysis was performed using structural equation modeling (SEM) with SmartPLS version 4. SEM was selected for its ability to assess complex relationships between multiple latent variables while accounting for measurement errors. SmartPLS was particularly suitable for this study due to its robustness in handling small to moderate sample sizes and its capability to perform both measurement model validation and structural path analysis. The analysis followed a systematic approach, beginning with the assessment of the measurement model, where reliability and validity checks, including Cronbach's alpha, composite reliability, and average variance extracted (AVE), were

conducted. Next, discriminant validity was assessed using the Fornell-Larcker criterion to ensure distinctiveness between the study constructs. Finally, structural model evaluation was performed, where path coefficients, R-square values, and statistical significance tests were analyzed to examine the hypothesized relationships.

## RESULTS

Table 1 provides a demographic and professional profile of the participants (n=337) based on age, gender, highest education level, current job position, and years of experience. The majority of participants fall into the 25–34 (30%) and 35–44 (30%) age groups, indicating that the sample is primarily composed of young to middle-aged individuals. A smaller proportion of participants are below 25 (10%) or 55 and above (11%), while 45–54-year-olds make up 19% of the sample. This distribution suggests that the workforce is relatively young, with a significant representation of individuals in their prime working years. The sample is predominantly male (62%), with females representing 38% of the participants. This indicates a gender imbalance in the workforce, with males outnumbering females. However, the presence of a substantial female representation (38%) suggests some level of gender diversity. A majority of participants hold a Bachelor's degree (52%), followed by those with a Master's degree (28%). A smaller percentage have an Associate degree (10%) or a high school diploma or below (10%). This highlights that the workforce is highly educated, with 80% of participants holding at least a Bachelor's degree. This level of education likely contributes to the professional competence and expertise of the workforce. The participants are evenly distributed between entry-level employees (30%) and mid-level managers (30%), indicating a balanced mix of early-career and mid-career professionals. Senior managers make up 20% of the sample, while executives/directors and business owners each account for 10%. This distribution reflects a hierarchical structure within the workforce, with a significant presence of both operational and leadership roles. The participants' years of experience are relatively evenly distributed. 2–5 years (30%) and more than 10 years (25%) are the most common experience levels, followed by 6–10 years (25%) and less than 2 years (20%). This indicates a mix of early-career professionals and seasoned experts, suggesting a workforce with both fresh perspectives and deep industry knowledge.

Table 1: Profile of Participants (n=337)

| Category                | Subcategory                  | Frequency | Percentage |
|-------------------------|------------------------------|-----------|------------|
| Age                     | Below 25                     | 34        | 10%        |
|                         | 25–34                        | 101       | 30%        |
|                         | 35–44                        | 101       | 30%        |
|                         | 45–54                        | 64        | 19%        |
|                         | 55 and above                 | 37        | 11%        |
| Gender                  | Male                         | 209       | 62%        |
|                         | Female                       | 128       | 38%        |
| Highest Education Level | High school diploma or below | 34        | 10%        |
|                         | Associate degree             | 34        | 10%        |
|                         | Bachelor's degree            | 175       | 52%        |
|                         | Master's degree              | 94        | 28%        |
| Current Job Position    | Entry-level employee         | 101       | 30%        |
|                         | Mid-level manager            | 101       | 30%        |
|                         | Senior manager               | 67        | 20%        |
|                         | Executive/Director           | 34        | 10%        |
|                         | Business owner               | 34        | 10%        |
| Years of Experience     | Less than 2 years            | 67        | 20%        |
|                         | 2–5 years                    | 101       | 30%        |
|                         | 6–10 years                   | 84        | 25%        |
|                         | More than 10 years           | 85        | 25%        |

