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GREEN MANAGEMENT PRACTICES, GREEN INNOVATION, ORGANIZATIONAL CULTURE AND SUSTAINABILITY OF MULTINATIONAL MANUFACTURING FIRMS IN KENYA

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ST. PAUL'S UNIVERSITY

A THESIS SUBMITTED TO THE SCHOOL OF BUSINESS AND LEADERSHIP STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY OF BUSINESS ADMINISTRATION OF ST. PAUL'S UNIVERSITY

JULY, 2026

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DECLARATION

This dissertation is my own work and has not been presented for examination in any other University.



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Supervisors Declaration

This dissertation has been submitted for examination with our approval as the University supervisors.



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DEDICATION

To my beloved wife, I dedicate this dissertation with profound gratitude and love. Your unwavering support, patience, and encouragement have been the cornerstone of my journey. Throughout the long hours of research, writing, and reflection, your understanding and sacrifices allowed me to remain focused and committed to this endeavor. Your wisdom, guidance, and faith in my abilities provided not only emotional strength but also intellectual inspiration, reminding me always of the purpose and meaning behind this pursuit. This accomplishment is as much yours as it is mine, for without your enduring presence and love, this milestone would not have been possible.

To my cherished children, I dedicate this work to you with boundless love and hope. Your laughter, curiosity, and innocent wonder have been a constant source of motivation, reminding me why the pursuit of knowledge is worthwhile. May this achievement serve as a living example of dedication, resilience, and the rewards of persistent effort. I hope it inspires you to dream ambitiously, embrace learning, and pursue your passions relentlessly. You have been my greatest joy, and every step I took toward completing this dissertation was made lighter and more meaningful because of your presence in my life.

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I am also deeply thankful to my family, whose love, understanding, and encouragement were a constant source of strength throughout this journey. To my colleagues and friends, your motivation, advice, and collaborative spirit played a significant role in sustaining my focus and determination. I recognize that this achievement would not have been possible without the collective support of everyone who contributed to this work, whether directly through guidance or indirectly through encouragement. Your belief in me has left an enduring impact, and I remain sincerely appreciative of all the support I have received along the way.

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ABSTRACT

Green management practices have become increasingly crucial for organizations seeking to maintain competitiveness while fulfilling environmental responsibilities. Multinational manufacturing firms in Kenya face growing international and domestic pressure to integrate sustainability into their operations to enhance competitiveness, comply with regulatory requirements, and meet stakeholder expectations. This study examined the relationship between green management practices, green innovation, organizational culture, and sustainability in multinational manufacturing firms in Kenya. Specifically, it investigated the direct influence of green management practices on sustainability, the mediating roles of green innovation and organizational culture on the relationship between green management practices and sustainability, and the joint effect of green management practices, green innovation, and organizational culture on outcomes. The study is anchored on the natural resource-based view, dynamic capabilities theory, institutional theory, and stakeholder theory. Adopting a positivist philosophy and explanatory research design, the study surveyed 95 managers from 95 multinational manufacturing firms using a census approach. Data were collected through structured questionnaires and analyzed using descriptive statistics and Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings indicate that green management practices significantly and positively influenced sustainability. Moreover, both green innovation and organizational culture fully mediated the relationship between green management practices and sustainability, while the combined effect of green management practices, green innovation, and organizational culture significantly enhanced sustainability outcomes. These results demonstrate that sustainability in multinational manufacturing firms is maximized when managerial practices, innovative capabilities, and a supportive organizational culture are aligned. The study contributes theoretically by empirically integrating green management practices, innovation, and organizational culture within a comprehensive sustainability framework, advancing the literature in developing-country manufacturing contexts. Practically, the findings offer guidance for managers to prioritize innovation and foster a sustainability-oriented organizational culture alongside implementing green practices, while policymakers are provided with evidence to design supportive frameworks that incentivize sustainable industrial practices. The study recommends further research to explore the moderating role of institutional pressures, digital green technologies, and organizational size on sustainability outcomes, as well as longitudinal designs to capture temporal dynamics in green management adoption.

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DEFINITION OF KEY TERMS

Green innovation	This is the development of products, processes, and practices that reduce environmental harm and ecological footprint across the entire life cycle of a product
Green Management Practices	The integration of environmentally friendly policies, technologies, and procedures into all areas of organizational operations such as sourcing, production, distribution, and waste management with the goal of balancing economic performance and ecological sustainability.
Green procurement	Involves purchasing goods and services with minimal environmental impact. It's a process that considers the entire life cycle of a product, from its production to its disposal, and aims to reduce resource consumption, pollution, and waste generation
Green Marketing	This involves promoting products and services based on their environmental benefits and sustainable practices.
Green operations	It is known as sustainable operations and involves integrating environmentally friendly practices into business processes to minimize negative impacts on the environment.
Multinational manufacturing	This refers to the production activities of a company in countries outside of its home country, often through foreign subsidiaries or affiliates
Organizational culture	These are the shared values, norms, and practices that guide employee behavior and decision-making within a firm, influencing how environmental initiatives such as green management and innovation are adopted and sustained
Sustainability	In this study, refers to the ability of multinational manufacturing firms to achieve long-term viability by integrating environmental, social, and economic goals in a way that preserves resources for future generations
Waste Management practices	Involves a range of techniques aimed at minimizing the negative impact of waste on the environment and human health. The practices include waste reduction at the source, reuse, recycling, composting, incineration, and landfilling. The desirable approach is waste prevention, then reuse, recycling, and lastly, disposal through incineration or landfilling

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LIST OF ABBREVIATIONS AND ACRONYMS

CIS	Community Innovation Surveys
COMESA	Common Market for Eastern and Southern Africa
EAC	East Africa Community
GCR	Green Compensation and Reward
GDP	Gross Domestic Product
GEI	Green Employee Involvement
GI	Green Innovation
GM	Green Management
GMM	Generalized Method of Moments
GMPs	Green Management Practices
GOC	Green Organizational Culture
GPM	Green Performance Management
GRS	Green Recruitment and Selection
GTD	Green Training and Development
HRM	Human Resource Management
ISERC	Institutional Scientific and Ethical Review Committee
KAM	Kenya Association of Manufacturers
MNEs	Multi-National Enterprises
NACOSTI	National Commission for Science, Technology and Innovation
SDGs	Sustainable Development Goals
SEM	Structural Equation Modeling
SPSS	Statistical Packages for Social Sciences
TRGB	Task-Related Green Behaviors
USA	United States of America
VGB	Voluntary Green Behaviors

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CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Sustainability has transformed from a choice for corporations to an absolute standard of competitive performance and organizational sustainability, especially for multinational manufacturing organizations operating in emerging markets with resource constraints, environmental fragility, and greater involvement in the global supply chain network. Indeed, anecdotal evidence shows that sustainability has become a strategic imperative that influences firms' legitimacy, resilience, and competitive advantage (Gomez-Trujillo et al., 2023). In this context, green management practices (GMPs) have emerged as an indispensable tool for managing organizational activities to mitigate environmental impact and increase efficiency. Moreover, green innovation plays a crucial role in linking GMP with sustainability initiatives by helping organizations to create more environmentally friendly products, technologies, and processes that are profitable for the environment and financially sustainable. As important as GMPs, organizational culture needs to be taken into account since it is a set of values and behavioral norms in organizations that influence their adoption and institutionalization of green initiatives (Mutunga, 2024).

Both empirical and theoretical literature have been able to establish a direct connection between GMPs and sustainability performance. Advocates hold that GMPs contribute positively to sustainability by minimizing resource waste, adhering to environmental standards, and enhancing legitimacy among stakeholders (Opoku, 2025). Companies pursuing strong environmental initiatives are likely to record high triple bottom line performances that include economic, social, and environmental aspects (Khan et al., 2023). However, contrary evidence, especially from emerging economies, shows that implementing GMP can lead to symbolic adoption, where poor institutional environments give businesses an opportunity to show green credentials but do not lead to significant sustainability impacts (Acquah et al., 2021). This contradiction reveals the fact that although GMP are needed, they are not enough by themselves to ensure sustainability.

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Green innovation is considered a crucial mediator responsible for converting GMP into actual sustainability outcomes. Innovation includes the development and adoption of solutions designed to minimize environmental damage, increase resource productivity, and save money (Hu et al., 2022). Through enabling efficiency and differentiation in the marketplace using eco-solutions, green innovation serves as the intermediary through which GMP contributes to sustainability performance (Le et al., 2022). Although the mediation function of innovation has been understudied in the context of African multinational manufacturing organizations, it is particularly relevant to countries experiencing resource limitations, technological transfers, and inadequate policy regimes compared to developed nations.

Organizational culture is another key mediator that similarly defines how far the GMPs and leads to sustainable results. Companies with a strong green culture create less internal resistance to change, increase employee involvement in sustainability programs, and integrate environmental values into everyday business (Noor Faezah et al., 2024). These cultures not only promote pro-environment actions but also innovation, as employees' efforts resonate with the corporate body's sustainability targets. When there is no such culture within an organization, the GMPs can only be adopted at face value without contributing to any real success towards sustainability (Yazdi, 2025). Leadership commitment, extensive training of employees, and incorporation of environmental stewardship into organizational values, mission, and routine are effective green cultures.

Sustainability has become a strategic requirement worldwide, guided by initiatives like the UN Sustainable Development Goals (SDGs), the Paris Climate Agreement, and ESG reporting standards. The idea of the circular economy, green innovation, and related approaches has gained the focus of multinational companies to address industry standards and stakeholder needs (Ostic et al., 2025). However, the climate change politics on a global scale, including the departure of the U.S. from the Paris Accord in 2020, reaffirm the vulnerability of international climate governance and emphasize the current tension between developed and developing states in terms of the speed and the amount of sustainable action (Williams & Studies, 2025; Kinley et al., 2021). Nevertheless, these

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issues have been overcome, and the evidence shows that GMPs can create tangible advantages in terms of competitiveness, efficiency, and resilience, which proves the topicality of the current research in assessing how multinational companies realistically implement sustainability beyond its nominal form (Simionescu, 2024).

Sub-Saharan Africa is experiencing the twin anguish of trying to move towards industrialization and trying to manage the fragile environmental processes and socio-economic limitations in the region. The African Union (AU) and East African Community (EAC) are among institutions that have advocated sustainable industrialization as a tool for inclusive growth, as stipulated by the Agenda 2063 of the African Union. However, African manufacturing industries always face certain major challenges, such as the inability to access green technologies, insufficient regulations, and inadequate financial capacities, which restrict their ability to implement green business on a systematic basis (Escoto et al., 2022; Bhattacharjee et al., 2025). These restrictions increase the dilemma of achieving economic growth and environmental care, which is usually a feature of partial or symbolic enactment of sustainability strategies.

Sustainability has become a major concern in Kenya's manufacturing industry, which is being geared towards long-term industrial transformation. Stakeholders are increasing their pressure on multinational corporations to reduce carbon emissions, improve waste management, and implement corporate social responsibility initiatives (Srivastava, 2024). Nevertheless, the efficiency of these sustainability policies is usually limited by structural realities, including the undesirable implementation of environmental regulations, high production prices, and imbalanced infrastructural systems (Amoah & Eweje, 2021). Adoption is often symbolic, intended to enhance reputational legitimacy rather than to have a practical effect on the environment (Haack & Rasche, 2021). However, Kenyan multinational companies are becoming pressured to adhere to international sustainability regulations as they become part of global supply chains, where failure to do so might reduce their access to markets and make them less competitive (Singh, 2023).

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The motivation behind this research is based on gaps both theoretically, empirically, and practically. While there have been attempts within the existing literature to show the link between GMPs and sustainability, the literature remains quite inconsistent, especially in the case of developing countries (Andoh-Baidoo et al., 2024). The bulk of the empirical literature focuses on developed economies, and there is a lack of context-specific information based on African multinational firms, even though they are more exposed to global environmental sustainability demands (Belal et al., 2024). This gap limits the formulation of specific strategies to address the operational, regulatory, and infrastructural peculiarities of firms operating in Kenya and across Sub-Saharan Africa. Besides, theoretical knowledge of how GMPs can be converted into quantifiable sustainability performance is insufficient, especially regarding the mediating effects of green innovation and organizational culture (Al-Hakimi et al., 2025).

1.1.1 Sustainability

Different definitions have been developed regarding the meaning of sustainability owing to the nature of this term. Sustainability according to Singh (2023) is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This description captures issues such as environmental protection and intergenerational equity in particular. Dichmont et al. (2021) go further and describe sustainability at the corporate level by viewing sustainability as balancing economic, social, and environmental goals, commonly referred to as the triple bottom line strategy. According to Stupak et al. (2021), sustainability can be delineated as embedding ecological and social considerations into business decision-making for the sake of legitimacy and organizational survival. Drawing on this plethora of definitions, this study defines sustainability as the ability of organizations to create lasting value by balancing economic, social, and governance concerns to achieve competitive advantage in international markets against the backdrop of socio-ecological conditions prevailing in Kenya.

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The concept of sustainability is of utmost importance in theory and practice since it dictates organizational permanence, validity and sustainability. Sustainability is theoretically grounded in the natural resource-based perspective and stakeholder theory, according to which the longevity of firms depends on their ability to use ecological resources appropriately and meet societal demands (Freeman et al., 2021). In practice, sustainability helps companies to increase the efficiency of their operations, make them more trusted by the stakeholders, and contribute to socio-economic progress, especially in industries where the environmental and social influence is considerable, such as multinational manufacturing (Haack & Rasche, 2021). Despite its recognized significance, there have been gaps and discrepancies in the literature on how sustainability can be operationalized and measured, especially within the context of developing countries, where the empirical data on how to integrate the social, environmental and economic aspect has not been a priority. These gaps warrant specific research on sustainability attainment and measurement among Kenyan multinationals in manufacturing.

To operationalize sustainability, this research used indicators based on the triple bottom line framework, focusing on the economic, social, and governance aspects. Economic indicators measure financial performance, profitability, and efficiency; social indicators measure employee welfare, community involvement, and contributions to society; and governance indicators measure adherence to regulation, transparency, and accountability (Belal et al., 2024). Such indicators apply to a Kenyan multinational manufacturing setting, correspond to the global sustainability reporting standards, and are backed up by previous empirical studies (Geng et al., 2021). They are also viable, quantifiable, and credible to offer a strong foundation for measuring sustainability performance in companies, comparability across industries, and alignment with local and international sustainability standards.

1.1.2 Green Management Practices

The conceptualization of GMPs has taken place in a number of different ways, and the concept is multidimensional and thus complex. The International Organization of Standardization (ISO, 2015) defines GMPs as organized environmental control processes

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that seek to reduce ecological footprint by effectively managing resources, reducing pollution, and adhering to environmental standards. Covarrubias et al. (2022) delineate GMPs as an intentional inclusion of environmental factors into business operations, work, and production systems to deliver ecological and economic advantages. On the same note, Farrukh et al. (2022) suggest that GMPs are organizational procedures that lower waste, pollution, and hazardous products during the production process, and also promote productivity and resource utilization. Based on these views, this research construes GMPs as planned and intended organizational patterns and routines through which environmental concern is integrated into fundamental manufacturing procedures to minimize environmental degradation, enhance operational effectiveness, and align with local and global environmental sustainability standards.

Moreover, GMPs are important factors that help promote sustainability and give companies competitive advantage. GMPs are grounded in the natural resource-based perspective, which states that organizations that create environmentally responsible capabilities are resilient in the long term, legitimate, and high-performing (Sharma et al., 2023). Also, GMPs help minimize resource waste, reduce operational costs, comply with regulations, and increase stakeholder legitimacy (Opoku, 2025). GMPs in multinational manufacturing companies are vital in ensuring that they meet international standards and also penetrate into those markets where sustainability certifications are a prerequisite. Yet, the empirical evidence is ambivalent: some researchers have argued that GMPs lead to high levels of sustainability benefits; others suggest that, in developing nations, weak institutional enforcement can restrain GMPs to symbolic programs with little environmental or social effect (Gilmore et al., 2023). These inconsistencies highlight the need to empirically examine the impact of GMPs on sustainability outcomes within Kenyan multinationals operating in the manufacturing sector.

GMPs are traditionally measured using common indicators that are based on environmental management frameworks and previous studies (Khanam et al., 2023). Indicators such as energy efficiency, waste reduction, air emission regulations, and recycling and re-use are commonly used (Yu et al., 2024). These indicators are conceptually based on sustainability

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and natural resource-based approaches, are consistent with the empirical research studies done in the emerging economies, and offer measurable and reliable data that is applicable to the Kenyan manufacturing context. Through focusing on these metrics, the study guarantees the alignment of its study with the international standards of sustainability, as well as the operational realities of the multinational manufacturing firms in Kenya, providing a sound basis for evaluating the impact of GMPs on the sustainability results.

1.1.3 Green Innovation

A plethora of definitions of green innovation have been used to reflect the versatile nature of the concept in varied organizational contexts. According to Oussama and Oluyede (2022), the concept of eco-innovation is general and describes it as innovating products, processes, or services with a lower environmental impact and a higher level of resource efficiency. Triguero et al. (2023) frame green innovation more operatively as the launch of new or markedly better products and production procedures that are particularly set to accomplish environmental targets across a product life cycle. Shehzad et al. (2022) delineate green innovation as one of the firm-level capabilities that include managerial practices, employee behavior, and knowledge flows that allow solving problems sustainably and improving constantly. Combining these views, this study views green innovation as the deliberate design and sharing of environmentally friendly products, processes, and managerial practices with organizational learning and the use of technology that would significantly minimize environmental impact but create financial and competitive value to multinational manufacturing firms operating in Kenya.

Green innovation is conceptually important because it clarifies how upstream GMPs translate into measurable sustainability outcomes. It represents a physical, organizational, and technological transformation that transforms GMPs into fewer emissions, less energy usage, and efficient utilization of materials and marketable eco-products (Tanaka, 2022). GMPs, which include policies, investments, and environmental systems, must have mechanisms such as green innovation to translate strategic intentions into operational and measurable results (Yu et al., 2024). In practice, a focus on green innovation assists

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companies in making a difference between significant environmental changes and greenwashing.

Firms that invest in and internalize innovation potential have higher chances of achieving cost reduction, differentiation of products, and compliance with regulations instead of superficial reputational benefits (Moon et al., 2025). Irrespective of this centrality, there are still some gaps in the areas of empirical evidence, that is: how technology transfer, resource constraints, and local institutional circumstances influence the innovation pathway, and how little exists on the topic of green innovation as an intermediary in the multinational manufacturing setting in developing countries. These gaps make it appropriate to employ green innovation as a mediator in the current study, as it has the ability to connect the GMPs to sustainability and has an empirical blind spot concerning how firms in Kenya translate environmental policies into actionable results.

In this study, green innovation is empirically quantified by four measures, namely eco-friendly product development, green process innovation, green R&D investment, and renewable energy technology. These indicators reflect both technological and organizational aspects of green innovation that represent the ability of a firm to produce sustainable products, process improvement, investments in environmental solutions research, and the use of renewable energy technologies. Recent research such as Wang et al. (2022) and Hafeez et al. (2024) confirms that, to operationalize the idea of green innovation, mixed indicators of organizational routines and technological advances are very important. The indicators used in the study are also relevant, reliable, and contextually appropriate for evaluating the extent to which Kenyan multinational manufacturing firms translate GMPs into practical sustainability outcomes.

