Technological Capability and Sustainability Performance of Medium and Large Manufacturing Firms in Nairobi County the Mediating Role of Innovativeness

Diana Chepkemboi Limo, Ronald Bonuke, Lydia Maket

Department of Management Science and Entrepreneurship School of Business and Economics, Moi University, Kenya

DOI: https://dx.doi.org/10.47772/IJRISS.2025.909000120

Received: 23 August 2025; Accepted: 29 August 2025; Published: 01 October 2025

ABSTRACT

This paper empirically examines the influence of technological capability on the sustainability performance of medium and large manufacturing firms in Nairobi County, Kenya, and assesses the mediating role of innovation in this relationship. The study used a sample of 302 manufacturing firms and employed Hayes' PROCESS macro (Model 4) to test the direct and indirect effects among the variables. Regression analysis was used to estimate the relationships, and bootstrapping with 5,000 samples was used to confirm the significance of the indirect effect. The results revealed that technological capability has a significant and positive direct effect on sustainability performance. Innovation was also found to positively influence sustainability performance and significantly mediate the relationship between technological capability and sustainability performance. Additionally, technological capability significantly predicted innovation. These findings suggest that firms with higher technological capabilities are more likely to achieve superior sustainability outcomes when such capabilities are deployed through innovative practices. The study provides valuable insights for managers, policymakers, and industry stakeholders in the manufacturing sector. Firms should prioritize investments in technological infrastructure and innovation capacity to enhance sustainable performance. Policymakers may consider developing incentives and policies that support technology adoption and innovation in manufacturing, particularly in Nairobi County. This study contributes to the literature by empirically validating the mediating role of innovation in the relationship between technological capability and sustainability performance in the context of medium and large manufacturing firms in Nairobi County. It highlights the importance of leveraging internal capabilities to drive innovation and sustainability outcomes in industrial enterprises.

Keywords: Technological capability, innovation, sustainability performance, medium and large manufacturing firms.

INTRODUCTION

It has long been common to judge a business's performance by looking at profit, productivity and how much of the market it controls. Yet, stricter demands from society and regulations have led companies to use performance measures that cover both their environmental and social activities (Chin et al., 2015). Consequently, organizations are choosing to become more sustainable to please stakeholders such as the government, local communities and environmental watchdogs (Acciaro et al., 2014). Through CSR and sustainable performance, organizations are able to balance meeting societal and ecological needs with their own economic growth (Iqbal et al., 2021).

When studying a company's sustainability, analysts usually look at economic, social and environmental factors (Niroumand et al., 2020). Specifically, these actions help solve other development problems, especially those related to reducing poverty, safeguarding the environment and building social trust (Holden et al., 2017). Companies are now expected to make sustainability a main goal in how they do business (Iqbal et al., 2021).

Following Environmental, Social and Governance (ESG) rules is what helps a company become sustainable. Both the business operations and investments of companies are typically evaluated with an ESG perspective (Xu et al., 2020; Li et al., 2021). Fears about pollution and how society is treated have led investors to focus more on ESG. After 2004, when ESG indicators became part of the system, they paved the way for new tools to assess and distribute information which secured sustainable development (Li et al., 2021).ESG continues to grow, but it is also becoming clear that having solid technology plays a key role in a firm's achievements. Isobe et al.

(2008) and Tello-Gamarra and Zawislak (2013) showed that how a company performs in certain areas is often tied to its technology and its ability to use it well. If a firm is technologically capable, it can gather beneficial knowledge, form links with other organizations and use lessons from the past to design new strategies and respond to shifts in the market (Bell & Pavitt, 1993; Figueiredo, 2016). Because of these abilities, companies can improve their processes, create new offerings and gain an advantage over competitors in demanding markets (Lall, 1980; Bag et al., 2020).

Many researchers and studies have pointed out how important technological capability is. Various scholars have looked at it using different approaches, including learning about technology (Lall, 1992), importing and exporting new technologies (Kim, 1980; Madanmohan et al., 2004) and its relationship to how companies perform (Tang et al., 2020). Authors Shou et al. (2014) found a positive link between technology skills and performance, but Coombs and Bierly (2006) argued there can be situations where this relationship turns negative.