The measurement model assessment presented in Table 2 evaluates the reliability and validity of the constructs used in the study. The constructs include green innovative technology, innovation performance, and economic sustainability, each measured by multiple items. The internal consistency reliability of each construct is confirmed through Cronbach's alpha values, all of which exceed the recommended threshold of 0.70, indicating strong

reliability. Composite reliability (CR) values also exceed 0.70, further confirming the consistency of the measurement items. Additionally, the Average Variance Extracted (AVE) values for all constructs are above the recommended threshold of 0.50, ensuring convergent validity. For green innovative technology, the CR value of 0.872 and AVE of 0.698 demonstrate that the construct is well-measured, with item loadings ranging from 0.768 to 0.816, indicating strong associations with the underlying concept. The items reflect the company's efforts in selecting environmentally friendly materials, minimizing material use, and ensuring ease of recycling, reuse, and decomposition. Similarly, Innovation Performance exhibits adequate reliability, with a Cronbach's alpha of 0.813 and CR of 0.739. The item loadings range from 0.728 to 0.866, reflecting a focus on product and service innovation, customer perception of innovativeness, technology adoption speed, and sustainable competitive advantage. Economic sustainability shows strong measurement properties, with a Cronbach's alpha of 0.823, CR of 0.841, and AVE of 0.728, ensuring that the construct is measured reliably. The item loadings range from 0.776 to 0.897, capturing key sustainability practices such as investment in CSR, waste minimization, sustainable procurement, resource efficiency, and cost-saving strategies. The overall results confirm that the constructs exhibit strong reliability and validity, supporting their use in further structural model analysis.

Table 2: Measurement Model

| Constructs with items                                                                                                                                                        | Loadings | Cronbach's alpha | Composite reliability | Average variance extracted (AVE) |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------|-----------------------|----------------------------------|
| <b>Green Innovative Technology</b>                                                                                                                                           |          | 0.784            | 0.872                 | 0.698                            |
| GI1: "Our company chooses the materials of the products or services that produce the least amount of pollution for conducting the products development or design"            | 0.768    |                  |                       |                                  |
| GI2: "Our company uses the fewest amount of materials to comprise the products or services for conducting the product development or design"                                 | 0.799    |                  |                       |                                  |
| GI3: "Our company would circumspectly deliberate whether the products or services is easy to recycle, reuse, and decompose for conducting the product development or design" | 0.816    |                  |                       |                                  |
| <b>Innovation Performance</b>                                                                                                                                                |          | 0.813            | 0.739                 | 0.694                            |
| IP1: "Our company has introduced more innovative products and services than our main competitors during the last 3 years"                                                    | 0.762    |                  |                       |                                  |
| IP2: "Our company new products and services are perceived by our customers as innovative"                                                                                    | 0.806    |                  |                       |                                  |
| IP3: "The speed of adoption of new technology is faster than at our main competitors"                                                                                        | 0.728    |                  |                       |                                  |
| IP4: "The number of innovations that provide the organization with a sustainable competitive advantage has increased during the last 3 years"                                | 0.866    |                  |                       |                                  |
| <b>Economic sustainability</b>                                                                                                                                               |          | 0.823            | 0.841                 | 0.728                            |
| ES1: "Our company invest in CSR without hurting our profits"                                                                                                                 | 0.801    |                  |                       |                                  |
| ES2: "Our company minimize waste to reduce our material cost"                                                                                                                | 0.824    |                  |                       |                                  |

|                                                                                               |       |
|-----------------------------------------------------------------------------------------------|-------|
| ES3: "Our company sustainably procure and preserve the materials to increase their lifecycle" | 0.86  |
| ES4: "Our company reduce resource consumption for sustainability"                             | 0.776 |
| ES5: "Our company reuse resources to reduce our costs"                                        | 0.897 |
| ES6: "Our company invest in quality for the increased life cycle of products"                 | 0.838 |

Table 3 presents the discriminant validity assessment using the Fornell-Larcker criterion, which ensures that each construct is distinct from the others. According to this criterion, the square root of the AVE for each construct should be greater than its correlations with other constructs. The diagonal values represent the square root of AVE, while the off-diagonal values indicate inter-construct correlations. The results confirm satisfactory discriminant validity. The square root of AVE for economic sustainability (0.853), green innovative technology (0.835), and innovation performance (0.891) is higher than their respective correlations with other constructs. The correlation between economic sustainability and green innovative technology is 0.632, while its correlation with innovation performance is 0.754, both of which are lower than the square root of their respective AVEs. Similarly, the correlation between green innovative technology and innovation performance is 0.735, which is lower than the AVE square roots of both constructs. These findings indicate that each construct captures a unique aspect of the research model and is not excessively overlapping with others. Therefore, the constructs exhibit strong discriminant validity, ensuring that they measure distinct theoretical concepts in the study.