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1.1.4 Organizational Culture

Organizational culture is multidimensional and central to behavior, coordination of actions, and the alignment of organizational strategies with long-term objectives. According to Saratian et al. (2025), organizational culture is delineated as a pattern of common basic assumptions acquired by a group in solving problems of external adaptation and internal integration, having a structural and cognitive aspect. Nurimansjah (2023) views culture in

a functionalist way and explains it as the collective programming of the mind that makes members of a particular organization different, i.e., shared values and norms that dictate ways of interacting. From a behavioral perspective, Caligiuri et al. (2024) pay attention to practices, rituals, and symbols that are observable and regulate everyday activity. By amalgamating these views, this research identifies organizational culture as the set of common values, norms, and practices that determine how members interact, how decisions are made, and how sustainability goals can be attained. This definition includes structural, behavioral, and functional aspects, which is why it is applicable in the study of culture as the supporter of the connection between GMPs and sustainability results.

The organizational culture is a very important mediator in that it determines the internalization and transformation of GMPs into a sustainable performance. Culture, in theory, aligns strategic objectives with operating practices, allowing companies to respond to external environmental factors and successfully incorporate internal practices (Nurimansjah, 2023). Practically, it motivates employee participation, supports the innovation process, and promotes the efficiency of sustainability practices, which explains how GMPs can shape sustainability results (Linnner & Wibeck, 2021).

Flexibility, shared responsibility, and continuous learning are the cultures that are associated with a greater likelihood of supporting GMPs and promoting long-term performance (Ahsan, 2024). Culture is especially significant in multinational companies where organizations are juggling between the demands of global sustainability and the institutional realities of local areas (Caligiuri et al., 2024). However, there are conflicting empirical data: adaptive and collaborative cultures correlate with better innovation and sustainability performance, and the inflexible or disintegrated cultures can prevent the introduction of environmental programs (Saratian et al., 2025). These gaps make it important to research organizational culture as an intermediary in investigating sustainability outcomes in Kenyan multinational manufacturing corporations.

To conduct this research, the organizational culture was operationalized through four main indicators, namely commitment to environmental values by top management, collaboration and teamwork, communication of environmental issues, and reward systems that

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encourage green behavior. Top management commitment keeps sustainability as a priority at the strategic level, indicating its relevance to employees and stakeholders (Nurimansjah, 2023). Teamwork and collaboration encourage shared ownership of environmental projects, which encourage people at all levels to participate. Environmental reporting increases openness, information exchange, and consistency of sustainability goals within the departments. Reward systems encourage environmentally responsible behavior, and employees are encouraged to incorporate sustainability into their daily activities. Empirical studies have shown that these indicators strongly affect a firm's ability to entrench sustainability in its operations and enhance environmental performance (Aggarwal & Agarwala, 2022). These combined actions offer a sound and practically useful model for assessing the effects of organizational culture on sustainability in multinational Kenyan manufacturing companies.

1.1.5 Multinational Manufacturing Firms in Kenya

Kenya's manufacturing industry has seen phenomenal growth and transformation in the past 50 years since industrialization, foreign direct investment (FDI), and regional integration through trade were in place. Since the sector became independent in the 1960s, the industry expanded due to the import-substitution models, which attracted multinational corporations (MNCs) who were keen to localize their output to cater to the local market. Competition and efficiency emerged in the 1990s due to economic liberalization, and Kenya Vision 2030 incorporated manufacturing as the primary aspect in the country's development. Recent activities such as industrial parks, special economic zones, and collaboration between the government and businesses, among others, have only added to the success of Kenya for multinationals. These firms have now become central to job creation, technology transfer, and export diversification, positioning Kenya as a manufacturing hub in East Africa (UNIDO, 2022; World Bank, 2023). However, over time, these changes have also led to a gradual shift towards sustainability, as companies begin embedding green objectives into their corporate strategies so that competitiveness does not undermine environmental responsibility.

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The politics of the regulatory environment of the multinational manufacturing companies in Kenya can be seen as an illustration of the priorities in the country and international relations. At the national level, the Kenya Industrial Transformation Programme (KITP) explains the approach that should be used in the competitiveness of industries, and the Kenya Bureau of Standards (KEBS), Kenya Revenue Authority (KRA), and National Environmental Management Authority (NEMA) are the agencies that regulate quality assurance, taxation, and environmental compliance, respectively. At the regional level, Kenya is a part of the East African Community (EAC) and the African Continental Free Trade Area (AfCFTA), in which the country has more access to the markets, and standardized requirements that characterize multinational business. The impact of global laws, including the UN Sustainable Development Goals (SDGs) and the Paris Climate Agreement, is also very strong, and companies are obliged to adhere to the international requirements of sustainability and climate-resilient operations (Chandel et al., 2025). Such frameworks have concentrated on sustainability reporting of corporations over the last few years on sustainability performance measures such as energy efficiency, carbon emissions, waste reduction, and social equity, which is a transition from compliance-based criteria of sustainability reporting to a performance-based sustainability framework.

This aspect has seen multinational manufacturers in Kenya growing under pressure to use green management systems that eliminate environmental footprint without undermining the needs of the more environmental conscious consumers and the controlling agencies. The adoption of renewable energy, the creation of environmentally friendly production, and the creation of a circular economy have risen and are indicative of a good sustainability trend among the leading companies, including Unilever, BAT, and EABL, which have registered significant water and energy intensity reductions (Narikiyo et al., 2025). However, loopholes still exist within the industry, wherein a large number of firms still operate on a fossil basis, face technological and financial constraints, and have intermittent environmental reporting. This has seen the development of green innovation as a major driver of sustainability, whereby companies are investing in greener technologies and greener product development, although the implementation of green innovation is still unequal. In line with this, the organizational culture has exhibited varying levels of

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maturity in, absorbing the values of the environment and the participation of employees in the sustainability projects.

The overall trend points to the increasing sustainability performance, particularly in the environmental and reputational aspects, but the social and governance aspects are yet to increase. Together, the historical progress, regulation, and the implementation of the sustainability trends in the multinational manufacturing enterprises in Kenya create the need for an integrated approach that would lead to the establishment of the connection between the GMPs, green innovation, and organizational culture on the one hand and sustainable performance on the other. Kenya's efforts to become a regional hub in the manufacturing industry have been tremendous, though disparities in the application of sustainability practices point to gaps between organizational realities and policy targets. These gaps are essential to the development of theoretical knowledge of sustainability transitions in developing countries, yet they also help businesses meet global sustainability requirements and inform evidence-based policymaking. Since Kenya is becoming a part of the wider discussion of sustainable manufacturing, the study allows addressing the existing gaps in the empirical and theoretical research and generating findings that can be utilized by scholars, entrepreneurs, and policymakers.

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1.2 Statement of the Problem

Sustainability has become an important strategic need of multinational corporations that has compelled them to align operations according to environmental, social, and economic goals. Empirical studies have established that companies with a sustainability orientation tend to be more efficient and cost-effective in their operations and, therefore, more profitable (Taneja et al., 2023). Nonetheless, there is an observed uneven adoption of sustainable practices depending on the regions, and this is greatly determined by institutional capacity, enforcement of regulations, and the existing organizational culture. Poor infrastructure, insufficient technological advancement, and poor policy enforcement are some of the issues that limit firms in incorporating sustainable practices in Sub-Saharan Africa, where firms are frequently constrained by using outdated technologies that lead to inefficiencies and polluting the environment (Zhang et al., 2025).

In Kenya, manufacturing currently accounts for only 7.2% of the national GDP compared to the 20% that the government has set (2023 Economic Survey-Kenya National Bureau of Statistics). This poor performance reflects institutional challenges such as low uptake of GMPs, low energy consumption, and poor waste management. Although the GMPs are theoretically constructed to increase resource efficiency, minimize waste, and improve organizational legitimacy, the empirical evidence on their effectiveness in the realization of sustainability outcomes is inconclusive. Research indicates that the effects of GMPs are usually mediated by the influence of environmental initiatives through factors like green innovation and organizational culture that transform environmental initiatives into measurable performance outcomes (Al-Hakimi et al., 2025). But in developing economies, it is observed that companies often adopt GMPs as a facade instead of an actual practice, which causes little or no ecological or social effect (Crossley et al., 2021).

These dynamics are further supported by international studies, but important gaps are noted. Existing studies indicate that in developed economies, green innovation and organizational culture can greatly improve sustainability outcomes, but these results may not directly apply to developing countries because institutional and market environments differ (Wang et al., 2024). In Sub-Saharan Africa, there is a paucity of empirical inquiries. For example, Abbas et al. (2021) focused on green human resources management in state universities but not in multinational manufacturing companies, creating a sectoral contextual gap. Similarly, meta-analyses and surveys (Bindeeba et al., 2025; Ahakwa et al., 2024; Al-Masud et al., 2025) also show the mediating effect of innovation and green competencies in sustaining performance, but this is confined to the Kenyan manufacturing context. The conceptual background of the role of green management can be endorsed by other research on the topic of GMPs and environmental management practices (Bour, 2023; Garad & Khalifa, 2024; Okeke et al., 2025), but the majority of studies consider the GMPs and environmental management practices within the context of SMEs or developed countries, and few studies focus on the organizational culture as a mediating factor.

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In Kenya, manufacturing companies are under pressure to comply with regulations and meet the demands of a sustainable environment, but empirical data on the dependence of GMPs, green innovation, organizational culture, and sustainability are limited. Although GMPs are becoming more popular, the practical application of them, which is mediated by the green innovation and organizational culture aspect, is not clear, especially among multinational manufacturing companies that have a significant influence on the industrialization of the country and its environmental performance. This knowledge gap is compounded by inconsistent attention to innovation and cultural mechanisms and by a lack of empirical studies employing sound statistical methods like PLS-SEM to measure the mediating variables.

Accordingly, the main problem this research addresses is that, in Kenya, multinational manufacturing companies can implement GMPs without adequate development of green innovation and organizational culture, which restricts the achievement of quantifiable sustainability benefits. The study aimed to empirically test the effect of GMPs through the mediation of green innovation and organizational culture on sustainability, creating context-specific findings that would close gaps in the literature in both theoretical and empirical terms.

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1.3 Objectives of the Study

1.3.1 General Objective

The main objective of the study was to determine the relationship among green management practices, green innovation, organizational culture, and sustainability of multinational manufacturing firms in Kenya.

1.3.2 Specific Objectives

The specific objectives were to: -

i. Examine the relationship between green management practices and sustainability of multinational manufacturing firms in Kenya.
ii. Establish the mediating role of green innovation on the relationship between green management practices and sustainability of multinational manufacturing firms in Kenya.

iii. Determine the mediating role of organizational culture on the relationship between green management practices and sustainability of multinational manufacturing firms in Kenya.

iv. Establish the joint effect of green management practices, green innovation, and organizational culture on the sustainability of multinational manufacturing firms in Kenya.

1.4 Research Hypotheses

The hypotheses were:

H_{01} There is no significant relationship between green management practices and sustainability of multinational manufacturing firms in Kenya.

H_{02} There is no significant mediating role of green innovation on the relationship between green management practices and sustainability of multinational manufacturing firms in Kenya.

H_{03}: There is no significant mediating role of organizational culture on the relationship between green management practices and sustainability of multinational manufacturing firms in Kenya.

H_{04}: The joint effect of green management practices, green innovation, and organizational culture does not significantly influence the sustainability of multinational manufacturing firms in Kenya.

1.5 Significance of the Study

The study contributes significantly to both theory and policy and practice, besides providing methodological insights. Theoretically, it contributes to the knowledge on the interaction of GMPs in relation to the organizational culture and green innovation to determine sustainability outcomes in multinational manufacturing companies. Although previous studies have recognized the importance of green innovation and GMPs in strengthening triple-bottom-line performance, the results are fragmented and inconsistent across settings. By incorporating the variables into the Kenyan multinational manufacturing environment, this research builds on frameworks such as stakeholder theory and the natural resource-based view. This illustrates the conversion of environmental

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strategies into visible sustainability results by organizational mechanisms, thus bridging gaps in theory in relation to the operationalization of sustainability in emerging economic systems with different institutional structures.

Policy-wise, the findings give actionable advice to policymakers, regulators, and the institutions of the government that have a role in ensuring sustainable industrial growth. Given the strategic significance of green development in Kenya's Vision 2030 and the Sustainable Development Goals, the empirical evidence provided in the study guides policies aimed at promoting the implementation of GMPs, establishing sustainable organizational culture, and promoting green innovation. The study is useful to policymakers in formulating regulatory frameworks, promoting technology transfer, and influencing multinational companies to integrate sustainability into their operations by identifying the key enablers and barriers to sustainability.

In practice, the findings offer managers of multinational manufacturing companies' insights into effective sustainability strategies. It shows that efficiency, performance, and competitiveness can be increased by implementing GMPs into the working processes, developing an environmentally-aware organizational culture, and investing in green innovation. The results include practical solutions to transcend beyond symbolic compliance and establish enduring and quantifiable environmental, social, and economic values, especially where the firms are under resource limitations, stakeholder scrutiny, and conflicting operational interests.

The methodological contribution of the study is that it used PLS-SEM and multi-mediation analysis to investigate the complex causes and effects between GMPs, green innovation, organizational culture, and sustainability. This method also includes direct and indirect impacts, which is a powerful tool for analyzing mediating processes. The methodology defines a research design that can be replicated in future similar studies and makes sustainability research more rigorous and reliable in emerging economies.

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1.6 Scope of the Study

This study examined the link between GMPs and sustainability performance among multinational manufacturing firms that were active in Kenya, and the mediating effects of organizational culture and green innovation. GMPs were evaluated based on four major dimensions, including energy efficiency, waste reduction, air emission control, and recycling and re-use, which sum up how much firms consider the environmental factor in sourcing, production, operations, and positioning in the market. The concept of green innovation was operationalized using the indicators that included the development of green products, improvements in processes, investment in green research and development (R&D), and the utilization of renewable energy technologies. Organizational culture was measured through top management commitment to environmental values, teamwork and collaboration in sustainability activities, communication of environmental concerns, and reward systems that encouraged environmentally friendly behavior. The conceptualization of sustainability performance was based on a holistic approach of economic, social, and governance indicators and was aligned with internationally accepted standards of sustainable business practices.

Geographically, the research targeted multinational manufacturing companies in the various industrial centers in Kenya. These companies were chosen because they have played a great role in the development of industry, integration into global supply chains, and because they follow strong international standards of sustainability, which made them one of the main drivers of the green change in the region. The Kenya regulatory and competitive environment, influenced by efforts like the Kenya Industrial Transformation Program and the bigger regional-level policies of green industrialization, offered an appropriate background to the study of the implementation and adaptation of GMPs, innovation, and the organizational culture to deliver a sustainable outcome.

The study observed key trends over the period between 2018 to 2025, the time when the world and the region experienced significant interest in sustainability, leading to the implementation of the United Nations Sustainable Development Goals (SDGs) and the Paris Climate Accord. The time frame provides a good context to understand the pressing

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need for companies to become greener, increase environmental compliance, minimize waste in industries, and deploy sustainable technologies, giving a timely and pertinent context to the research problem of how GMPs, green innovation, organizational culture, and sustainability performance interact.

Methodologically, the research targeted all 95 multinational manufacturing firms registered with the Kenya Association of Manufacturers, with the top managers and decision-makers being the key units of analysis. Based on the positivist philosophy, the research adopted an explanatory research design to explore the causal effects among GMPs, green innovation, organizational culture, and sustainability. The collected data was analyzed by means of PLS-SEM, which made it possible to robustly model complex relationships with multiple mediators, which is why the study was able to identify direct, indirect, and total impacts of GMPs on the sustainability outcomes via green innovation and organizational culture.

1.7 Organization of the thesis

To achieve a clear and systematic presentation of the research process, findings, and implications, the thesis is divided into five chapters. Chapter one lays the background of the study by placing the GMPs, green innovation, organizational culture, and sustainability in the context of multinational manufacturing firms in Kenya. This chapter provides the background to the study, the statement of the problem, and the objectives of the research. It also highlights the study objectives, hypotheses, significance, and scope of the study. Chapter one provides the basis for understanding the relevance and contribution of the research by providing the rationale of the study and the contextualization of the research to the local and global sustainability initiatives.

The second chapter a review the literature available concerning the study variables. It gives an in-depth theoretical review, which includes the natural resource-based theory, dynamic capability theory, institutional theory, and stakeholder theory, and presents how each has been used to form the research constructs. The chapter also summarizes the empirical research works of GMPs, green innovation, organizational culture and sustainability performance and this leads to the gaps that are filled by the current study. Conceptual

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framework devised created and explained and it shows the hypothetical relationships existing among variables and helps in formulating the research hypotheses.

The third chapter provides the research methodology that was used in response to the objectives of the study. It provides the description of the philosophical basis, research design, population and collection of data. Another aspect elaborated in the chapter is the process of preparing and validating research tools, pilot testing, ethical issues and data collection and management procedures. Besides, it explains the diagnostic tests used and the models employed to examine the relationships among variables, such as the application of PLS-SEM to evaluate both direct and indirect relationships among GMPs, organizational culture, green innovation, and the sustainability outcomes.

Chapter four reports the empirical results of the study. The chapter starts with the descriptive statistics and moves on to the evaluation of measurement and structural models. It describes the test of hypotheses, mediation tests, and explanation of the linkages among the study variables. The results are analyzed against the theoretical framework and available literature, and the benefits of the study to the theory and practice are identified.

Chapter five is the conclusion of the thesis in which the main findings are summarized and the conclusions are made based on the facts provided. The chapter is a discussion of the theoretical, practical, and policy implications of the research, recommendations to practitioners and policymakers, limitations of the research, and recommendations of the proposed research in future. Chapter five offers a detailed conclusion of the research in the process of integrating the study findings with the larger sustainability and organizational practices.

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CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter presents the theoretical framework of the study, indicating the central theory and supporting theories applicable to GMPs, green innovation, organizational culture, and sustainability. Moreover, the chapter examines the available empirical literature and summarizes the way previous researchers and authors have studied the related issues. The review helps define the gaps in the research and informs the study objectives and hypotheses. The discussion incorporates international and Kenyan contexts to ensure relevance. Finally, it provides the conceptual framework, outlining the relationships among the study's main variables.

2.2 Theoretical Review

This study is grounded in the Natural resource-based theory (NRBT), which states that a firm's competitiveness and long-term survival depend on its ability to manage natural resources effectively, as well as on environmentally based strategies. NRBT offers the main prism through which one ought to view the case of GMPs in multinational manufacturing companies in Kenya and the ways in which these companies incorporate green management in their production processes to realize sustainable economic, social, and environmental impacts. Dynamic capability theory, which focuses on the ability of a firm to be flexible and reorganize its resources to use in bringing green innovations, Institutional theory, which focuses on the impact of regulatory, social, and normative pressure on the adoption of sustainability, and stakeholder theory, which highlights the role of both internal and external stakeholders in encouraging the adoption of green practices, all support the study. These theories combine to provide a holistic approach to investigating the role of organizational capabilities, external pressures, and stakeholder involvement in sustaining performance.