With better technology skills, companies can introduce measures that improve their efficiency and set apart their products from others (Teece & Pisano, 1994). The creation of flexible manufacturing systems by Toyota made it easier to set up the machines and greatly boosted how effectively the company ran (Cusumano, 1989). Honda also used its technological advantages to add more products and customize for special markets (Stalk & Hout, 1990). This proves that a business's tech strengths can push both creativity and endurance over time.

The academic understanding of technological capability has also evolved. Acha (2000) described it as the skills and knowledge needed to identify, develop, and utilize technologies effectively. Meanwhile, Figueiredo (2002a, 2002b) emphasized its role in fostering innovation across products, processes, and engineering domains. Technological capability is also viewed as the ability to leverage scientific knowledge for production efficiency (Kim, 2000; Howells, 1994), which is vital in sectors like aerospace (Reed & Walsh, 2002) and pharmaceuticals (Schoenecker & Swanson, 2002).

Several empirical studies support the positive relationship between technological capability and firm performance. Aw and Batra (1998) used R&D spending and on-the-job training as proxies for technological capability in Taiwan's manufacturing sector and found a positive link to firm efficiency. Likewise, Afuah (2002) demonstrated that firms with superior technological capabilities in the pharmaceutical sector were more likely to generate customer value and enjoy competitive advantages. However, many studies have narrowly focused on single constructs, often using R&D expenditure or patent counts as primary indicators. While useful, these proxies are not entirely sufficient to capture the broader and more dynamic nature of technological capability (Helfat, 1997; Acs & Audretsch, 1989).

Innovation serves as the critical bridge between technological capability and sustainability performance. In the modern industrial landscape, innovation is widely recognized as a driver of environmental, social, and economic improvements (Michelino et al., 2019). Eco-friendly innovations can lead people to use fewer resources and use them wisely (Adams et al., 2016). Studies show that ecological concerns can be handled and the economy can prosper through sustainable innovations (Barbieri et al., 2010; Christensen, 2019).

Even so, some innovations are more helpful for sustainability than others. Many disruptive ideas are uncertain and it may take time before their impacts, good or bad, can be noticed (Hallenga-Brink & Brezet, 2005; Nill & Kemp, 2009). For these reasons, examining how different innovations together affect sustainability performance is still an area that needs to be explored (Jin et al., 2018; Orji & Liu, 2019). For medium and large

manufacturing firms, this gap matters most because they need to combine innovation and sustainability to stay competitive and follow the rules.

Recently, many scholars have looked into the role innovation plays in reaching sustainability. Experts have examined lean innovation in the supply chain (Orji & Liu, 2019), sustainability-focused innovation in services (Tseng et al., 2018) and eco-innovation in operations (Ball & Lunt, 2018). Little research has been done on how innovativeness helps to link technological capability and sustainability performance, mostly in emerging countries like Kenya.Understanding how this happens is especially important in Nairobi County, where manufacturing plays a major role in economic growth. For medium and large firms facing greater demands for sustainability, their long-term success will depend on how effectively they use new technology. Thus, this study seeks to examine the relationship between technological capability and sustainability performance among medium and large manufacturing firms in Nairobi County, with a specific focus on the mediating role of innovativeness. By addressing this gap, the research aims to contribute valuable insights to both academic scholarship and managerial practice. For the rest of the paper, we proceed as follows. Section 2 discusses previous literature and hypotheses development. Section 3 introduces the research method. We present the results and discussion in Section 4. Section 5 concludes our research, and we provide limitations and future studies.

LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

Consistent with the Diffusion of Innovation Theory, technological capability plays a critical role in the adoption and implementation of innovations that enhance sustainability performance. Rogers (2003) posits that the diffusion of innovation within firms depends on internal characteristics such as leadership, communication structures, and technological infrastructure. Firms with advanced technological capabilities are better positioned to absorb and implement eco-innovations that contribute to environmental and social performance. In medium and large manufacturing firms, this capability facilitates the development or adoption of green technologies and sustainable processes. However, technological capability does not automatically result in improved sustainability outcomes; innovation acts as a necessary mediator that converts capability into tangible environmental and social benefits (Damanpour & Schneider, 2006).