Table 4 presents the results of the structural model assessment, highlighting the path coefficients, significance levels, and hypothesis testing outcomes. The findings indicate that all proposed hypotheses are supported, as the path coefficients are significant at the 0.05 level ( $p < 0.05$ ), with strong T-statistics. The direct relationship between green innovative technology and innovation performance ( $\beta = 0.735$ ,  $p = 0.00$ ) is significant, confirming that organizations adopting green innovation practices achieve higher levels of innovation performance (H1 supported). Similarly, green innovative technology significantly influences economic sustainability ( $\beta = 0.509$ ,  $p = 0.00$ ), indicating that environmentally friendly innovation contributes to long-term financial stability and resource efficiency (H2 supported). Innovation performance also has a strong positive impact on economic sustainability ( $\beta = 0.848$ ,  $p = 0.00$ ), suggesting that firms excelling in innovation achieve better financial outcomes and sustainability practices (H3 supported). Furthermore, the mediating effect of innovation performance in the relationship between green innovative technology and economic sustainability ( $\beta = 0.623$ ,  $p = 0.00$ ) is significant, reinforcing the idea that innovation acts as a key mechanism linking green technology adoption to economic sustainability (H4 supported). The results confirm that Green Innovative Technology not only enhances innovation performance but also contributes to economic sustainability, both directly and indirectly through innovation performance. These findings emphasize the importance of sustainable innovation strategies in achieving long-term business success.

Table 3: Discriminant Validity (Fornell-larcker criterion)

|                             | <b>Economic Sustainability</b> | <b>Green Innovative Technology</b> | <b>Innovation Performance</b> |
|-----------------------------|--------------------------------|------------------------------------|-------------------------------|
| Economic Sustainability     | 0.853                          |                                    |                               |
| Green Innovative Technology | 0.632                          | 0.835                              |                               |
| Innovation Performance      | 0.754                          | 0.735                              | 0.891                         |

Table 4: Path Coefficients

| <b>Paths</b>                                          | <b>Beta</b> | <b>Standard deviation</b> | <b>T statistics</b> | <b>P values</b> | <b>Results</b> |
|-------------------------------------------------------|-------------|---------------------------|---------------------|-----------------|----------------|
| Green Innovative Technology -> Innovation Performance | 0.735       | 0.074                     | 9.887               | 0.00            | H1 supported   |

|                                                        |       |       |       |      |              |
|--------------------------------------------------------|-------|-------|-------|------|--------------|
| Green Innovative Technology -> Economic Sustainability | 0.509 | 0.125 | 5.068 | 0.00 | H2 supported |
| Innovation Performance -> Economic Sustainability      | 0.848 | 0.097 | 8.715 | 0.00 | H3 supported |
| Green Innovative Technology -> Innovation Performance  | 0.623 | 0.102 | 6.132 | 0.00 | H4 supported |

The R-square ( $R^2$ ) values presented indicate the proportion of variance explained by the independent variables for each dependent variable in the structural model (Figure 2). Economic sustainability has an  $R^2$  value of 0.729, meaning that 72.9% of its variance is explained by green innovative technology and innovation performance. The adjusted  $R^2$  value (0.720) accounts for the number of predictors, confirming the model's robustness in explaining economic sustainability outcomes. Similarly, innovation performance has an  $R^2$  value of 0.541, indicating that 54.1% of its variance is explained by green innovative technology. The adjusted  $R^2$  (0.533) suggests a slight reduction due to model complexity but remains within an acceptable range, demonstrating that green innovation significantly contributes to improved innovation performance.