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2.2.1 Natural Resource-Based Theory

Hart (1995) naturalized the traditional Resource-Based View (RBV) by introducing environmental issues to the strategic management model, which he termed natural resource-based theory (NRBT). Unlike the RBV, where internal resources and capabilities are the antecedents of competitive advantage, NRBT presupposes that the abilities of firms to react to environmental pressure and build long-term sustainable capabilities are relevant to long-term competitive advantage (Alkaraan et al., 2024). This theory is a key anchoring theory and is particularly relevant to multinational manufacturing businesses, as it explains how these companies can use the concept of GMPs, green innovation, and organizational culture as a strategic tool to achieve sustainability outcomes (Al-Hakimi et al., 2025).

In simple terms, NRBT explains that sustainable advantage is generated because of the firm-specific capabilities that respond to the environmental and social stress. Hart (1995) has defined three key strategic capabilities as being pollution prevention, product stewardship, and sustainable development. Pollution prevention is aimed at reducing waste and emissions by providing greater diversity to the utilization of the resources, and product stewardship is a concept where the environment is placed into the product lifecycle. Sustainable development goes the extra mile, advising companies to align their activities with broader societal and environmental aims. Companies that incorporate them are not just prosperous at the economic level but sustainable as well, which is why NRBT is one of the powerful models to analyze how environmental practices create long-term value (Wang et al., 2024).

Over the years, the NRBT has undergone transformation, and scholars have included the concepts of dynamic capabilities, institutional pressures, and stakeholder engagement (Alkaraan et al., 2024). Dynamic capabilities stress the ability of companies to react to the transformation of environmental strategies to the alterations of the markets and regulatory requirements (Albort-Morant et al., 2021). Green innovation is also prioritized in recent research as the primary tool to execute NRBT and transform environmental responsibility into economic performance, social performance, and environmental performance, which can be measured (Al-Ali & O'Mahony, 2025). Such adaptability makes NRBT very

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relevant to many circumstances, such as Kenya, where international sustainability issues and challenges of the local institution worry businesses. There are some drawbacks of NRBT.

One of the weaknesses of NRBT is that it assumes firms possess or can readily acquire environmental capabilities, which is unlikely in resource-constrained developing economies (Bag, 2023). Another perspective advanced by critics is that NRBT places too much emphasis on firm-level strategies, overlooking the contribution of institutional and cultural factors that shape sustainability outcomes (Engelke et al., 2024). Moreover, NRBT may not be explanatory in this context when businesses seek the advantages of sustainability as a symbolic reward to gain legitimacy without a real impact (Mulei & Iravo, 2022). These negative comments illustrate why NRBT has to be implemented differently in context-specific ways in sub-Saharan Africa.

The usefulness of NRBT to this research is that it links GMPs, green innovation, organizational culture, and sustainability performance. GMPs are helpful in the context of pollution prevention and stewardship principles of NRBT. Green innovation establishes the dynamic capabilities necessary to make changes, and organizational culture ensures that the environmental values are embedded into the firm. The expected outcome of the effective use of these abilities is sustainability performance in terms of economic, social, and governance.

Finally, NRBT explains some conceptual and methodological premises of this research. Ideally, it eases mediation and moderation theories since it bridges firm-level practices and culture to sustainability outcomes through a process of innovation. The approach supports the explanatory type of research and the use of such complex tools as PLS-SEM, allowing the researcher to test direct, indirect, and moderated impacts within the framework of NRBT propositions (Alkandi et al., 2024). The generalizability of NRBT to the Kenyan multinational manufacturing context is thus not only extrapolated to the developing world, but also contributes to the latter, theoretical clarification, and practical knowledge of how companies can develop sustainable competitive advantage.

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2.2.2 Dynamic Capability

The dynamic capability theory (DCT) was suggested by Teece et al. (1997) as an expansion of the traditional Resource-Based View (RBV) in the sphere of dynamic capabilities, wherein the resources are owned, yet at the same time, they could be restructured, combined and refurbished with regard to the changing circumstances. Unlike the fixed perspectives on competitive advantage, DCT lays emphasis on adaptive capacity as the competitive factor, especially under dynamic and uncertain conditions. This makes the theory particularly relevant to the sustainability of large manufacturing enterprises that operate internationally and focus on continuous adaptation in response to market influences, technological change, and regulatory requirements, supported by GMPs, innovation, and cultural change (Ebrahimi & Koh, 2021).

Sensing, seizing, and reconfiguring are the three interrelationship qualities of DCT that are the main postulates of this theory. Sensing is the ability of the firm to recognize emerging opportunities and threats in the environment, such as new regulatory rules or the emergence of green technologies (Alkandi et al., 2024). Seizing involves mobilizing resources to realize these opportunities, usually through investment in sustainability and innovation programs. Reconfiguring involves altering structures, processes, and routines to remain competitive in the long run. These dynamic capabilities may be viewed from a sustainability perspective on the way businesses conceptualize the ecological problem, invest in green innovations, and redesign culture and processes to accommodate the sustainable phenomenon (Liboni et al., 2023).

Since its inception, DCT has become refined to a great extent. On the basis of this reasoning, Eisenhardt and Martin (2000) reckon that dynamic capabilities are firm-specific and constitute recognizable and repeatable processes such as product development and formation of an alliance. DCT was also further developed by Asiaei et al. (2021), as the theory was linked with innovation, knowledge management, and coordination of non-physical assets in turbulent settings. Subsequently, scholars emphasized the necessity of digitalization, global supply chains, and sustainability transitions as spheres where dynamic capabilities are key to survival and competitiveness (Bari et al., 2022). This

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evolution highlights the theory's flexibility and growing applicability in manufacturing, where regulatory changes and technological disruptions are the order of the day.

The DCT has not gone without its share of criticism despite its brilliant contributions to the theory. One challenge is that dynamic capabilities are intangible and context-dependent, making them harder to operationalize and measure (Cavusgil & Deligonul, 2025). For instance, there is still no clear evidence on whether learning routines within a firm are actual dynamic capabilities or past outcomes. The threat of tautology is also another downside, which is criticized as, under certain circumstances, DCT describes capabilities as the outcomes and the preconditions of competitive advantage, leading to circular reasoning (Alkandi et al., 2024). Additionally, the theory is characterized by the excessive focus on the strategic agency of the firms and ignores the institutional, cultural, and structural constraints that are particularly high in the emerging economies (Angeles et al., 2022). Using the case of Kenya, multinational production firms may possess good technical and managerial potentials that they are unable to translate into long-term competitiveness due to regulatory inefficiencies, infrastructural issues, and a lack of innovative systems. The following criticisms underscore the fact that additional context-specific empirical applications of DCT in emerging market settings are wanting.

Regarding the current study, DCT provides a strong theoretical framework on which the contributions of GMPs, green innovation, and organizational culture can be measured so as to generate a sustainability outcome. GMPs mirror the senses and capabilities through which companies can discern sustainability problems and allocate their resources accordingly. Green innovation is associated with reconfiguring capacity because businesses rethink technologies, processes, and products to achieve financial and environmental goals. Organizational culture helps these processes and establishes learning. The estimated outcome of the dynamic processes is sustainability performance, which is consistent with the claim by DCT that companies that adapt continuously have a sustained competitive advantage.

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The conceptual and methodological design of the research was informed by DCT from a research standpoint. Conceptually, it describes the interaction between GMPs, green innovation, and organizational culture to generate sustainability outcomes, thus justifying the suggested mediation and moderation pathways. Concerning the methodology, the application of PLS-SEM and multi-mediation is also in line with the preoccupation of DCT to measure complex, flexible, and interconnected processes (Makhloufi, 2023). This research contributes to the empirical confirmation of DCT in developing economies, where, due to environmental demands and institutional complexities, dynamic adaptation is not just the best, but the only survival and competitive strategy. It does this by implementing DCT in multinational manufacturing companies in Kenya.

2.2.3 Institutional Theory

Institutional theory, initially postulated by Meyer and Rowan (1977) and later extended by DiMaggio and Powell (1983), offers a framework through which organizations are understood to respond to external forces, conventions, and expectations by society in the quest to gain legitimacy, stability, and survival. Institutional theory predicts the impact of the social-political, cultural, and regulatory environment on organizational behavior, unlike other theories such as the resource-based view and dynamic capability theory, which focus on internal resources/capabilities (Cavusgil & Deligonul, 2025). The theory is quite applicable in the present research as it helps to understand how multinational manufacturing companies embrace the idea of GMPs, go green, and integrate sustainability principles into the culture of the organization in reaction to the institutional pressure on a global, regional, and national level (Huang & Huang, 2022).

Fundamentally, the institutional theory holds that organizations are not purely economic beings but they are also social entities that have to earn legitimacy. Among the key concepts is isomorphism, which presupposes that organizations within the same institutional field continue to become increasingly similar in three processes (Makhloufi, 2023). Coercive pressures include legislation, government regulations, and international treaties such as the Paris Climate Accord. The normative pressures are developed through professional standards and networks in the industry that make firms adopt eco-social responsibility

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(Asiaei et al., 2021). Mimetic pressures refer to forces that occur in situations where organizations emulate their peers or leaders in situations of uncertainty (Engelke et al., 2024). Such mechanisms can be implemented in sustainability since the motivations behind the use of green practices by firms are not limited to attaining efficiency but also to addressing global requirements and meeting the demands of all stakeholders (Lashitew, 2021; Wang et al., 2024).

The theory has also been made to accommodate conformity and change. The original solutions, the first postulated by DiMaggio and Powell (1983) were based on institutional congruence and homogeneity in organizations, which held that companies tend to have organizational forms and practices when they are exposed to coercive, imitative, and normative pressures. On the other hand, later theorists such as (Kang, 2024) added a different meaning by introducing the concept of institutional entrepreneurship and institutional logics whereby the organizations were considered to be agents that could create or manipulate institutional surroundings. Moreover, globalization has elevated the relevance of transnational institutions and systems of sustainability governance that demand the companies operating in the developing economies to adhere to the international standards (Sun et al., 2021).

This tendency stresses the dynamism of institutions and the contestability of the latter, especially when the multinational manufacturing companies have to operate in numerous, often incompatible institutional frameworks. The Institutional theory is wobbly even after its usage. It tends to be overemphasizing conformity and the firms are passive receivers of the institutional pressure and the firm behaviour is homogeneous (Engelke et al., 2024). The result of the loose application of the laws in some of the developing countries is symbolic compliance, where businesses simply put their sustainability plans on paper, and no actual action is taken (Opoku, 2025). These shortcomings indicate the need to explore how the firm-level resources, innovation, and culture can interact with institutional factors to influence sustainable outcomes.

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Institutional theory gives an essential framework, which links the GMPs, organizational culture, green innovation, and to the sustainability performance. GMPs are coercively pressured by the international policy frameworks and environmental laws. Normative and mimetic forces play the primary role in bringing about green innovation as businesses borrow peer behaviour and best practices. Organization culture mediates these pressures by instilling the values of the environment and ensuring the authentic rather than the token implementation of a sustainable initiative (Alemu & Null, 2025). Finally, sustainability outcomes indicate the capability of firms to strike the right balance in the requirements of the external institutions and the firm strategic capabilities.

In the perspective of research, the institutional theory assists the conceptual framework of the current study and introduces sustainability as both a valid option and a strategic choice. It is especially relevant with respect to multinational manufacturing firms located in Kenya that work under the national policy frameworks, regional trade agreements, and international regulatory regimes (Otiende, 2022). The methodological combination of the institutional theory, multi-mediation analysis, and PLS-SEM makes the empirical study of the effect of institutional forces on sustainability results possible by using the mediating actions of organizational culture and green innovation. This enhances the theoretical understanding and practical insight on how firms in emerging countries a strike a balance between internal strategies and institutional requirements.

2.2.4 Stakeholder Theory

The stakeholder theory was initially suggested by Freeman (1984), who emphasizes the necessity for organizations to balance their relationships with a number of vital groups who can either influence or be affected by the operations of the firm. It argues that to survive in the long term, organizations must fulfill the needs of consumers, workers, suppliers, regulators, communities, and the environment, which goes beyond the shareholder-focused paradigm of profit maximization (Rossi & Tanweer, 2023). The theory is particularly relevant to the context of sustainability since it explains how global manufacturing industries seek green innovation, integrate stakeholders' needs into GMPs, and develop an

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organizational culture that integrates social and environmental values (Al-Hakimi et al., 2025).

The key argument associated with stakeholder theory is that organizations are placed in an intricate system of dependencies and must strike a balance between conflicting stakeholder expectations (Alemu & Null, 2025). In sustainability practice, this involves answering the demands of regulators, normative pressure from industry associations, and the demand by advocacy groups to be environmentally responsible. At the same time, businesses must respond to the pressure of the environmentally conscious population and the demand of the community in ethical regulation (impact of corporate social responsibility policy on customers, appetite to buy environmentally friendly products before and after COVID-19). These illustrations can be added to the empirical inquiry in that the process of stakeholder relations should be built on fairness, responsibility, and reciprocity when creating sustainable values.

The theory has gradually evolved from a moral foundation to instrumental and normative ones. The instrumental lens links stakeholder management to financial and operational performance, whereas the normative perspective concerns the moral obligation to respect stakeholders' rights (Valentinov & Hajdu, 2019). The latest developments build upon the theory into the fields of sustainability and ESG ecologies, pointing out that environmental governance and social well-being are turning into stakeholder management ones (Lopez-Concepcion et al., 2021). Furthermore, the number of demands on different stakeholders posed by international frameworks such as UN Sustainable Development Goals (SDGs) and the establishment of mandatory ESG disclosure requirements continues to increase, and this is why active sustainability strategies are becoming the source of competitive distinction (UNCTAD, 2023; Kotsantonis & Pinney, 2023).

Although stakeholder theory has strengths, it also has myriad flaws. To begin with, it must address the lack of clarity in the definition of stakeholders, which leads to the issue of prioritizing interests (Horisch et al., 2020). Second, the trade-offs or weakened strategies when faced with conflicting demands are also difficult to balance when limited resources are involved in constrained settings (Ganda, 2021). Thirdly, the symbolic adoption is

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possible when the companies are involved in shallow stakeholder engagement, i.e., in the case when a company provides sustainability reports as a form of reputational legitimacy and does not yield any results (Boiral et al., 2020). These objections lead to the fact that stakeholder management needs to be supported by concrete mechanisms such as organizational culture and innovation that introduce the aspect of accountability into practice and prevent the veneer of practice Mulei & Iravo, 2022). Stakeholder theory fits well with the fundamental variables of this empirical investigation. The GMP is a direct response by the firms to the needs of the stakeholders to be environmentally responsible. Green innovation demonstrates efforts to create products, processes, and technologies that meet the expectations of consumers and other people in society. Organizational culture mediates these pressures by instilling values of the environment and making employees work towards results that are stakeholder-oriented.

Finally, sustainability performance, operationalized through the economic, social, and governance (ESG) aspects, demonstrates the extent to which multinational manufacturing companies balance stakeholder requirements with competitiveness (Asih et al., 2025). In terms of a research approach, the stakeholder theory offers a methodological and conceptual ground to examine the mediating quality of green innovation and organizational culture to trace how the expectations of the stakeholders are transformed into sustainability results. It is particularly applicable in the multinational manufacturing industry of Kenya, in which companies have to contend with international standards of the supply chain, local community expectations, regional regulatory frameworks, and expectations. It is through this that the research assists in contributing to the proposed theoretical discourse and the empirical insights of how firms in developing economies can make themselves sustainable by inculcating profitability, environmental stewardship, and accountability to stakeholders.

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2.2.5 Summary of Theoretical Literature and Conceptual Integration

The concept of sustainability is very complicated and depends on an intricate set of internal resources, organizational operations, cultural activities and external stressors. In order to establish how GMP, green innovation, and organizational culture interact to lead to sustainability performance, this research relied on the four complementary theoretical

perspectives, namely natural resource-based theory, dynamic capability theory, institutional theory, and stakeholder theory. These theories offer unique insights: NRBT and DCT focus on the formation and adjustment of a firm's capabilities, while institutional and stakeholder theories focus on the impact of external demands, legitimacy, and responsibility. These points of view provide a strong conceptual base that covers both internal and external factors that determine sustainability performance, and they are used to formulate the research structure and hypotheses.

Table 1: *Summary of Theoretical Literature*

Theory	Author(s) & Year	Key Postulations	Variables Supported
Natural Resource-Based Theory (NRBT)	Hart (1995); Alkaraan et al. (2024)	Firms gain sustainable competitive advantage by developing firm-specific capabilities to manage environmental pressures. Strategic capabilities include pollution prevention, product stewardship, and sustainable development. Emphasizes long-term value creation through environmental responsibility.	GMPs (pollution prevention, energy efficiency, waste management), GI (innovation as dynamic capability), OC (embedding environmental values), Sustainability (ESG performance)
Dynamic Capability Theory (DCT)	Teece, Pisano & Shuen (1997); Eisenhardt & Martin (2000); Asiaei et al. (2021)	Firms achieve competitiveness in dynamic environments by sensing opportunities/threats, seizing them through resource allocation, and reconfiguring capabilities, processes, and routines. Emphasizes adaptability, innovation, and learning.	GMP (identifying sustainability issues, resource allocation), GI (reconfiguring processes, eco-innovation), OC (learning orientation, pro-environmental values), Sustainability (ESG performance)
Institutional Theory	Meyer & Rowan (1977); DiMaggio & Powell (1983); Kang (2024)	Organizations respond to institutional pressures (coercive, normative, mimetic) to gain legitimacy and stability. Emphasizes conformity and strategic adoption of practices under societal and regulatory expectations.	GMPs (adoption due to regulations), GI (innovation driven by norms and peer practices), OC (shaping culture to meet institutional expectations), Sustainability (legitimacy and ESG outcomes)
Stakeholder Theory	Freeman (1984); Rossi & Tanweer (2023); Lopez-Concepcion et al. (2021)	Organizations must balance the interests of multiple stakeholders (employees, customers, regulators, communities, environment) to ensure long-term survival. Emphasizes accountability, social responsibility, and value creation for all stakeholders.	GMPs (responding to stakeholder environmental expectations), GI (developing eco-friendly products/processes), OC (internalizing stakeholder values), Sustainability (economic, social, governance outcomes)

Note: Synthesis of theoretical literature

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2.3 Empirical Literature Review

The literature review is based on empirical research, which entails an in-depth examination of previous works that have been conducted on the relationship among GMPs, green innovation, organizational culture, and sustainability performance. The section synthesizes existing international and local literature, focusing on methodological approaches, major findings, and gaps. By exploring the operationalization of these constructs in past studies, the review establishes consistencies, inconsistencies and gaps in knowledge, thus warranting the current research. Moreover, it sets a basis through which theory is related to practice and shows how empirical evidence can be used to guide the conjectured relations in the Kenyan multinational manufacturing setting.