From the perspective of the Triple Bottom Line (TBL) Theory, firm performance should be evaluated across economic, environmental, and social dimensions (Elkington, 1997). Technological capability provides the foundation for achieving TBL goals by enabling resource efficiency, pollution control, and social responsibility. Innovation mediates this relationship by transforming technological inputs into new sustainable products, cleaner production systems, and improved stakeholder engagement (Chen, 2008). By making energy-saving changes in manufacturing or choosing biodegradable packaging, a firm can reduce its effect on the planet, make more money and be seen in a positive light. Firms that maintain balance in profit, people and planet stand a better chance of being competitive for a long time.

Both approaches believe that innovation helps connect a company's technology with its sustainability success. Diffusion of Innovation Theory describes the process by which a new idea becomes popular and TBL Theory focuses on the results of those ideas for the environment, society and the economy. They also show how innovation connects technology with sustainability.

Li and her colleagues (2021) analyzed many studies to understand how Environmental, Social and Governance (ESG) research has developed and why it matters for sustainable development. Through their review of ESG-linked articles in Scopus and Web of Science, the researchers found that advances in technology are vital for the progress of ESG adoption. Authors believe that digital technology and new ways of working improve transparency, make sure measurements are accurate and support the achievement of sustainability in the long term. They also investigated the link between green supply chain management (GSCM), environmental teamwork and how Malaysian manufacturing companies fare when it comes to sustainability. Analysis of survey data through SEM showed that companies with better environmental technology were more successful at protecting the environment as well as their economy. Due to technology, these firms can now include environmental care as a regular step in their supply chain.

Further, Niroumand, Shahin, Naghsh and Peikari (2020) explored the elements supporting frugal innovation and their effects on sustainability, using a framework set up through the Delphi method and then tested using SEM. It was found that using technology, particularly affordable and digital solutions, was central to achieving long-term results, especially in places with few resources. This means that using technology properly can help companies deal with their financial and operational challenges to survive. After this, Xu, Liu and Shang (2020) considered how research and development activities and strong performance in ESG help drive green innovation among Chinese firms listed on the stock market. Results from the 2011 to 2017 panel regression analysis indicate that technological capability is important in connecting ESG and green innovation. According to the findings, increased R&D efforts encouraged innovation and improved how environmentally friendly the companies became. They sum up by stating that organizations need technical ability to be green and keep going long-term.

Coombs and Bierly (2006) used empirical methods to analyze how a firm's ability to use technology is related to its performance in major U.S. manufacturing companies. The authors included several factors by examining data from 201 public manufacturing companies using both patent statistics and R&D intensity as measures of technology. As dependent variables, we relied on return on assets, return on equity, return on sales, market value, market value added and economic value added. The results revealed that different combinations of technology measures and performance led to widely differing results, revealing how complicated and inconsistent the link can be.

Fitz-Oliveira and Tello-Gamarra (2024) carried out a recent meta-analysis, studying the variance in studies on the connection between technological capability and firm performance in 23 primary studies with 5,882 manufacturing firms. The authors found, based on data from the Scopus and Web of Science, that most of the time, organizations with more advanced technology see better results. Even so, the researchers found that the findings varied widely which they linked to four important reasons: differences in how technology was measured, variations in the study themes, the use of a mix of data sources and the settings of the primary studies. It underlines that evaluations of technology's impact should consider both continuity in measurement and a sense of the local context.

In an industry-specific analysis of Taiwan's electronics sector, Tsai (2004) aimed to find out how technology capability is developed in an unpredictable way and how this affects firm productivity. He defined technological capability differently than previous studies, using it as a stock that reflects the more lasting knowledge and innovations inside a firm. The use of a Cobb–Douglas production function on panel data indicated that firm productivity growth was mostly due to technological capability which surpassed standard input factors in impacting firm performance. They underlined how maintaining investments in technology and innovation helps a company remain competitive for a long time. Therefore, based on this literature, the following hypothesis was formulated:

H1. Technological capability has a significant effect on sustainability performance

New studies are emphasizing that better technology and innovation help small and medium-sized businesses achieve success and remain competitive. Valdez-Juárez and Castillo-Vergara (2021) discovered that for 684 Mexican SMEs, technological capability plays a major role in open innovation and eco-innovation. While innovation does not immediately influence corporate performance, it shapes innovation channels that influence how the company performs. Also, Li et al. (2019) built a model to study how effective use of green technologies influences the competitiveness of Chinese firms. Hierarchical regression analysis found that this relationship is mediated by how different a product is and moderated by the size of the enterprise, implying that combining internal strengths with firm size affects competitiveness.