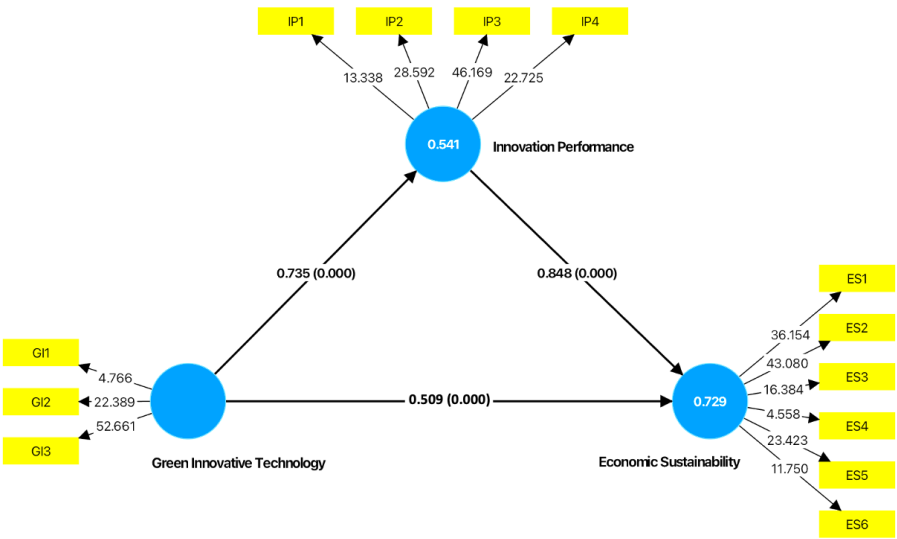


Figure 2: Structural Model

DISCUSSION

The findings of this study highlight the critical role of green innovative technology in driving both innovation performance and economic sustainability. The significant path coefficient ( $\beta = 0.735$ ,  $p = 0.00$ ) between green innovative technology and innovation performance confirms that adopting environmentally friendly innovations enhances a firm's ability to introduce novel products and services. Hence, sustainable technological advancements improve competitive advantage by fostering innovation. Organizations that prioritize green innovation not only meet regulatory and environmental standards but also enhance their market positioning through differentiated and eco-friendly offerings (Dabbous & Barakat, 2023).

Furthermore, the study establishes a direct and significant relationship between green innovative technology and economic sustainability ( $\beta = 0.509$ ,  $p = 0.00$ ), supporting the argument that environmentally responsible practices contribute to long-term financial stability. By minimizing material waste, improving resource efficiency, and adopting sustainable procurement strategies, firms can achieve cost savings and long-term profitability (Yin & Li, 2022). This finding reinforces prior research suggesting that green innovation reduces operational costs and enhances financial resilience (Abbas & Najam, 2024). Innovation performance is also found to be a strong predictor of economic sustainability ( $\beta = 0.848$ ,  $p = 0.00$ ), indicating that firms excelling in innovation achieve better financial outcomes. This supports the idea that innovative firms are more likely to generate revenue growth, improve efficiency, and maintain sustainable business practices (Alshebami, 2023). Additionally, the mediation analysis confirms that innovation performance serves as a crucial link between green innovative technology and economic sustainability ( $\beta = 0.623$ ,  $p = 0.00$ ), suggesting that firms must leverage green innovation not only for compliance

and sustainability but also to drive innovation-led economic gains. The R-square values further strengthen these conclusions, with 72.9% of the variance in Economic Sustainability explained by Green Innovative Technology and Innovation Performance, and 54.1% of Innovation Performance explained by Green Innovative Technology. These results indicate a strong explanatory power, demonstrating the effectiveness of green innovation strategies in achieving both competitive and economic advantages. This study provides empirical evidence that integrating green technology into business operations enhances both innovation and economic outcomes. These findings underscore the need for firms to adopt sustainability-driven innovation strategies, as they not only support environmental objectives but also lead to substantial financial and competitive benefits.

The findings of this study provide valuable implications for businesses, policymakers, and academia, emphasizing the strategic role of green innovative technology in fostering both innovation performance and economic sustainability (Alateeg & Alhammadi, 2023). For business leaders and managers, the results highlight the necessity of embedding green innovative technology into core business strategies (Asiaei et al., 2023). The significant positive relationship between green innovative technology and innovation performance suggests that firms investing in sustainable innovation can enhance their ability to introduce novel products and services (Alateeg et al., 2024). This reinforces the need for businesses to integrate environmental considerations into their research and development (R&D) processes, ensuring that new products are designed with resource efficiency, recyclability, and minimal environmental impact in mind.