2.3.1 Green Manufacturing Practices and Sustainability

Liu et al. (2024) conducted an inquiry into the effect of green supply chain management (GSCM) practices on environmental performance, using the mediating variables of green innovation and zero-waste management. The research conceptualized GSCM, green innovation, and zero-waste management through multidimensional indicators, and environmental performance through the conventional measure of energy use, emissions, and waste minimization. Using a cross-sectional survey of manufacturing companies and analyzing them with PLS-SEM, the results indicated that GSCM positively increases environmental performance, an effect strengthened by green innovation and robust zero-waste systems. There are still critical gaps in relying on self-reported and cross-sectional data, inadequate exploration of firm heterogeneity (size, technology intensity, export orientation), and no dynamic capability or institutional theory viewpoint to explain sustained environmental advantage, not to mention the ethical aspects; the study failed to mention possible biases or the need to follow ethical research standards.

Al-Masud et al. (2025) also examined the internal human capital processes between Green Human Resource Management (GHRM) and sustainable performance with the aid of covariance-based SEM (CB-SEM) to determine that organizational investments in green competency development and the development of green passion within the workforce mediate the impact of HR systems on environmental, social, and economic performance.

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The research focused on manufacturing organizations in Bangladesh, and the data were gathered in 2023/2024.

The dimensions that captured GHRM were green recruitment, training, appraisal, and rewards; green competency building was operationalized through the eco-skills of the employees and formal competency programs; green passion was operationalized via the affective commitment to environmental objectives and voluntary pro-environmental behavior; and sustainable performance was quantified through multi-dimensional firm outcomes, including environmental measures, cost savings, reputation, and social impact. The research design used a quantitative cross-sectional survey study with an adequate sample size to carry out SEM, test direct, partial-mediated, and indirect pathways, and verify reliability and validity. The results suggested that GHRM significantly influences sustainable performance, and both green competency building and green passion partially mediate this relationship, pointing to micro-foundations (skills and intrinsic motivation) as important channels. The study has a geographical contextual gap because it is restricted to manufacturing organizations in Bangladesh and thus cannot be generalized to other geographical areas such as Kenyan multinational manufacturing companies.

In the same way, Okeke et al. (2025) investigated the impacts of GMPs on the sustainability of the performance of SMEs in Anambra State, Nigeria. They operationalized green management using indicators such as waste reduction, energy conservation, green purchasing, and environmental policy compliance, and performance sustainability using financial stability and ecological resilience indicators. The authors collected data based on the sample of 250 SMEs which represents the manufacturing, hospitality, and service industries in the state using the descriptive-correlational survey design. The data were also examined through multiple regression so as to estimate the direct contribution of GMPs to sustainability results. The results indicate that there is a strong positive correlation between GMPs adoption and performance sustainability, which implies that companies that implement eco-efficiency initiatives systematically perform better in comparison with those that do not have the system of environmental management strategies. Nonetheless, there is a methodological weakness in the way the data is analyzed, because the study is

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conducted by using simplistic analysis of statistical procedures (regression) and ignores more sophisticated forms of analysis (SEM) which might help to understand complex causal relationships, mediating, and moderating effects among variables.

Opoku (2025) examined the role of sustainable management in production and environmental performance in the manufacturing sector of Ghana through PLS-SEM, building on the previous research by breaking down sustainability into four categories production, energy, waste, and the emission-control dimension. The main aim of the study is to examine the hypothesis that incorporating sustainability into the mainstream operations can be translated into quantifiable performance efficiencies and ecological consequences. Environmental planning, waste reduction, cleaner production technologies and supply-chain greening were used as the measure of sustainable management practice whereas, operational performance was measured by process efficiency, defect rates and cost control, and environmental performance was measured by the reduction of pollution and compliance. The inquiry reviewed survey data of 310 managers of Ghanaian manufacturing companies with medium and large size.

The results prove that sustainable management practices are very much and positively effective in relation to both operational and environmental performances as well as the association is more effective where firms have formal environmental management systems and commitment to sustainability by the leadership. The study reinforces the presence of developing-economy manufacturing situations and proves that sustainability, in fact, is not merely a compliance mechanism but a source of efficiency benefits. One of the major weaknesses of the research, however, is the fact that it depends on self-reported performance indicators, thus exaggerating associations because of the perceptual bias. Further, the research fails to test the possible mediating variables like green innovation or organizational culture, which creates a conceptual gap that may be filled later with research that incorporates the concept of innovation capability and cultural adaptation into the sustainability-performance context.

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The empirical study by Gelagay (2024) examined the impact of the GHRM and internal GSCM practices on operational performance in Ethiopian manufacturing companies, with the purpose of determining how the practices associated with eco-oriented management can contribute to process efficiency and environmental compliance. Indicators used to measure GHRM included green recruitment, training, performance appraisal, and rewards, while those for internal GSCM included green procurement, resource efficiency, and waste reduction. The measurement of operational performance was based on measures of production efficiency, quality, and resource utilization. A quantitative survey design was used, and the 210 managers and supervisors of various manufacturing industries in Ethiopia were the target population. Data were analyzed using PLS-SEM to test both direct and indirect relationships. The results showed that both GHRM and internal GSCM significantly enhance operational performance directly, with the strengthening of GHRM, and that GSCM indirectly influences operational performance through the mediation of green operational practices to some extent. However, the research has created a conceptual gap because it does not incorporate external green innovation or organizational culture as possible intermediaries.

Moreover, Gupta et al. (2025) focus on the impact of GSCM practices on the performance of firms in the manufacturing industry in India by examining how various sustainability-based supply chain-related activities evaluate their financial, operational, and environmental performance. The indicators used to operationalize GSCM were green procurement, eco-design, reverse logistics, and collaboration with suppliers, whereas firm performance, operational efficiency, and environmental compliance measures were used as indicators of firm performance. The research is based on a cross-sectional survey of 360 managers from large and medium-sized manufacturing companies, which was analyzed through SEM. The results showed that all GSCM dimensions have a positive impact on firm performance, and the effects are especially strong in supplier collaboration and eco-design initiatives. Another point made by the study is that the alignment of GSCM with internal organizational processes is essential to achieving sustainability objectives. There is, however, a methodological gap as the random sampling technique, where the

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respondents were selected at random, was used. Stratified proportional sampling would have been suited better, as manufacturing consisted of large and small-sized firms.

In the process of using the OLS estimation technique, Zaidi and Sudo (2025) investigated how lean manufacturing, GSCM, and sustainable performance relate and aimed to determine the role of operational efficiency initiatives in environmental and economic sustainability. Measurement of lean practices involved waste minimization, just-in-time production, and process optimization, whereas the operationalization of GSCM was based on green procurement, eco-design, and green logistics. Green measurements were sustainable performance, reduction in environmental impact, resource efficiency, and cost-effectiveness. The research took the quantitative survey approach, with a sample of 310 managers and production supervisors in manufacturing companies based in Asia, and examined the ways in which lean practices contribute to GSCM and sustainable performance.

The results show that lean manufacturing is positively related to the adoption of GSCM which, in its turn, leads to the substantial improvement of sustainable performance, implying that lean practices are a predetermined step to the successful GSCM program. But there is also a methodological limitation of the data analysis strategy because the research is based on simplistic statistical techniques such as OLS regression, but did not adopt more sophisticated analytical tools such as SEM, which may prove useful in terms of representing more complex interrelationships, mediations, and moderations among constructs. Subsequent research must thus use SEM or any other multivariate methods to offer a more stringent and holistic explanation of how lean and green practices can be used simultaneously to create sustainable performance.

On the other hand, a study by Nabilla et al. (2025) investigated the role of GSCM and environmental management practices (EMP) in the performance of enviropreneurship in SMEs in the Indonesian tourism industry. GSCM was operationalized with pointers of green procurement, environmentally friendly logistics, and waste minimization, whereas EMP had energy efficiency, pollution, and regulation compliance. The performance of enviropreneurship was gauged using firm profitability, eco- products/services innovation,

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and market competitiveness. The study used a quantitative survey design targeting 250 owners and managers of SMEs at major tourism attraction sites in Indonesia. PLS-SEM was used to analyze the data and measure both direct and indirect effects. The results suggest that both GSCM and EMP have a significant positive effect on enviropreneurship performance and that both practices have complementary impacts on it. Nevertheless, there is a sector- and context-specific gap, as the study is conducted on tourism SMEs in Indonesia, thereby limiting the generalizability of the results to larger enterprises, multinational corporations, or other manufacturing and service industries. Moreover, the research failed to investigate the mediating power of green innovation or the moderating power of organizational culture, with the remaining issue being how they can reinforce or alter the relationship between GMPs and enviropreneurship performance.

2.3.2 Green Manufacturing Practices, Green Innovation and Sustainability

According to a study by Bindeeba et al. (2025), two-stage meta-analytic structural equation modeling (TSSEM) was conducted to assess how GHRM can facilitate sustainable business performance (SBP) by promoting the mediating effect of green innovation. The study synthesizes 210 effect sizes from 137 empirical studies across 43 countries and over 167,000 firm-level observations, making it one of the most extensive quantitative integrations in the GHRM-sustainability literature. The results found that GHRM has a significant positive effect on firms' economic, environmental, and social performance, directly and indirectly through green innovation, validating the hypotheses that green-based HR practices increase employees' capacity, motivation, and opportunity to innovate sustainably. The theoretical basis of the study combines Ability Motivation Opportunity (AMO) theory, the Theory of Planned Behavior (TPB), and the Resource-Based View (RBV) to help understand how human-capital-spurred innovation can lead to sustainability. The methodological approach of estimating direct and mediated effects using a multivariate random effects model and meta-SEM techniques overcomes the weaknesses of bivariate meta-analyses in previous studies. Nevertheless, there is a major conceptual gap, as the meta-analysis is cross-country, and it is a compilation of different economic, cultural, and regulatory settings. Such cross-national heterogeneity can conceal country dynamics and contextual effects that determine GHRM and green innovation interaction to elicit

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sustainability effects. Thus, it is still unclear whether these global results would be applicable to specific situations, e.g., in manufacturing companies in Kenya.

Empirical works of Kanan et al. (2023) probed the relationship between green innovation and sustainable performance, on the one hand, and GHRM practices, on the other hand, in the Palestinian manufacturing industry. The research was carried out among the registered manufacturing companies under the Palestinian Federation of Industries (PFI) and comprised 58 top management respondents who were selected through the probability sampling method. The researchers operationalized the constructs of the study using 47 measurement items based on the previous validated studies; 18 items measured the dimensions of GHRM which included green job analysis, recruitment, training, performance appraisal and rewards, 14 items measured the dimensions of green innovation in product, process, managerial and marketing aspects and 15 items measured sustainable performance in 3 dimensions: environment, economic and social. Using a quantitative research design, data were estimated using PLS-SEM.

The findings indicated that both GHRM practices, green innovation, and sustainable performance were applied moderately, with GHRM having an important positive effect on green innovation and sustainable performance, and green innovation having a mediating effect on the relationship. Nevertheless, the study has a gap in the conceptualization of constructs as it only focused on HR-related practices and omitted other important constructs like energy efficiency, air emissions, recycling and reuse, which could result in a broader picture of the effect of green management on sustainability.

Islam et al. (2025) used a quantitative design and SEM to explore the effect of GHRM practices on worker productivity and sustainability, with green innovation, pro-environmental behavior, and employee engagement as the most relevant mediators in the Bangladeshi manufacturing sector. The aim of the study was to learn the reasons why GHRM practices develop engagement and productivity and to use the Ability-Motivation-Opportunity (A-M-O) theory as a conceptual framework. The data collection involved the use of a web-based structured questionnaire that was administered to workers of various manufacturing companies. Specific indicators were used to operationalize variables:

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GHRM practices, which took the form of recruitment, training, performance appraisal, rewards, and environmentally oriented HR policies; green innovation which included product, process, managerial, and marketing innovations; pro-environmental behavior which covered employee participation in environmental initiatives, energy saving actions and waste reduction actions; employee engagement measured in terms of involvement, commitment and motivation towards organizational goals and objectives; and productivity and sustainability through environmental, economic and social performance indicators at the firm level.

The survey items were measured on a seven-point Likert scale, and the instrument was tested on the basis of an expert review and pilot testing, and reliability was determined through Cronbach's alpha. The results showed that GHRM practices increase employee engagement, which subsequently leads to productivity, and green innovation and pro-environmental behavior are intermediaries between GHRM and sustainability outcomes. Nevertheless, there is a geographically specific contextual divide since the results are only found in the manufacturing industry in Bangladesh, thus not relevant to multinational manufacturing industries in Kenya where organizational, cultural, and regulatory environments are dissimilar.

Mahar et al. (2025) conducted an empirical study examining the impact of GSCM practices on the sustainable performance of firms in the manufacturing and service sectors in Pakistan using green technological innovation (GTI) and green managerial innovation (GMI) as one of the mediators and green organizational culture (GOC) as one of the moderators. The study addressed whether adopting environmentally responsible supply chain practices affects sustainability outcomes in the context of post-pandemic challenges and emerging markets. Four hundred and eighty middle- to senior-level management professionals were sampled through the purposive sampling method to enable respondents to be informed about sustainability and supply chain management. Measurement included indicators of GSCMPs (e.g., green procurement, eco-design, reverse logistics), green innovation (product, process, and managerial innovation), green organizational culture

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(environmental values, norms, and practices and sustainable performance (environmental, economic, and social outcomes).

The methods of analysis were PLS-SEM and multi-group analysis (MGA) to verify the relations and differences with respect to sectors. The results proved that GSCMPs have a positive impact on sustainability performance, especially when green innovation is adopted, and the manufacturing sector is more affected by regulatory pressures and technological usage. Nevertheless, there is a methodological limitation concerning the sampling methods, as the purposive sampling used might not be fully representative of the target population, and this may restrict the generalization of the results; more robust probability sampling or stratified sampling may be used in future research.

In another study by Garad and Khalifa (2024), the authors probed the connection between environmental management practices (EMPs), green innovation, and firm performance, both financial and environmental. The objective of the study was to examine the mediation of the EMPs' impact on firm performance through green innovations, and the authors emphasize the significance of sustainable products, energy efficiency, and socially responsible practices in increasing productivity, competitiveness, and returns to assets. Green innovation was measured, and data were collected according to product and process innovations that enhance sustainability, EMPs through internal and external practices that are environmentally responsible, and the performance of the firm through financial and environmental indicators. The OLS regression was selected as the main method of estimation carried out in the study and was utilized to examine the relationship between variables and mediate the impacts of green innovation.

The findings showed that EMPs, with the support of green innovations, have a positive effect on firm performance, such as international competitiveness and market position. Nevertheless, there is a conceptual gap since too much reliance was placed on the Resource-Based View (RBV) theory because the research failed to critically incorporate and evaluate other viable theoretical frameworks like natural resource-based theory, dynamic capability theory, institutional theory, stakeholder theory, or integrated multi-

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theory methods, which would have provided more comprehensive theoretical insights and explanatory credibility of the research.

Ahakwa et al. (2024) carried out an empirical study to determine how GHRM practices influence environmental performance in SMEs in the Greater Accra Region of Ghana, using green innovation as a mediating variable. The purpose of the study was to know the role of environmentally oriented HR practices in sustainable organizational performance in terms of innovation in both the products and processes. The data were gathered through a structured questionnaire distributed to the top 300 business owners and employees, and 294 responses were found to be valid. Specific indicators were used to operationalize its variables: green training and development (GTD), green compensation (GC), and green recruitment and selection (GRS) were used to measure the GHRM practices; there were three items used to measure green innovation (product innovation) and two items used to measure green innovation (process innovation); the environmental performance was measured with four items representing everyday operational sustainability practices.

The quantitative design was adopted, and data were analyzed using the PLS-SEM to test the direct and mediating effects. The results showed that GHRM practices have direct and significant impacts on environmental performance, and green innovation mediates this relationship to some extent. Green compensation using green innovation was one of the HR practices that significantly affected the environmental performance. The research offers a practical advice to managers and policymakers to motivate green operations and enhance the sustainability in the SMEs. There is a contextual gap in the sector, in that the research study has only discussed SMEs in the manufacturing sector of one region in Ghana and has not generalized the findings to other sectors, other geographical areas, or other multinational manufacturing companies.

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2.3.3 Green Manufacturing Practices, Organizational Culture and Sustainability

Al Hakimi et al. (2022) examined the impact of GMPs on corporate sustainable performance (CSP) in a study of 328 sampling of manufacturing SMEs in Saudi Arabia and investigated the effect of green innovation as a mediator and green organizational culture as a moderator. Variables were measured as follows: GMPs (e.g., process

optimization, energy efficiency, waste reduction); green innovation (product and process innovations); CSP (environmental, social and financial performance); and green organizational culture (sustainability oriented cultural values). The research design was a quantitative one, and Saudi manufacturing SMEs and the responses to the survey (328 valid) were chosen at random. Hierarchical regression and moderated mediation were used to analyze the data collected. Significant results depict that GMCs positively impact on CSP through green innovation both directly and indirectly and the impact is greater in an enabling green culture. The study provides a gap in context of the sector since the study targets the SMEs in Saudi Arabia making it difficult to generalize the findings to other regions or large multinational manufacturing companies.

Junejo et al. (2025) investigated the role of the green organizational culture in promoting sustainable logistics performance among manufacturing SMEs operating in a developing economy (Pakistan). Operationalization of the variables was made in a way that green culture incorporated a dimension of environmental awareness, green employee participation, and sustainability dimension, and that sustainable logistics performance was measured through operational efficiencies, resource optimization, and environmental compliance. The research adopted a quantitative survey design, focused on manufacturing SMEs, and involved middle and senior managers to collect data. Analysis was conducted using SEM. The result implied that the presence of a robust green culture plays a large role in increasing the sustainable logistics performance in SMEs. There is, however, a geographically specific contextual gap that lies in the fact that the research narrows down to SMEs in Pakistan and, as a result, it cannot be applied to multinational manufacturing companies operating in other countries with varying institutional settings.

Research conducted by Mousa et al. (2025) investigated the relationship between GSCM and environmental performance in the Turkish textile industry, with competitive pressure as an intermediary and adaptive green culture serving as a moderator. The indicators such as supplier collaboration, adoption of eco-design, green procurement, and reverse logistics were used to measure the GSCM practices; indicators such as environmental performance included reduction in emissions, energy efficiency, and waste management; competitive

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pressure measured competitive market and stakeholder pressures; and adaptive green culture measured the flexibility with which organizations embrace green initiatives. The study employed a purposive sample of 408 managers of Turkish textile industry companies in a quantitative survey design that was analyzed using PLS SEM. The main results showed that GSCM practices have a significant positive effect on environmental performance, and that competitive pressure mediates this effect, with stronger green culture. There is a contextual and methodological gap in the study, as it is restricted to a single sector (textile) and a single country (Turkey) and uses purposive sampling, which could impact representativeness and generalizability to larger and more diverse multinational manufacturing settings.

Furthermore, Sobaih et al. (2024) examined the mediating role of green organizational culture on the relationship between GHRM and green innovation within the export-oriented textile and clothing industry in Tunisia. Operationalization of the study variables was as follows: GHRM practices: items on job analysis, recruitment, training, performance appraisal, and rewards in a green context; green organizational culture: items on shared sustainability values, norms, and culture in the organization; green innovation: items on product and process innovation towards environmental sustainability. The design was quantitative: the decision makers were requested to answer a structured questionnaire, and the data were processed with the help of SEM. The results showed that GHRM has a positive impact on green organizational culture as well as green innovation; green organizational culture directly impacts on green innovation; and green organizational culture partly mediates the relationship between GHRM and green innovation. However, there is still a gap regarding the conceptualization, as the research is based on a single direction, between GHRM, culture, and green innovation, without incorporating other possible constructs like GMPs, thereby limiting generalizability.