In order to continue the discussion on innovation in SMEs, Saunila (2020) performed a systematic review that discovered a general but scattered view of innovation capability in small businesses. What she has found is that innovation capability research has developed in several themes and among various scholarly communities, stressing its complexity in small firms. The authors suggest that EI takes place when companies reorganize their technology and structures to meet updated environmental standards, new technology and what consumers want. These results emphasize that when firms have executive-led management for the environment, do

ecological R&D and sense trends in the green market, they are better able to drive sustainability-oriented innovation.

In Indonesia, Lestari and Ardianti (2019) showed that technology skills influence SMEs' performance both by themselves and indirectly through innovative efforts. Results from PLS modeling suggest that innovation helps explain the link between a company's technology and how successful it is. Liu, Wu and Wang (2020) then investigated how technology management affects product innovation at different stages of the firm's technological development. They discovered that how firms manage information, equipment, culture and risks depending on their capabilities, has a different impact on their product innovation performance. All things considered, these investigations suggest that using technology effectively together with new ideas can greatly improve the competitiveness and results of SMEs in changing markets. Therefore, based on this literature, the following hypothesis was formulated:

H2. Technological capability has a significant effect on innovation

Kuzma et al.,(2020) did a broad meta-analysis to examine how innovation contributes to a company's sustainability performance in environmental, economic and social areas. The study used data from Scopus, Web of Science, ScienceDirect, Emerald, Sage, Wiley Online Library and ProQuest, confirming that innovation helps improve a company's sustainability performance. The strongest links were discovered between economic innovation and sustainability and between environmental innovation and sustainability. Important findings from the study are the calculated effect size ($r = 0.529$, $p < .000$) which demonstrates how much innovation contributes to sustainability and the identification of research gaps on this subject in current literature.

Rauter et al. (2019) examined how different open innovation partners can boost both economic and sustainability innovation among industrial firms. The study which used a cross-sectional analysis and compared companies, found that joining forces with universities, customers, NGOs and intermediaries helped businesses innovate. Importantly, the study proved that better economic innovation performance is linked to better sustainability innovation performance, meaning firms can work towards economic and sustainability goals at the same time.

Applying RBV and Schumpeterian innovation theory, Zhang et al. (2022) looked at how innovation helps SMEs following CE models achieve sustainable results. It was found that spending on research and development, as well as patenting, supports better sustainability in all three areas. It was also found that better social and environmental performance helps link innovation to greater profit. Social performance had a strong effect, but environmental performance played a minor role. The analysis found that a company's age and ownership affected the link between innovation and how the economy performed.

Mukhtar, Shad, and Lai (2025) explored the impact of green technology innovation on sustainability performance and looked at how innovation capabilities might moderate this effect for Malaysian manufacturing companies. The study collected data from 204 companies within the consumer products and services sector listed on Bursa Malaysia using a quantitative method and structural equation modeling. The research proved that green technology innovation led to better sustainability results in economic, environmental and social areas. In addition, it was discovered that having innovation capabilities helps to improve the link between green technology innovation and sustainability performance, showing that being ready for innovation matters.

Zhou et al. (2023) studied how firm innovation affects the link between Environmental, Social and Governance (ESG) performance and sustainability performance. According to the authors, structural equation modeling was used on survey responses from manufacturing firms in Bangladesh. It was found that ESG performance greatly improves both innovation and sustainability performance and that innovation acts as a full mediator between ESG and sustainability. What we find highlights how ESG practices encourage innovation which benefits sustainability in emerging markets. Therefore, based on this literature, the following hypothesis was formulated:

H3. Innovation has a significant effect on sustainability performance

CONCEPTUAL FRAMEWORK

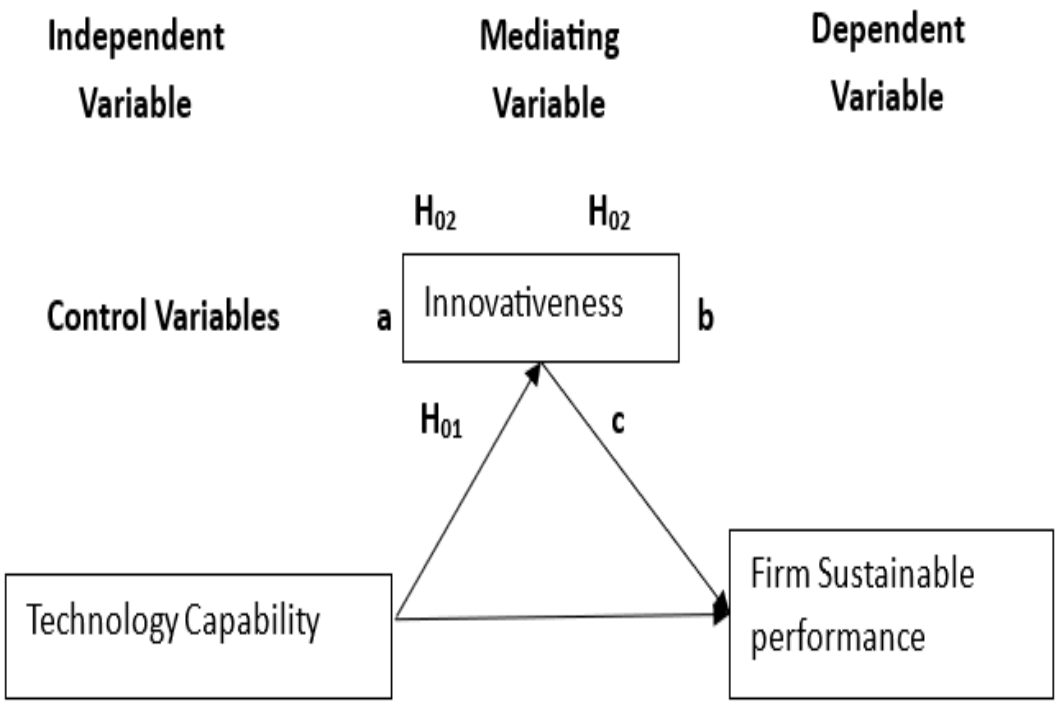

Figure 1: Conceptual framework

RESEARCH METHODOLOGY

Sample size and data

The study targeted 1,900 medium and large manufacturing firms drawn from different sectors including food and beverage (570), textile and apparel (190), chemicals (228), metals and machinery (190), wood and paper products (152), plastic and rubber (190), electronics and electronic equipment (95), and construction materials (285). These firms are registered under the Kenya Association of Manufacturers (KAM) and have been in operation for more than five years. The study targeted both medium and large manufacturing firms, given their contribution to industrial output and sustainability, and the likelihood of having established technological capabilities and innovation processes. The unit of analysis was the firm, while the unit of inquiry consisted of owners or managers involved in day-to-day operational decision-making. The sample size was computed using Yamane's formula (Yamane, 1967) as cited by Thompson and Lange (2011). This is given by:

$$n = \frac{1900}{1 + N(e)^2}$$

Whereas, N=204 and e=5%

$$n = \frac{1900}{1 + 1900(0.05)^2}$$

A sample of n=330 was adopted.

Measurement of variables

The study used a five-point Likert scale to measure technological capability. Innovation and sustainability performance.

Table 1: Measurement of variables

Variable	Dimensions	Number of Measurement items	Sample Items	Source
Firm Sustainability Performance	1. Economic Sustainability Performance 2. Social Sustainability Performance 3. Environmental Sustainability Performance	30 items anchored on a 5 point-Likert scale	- Our firm generates revenue from the sale of new products - Our firm improved employees' safety at the workplace - Our firm reduced energy consumption	Dyllick&Hockerts (2002) Chow & Chen (2012) Pedersen *et al.,* (2018) Globocnik *et al.,* (2019)
Firm Innovativeness	1. Product Innovativeness 2. Process Innovativeness 3. Management System Innovativeness	17 items anchored on a 5 point-Likert scale	- In the last five years our firm has introduced a range of new products - We constantly improve our business processes - We improve our leadership behavior to enhance staff motivation	Golgeci & Ponomarov (2015) Wang & Ahmed (2004) Globocniketal(2018) Tsai *et al.*, (2001)
Technological capability	1. acquisition of skills, 2. knowledge, 3. experience 4. establishment of firm systems	10 items anchored on a 5 point-Likert scale	- We recruit staff who are qualified, - We do a lot of in-house market research. - We constantly improve our business processes	Wang and Ahmed (2004), Tsai, Huang, and Kao (2001), and Mafabi *et al.*, (2012).