Additionally, the strong link between innovation performance and economic sustainability underscores that firms excelling in innovation tend to achieve better financial outcomes (Opazo-Basáez et al., 2024). Managers should leverage green innovation not only to comply with environmental regulations but also to drive competitive advantage and profitability. Investing in sustainability-driven innovation can lead to cost savings through efficient resource utilization, waste reduction, and energy conservation (Alateeg & Alhammadi, 2024a). Furthermore, firms that prioritize green initiatives are more likely to attract environmentally conscious consumers and investors, enhancing brand reputation and market share (Costantini et al., 2017). To maximize the benefits of green innovation, organizations should foster a culture of continuous improvement by training employees, encouraging cross-functional collaboration, and implementing sustainability-driven key performance indicators (KPIs). Firms should also form strategic partnerships with suppliers, industry associations, and research institutions to accelerate the adoption of green technologies.

For policymakers, the study underscores the importance of creating an enabling environment that supports businesses in adopting green innovative technology. Governments should implement policies that incentivize sustainability-driven innovation, such as tax credits, grants, and low-interest loans for companies investing in green R&D. Additionally, regulatory frameworks should be designed to encourage firms to incorporate environmental sustainability into their operations while ensuring compliance with global environmental standards (Li & Qamruzzaman, 2023). Public-private collaborations can further drive green innovation by facilitating knowledge sharing and technology transfer (Alateeg & Alhammadi, 2024b). Policymakers should also invest in infrastructure that supports sustainability initiatives, such as renewable energy sources, recycling facilities, and eco-friendly supply chain networks. Moreover, awareness campaigns and educational programs can help businesses and consumers understand the long-term economic benefits of adopting sustainable practices.

From a theoretical perspective, this study contributes to the growing body of literature on sustainability, innovation, and economic performance. The results provide empirical evidence supporting the resource-based view (RBV) and stakeholder theory, which suggest that firms achieving sustainability-driven innovation can secure a competitive advantage while addressing stakeholder concerns. The study also highlights the mediating role of innovation performance in the relationship between green innovative technology and economic sustainability, offering new insights into the mechanisms through which sustainability-oriented firms achieve financial stability (Alateeg & Al-Ayed, 2024). Future research could explore additional moderating variables, such as organizational culture, regulatory frameworks, and industry-specific factors, to deepen understanding of the green innovation–performance relationship. Both small and medium enterprises (SMEs) and large corporations can benefit from adopting sustainability-driven innovation strategies. SMEs, often constrained by limited financial resources, should seek partnerships, grants, and government incentives to facilitate their transition toward green technologies. Larger firms, on the other hand, should leverage their economies of scale to integrate sustainable practices across their supply chains, reducing costs and improving long-term profitability.

## CONCLUSION

This study underscores the critical role of green innovative technology in driving both innovation performance and economic sustainability. The findings reveal that firms integrating sustainability-focused innovations into their product development processes achieve a competitive edge by enhancing their ability to introduce novel products and services. Moreover, innovation performance serves as a key enabler of economic sustainability, as firms that excel in innovation tend to experience improved financial outcomes through cost efficiencies, resource optimization, and market differentiation. The strong positive relationship between green innovative technology and innovation performance suggests that businesses should prioritize environmentally conscious design, efficient resource utilization, and sustainable production practices. Additionally, the mediation effect of innovation performance between green innovative technology and economic sustainability highlights the need for firms to strategically align their sustainability initiatives with their broader innovation objectives. From a managerial perspective, organizations must embed sustainability-driven innovation into their core strategies to remain competitive in an increasingly eco-conscious market. Policymakers, on the other hand, should develop regulatory frameworks and incentive structures that encourage businesses to invest in sustainable technologies and innovation. The study contributes to the growing discourse on sustainability, innovation, and performance, offering valuable insights for businesses, policymakers, and researchers. Future studies should explore industry-specific dynamics, regulatory influences, and consumer preferences to further refine strategies that enhance the impact of green innovation on economic sustainability.

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