On the basis of the quantitative research design and backed by the PLS-SEM estimation strategy, Aloqaily et al. (2024) examined the effect of GHRM practices on the green sustainable performance of Jordanian logistics SMEs in the logistics sector, having green culture as a mediating variable. The research surveyed 321 employees and managers in

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logistics SMEs in terms of a structured survey using questionnaires to measure GHRM in terms of green recruitment, training, and reward system; green culture in terms of organizational values, beliefs, and pro-sustainability behavior; and green sustainable performance in terms of indicators of sustainable operational outcome in logistics processes. The discussion showed that GHRM is an important way of increasing green sustainable performance and that green culture is the only mediator of this relationship, which demonstrates the importance of developing an enabling environmental culture to convert HRM actions into material sustainability results. Nevertheless, the study has a contextual gap that is specific to the sector in which it was done since the study is limited to the Jordanian SME logistics firms, which does not have a strong generalizability of the findings to other manufacturing corporations, multinational corporations, and organizations in other economic, cultural, and regulatory contexts.

In the context of the Kenyan manufacturing industry, Mohammed et al. (2019) conducted a study to examine the impact of environmentally sustainable supply chain practices on the performance of firms, the mediating variable being the organizational culture. The scholars surveyed 281 manufacturing companies and quantified the environmentally sustainable supply chain practice along environmental, social, and economic sustainability dimensions; organizational culture as the similar norms, values, and behavioral patterns in the organization; and firm performance based on financial, operational, and competitive measures using a quantitative explanatory design. The data were analyzed using descriptive statistics, Pearson correlation, and SEM using bias-corrected bootstrapping.

The findings showed that organizational culture is a complete mediator of the correlation between environmentally sustainable supply chain practices and the performance of the firm, meaning environmentally sustainable supply chain initiatives only yield better performance with an enabling cultural environment. However, the research has a number of gaps: conceptually, it limits mediation to the organizational culture without analyzing alternative mediating mechanisms, i.e. green innovation; contextually, the research provides population-specific, contextual gap, in the sense that it in wholesomely studied the entire manufacturing sector in Kenya, and not disaggregated into specific subgroups, i.

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e. multinational manufacturing firms, and thus limited insights into the possible ways in which environmentally sustainable supply chain practices and organizational culture could be different in globally integrated, internationally controlled, and competitively diverse manufacturing settings.

Similarly, a research study by Permadi et al. (2024) addressed the impact of GHRM practices on employee performance within Indonesian SMEs, using organizational culture as a mediating factor. The study operationalized GHRM with the help of a quantitative research design and PLS-SEM in terms of green recruitment, green training, and green performance appraisal; organizational culture through the level of integration of sustainability-oriented norms, values and behavior in the firm; and the level of employee performance by using such indicators as productivity, job performance, and engagement. The findings indicated that whereas GHRM has a strong ability to boost the organizational culture, its direct impact on employee performance is insignificant, but a well-institutionalized green culture completely mediates the GHRM-performance relationship, which means that the HR practices only yield positive employee performance in the event that sustainability values are highly incorporated into the organization. Nonetheless, the research has a conceptual gap because it is very narrow in that it only addresses culture as the sole mediator without considering other mechanisms that may have led to the same results, including employee motivation.

Awatara et al. (2024) examined the effect of GHRM practices, specifically green training, green rewards, and green organizational culture, on the degree of commitment among employees in the Indonesian manufacturing and service companies. The variables were operationalized based on the previously tested scales: green training and rewards were operationalized on the basis of employee perceptions of organizational investment in eco-competent and performance incentives development, and commitment was operationalized with the help of affective, continuance, and normative dimensions. The survey design was quantitative as 214 employees working in different companies were surveyed with structured questionnaires. The researchers analyzed the data using PLS-SEM to estimate both direct and indirect effects.

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These findings indicated that green training and rewards greatly promoted employee commitment, and green organizational culture partly mediated the two. The authors identified that a good environmental culture strengthens HRM systems that enhance long-term sustainability behavior among employees. Nonetheless, the study has a significant inconsistent-constructs research gap, which is connected with the variability in the operationalization of the key variables, in particular, the mixed Likert scales (5-point to measure some constructs and 7-point to measure other constructs). This inconsistency compromises measurement equivalence and makes cross-study comparisons more difficult and theoretical integration challenging in the overall GHRM-commitment literature.

Likewise, Gazi et al. (2024) investigated how GHRM practices can facilitate organizational agility and green culture and, therefore, improve social and environmental performance in the industrial enterprises in Bangladesh. The objective of the study was to test a combined model that relates HR sustainability practices to organizational outcomes through behavioral and cultural processes. The researchers operationalized such as green recruitment, training, performance appraisal, compensation, and environmental and social performance, measured with multidimensional sustainability indexes. The study was conducted using a quantitative cross-sectional survey to collect data on 362 employees working in manufacturing and service sectors. The data was analyzed using PLS SEM with mediation and path analyses as its focus. The results showed that GHRM had a significant positive effect on both green culture and organizational agility, which also led to sustainable social and environmental performance, verifying the chain-mediating effect. The research highlighted the integration of agility and culture as transitory mechanisms of sustainability change.

However, despite the contribution of the study to the realization of the behavioral pathways through which HR sustainability practices are associated with the organizational outcomes, one can find a conceptual gap; that is, the selected aspects of GMPs are considered, whereas other essential elements, including green innovation, green leadership, environmental strategy or green operational practices, which might provide a broader understanding of

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how GHRM is interacting with broader organizational systems to impact on the sustainability performance.

Using SEM as the estimation approach, Khawaja and Janjua (2025) investigated the link between GHRM practices and organizational sustainability using a mediating variable: green knowledge sharing within the manufacturing industry in Pakistan. The research aimed to learn the internal knowledge processes that can establish a connection between HR sustainability practices and the overall environmental, social and economic performance. The constructs developed by GHRM include: green training, green performance appraisal, green recruitment, and green training, which were measured using the validated Likert-scale measures, and sustainability performance that was evaluated on the economic, social, and environmental axes. The researchers implemented a quantitative explanatory research design, gathered data from 278 employees in middle- and large-scale manufacturing companies in Lahore and Karachi, and analyzed the data.

The findings ensured that the presence of GHRM practices has a positive effect on knowledge-sharing behavior and sustainability performance, and green knowledge sharing is significant as a partial mediator, thus proving that a knowledge-driven culture enhances the effects of HR sustainability practices on organizational performance. However, the study suffers from the contextual gap of geographical location, since the results are limited to manufacturing companies in Pakistan, whereas in the current study the findings are based on Kenyan multinational manufacturing companies whose organization, regulatory frameworks, workforce diversity, and sustainability pressures are very different, and the results need to be empirically validated in the context of a specific geographical setting and organization.

Although using SEM as the main estimation strategy, Tamin (2024) investigated the relationship between green recruitment and selection practices and employee performance, mediated by innovative organizational culture, in the context of the Indonesian service industry. Green recruitment and selection were measured using validated 5-point Likert scales, which included items that assessed eco-conscious hiring practices, environmentally conscious job design and candidate evaluation criteria; innovative organizational culture

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was measured using indicators of creativity, experimentation and openness to change, and employee performance was measured using self-reported measures of productivity, adaptability and goal achievement.

A quantitative explanatory design was adopted, and 210 employees were surveyed in five large service organizations in Palangkaraya, Indonesia, using stratified random sampling and analyzed using SEM. The research concluded that green recruitment and selection practices had a great impact on employee performance at both a direct level and an indirect level, with the help of the innovative culture as a partial mediator, meaning that innovation-focused culture helps in increasing the effectiveness of green HR practices. Nevertheless, there is a conceptual cross-disciplinary gap in the study because the authors predominantly rely on the literature on HRM and organizational behavior and disregard the presence of other related concepts such as environmental psychology, innovation management, and sustainability science, which would be of relevance in enriching the theoretical coverage and expression of the joint effects of the two variables on the attainment of the performance outcomes.

Delphinus and Mwita (2024) surveyed the effects of GHRM practices on the environmental performance of organizations, with particular focus on the mediating role of perceived organizational support towards the environment among employees of Tanzanian manufacturing companies. GHRM was operationalized in terms of green rewards, green training, green employee involvement, and green performance management, whereas the environmental performance was measured by green indicators like waste reduction, emission control, and energy-saving outcomes. Perceived organizational support for the environment was the perception of the employees about how committed the managers were to the environment, and how the managerial resources were distributed among the environmental efforts.

The researchers adopted a quantitative cross-sectional design because of which they gathered data on 298 workers in medium and large manufacturing companies of Dar es Salaam and Arusha. The PLS-SEM analysis revealed that environmental performance was greatly affected by GHRM practices, and that perceived organizational support for the

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environment fully mediated this performance, with the significance of organizational support in transforming HR practices into sustainability performance. The study exhibits a conceptual gap since the research has been based more on traditional theoretical frameworks, especially social exchange theory, without critically assessing their applicability to the specific case of environmental and organizational dynamics in the African industrial context, thus failing to consider more context-specific theoretical perspectives in the form of RBV.

2.3.4 Green Manufacturing Practices, Green Innovation, Organizational Culture and Sustainability

Zihan and Makhbul (2024) carried out an empirical study in Malaysia to explain how GHRM can lead to sustainable performance through the mediating effect of green innovation in SMEs. The research, based on the resource-based perspective and on the ability-motivation-opportunity theories, placed GHRM as a driver of strategic facilitation that develops innovation-related environmental resources. The researchers gathered information on a cross-sectional survey of 425 managers and employees of SMEs in the Klang Valley area, as sampled using a convenience sampling method. Construct measurement was rigorously validated using scales: GHRM consisted of green recruitment, training, and compensation dimensions; green innovation of both product and process innovation; and sustainable performance as a multidimensional construct that included economic, environmental, and social performance. Using PLS-SEM, the authors tested both the measurement and structural models to evaluate direct and indirect effects.

The outcome indicated that GHRM had a robust positive influence on long-run performance, which was mainly due to green product innovation, and transformational leadership enhanced the association. The overall contribution of the study is that HR-based sustainability practices have been empirically correlated with innovation outcomes in developing-country SMEs. However, there was a contextual gap in the study, as it is confined to the Malaysian context, which restricts the extrapolation of the study to other sectors and institutional settings.

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In addition, Huynh et al. (2024) analyzed the relationships among knowledge management, green transformational leadership, and green organizational culture, and examined how these variables contribute to green innovation and sustainable performance among Vietnamese manufacturing and service companies. Based on the RBV framework and dynamic capabilities, the inquiry was developed to integrate leadership, cultural, and knowledge-based enablers into a comprehensive model of environmental innovation and performance improvement. The study followed a quantitative cross-sectional design and sampled 417 managerial workers who represented various industries in Vietnam using structured questionnaires.

The validated multi-item Likert scales were used to measure the constructs, with knowledge management measuring knowledge sharing, creation, and storage; green transformational leadership measuring inspirational motivation and environmental vision; green organizational culture measuring shared sustainability values; and green innovation measuring product, process, and managerial innovations and sustainable performance integrating environmental, economic, and social aspects. PLS-SEM was used to analyze data to examine direct and indirect relationships. The results revealed that knowledge management, green transformational leadership, and green organizational culture had a huge positive influence on green innovation, which in turn mediated their influence on sustainable performance. It is notable that green organizational culture emerged as a key organizational facilitator that increased both knowledge diffusion and innovation-driven sustainability.

The theoretical contribution of the study to the literature is the inclusion of leadership and culture within the RBV logic to explain environmental performance in emerging economies. However, a conceptual gap is also present since the study fails to consider fast-developing phenomena, including digital green technologies and AI-based knowledge systems, as well as emerging sustainability governance frameworks which are increasingly defining how organizations are seeking to achieve green innovation. Consequently, the model might be less successful in reflecting the modern-day dynamics that affect sustainability performance in rapidly evolving global settings.

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Additionally, Mousa et al. (2025) developed strong empirical research on how GSCM practices promote environmental performance, including the mediation of competitive pressure and the moderating impact of adaptive green culture. The research was carried out in the context of manufacturing companies in Jordanian industrial zones, where environmental compliance is becoming a more serious issue due to the increase in global and national requirements for sustainability. GSCM was conceptualized around five major dimensions: green purchasing, green manufacturing, eco-design, reverse logistics, and environmental collaboration with suppliers and customers. Standardized measures of energy efficiency, waste reduction, and emissions control were used to assess environmental performance.

The researchers' chosen research design was quantitative and cross-sectional, surveying 420 managers and supply chain officers through structured questionnaires. The applications of PLS SEM included hypothesis testing, mediation, and moderation. The findings showed that GSCM practices had a significant positive effect on environmental performance, and the relationship between the two was partially mediated by competitive pressure. In addition, adaptive green culture strengthened the positive relationship between GSCM and environmental performance, underscoring the strategic value of a flexible, innovation-oriented cultural framework. Nonetheless, the contextual factor regarding the choice of study for Jordanian firms creates a contextual gap because the current study targets the Kenyan multinational manufacturing firms whose microeconomic environment is defined by a distinctive regulatory environment.

An empirical inquiry by Bour (2023) introduced a multifaceted conceptual and practical study of green manufacturing (GM) practices as one of the essential processes of environmental sustainability in modern industrial systems. The study synthesized the emerging research and cases of global industries to illustrate how manufacturing companies incorporate eco-efficiency strategies, minimizing waste, energy conservation, and clean production technologies to improve sustainable performance. Even though the study was largely conceptual, it had empirical examples of the top international

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manufacturers to illustrate the connection between GM adoption and carbon intensity, waste generation, and operational cost reduction.

Based on a qualitative-descriptive approach, it relied on secondary data, such as policy reports, industry white papers, and peer-reviewed studies, to suggest a framework to place organizational environmental culture at the core of the enabler of effective implementation in green technology and unceasing innovation. The results highlighted that companies with ingrained environmental values consistently achieve better, more long-lasting sustainability performance, underpinned by increased employee commitment and innovation-driven competitiveness.

Nevertheless, the use of secondary evidence, the unavailability of primary information, and the lack of empirical research limit the study's extrapolability and the ability to draw causal conclusions. It is in this light that any future study must empirically support the suggested framework through the application of sound quantitative methodologies such as SEM, particularly in the context of multinational manufacturing companies in emerging economies like Kenya, where the institutional factors, infrastructural barriers, and regulatory conditions might play critical roles in determining the effectiveness of green manufacturing practices.

Al-Doghan et al. (2022) conducted a study to test the influence of organizational environmental culture on environmental sustainability and environmental performance amongst SMEs in Saudi Arabia with the mediating role of GHRM and green innovation. The sample consisted of 236 top- and middle-level managers of Saudi Arabian SMEs. The variables were measured through surveys: organizational environmental culture measured using such dimensions like organizational beliefs and values on the environment; GHRM measured with the help of the items on green recruitment, training, and reward practices; green innovation measured with the help of the items on the green product and process innovation; and environmental performance measured with the help of the items on the environmental practices and performance. This was a cross-sectional quantitative study that utilized convenience sampling and a study which was analyzed using SEM.

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The results showed that the organizational environmental culture has a significant impact on GHRM and green innovation; GHRM and green innovation, in turn, have a positive impact on environmental sustainability and environmental performance; and both mediators partially mediate the impact of organizational environmental culture on environmental sustainability and environmental performance. The researcher noted a contextual gap in their studies since it is limited to Saudi Arabian SMEs; therefore, findings cannot be generalized to multinational companies or large manufacturing enterprises based in other cultural or regulatory settings.

Further, Wagan and Sidra (2025) investigated how green organizational culture (GOC) and green entrepreneurial orientation (GEO) affect entrepreneurial firm performance (EFP), with the mediating role of the green business model (GBM). Based on 342 companies in different industries located in Shanghai, China, the research used a structured questionnaire that contained validated predictors based on previous studies and operationalized the constructs of the study. The measure of GOC was based on indicators such as management commitment to environmental values, involvement of employees in eco-friendly activities, organizational focus on sustainability communication, and the integration of green norms in daily operations. GEO was measured using measures of proactive firms in seeking environmental opportunities, readiness to invest in eco-innovations, risk-taking in sustainable ventures, as well as sustained environment-related improvement. GBM was measured using indicators representing the incorporation of environmental sustainability into product and process design, resource efficiency, waste reduction, and the development of green value propositions that meet stakeholder expectations. The indicators of financial growth, profitability, market competitiveness, and the firm's reputation as a sustainability-driven innovator were used to evaluate EFP.

The findings demonstrated that both GOC and GEO play an important role in the formation of GBMs that, in turn, improve the firm's performance and have positive direct impacts on EFP. The results highlight that companies with effective green-oriented cultures and entrepreneurial orientations are better positioned to develop innovative, sustainable business models that deliver superior performance. Nevertheless, there is a tendency to

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have a gap in the context of the research since the study was carried out in China, where the institutional and policy environments are unique, whereas in the present study, the target population was multinational manufacturing companies based in Kenya, the regulatory scenario, the cultural and industrial orientations, and the impact these elements have on GMPs, and sustainability performance are quite different.

2.4 Research Gaps

The empirical evidence on GMPs, green innovation, environmental management, and sustainability performance has grown significantly over the last ten years, influenced by increasing regulatory demands, stakeholder expectations, and international commitments to sustainable development. Various constructs have been addressed by scholars, including GMPs, green innovation, and green organizational culture, and their implications for organizational performance across different contexts and methodological frameworks. The empirical data, despite this increase, remain very fragmented, spanning various sectors, nations, sampling methods, and research methods, and therefore require a systematic synthesis to clarify convergent and divergent trends. With industries, in particular the manufacturing industry, going through the process of sustainability transitions, the question of how enabling green capabilities, innovative mechanisms, and contextual enablers influence the outcome of firms becomes a growing point of focus in academic and policy discussions.

Critical analysis of current empirical studies thus forms the basis for identifying unanswered conceptual, methodological, and contextual questions that need to be addressed in a scholarly manner. Most of the studies are characterized by constraints like sector specificity, country-specific situations, simplistic analytic models, weak theoretical base, and limited focus on mediating or moderating mechanisms. These loopholes undermine the generalizability and theoretical strength of existing results and underscore the necessity of conducting more comprehensive, integrative, and context-specific empirical studies. Table 2 summarizes the major contributions of empiricism, exposes existing gaps in research, and demonstrates how the present study can fill these gaps using

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a multi-theoretical, multi-method, and multi-national manufacturing-based research design.