Source ,Researcher, (2024)

Model specification

Hypotheses one to three were tested using Model 1 and 2 in the multiple linear regression.

$INN = \beta_0 + \beta_1 TC + e_1$……. Model 1

$SP = \beta_0 + \beta_1 TC + \beta_2 INN + e_2$……. Model 2

Where

SP= Sustainable performance

β_0 = Constant Term

β_1, β_2, β_3, β_4 = Beta coefficients

TC= Technological capability

INN= Innovativeness

e = Error Term

Data analysis and presentation

Response rate

A total of 330 questionnaires were distributed, and 302 were correctly filled and returned, yielding a high response rate of 91.52%, which exceeds the recommended threshold for robust survey research. The target population consisted of 1,900 medium and large manufacturing firms in Nairobi County, Kenya. Data cleaning involved screening for missing values and outliers, with no missing values detected, while identified outliers were removed to avoid biasing the analysis.

Descriptive Statistics

The study demonstrated strong firm sustainability performance, with a mean of 3.8602 and a standard deviation of 0.50000. The descriptive statistics for innovation indicated a high level of innovativeness among the firms (mean = 3.9194, SD = 0.55764). The firms also exhibited a relatively high level of technological capability (mean = 3.5781, SD = 0.60060).

Table 2: Descriptive statistics results

	N	Minimum	Maximum	Mean	Std. Deviation
Technological Capability	302	1	5	3.5781	.60060
Innovation	302	1	5	3.9194	.55764
Firm Sustainability Performance	302	1	5	3.8602	.50000

Source: Research Data, 2024

Diagnostic test

The study satisfied all key assumptions for reliable regression analysis. Normality was confirmed by the Jarque-Bera test (JB = 0.0785), with skewness (−0.039) and kurtosis (2.0789) values indicating a symmetric and normal distribution. Linearity was supported through the P-P plot, where residuals aligned along the diagonal line, suggesting a linear relationship between variables. Multicollinearity was not a concern, as all tolerance values were above 0.20 and VIF values were below 4.0, indicating no excessive correlation among independent variables. Homoscedasticity was also confirmed, as the plot of standardized residuals showed no funneling and residuals were within the acceptable ±2 range. Additionally, the reliability of measurement instruments was established with Cronbach's alpha values exceeding 0.70 across all constructs: firm sustainability performance (α = .931), technological capability (α = .829), firm innovativeness (α = .947). Overall, the data met the essential statistical assumptions for regression, reinforcing the validity and dependability of the study's results.

Correlation results

The Pearson correlation results show that technological capability is positively and significantly correlated with firm sustainability performance (r = 0.558, p = 0.000) at the 5% significance level. Innovation is also positively and significantly related to sustainability performance (r = 0.581, p = 0.000). Additionally, technological capability and innovation are significantly correlated (r = 0.332, p = 0.000). Since all p-values are less than 0.05, the relationships among these variables are statistically significant. These findings suggest that both technological capability and innovation contribute to improved sustainability performance.

Table 3: Pearson Correlation Coefficients

		FSP	TC	INN
Sustainability Performance	Pearson Correlation	1		
	Sig. (2-tailed)			
Technological Capability	Pearson Correlation	.558**	1	
	Sig. (2-tailed)	.000		
Innovation	Pearson Correlation	.581**	.332**	1
	Sig. (2-tailed)	.000	.000	

Source: Research Data, 2024

Regression results

In this paper, three hypotheses were evaluated to examine the influence of technological capability and innovation on the sustainability performance of medium and large manufacturing firms in Nairobi County, as well as the mediating role of innovation in the relationship between technological capability and sustainability performance. The mediation analysis was conducted using Hayes' PROCESS Macro Model 4, which is widely recognized for its robustness in estimating direct and indirect effects in mediation models (Hayes, 2022).

The first hypothesis tested the direct effect of technological capability on sustainability performance. The results showed a statistically significant and positive relationship ($\beta = 0.3418$, $p = 0.000 < 0.05$), with a 95% confidence interval [0.2699, 0.4136], indicating that technological capability significantly influences firm sustainability performance. This is consistent with prior studies that have identified technological capability as a key driver of sustainable competitiveness and operational efficiency in firms (González-Benito & González-Benito, 2006; Liu et al., 2019). The R-squared value ($R^2 = 0.4878$) indicated that technological capability and innovation jointly explained 48.78% of the variation in sustainability performance, supporting Hypothesis 1.