Table 2: *Summary of Empirical Literature and Research Gaps*

Author	Study Focus	Methodology	Findings	Research Gaps	Addressing Gaps
Ahakwa et al. (2024)	GHRM → Environmental performance mediated by green innovation	PLS-SEM	GHRM improves environmental performance; green innovation partially mediates; green compensation strongest	SME-only context limits generalizability	Current study used multinational manufacturing context
Al-Masud et al. (2025)	GHRM → Sustainable performance via green competencies & green passion	Cross-sectional survey; CB-SEM	GHRM significantly enhances sustainability; mediators partially significant	Geographical gap (Bangladesh only)	Current study focused on Kenyan multinational firms
Bindeeba et al. (2025)	GHRM → Sustainable business performance mediated by green innovation (global meta-analysis)	TSSEM; multivariate random-effects MA	Strong evidence that GHRM enhances sustainability directly & via innovation	Heterogeneity limits contextual specificity	Current study provides context-specific evidence in Kenyan manufacturing
Bour (2023)	Green manufacturing practices → environmental sustainability	Conceptual + empirical illustrations	GMP enhances eco-efficiency, reduces emissions, improves sustainability	Not empirically tested in developing countries	Current study provides empirical evidence from Kenyan firms
Garad & Khalifa (2024)	Environmental management practices → firm performance via green innovation	Survey; OLS regression	EMP improves financial & environmental performance via innovation	Overreliance on RBV theory; limited multi-theory grounding	Current study integrates RBV + DC + Institutional + Stakeholder theories
Gelagay (2024)	GHRM & internal GSCM → operational performance	Survey; PLS-SEM	Both GHRM and GSCM enhance performance; partial mediation	Excludes external innovation & organizational culture	Current study includes innovation and culture mechanisms
Gupta et al. (2025)	GSCM → Economic, operational & environmental performance	Cross-sectional survey; SEM	All GSCM dimensions improve performance; eco-design strongest	Random sampling weak; lacked stratified representation	Current study uses stratified sampling in multinational firms
Islam et al. (2025)	GHRM → productivity & sustainability via	Web-survey; SEM	GHRM improves productivity and sustainability via	Limited to Bangladesh manufacturing	Current study tests in Kenyan

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	engagement, green innovation & PEB		mediators		multinationals
Kanan et al. (2023)	GHRM → Green innovation → Sustainable performance	Probability sampling; PLS-SEM	GHRM improves innovation & sustainability; partial mediation	Limited GMP constructs—focused only on HR	Current study incorporates broader GMP (energy, emissions, waste, etc.)
Liu et al. (2024)	GSCM → Environmental performance with mediating GI & zero-waste	Cross-sectional survey; PLS-SEM	GSCM improves environmental performance; mediators strengthen effect	Self-report bias; no dynamic/institutional theory	Current study expands theoretical foundation & heterogeneity
Mahar et al. (2025)	GSCM → sustainability via GTI & GMI moderated by green culture	Purposive sampling; PLS-SEM & MGA	Innovation mediates; culture strengthens effects	Purposive sampling reduces representativeness	Current study uses probability sampling
Nabilla et al. (2025)	GSCM & EMP → Enviropreneurship performance	Survey; PLS-SEM	Practices enhance enviropreneurship; stronger when integrated	Sector gap—tourism SMEs; excludes mediators/moderators	Current study focuses on manufacturing; includes innovation & culture
Okeke et al. (2025)	GMP → Performance sustainability in SMEs	Descriptive-correlational; multiple regression	GMP improves financial & ecological sustainability	Simple regression; no SEM/mediation	Current study applies PLS-SEM with mediators
Opoku (2025)	Sustainable management practices → operational & environmental performance	Survey of 310 firms; PLS-SEM	Strong positive effects; EMS strengthens results	Reliance on self-report; lacks mediators	Current study integrates green innovation and objective indicators
Zaidi & Sudo (2025)	Lean manufacturing & GSCM → Sustainable performance	Survey; OLS regression	Lean strengthens GSCM → sustainability	OLS limits causal complexity	

Note: Summary of empirical literature

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2.5 Conceptual Framework

The theoretical framework that guides this research is an integrated model in the explanations of how GMPs influences the sustainability of multinational manufacturers in Kenya via the mediating functions of green innovation and organizational culture. The framework is anchored on the natural resource-based theory with strong support of the dynamic capability theory, institutional theory, and the stakeholder theory, which states that sustainability outcomes are not the result of independent actions carried out by the

company in the environment but rather a systemic set of management practices, innovation capabilities, and supportive organizational values (Okeke et al., 2025). The framework offers a rational framework of comprehending the cause-and-effect links between the management of the environment and the long-term sustainable performance.

The framework relies on green management practices as the independent variable, which depict the firm's operational-level environmental activities. These involve energy conservation, minimization of waste, air emissions, and recycling and re-use that are incorporated into the procurement, production, and operational processes (Opoku, 2025). GMPs serve as the structural and strategic core of a firm's environmental orientation, helping make resources more efficient, minimize ecological footprints, and comply with regulations. In line with the sustainability and environmental management literature, the concept of GMP is defined as the initial forces of transformation in the organization towards environmentally friendly and competitive manufacturing processes (Nabilla et al., 2025).

The first mediating variable in the conceptual framework is green innovation, which captures the technical and process-based transformations through which GMPs translate into manifested sustainability outcomes. It includes green product development, green process innovation, green research and development investments, as well as uptake of renewable energy technologies. Based on the natural resource-based theory and dynamic capability theory, the framework presupposes that GMPs develop valuable environmental resources and learning routines which can trigger innovation (Kenan et al., 2024). Green innovation, in turn, can allow the firms to use these resources to enhance operational efficiency, minimize their impact on the environment, and improve the effectiveness of economic and reputational performance, thus becoming a highly important channel in connecting GMPs with sustainability.

To supplement the concept of green innovation, organizational culture is theorized as a parallel mediating variable that encompasses the behavioral, normative, and social contexts in which green practices are carried out. An organizational culture that is green is demonstrated by top management adherence to environmental values, excellent

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communication of environmental objectives, coordination and cooperation in sustainability programs, and incentive schemes that uphold and support environmentally friendly behavior (Liu et al., 2023). The framework is based on the perspectives of institutional theory and organizational behavior, which assumes the mediating role of the organizational culture in the GMPs sustainability relationship through internalizing environmental values, determining the attitudes of employees, and integrating green practices into the daily routine. It is difficult to sustain GMP and green innovations without such a supportive culture in the long-run.

Sustainability, the dependent variable, is holistically represented as an economic, social, and governance (ESG) approach, which is based on internationally accepted criteria of sustainable business practices (Opoku, 2025). This multidimensional approach recognizes that sustainable business goes beyond environmental compliance to encompass long-term financial viability, social responsibility, ethical governance, and stakeholder accountability. Under the framework, sustainability results are mainly obtained through indirect means, i.e., GMPs affect sustainability through green innovation and organizational culture as opposed to the direct effect.

Thus, the conceptual framework presents both complementary and dual mediation mechanisms: to begin with, GMPs improve sustainability by formulating and implementing green innovation; and, to finish, GMPs improve sustainability by fostering an organizational culture conducive to it. The combination of these mediating mechanisms can explain how operational environmental practices translate into systematic, organization-wide, and long-term sustainability outcomes. The framework, as shown in Figure 1, gives a logical foundation to the development of hypotheses, empirical modeling with PLS-SEM, and interpretation of the results in the setting of multinational manufacturing companies that are based in Kenya. The conceptual framework schematic diagram is shown in Figure 1.

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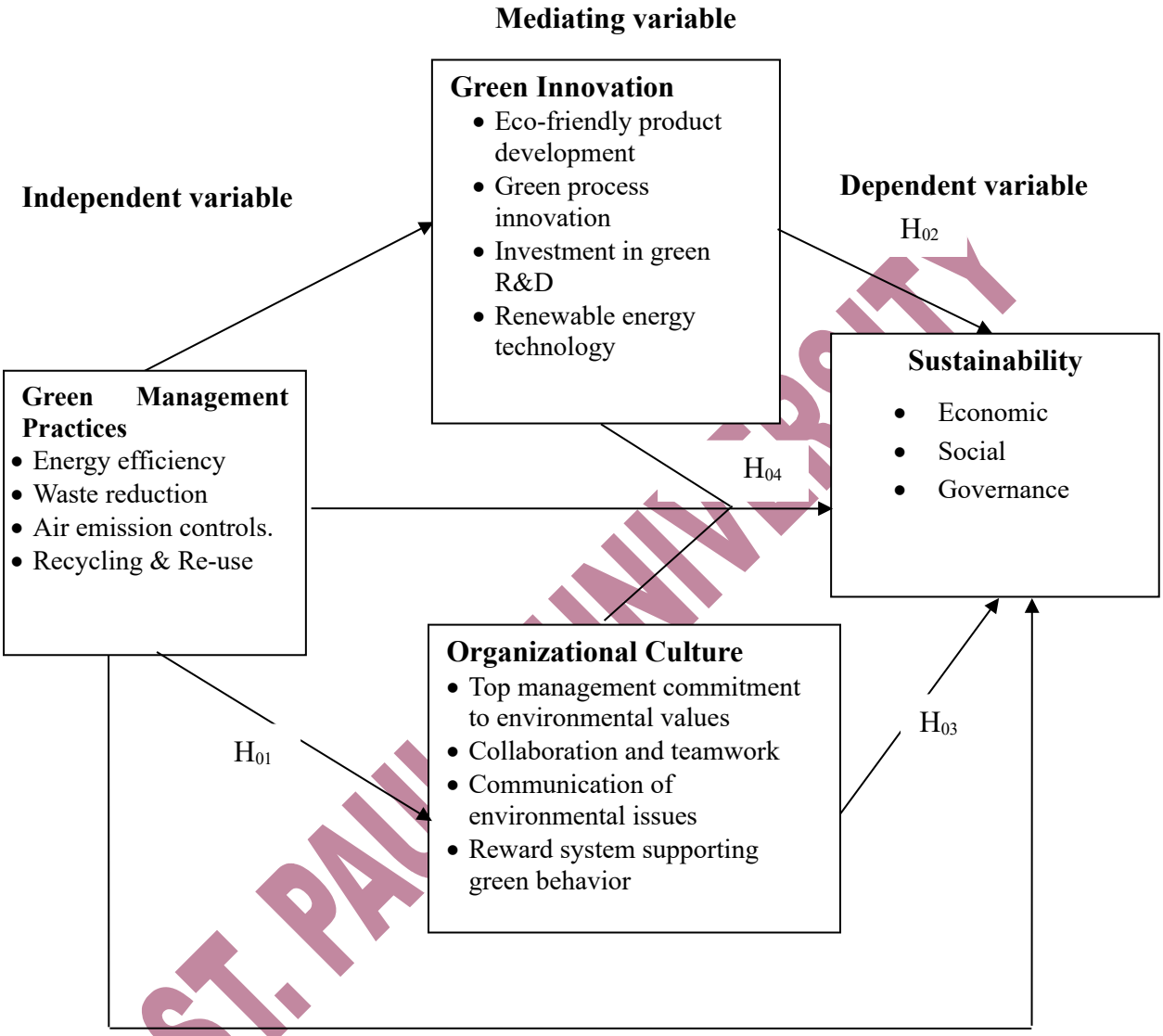


Figure 1: *Conceptual Framework*
Source: *Author (2025)*

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CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the research methodology followed in the study is given. It details the research philosophy, the research design, the population and sample, data collection methods, the instrument validity and reliability, the data analysis methods and the ethical considerations. The chapter also supports the approach of choice and show its comprehension with the goal of the study that is to investigate the relationships that exist between GMPs, green innovation, organizational culture, and sustainability performance in multinational manufacturing companies in Kenya.

3.2 Research Philosophy

The research philosophy followed in this study is positivism, which assumes that reality is objective, measurable, and quantifiable by being systematically observed (Ali, 2024). Positivism underlines that phenomenon in the social and organizational field, such as practice, culture, and innovation, are independent entities that do not depend on the perception of the individual and can be grasped using empirical inquiry. This philosophy is especially appropriate in studies where the researcher aims to explore causal and predictive associations because it enables researchers to convert abstract constructs into quantifiable variables and calculate them through statistical methods. Positivism, in line with this work, offers the opportunity to understand how GMPs affect sustainability in Kenyan multinational manufacturing companies in both direct and indirect ways through green innovation and organizational culture (Rotondo et al., 2022).

The positivist approach is also in line with the purposes of this study as they involve investigation of the direct correlation between GMPs and sustainability and evaluation of mediating variables in the form of green innovation and organizational culture. Positivism is the one that has enabled these intricate relationships to be empirically examined in an ordered and systematic way. After operationalizing the major constructs that include energy efficiency, reduction of waste, eco-innovation, and organizational norms, the study will be able to produce quantitative data that can be empirically tested. The philosophy also makes

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the findings generalizable and can give predictive information on how multinational manufacturing companies can improve their sustainability performance via structured green initiatives.

The theoretical frameworks used to support the study also support the appropriateness of positivism. Natural Resource-Based View (NRBV) points to the strategic importance of firm resources in creating a sustainable competitive advantage, whereas the dynamic capabilities theory focuses on the capability of the firm to adjust, innovate, and redesign resources to meet environmental pressure. In the same manner, Institutional theory describes the impact of external pressure on organizational norms and practices, and Stakeholder theory highlights the necessity of harmonizing the presence of various interests to attain sustainability (Alkaraan et al., 2024). These theoretical frameworks are aligned with positivism, in that they posit organized relationships that can be tested empirically using quantifiable variables. At the methodological level, positivism directly guided the explanatory research design used in this study. The design is defined by the collection of measurable data via structured questionnaires and the ability to test hypotheses using PLS-SEM. This design enables the research to measure latent variables and evaluate the mediation effect and the strength and significance of the linkage between variables, which guarantees a high level of methodological rigor and reliability (Munyon et al., 2021).

Positivism therefore helps provide a clear and methodical line of analysis on how operational green practices, with the help of organizational culture and technological innovation, can be converted into sustainable results. Thus, the implementation of positivist philosophy helps enrich both the theoretical and practical contributions of the study. The methodology enables the development of evidence-based findings that confirm theoretical hypotheses about green management, innovation, and culture, while also offering practical advice to managers at a multinational manufacturing company planning to introduce an efficient sustainability strategy. By basing the research on positivism, the study makes the findings strong, good, and applicable in policy-making, managerial decision-making, and furthering sustainability scholarship in the Kenyan manufacturing setting.

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3.3 Research Design

The study adopted an explanatory research design in the form of a quantitative research design. This type of research design is suitable when causal and mediated relationships among GMPs, green innovation, organizational culture, and sustainability need to be studied in the context of multinational manufacturing companies in Kenya. The explanatory research designs are especially applicable to studies that seek to evaluate the theoretical relationships and test hypotheses as opposed to describing the phenomena or providing initial understanding (Annamalah, 2024). In contrast to a descriptive or exploratory design, which is aimed at describing events or creating an initial insight about a specific phenomenon, explanatory designs enable researchers to explore the processes and causal directions in which the independent variables affect the results, which offers a systematic and well-staged approach to comprehending sustainability performance.

A quantitative explanatory design is in line with the study's research purpose by providing a quantitative measure of the direct and mediated impacts of GMPs on sustainability. This structure allows the operationalization of abstract constructs such as GMPs, green innovation, organizational culture, and sustainability into quantifiable units and enables rigorous statistical analysis and hypothesis testing (Val & Quintas, 2025). In addition, the methodology aligns with the positivist philosophy of the study, which focuses on objectivity, empirical validation, and evidence-based inferences. The study used standardized tools and structured questionnaires, which guaranteed the quality of the collected data, which are reliable and replicable across the target population.

The explanatory design is well supported by the use of PLS-SEM as the primary analytical instrument. PLS-SEM is suitable for testing complex models that comprise latent constructs, mediating variables, and predictive relations (Kenny, 2014). Applying the PLS-SEM in the current study, both direct and indirect and multi-mediation effects of GMPs on sustainability via green innovation and organizational culture was studied simultaneously. Another key aspect of using this research design was the need to resolve inconsistencies in previous research on the effectiveness of GMPs, as it enables quantitative analysis of

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effects and identifies the key pathways that influence sustainability outcomes (Fang et al., 2022).

The study had to strike a balance between feasibility and methodological rigor by utilizing a cross-sectional survey design, in which the data were collected at one point in time among 95 multinational manufacturing companies in Kenya. Although this type of study has certain limitations such as the inability to track causal changes over time, it is good enough to determine correlations and test the theoretical hypotheses within the explanatory framework since it is cross-sectional (Wanyonyi, 2023). The design offers an effective way of capturing the relationships existing among GMPs, green innovation, organizational culture, and sustainability, and producing the insights that can be generalized in the framework of the Kenyan manufacturing industry.

Consequently, an explanatory quantitative design provides a strong framework for exploring the nexus among the research variables. It not only serves to test hypotheses and validate theories but also creates actionable knowledge to help managers, policymakers, and scholars improve sustainability practices in multi-national manufacturing companies. The study provides its contribution to the body of empirical literature as well as to practical decision-making in green manufacturing through systematic connection of operational green practices to both organizational culture and sustainability outcomes.

3.4 Target Population

Target population for this study comprised 95 multinational manufacturing firms in Kenya as provided in the Kenya Association of Manufacturers (KAM) 2023 Membership Directory (Appendix V). This constitutes the unit of analysis. These are the companies strategically located in Kenya's major industrial areas, such as Nairobi, Mombasa, Kisumu, and Nakuru, as well as in the most important subsectors, including food and beverage, textiles, chemicals, building materials, and others (KAM, 2023). MNCs were specifically chosen because they have demonstrated the ability to enact organized GMPs, allocate investments in sustained green innovation, and create organizational cultures that correspond to international sustainability, such as the ISO 14001 certification. Their magnitude of operation, accessibility of resources, and great proportion in the Kenyan

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gross domestic product make them the key players in ensuring sustainable manufacturing is realized (Wairimu, 2025).

Multinational manufacturing companies are the perfect settings where the relations between GMPs, green innovation, and organizational culture can be explored because such companies have to balance between local operational efficiency and global sustainability responsibilities. Their production systems are usually capital intensive, the workforces are large and diverse, and the stakeholders, regulators, and supply chains around the world are mounting pressure on them to integrate sustainability in their operations. This target population also ensures that the research results have empirical strength, contextual relevance, and indicate the operational realities of the most promising firms to pursue comprehensive sustainability strategies (KAM, 2023).

Since the population is not very large, the research was based on a census, and all 95 multinational manufacturing companies are included in the study. This method avoids sampling error and makes sure that the study is fully covered to give a complete picture of the relationship that exists among GMPs, green innovation, organizational culture, and sustainability. The census method is especially suggested to be used in populations of less than 200 units since they increase the representativeness, reliability, and feasibility of the results. The study is also as representative of the whole population as possible, which increases the validity of the findings and also makes sure that all of the major subsectors, food and beverage, textiles, chemicals, and building materials, are adequately represented.

Within each firm, primary respondents were purposively selected managers responsible for operations, environmental management, supply chain management, and corporate strategy. These people are well placed to give the correct and pertinent information since they are the ones who get to implement the green initiatives, develop the organizational culture and green innovation. They are the most suitable informants to be used to offer data that indicates the actual implementation of sustainability practices in the Kenyan multinational manufacturing industry, as they have first-hand experience to support their expertise. The sampling frame was developed based on the official KAM membership list, which was

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cross-tabulated with the Kenya National Bureau of Statistics data to ensure completeness, reliability, and accuracy of the target population.

3.5 Data Collection

This section describes the data collection. It begins with the data sources, which were mainly primary data. It also presents the data collection procedure and encompasses ISERC and NACOSTI. The information that was to be gathered was primary data. Data collection instruments were questionnaires composed of structured questions, which were used as the response format for the variables.

3.5.1 Data Sources

Primary data were obtained directly from the respondents to ensure that the research objectives regarding GMPs, green innovation, organizational culture, and sustainability performance among MNEs in Kenya are met. The primary data were collected through the use of a structured questionnaire, which is an instrument capable of providing firsthand data from decision-makers who play critical roles in sustainable practices.

A five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) was used in the questionnaire to assess the frequency with which respondents perceived and practiced with respect to the variables in the study. Such practice facilitates standardization, allows conducting a quantitative analysis, and reflects the strength of agreement or disagreement to give subtle insights about the implementation and effectiveness of GMPs.

The primary data is justified due to the fact that it offers direct, context-specific, and dependable evidence of the target population, which is the requisite for assessing the mediating importance of green innovation and organizational culture between translating the GMPs into sustainability consequences. In addition, primary data were used to ensure that the results are current, representative of the realities on the ground, and can be used to inform managerial practice as well as policy-making in the Kenyan manufacturing industry.

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3.5.2 Data Collection Procedure

The data used in this study were gathered in a systematic stepwise approach, which has been developed so as to guarantee the validity, reliability, and adherence to the ethical standards. The researcher sought the relevant research approvals of the Institutional Scientific and Ethics Review Committee (ISERC) and a research permit from the National Commission for Science, Technology, and Innovation (NACOSTI), which are compulsory when carrying out field research in Kenya. The researcher then formally sends introductory letters and official emails to the 95 multinational manufacturing companies listed in the Kenya Association of Manufacturers database to inform them about the purpose of the study and seek their participation. The response rates were also increased through follow-up phone calls and personal visits to address any questions. To be more flexible and inclusive, the data were collected via online survey links (sent via email) and through in-person drop-off and pickup when respondents were ready and willing to participate. Frequent follow-ups were done using telephone and email reminders to keep track of ensuring that the process was done in time, whereas ethical issues like informed consent and confidentiality were also adhered to.

3.5.3 Data Collection Instruments

The main data collection tool in this study was a structured questionnaire, which was used to collect quantitative information systematically from the relevant managers of the chosen multinational manufacturing companies. The structured questionnaires were applicable in this study, as they allow for standardized information collection, reduce interviewer influence, and enable efficient statistical analysis, including reliability and validity tests (Al-Hakimi et al., 2025). This tool adheres to previous studies that examined the linkages among GMPs, green innovation, organizational culture, and sustainability in manufacturing settings, ensuring that the data obtained will be rigorous and comparable.

The questionnaire was divided into four major sections representing key study constructs. The first section addressed GMPs, and this is what operational-level environmental activities of the firms entail. The respondents rated their levels of agreement with statements on a five-point Likert scale (1-Strongly Disagree, 2-Strongly Disagree, 3-

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Strongly Disagree, 4-Strongly Disagree, 5-Strongly Agree). The most important ones are energy efficiency, waste minimization, air emission, and recycling and re-use programs which were employed to represent GMPs. In this section, the degree to which firms have incorporated environmentally responsible practices in their operations was evaluated as the basic component of sustainability performance.

The second segment evaluated green innovation, which refers to technological and process innovations that translate GMPs into quantifiable sustainability results. On the same five-point Likert scale, respondents provided details on the development of eco-friendly products, green process innovation, green research and development (R&D) investment, and the adoption of renewable energy technologies. This part is very important in capturing the processes under which the operational green practices produce long term sustainability benefits that may go hand in hand with the theoretical frameworks, including the RBV and dynamic capabilities theory.

The third section was an assessment of organization culture, which was focused on internal behavioral and normative environment where the sustainability practices are supported. The respondents ranked statements on the top management commitment to environmental values, teamwork and collaboration, communication of environmental concerns, and reward systems that support green behavior. The five-point Likert scale was also utilized in the measurement to facilitate comparisons among respondents and firms. This section gave an insight into the mediation of the effectiveness of GMPs by cultural factors and how environmentally responsible practices can be adopted by the firms throughout the organization.

The last section was devoted to sustainability results, including the economic, social, and governance (ESG) areas. The respondents were asked to state how far their firms have progressed toward the economic, social, and governance performance goals on a five-point Likert scale. This part defines the final dependent variable of the research and provides a holistic perspective on the roles of green practices, innovation, and organizational culture in contributing to sustainability in multinational manufacturing companies.

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The structured questionnaire was selected because it can gather quantitative, analyzable, and comparable data, which aligns with the explanatory research design of the study. Likert scale measurement and closed-ended questions allow for rigorous statistical analysis, hypothesis testing, and evaluation of reliability and validity. Moreover, the instrument was also based on the prior empirical research in the same context, so the data obtained is strong and aligns with the existing research practices (Al-Hakimi et al., 2025).

3.6 Pilot Testing

Before the actual data collection, a pilot test was conducted to assess the suitability of the structured questionnaire in practice and to determine its clarity, reliability, and overall appropriateness for the study. The pilot used 10 respondents who were the assistants of the respondents involved in the final study and were well versed with the various aspects of the study variables. This was approximately 10 percent of the targeted population of multinational manufacturing firms in Kenya. The sample of these respondents was selected based on a limited number of firms based in Nairobi, which was selected based on its concentration of multinational manufacturing firms, making it a convenient representative for the pretest of the instrument.

The main aim of the pilot test was to evaluate the clarity, comprehensibility, and logical flow of the questionnaire items; besides, it was to evaluate how long it would take to complete the questionnaire. Special focus was made on finding vague and ambiguous wording, items, or questions that are unnecessary or have structural inconsistencies that can affect the quality of answers. The pilot test also enabled pre-test statistical evaluation of the measurement scales of the questionnaire, such as internal consistency with Cronbach's alpha and composite reliability (CR), and average variance extracted (AVE) of convergent validity, and the Fornell-Larcker paradigm of discriminant validity. The tests assisted in assuring that constructs used to measure GMPs, green innovation, organizational culture, and sustainability are reliable and valid.

The results obtained from the pilot participants were critically examined and compared with the statistical results to refine the questionnaire. Adjustments required included rephrasing unclear items, rearranging questions to improve flow, and deleting or combining

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overlapping items. The effectiveness of the instrument in capturing the intended constructs in the main study was guaranteed by this iterative process, as the clarity, coherence, and reliability of the instrument were improved. The integrity of the final dataset was preserved by excluding responses obtained during the pilot test to avoid contamination of the study results. The research with this pilot test guaranteed that the final questionnaire was valid and reliable, and this offered a strong platform for accurate data collection and strong analysis in the actual research.

3.7 Quality of the Instrument

The quality of the questionnaire is determined by its reliability and validity. The reliability provided the instrument with consistency and stability in its results, whereas the validity established that the instrument measures what it was supposed to measure. Combined, the tests determine the trustworthiness and soundness of the research tools.3.8.1 Reliability of Research Instruments

According to Taherdoost (2021), reliability is the degree of consistency with which an instrument is able to measure a certain characteristic such that when it is administered repeatedly in almost the same conditions, it produces consistent findings. For the study, the reliability assessment focused on examining the internal consistency of the constructs of GMPs, green innovation, organizational culture, and sustainability. There are several indicators for determining reliability using PLS-SEM which is executed in Smart PLS.

Firstly, the value of Cronbach Alpha (α) was computed in order to determine the degree of correlation between the variables that represent the construct. According to the classical levels, alpha level of 0.70 and above was considered a reliably good measure, and the lower level requires the revision of uncertain or ineffective items (Hair et al., 2021). Second, the study employed composite reliability, which is supposedly a more potent instrument of internal consistency in PLS-SEM since it takes into account multiple weights between indicators compared to Cronbach's alpha, which gives all indicators equal weights. A composite reliability of 0.70 or higher is considered satisfactory and reflects high internal consistency of the indicators. Third, the rhoA (rA) reliability was considered, a more

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precise measure of reliability proposed in PLS-SEM when the items comprising the constructs are fewer (Guevara Rabanal et al., 2025).

Typically, the values nearer to 1.0 indicate a strong degree of reliability, and above 0.70 is generally taken as the minimum. To maintain the questionnaire's stability over time, a pilot sample of participants (assistant managers) was used to test it. Objects or structures that brought various results were studied and revised. The ambiguous questions, where necessary, were reformulated, redundant questions were removed, and the entire instrument was streamlined to provide a clear and reliable version. The Smart PLS reliability measures (Cronbach's alpha, composite reliability, and rhoA) offered the study stability, consistency, and credibility of the research tool to produce consistent, reliable outcomes in various conditions and samples. In addition to internal consistency, the research also conducted indicator reliability tests in Smart PLS using item loading checks.

According to Cheung et al. (2024), it has been highlighted that if 0.70 or more is achieved for the indicator loading, it shows that there was sufficient variance shared between the items and constructs and loadings between 0.40 and 0.70 can be considered reliable (Cheung et al., 2024). The constructs also ensured that items with ratings below 0.40 were considered for removal to increase construct reliability. This ensures that each item makes a meaningful contribution to the latent construct measure. Additionally, the adoption of a combination of old reliability indices (Cronbach alpha and test-retest) and new PLS-SEM indices (composite reliability, rho A, and indicator loadings) makes the study a multi-method study, which enhances the performance of the intended measurement paradigm. The reason is that this comprehensive plan of reliability testing minimizes the probability of measurement error to a large extent, not to mention that it also increases the validity of the results obtained with the help of the data.

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3.7.1 Validity of Research Instruments

The concept of validity describes the extent to which a particular instrument is supposed to measure what it is meant to measure so that the researcher can obtain not only reliable data but also representing and reflective of the constructs of interest (Lambert & Newman, 2023). Content and construct validity was tested in this study in relation to the

questionnaire. The concerns of content validity were addressed at the stage of development and judgment by aligning the items to the definitions used in the preceding literature, consulting with experts, and consulting with population representatives. Specifically, the researcher also involved the research supervisor, as well as the subject matter experts, to answer the question of whether the questionnaire questions were utilized to measure the constructs of GMPs, green innovation, organizational culture, and sustainability. Following the recommendations of Mandhana et al. (2024), the items were kept simple, redundant ones were deleted, and irrelevant ones were replaced after piloting.

This would be a refining process because the instrument must be capable of recording the desired data in a transparent and applicable way. Construct validity was conducted through the PLS-SEM using Smart PLS, as it provides strong statistical approaches for establishing the degree of capturing the theoretical constructs that the hypothetical variables assess (Hair & Alamer, 2022). First, the convergent validity was evaluated by Average Variance Extracted (AVE), and a value above 0.50 means that more than half of the variance among indicators is accounted for by the latent construct. Also, individual items' outer loadings were investigated, and values > 0.70 were considered acceptable, whereas between 0.40 and 0.70, an item may be used because it can support construct validity (Howard & Henderson, 2023). Second, the Heterotrait-Monotrait ratio (HTMT) was used to assess discriminant validity; a value below 0.85 indicates sufficient differentiation between constructs (Dirgiatmo, 2023). The Fornell-Larcker criterion was also utilized to verify whether the square root of the construct AVE is bigger than the correlation with other constructs.

Besides, criterion-related validity was assessed by examining correlations among the constructs of interest to determine whether they were expected and consistent with previous empirical results. This involved assessing the concurrent and predictive validity of the PLS-SEM structural model to determine whether the GMPs, green innovation, and organizational culture predict sustainability outcomes in a manner consistent with theoretical developments and previous studies. Face validity, though regarded as a weaker form of validity, was applied by applying expert ratings so that every question appears to

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measure what it is supposed to measure and is contextually applicable to the Kenyan manufacturing industry.

The analysis was conducted using a multidimensional approach, combining content and construct validity with Smart PLS SEM methodology to ensure theoretical and statistical validity. The validation process ensures that the survey tool yields valid findings that accurately measure what it is intended to measure. Finally, such a comprehensive validity test helped enhance the credibility of the study's results.

3.8 Diagnostic Tests for Data Robustness and Assumption Checks

A series of diagnostic tests was carried out to verify the strength, reliability, and authenticity of the data before performing the principal PLS-SEM analysis. Such tests were multicollinearity, homoscedasticity, and outlier tests. The Variance Inflation Factor (VIF) was used to assess multicollinearity, as it was necessary to ensure that each predictor contributed differently to the variation in sustainability performance (Hair et al., 2021). The Breusch-Pagan test was used to determine homoscedasticity to ensure that the standard errors of the independent variables were unbiased, and the significance was tested without bias since the standard errors remain constant at all levels of the independent variables (Gujarati & Porter, 2020). The Interquartile Range (IQR) was used as an outlier detection and control method to detect and remove extreme values that would skew the regression estimates (Akoglu, 2018).

The paper has also measured common method bias by administering Harman's single-factor test and checking for a common latent factor to determine that the effect of measurement methods did not inflate relationships between the variables (Podsakoff et al., 2003). These diagnostics offered a good basis for the later analysis of GMC, green innovations, organizational culture, and sustainable performance. These tests ensured that the estimated relationships accurately reflected the patterns inherent in the dataset, making the study findings credible.

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3.8.1 Homoscedasticity

Assuming that the residuals (errors) of a regression equation have the same variance at all levels of the independent variable(s) is known as homoscedasticity. In this contextual study, it will ensure that the variability of the dependent variable, sustainability performance, will be constant at different levels of GMP. This assumption is essential to generate effective and dependable regression estimates because any breach of it may result in biased standard errors, faulty statistical results, and altered levels of significance (Gujarati & Porter, 2020). Homoscedasticity is especially paramount in models that examine the impact of many predictors, intermediates, and moderators, as it protects the validity of parameter estimates and the strength of the study's findings.

To assess homoscedasticity, the research used the Breusch-Pagan test, a well-known statistical tool for identifying unequal variance in the regression errors (Weinsberg, 2021). This test is based on the p-value: a non-significant p-value ($p > 0.05$) means that the residual values are homoscedastic, whereas a significant p-value ($p \leq 0.05$) means that the residual values are heteroscedastic. In the event that heteroscedasticity had been detected, corrective measures such as transforming the dependent variable (e.g., logarithmic or square-root transformations) or the application of robust standard errors based on the Huber-White method would have been taken. With this approach, the study makes the regression estimates unbiased and statistically valid, and the regression estimates will be representative of the relationships between GMPs and sustainability performance among multinational manufacturers in Kenya.

3.8.2 Multicollinearity

Multicollinearity is a form of correlation between two or more independent variables in a regression model, meaning that a given predictor is highly correlated with another, making it redundant and thus the coefficient estimates may be unstable. Multicollinearity testing aims to check whether the predictors (GMP, green innovation, and organizational culture) make independent contributions to the variation in sustainability without overstating standard errors or bending the strengths and direction of relationships. Multicollinearity is

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an important issue to detect and manage to ensure that the results of the regression and SEM remain valid and interpretable (Hair et al., 2021).

To test this assumption, the research calculated VIF and Tolerance values for each independent variable. VIF greater than 10 or Tolerance less than 0.10 means that there is significant multicollinearities (Kline, 2016). Moreover, a pairwise correlation coefficient of independent variables was studied, and values exceeding 0.80 showed possible multicollinearity issues.

In the event that multicollinearity is identified, the corrective actions to be implemented include removal or pooling of variables with high levels of correlation and the centering of the data by subtracting the mean of the predictor variables using PLS-SEM, which is more sensitive to multicollinearity. The high strength, accuracy, and consistency of the parameter estimate in the model that investigates the impact of GMP, green innovation, and organizational culture on sustainability amongst multinational manufacturing companies in Kenya was increased by ensuring there is no or minimal multicollinearity.

3.8.3 Outlier Detection

Outlier detection is one of the necessary diagnostic processes to determine the integrity and quality of the data before structural equation modeling. Outliers are extreme values that deviate from the general trend of the data and may affect parameter estimates, inflate error variance, and reduce the model's predictive accuracy (Hair et al., 2021). Univariate and multivariate outliers were taken into consideration in this research work to make sure that every observation would play a significant role in the analysis of the GMPs, green innovation, organizational culture, and sustainability performance of multinationals in the manufacturing industry in Kenya.

Univariate outlier detection was performed using the Interquartile Range (IQR) technique because it is a powerful approach for non-normally distributed data and an easy yet effective way to detect extreme values (Ghasemi & Zahediasl, 2012). The first (Q1) and third (Q3) quartile of the indicator variables was computed, and the IQR was computed using the formula Q3-Q1. The observations below Q1 -1.5IQR or above Q3 +1.5IQR were

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flagged as potential outliers. These absolute extremes were scrutinized well to give an insight on whether they were actually the responses or were just a data entry mistake. The outliers caused by errors during the entry were eliminated, and the valid extreme values were retained but appropriately controlled to reduce their effect on further PLS-SEM analysis.

This method ensures that the sample remains representative and varied while reducing potential biases introduced by extreme values (Tabachnick & Fidell, 2019). By implementing IQR-based outlier detection, the study enhances the efficiency and validity of the estimated paths and model coefficients, making the conclusions regarding the relationships among green management practices, green innovation, organizational culture, and sustainability performance valid and applicable to Kenyan multinational manufacturing companies.

3.8.4 Common Method Bias

Common Method Bias (CMB) occurs when a measurement error is caused by the use of one source of data, measurement instrument, or context of response that may over- or underestimate the observed relationships between variables (Podsakoff et al., 2003). CMB may jeopardize structural model inferences in survey-based research, especially when self-reported measures are drawn from the same set of respondents. Since this study relies on data collected from managers across multinational manufacturing firms, it was necessary to assess and mitigate potential method bias to ensure that the observed associations among GMP, green innovation, organizational culture, and sustainability performance reflect true theoretical relationships rather than methodological artifacts.

To identify CMB, the research used the Harman single-factor test, which entails loading all indicators measured in an unrotated exploratory factor analysis (EFA). When a single factor accounts for more than 50 percent of the total variance, the indicator can be said to reflect a high degree of method bias (Podsakoff et al., 2003). The first unrotated factor in this research explained less than 50 percent of the variation, indicating a small bias.

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These CMB detection methods are carefully applied to ensure that the structural relationship between the variables of study is also credible and strong. By covering CMB, the study increases the validity and reliability of the results, which gives confidence that the observed effects of GMPs on sustainability performance, both directly and through mediators such as green innovation as well as organizational culture, are not artifacts of measurement but actual organizational phenomena.

Table 3: *Diagnostic Tests for Data Robustness and Assumption Checks*

Test	Tool / Method	Decision Criteria / Hypotheses
Multicollinearity Test	Variance Inflation Factor	VIF < 10 → No multicollinearity; VIF ≥ 10 → Presence of multicollinearity
Homoscedasticity Test	Breusch-Pagan Test (Breusch & Pagan, 1979)	H_0: Residuals are homoscedastic H_1: Residuals are heteroscedastic
Outlier Detection	Interquartile Range (IQR) method	Values beyond Q1 − 1.5*IQR or Q3 + 1.5*IQR → Outliers present; Values within range → No outliers
Common Method Bias	Harman's Single Factor Test	First factor explains <50% variance → Minimal common method bias; >50% → Potential CMB present

Note: These diagnostic tests were conducted to ensure robustness, reliability, and validity of the PLS-SEM analysis.