The second hypothesis examined the direct influence of innovation on sustainability performance. Findings revealed a statistically significant positive effect ($\beta = 0.3990$, $p = 0.000 < 0.05$), with the confidence interval [0.3216, 0.4764], thereby supporting Hypothesis 2. This confirms previous literature suggesting that innovation enhances organizational adaptability, resource efficiency, and long-term competitiveness, all of which are essential for sustainability (Dangelico & Pujari, 2010; Schiederig et al., 2012).

The third hypothesis tested the effect of technological capability on innovation. Results indicated a positive and statistically significant relationship ($\beta = 0.3080$, $p = 0.000 < 0.05$), with a confidence interval [0.2085, 0.4075], and an R^2 value of 0.1101. This confirms that technological capabilities are foundational to the development and enhancement of innovative capabilities in firms, consistent with findings by Guan and Ma (2003) and Tsai and Wang (2005). Thus, Hypothesis 3 was supported.

Further, the mediation analysis confirmed that innovation partially mediates the relationship between technological capability and sustainability performance. The indirect effect was statistically significant (indirect effect = 0.1229, 95% CI [0.0386, 0.2032]), as the confidence interval did not include zero. This aligns with studies by Gunday et al. (2011) and Jabbour et al. (2020), which emphasize innovation as a strategic conduit through which technological investments contribute to sustainability goals.

Table 4: Regression results

Component	**Variable**	**Coefficient (B)**	**SE**	**t**	**p**	**95% CI [LLCI, ULCI]**
Mediator Model (INN)	Constant	2.8172	0.1835	15.36	.000	[2.4561, 3.1782]
	TC → INN	0.3080	0.0506	6.09	.000	[0.2085, 0.4075]
Outcome Model (FSP)	Constant	1.0735	0.1671	6.43	.000	[0.7447, 1.4023]
	TC → FSP (Direct)	0.3418	0.0365	9.36	.000	[0.2699, 0.4136]
	INN → FSP	0.3990	0.0393	10.14	.000	[0.3216, 0.4764]
Indirect Effect (TC → INN → FSP)	INN	0.1229	0.0420	–	–	[0.0386, 0.2032]

Note: INN = Innovation, SP = Sustainable Performance. Indirect effect significance based on 95% bootstrap CI not crossing zero.

Source: Research Data, 2024

CONCLUSION AND RECOMMENDATION

This study investigated the relationship between technological capability, innovation, and sustainability performance among medium and large manufacturing firms in Nairobi County, based on data from 302 respondents. The findings show that technological capability directly and significantly improves sustainability performance, confirming its important role in making operations more sustainable. In addition, innovation on its own helped improve sustainability performance, showing how important it is for environmental and

operational improvements. Research found that innovation acts as a partial mediator, showing that firms with advanced technology are more successful at sustainability when they use their advanced skills to develop new innovations. It is consistent with research mentioned in Gunday et al. (2011) and Jabbour et al. (2020) that show firms convert their technological strengths into achievements that sustain them long term by embracing innovation. Generally, the study reveals that strong technological capability and new innovation help each other to support sustainability in the manufacturing sector.

Because of these findings, a set of recommendations is suggested. First, businesses in manufacturing can invest in technology and learn more to build the base they need to achieve sustainability. This requires purchasing advanced systems, doing research and development and training employees to strengthen the company's sustainability-focused skills. Next, organizations should add innovation to their core business and day-to-day activities. This means creating a work environment that promotes new solutions to problems, ongoing progress and ideas brought forward by employees, mainly in resource management, waste reduction and eco-friendly products. Next, groups like the Kenya Association of Manufacturers and related government bodies ought to introduce policies and support systems that motivate companies to improve and introduce new technologies. The policies might involve reducing taxes for eco-friendly technology, granting money for new ideas or aiding in digital transformation. Finally, it is important for academic and training organizations to collaborate with private companies to create programs that teach manufacturing professionals how to control both new technologies and sustainability systems. When medium and large manufacturing businesses in Nairobi County combine technology with innovation, they can operate better, use fewer resources and remain competitive as the world shifts toward sustainable development.

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