3.9 Measurement of the Study Variables

Operationalizations and measurements of key variables are used in this study to ensure clarity, consistency, and alignment with the research objectives. The independent variable is operational-level environmental practices in firms. The GMP indicators: energy efficiency, waste reduction, air emission controls, and recycling/re-use are based on the previous research on environmental management in the manufacturing setting. The first mediating variable is green innovation, which was measured by eco-friendly product development, green process innovation, investment in green R&D, and adoption of renewable energy technologies. This is indicative of the technological and process innovation aimed at converting GMPs into sustainability outcomes.

The second mediator variable is organizational culture; it comprises internal behavioral norms and management's encouragement of sustainability efforts. The indicators comprise the top management commitment to environmental values, collaboration and teamwork,

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communication of environmental issues, and reward systems supporting green behavior. Sustainability is the dependent variable, measured in the three dimensions of economic, social, and governance (ESG), as a reflection of the GMPs, green innovation, and organizational culture.

Each construct was rated on a five-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree), enabling quantitative assessment in a standardized manner and allowing statistical analysis of linkages, including mediation effects. This measurement method is consistent with empirical studies conducted in the field, making the instruments reliable and valid.

Table 4: *Summary of Operationalization and Measurement of the Study Variables*

Variable	Scale	Indicators
Green Management Practices	5 Likert	Energy efficiency Waste reduction Air emission controls Recycling and Re-use
Green Innovation	5 Likert	Eco-friendly product development Green process innovation Investment in green R&D Renewable energy technology
Organizational Culture	5 Likert	Top management commitment to environmental values Collaboration and teamwork Communication of environmental issues Reward system supporting green behavior
Sustainability	5 Likert	Economic Social Governance

Note: Variable, scale and indicators

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3.10 Empirical Model

The study assessed the relationship among GMPs, green innovation, and organizational culture on sustainability in multinational manufacturing organizations in Kenya.

3.10.1 Green Management Practices and sustainability

To examine the relationship between GMP (Independent variable) and sustainability (Dependent variable) (objective 1, hypothesis H_{01}), a general linear regression model is specified as follows.

Table 5: *Total Effect Model (Testing the Relationship Between GMP and Sustainability)*

Step	Structural Equation	Interpretation
1	**$SUS = \beta_0 + \beta_1 GMP + \varepsilon$**	A significant and positive path coefficient (β_1, $p < 0.05$) indicates that Green Management Practices have a strong positive total effect on Sustainability

Note: This model establishes the baseline relationship between GMP and sustainability.

Where: SUS = Sustainability; GMP = Green Management Practices; $\boldsymbol{\beta_0}$= regression constant; $\boldsymbol{\beta_1}$ = path coefficient; $\boldsymbol{\varepsilon}$ = error term (unobserved factors, random fluctuations, or other variables that influence the dependent variable but are not openly considered in the model).

3.10.2 Mediator Models

To test the proposed hypothesis, the study utilized the PLS-SEM framework to probe the hypothesized linkages among GMPs, green innovation, organizational culture, and sustainability. The methodology of analysis was the parallel mediation model, where green innovation and organizational culture mediate the relationship between GMP and sustainability. This model captures the possibility that multiple internal mechanisms simultaneously transmit GMPs' influence on sustainability outcomes.

In spite of the fact that the causal steps approach suggested by Baron and Kenny (1986) is the conceptual basis of mediation comprehension, it is criticized as having low statistical power and reliance on sequential testing of significance. Modern mediation analysis advocates the use of bootstrapping techniques that do not require assumptions about the normality of indirect effects to estimate the sampling distribution of the indirect effect (Hayes, 2018; Preacher & Hayes, 2008). Thus, this research primarily used bootstrapping in PLS-SEM to assess the statistical significance of the indirect effect, whereas the Baron and Kenny (1986) logic was applied to organize the conceptual flow of relationships.

In the parallel mediation model, two mediators (green innovation and organizational culture) are modeled to operate simultaneously and independently in the relationship between GMP and sustainability. The model enables the researcher to establish the

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contribution of each of the mediators to the indirect relationship, and to evaluate the sum total mediated and direct effects of GMP on sustainability.

Figure 2: *Statistical Path Plot*

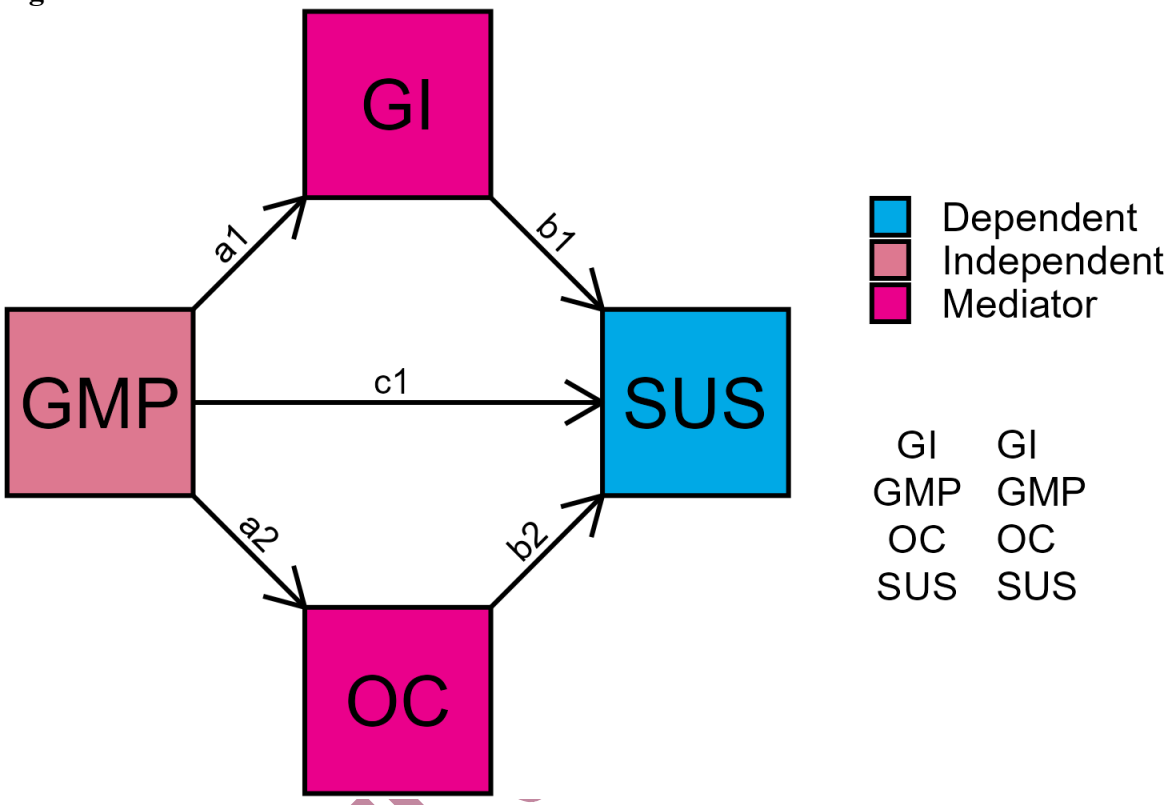


Table 6: *Causal Steps for Parallel Mediator Models*

Step	Structural Equation (with constants)	Purpose
1	$SUS = c_0 + c\,(GMP) + \varepsilon_0$	Test whether GMP directly affects sustainability (total effect).
2	$GI = a_{01} + a_1(GMP) + \varepsilon_1$	Test whether GMP significantly predicts green innovation (path a_1).
3	$OC = a_{02} + a_2(GMP) + \varepsilon_2$	Test whether GMP significantly predicts organizational culture (path a_2).
4	$SUS = b_0 + c'(GMP) + b_1(GI) + b_2(OC$	Test whether GI and OC predict sustainability while controlling for GMP (paths b_1, $b_2$and c').

Note: The model tests both the direct and indirect effects of Green Management Practices (GMPs) on Sustainability (SUS) through Green Innovation (GI) and Organizational Culture (OC).

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Where:

SUS = Sustainability

GMP = Green Management Practices

GI = Green Innovation

OC = Organizational Culture

c_0 = denotes the intercept of the total-effect model and captures the baseline level of Sustainability (SUS) before accounting for mediators.

a_{01} = represents the intercept of the Green Innovation (GI) equation, reflecting the expected level of GI when GMPs is zero, while

a_{02} = the intercept of the Organizational Culture (OC) equation, indicating the baseline OC in the absence of GMPs.

b_0= the intercept of the full structural model that includes both mediators, representing the baseline sustainability after controlling for the effects of GMPs, GI, and OC.

a_1, a_2 = Paths from GMPs to GI and OC, respectively (effect of predictor on mediators)

b_1, b_2 = Paths from GI and OC to SUS, respectively (effect of mediators on outcome)

c = Total effect of GMPs on SUS (without mediators)

c′ = Direct effect of GMPs on SUS (controlling for mediators)

ε = Error term capturing unexplained or random variance

The indirect effects are computed as:

Indirect effect via GI: $(a_1 \times b_1)$

Indirect effect via OC: $(a_2 \times b_2)$

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Total indirect effect: $(a_1 \times b_1) + (a_2 \times b_2)$

Total effect: $c = c' + (a_1 \times b_1) + (a_2 \times b_2)$

The bootstrapping procedure with 5,000 resamples was used to obtain bias-corrected 95% confidence intervals for each indirect effect. The confirmation of mediation is made when the indirect effect confidence interval is not zero, meaning it is statistically significant (Zhao et al., 2010; Hair et al., 2021).

This parallel mediation model enables an intensive and decisive evaluation of multiple mediating actions within a single framework. It improves theoretical knowledge of how GMPs help to improve sustainability through green innovation as well as green culture, which is an expression of technological and process improvements, and organizational culture, which is an expression of shared values and rules for environmental stewardship. The results provide further insights into how internal capabilities and cultural considerations work together to produce sustainable outcomes in organizations.

Table 7: *Interpretation Criteria for mediation*

Effect Type	Formula	Interpretation
Total Effect	c	Overall impact of GMP on SUS before including mediators
Direct Effect	c'	Impact of GMP on SUS controlling for GI and OC
Indirect Effect 1	$a_1 b_1$	Indirect impact through Green Innovation
Indirect Effect 2	$a_2 b_2$	Indirect impact through Organizational Culture
Total Indirect Effect	$a_1 b_1 + a_2 b_2$	Combined mediated effect via both mediators

Note: The total effect (c) equals the sum of the direct (c') and total indirect ($a_1 b_1 + a_2 b_2$) effects. Bootstrapping methods are recommended for testing the significance of indirect effects in parallel mediation models.

3.10.3 Joint Effect Model

This research also examined the combined effects of GMP, green innovation, and organizational culture on sustainability. GMP, green innovation, and organizational culture are independent variables in this framework, while sustainability is the dependent variable. While the error factor (ε) accounts for unexplained volatility, the constant (β_0) represents

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the baseline level of sustainability. The model implies the testing of both direct and combined impacts that might enable the formation of the full picture on whether managerial practices, innovation, or cultural alignment is a more essential driver of sustainability results in Kenyan multinational manufacturing companies or whether these constructs interact to produce the maximum impact (Chatterjee et al., 2024). The joint effect estimation model is given by the following:

Table 8: *Causal Steps for Joint effect model*

Model	Structural Equation	Interpretation
Joint Effect	$\mathbf{SUS = \beta_0 + \beta_1 GMP + \beta_2 GI + \beta_3 OC + \varepsilon}$	A significant model indicates that the predictors collectively enhance sustainability outcomes, highlighting the integrated role of management practices, innovation, and culture in driving sustainable performance.

Note: The joint effect model captures the overall explanatory power of all predictors when considered together. It helps determine the collective impact of independent and mediating variables on the dependent variable (sustainability), beyond their individual effects.

By demonstrating how GMP affects sustainability both directly and indirectly through green innovation and organizational culture, this combined-effect model relates directly to the mediation models. The combined model incorporates the mediation findings into an overall framework, as it covers all three elements, while the mediation models isolate only the channels through which innovation and culture mediate the influence of GMPs on sustainability. This alignment shows whether the direct and combined effects of green innovation and organizational culture mediate, partially mediate, or enhance GMP's impact on sustainability.

3.11 Data Analysis and Presentation

Data were cleaned to eliminate any missing data, outliers, and inconsistencies and coded so as to perform statistical processing. Study variables were summarized with the help of descriptive statistics (i.e., means, standard deviations, and coefficient of variation), and the inferential analysis involved correlation analysis and PLS-SEM with SmartPLS to

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determine relationships, mediation effects, and joint contribution of GMPs, green innovation, and organizational culture on sustainability. PLS-SEM is helpful, as it is well suited to conducting predictive studies, can use small to medium sample sizes, and does not assume multivariate normality, making it more resilient in applied research in organizations (Legate et al., 2023). Compared to covariance-based SEM methods, including AMOS or LISREL, which are theory-testing oriented and need large samples with normally distributed data, PLS-SEM was especially appropriate in this study since the model was very complex, with multiple latent constructs, mediation, and joint effects. Also, predictive methodology aligned with the aim of the study to identify pathways through which GMPs, green innovation, and organizational culture influence sustainability in Kenyan multinational manufacturing companies (Oduro et al., 2025).

Reliability and validity were tested using Cronbach's alpha, composite reliability, AVE, Fornell-Larcker criterion, and HTMT ratios, respectively. Path significance and predictive relevance were assessed using bootstrapping. To ensure clarity, accuracy, and ease of understanding, the findings were presented as tables, charts, graphs, and path diagrams. This methodological option will ensure that the study, in addition to addressing the limitations of classic CB-SEM posed by the complex, non-normal, and prediction-oriented models, produces statistically sound and practically meaningful findings.

3.12 Ethical Consideration

This research was conducted in strict compliance with the accepted ethical principles of research in order to protect the participants and prevent the loss of research integrity and credibility of the results. Informed consent was obtained from all participants in advance, and the objectives of the study and procedures employed were explained to them, and their rights were provided, including the right to drop out of the study at any point with no penalty or adverse outcomes (Fons-Martinez et al., 2021). This ensured that the participants received all necessary information about the study's intentions and participation, which facilitated transparency and ethical considerations.

Participation in the research was totally voluntary. This means the subjects took part voluntarily, without coercion of any kind. The methodology preserves participants'

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independence and provides information deemed representative of actual responses, thereby increasing the reliability and validity of the research results. Confidentiality and anonymity were assured by omitting all company names or personal identifiers from the report. The answers were analyzed and presented in such a way that they could not be traced back to anyone in particular. This assures the anonymity of respondents and allows them to answer questions freely without fear of being identified.

Strict data protection measures and safe storage were also implemented in the study. The questionnaires were completed, and electronic data was stored with high security and electronic files encrypted so that only the researcher could have access. The data contained in hard copy were stored in a locked storage facility to avoid unauthorized access. Any data were stored just as long as it was required to do the academic analysis and shall be destroyed in a safe manner thereafter. All these measures were aimed at ensuring that the rights, privacy and dignity of the participants was safeguarded during the research process as well as maintaining the highest ethical standard.

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CHAPTER FOUR
DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter reports the findings of the analysis of the data gathered among managers of multinational manufacturing firms in Kenya, and the objective of the study was to establish the relationship among the GMPs, green innovation, organizational culture, and sustainability performance. The analysis in the chapter is directly associated with the objectives and hypotheses, providing empirical evidence to test the proposed theoretical model.

The analysis sequence starts with descriptive statistics that summarize the attributes of the data and proceeds to the measurement model evaluation, which assesses the reliability and validity of constructs. Afterward, the structural model was tested using PLS-SEM to examine the hypothesized relationships, including the direct, indirect (mediating), and joint effects. Multicollinearity, homoscedasticity, outliers, and common method bias diagnostic tests were performed to enhance the strength and reliability of the results. The chapter concludes with a discussion of key empirical results in relation to the study objectives.

4.2 Questionnaire Administration and Response Rate

In order to get empirically sound and representative data for this study, structured questionnaires were carefully administered to the main office staff of 95 multinational manufacturing companies in Kenya, and they included sustainability managers, operations managers, and other executives charged with environmental management and strategic oversight. The aim of this data collection plan was to have high-quality, comprehensive data on the GMPs, green innovation pursuits, organizational culture, and sustainability performance of the firms. The findings are captured in Table 9.

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Table 9: *Questionnaire Distribution, Returns, and Usable Responses*

Description	Number	Percentage (%)
Questionnaires distributed	95	100.0
Questionnaires returned	93	97.9
Usable questionnaires	92	96.8
Non-usable questionnaires	1	1.1
Non-respondents	2	2.1

Note. The response rate is computed as the number of usable questionnaires divided by the total distributed, multiplied by 100.

The data revealed a very high response rate, with 92 usable questionnaires out of 95 distributed, yielding a response rate of 96.8%. A single questionnaire was considered unusable because it was incomplete, and a very small percentage of companies (2.1%) failed to respond. This high participation rate indicates strong involvement among the targeted population, meaning that the respondents were not only willing but also able to provide detailed, precise information relevant to the constructs being studied. The high response rate is ascribed to constant follow-ups with the respondents to fill the questionnaires.

Methodologically, the response rate is by far better than the usual 50 percent threshold of organizational survey research, which is usually viewed as adequate to alleviate the fear of non-response bias (Baruch & Holtom, 2008; Fowler, 2014). This high response rate is a sign of the strength and completeness of the dataset, which guarantees the credibility, reliability, and representativeness of the empirical analysis, providing a sound basis upon which the further analysis of the study was going to be performed with the help of PLS-SEM.

4.3 Preliminary Data Screening and Diagnostic Tests

Prior to performing inferential analyses, it is important to confirm that the dataset is of high quality and satisfies the assumptions required for robust statistical modeling. The

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preliminary data screening consisted of coding, cleaning, handling missing values, and computing composite scores for the study constructs. At the same time, diagnostic tests are used to examine the model's critical assumptions, such as the presence of outliers, multicollinearity, heteroscedasticity, and common method variance, which might invalidate the study's results. By performing these steps, the rigor, transparency, and credibility of the further PLS-SEM analysis is increased, which makes the empirical results and interpretations not only reasonably grounded but also applicable.

4.3.1 Data Screening and Preparation

To ensure data integrity and soundness, a data screening and cleaning procedure was conducted on the raw responses. All the questionnaires were carefully reviewed for consistency, completeness, and accuracy, with strict attention to potential data-entry errors, unreasonable answers, and values outside the anticipated range of the Likert-scale measures. All responses that were ordinal were coded in a systematic manner to ease the quantitative analysis, whereas numerical responses were standardized where necessary. This stringent procedure ensured that the dataset was methodologically appropriate, and thus the chances that there might be bias or distortion in the further statistical modeling were low.

Missing values were also checked, as they have the potential to affect reliability and validity when not addressed in the dataset. The incidence of missing data was low, given the exceptionally high response rate (96.8%) observed in this study. Any missing cases were handled using appropriate methods, such as mean imputation and listwise deletion, so that the final dataset included complete, representative cases across all constructs. These steps were consistent with the best practices in survey research, where the quality of data is paramount in accurate modeling of latent constructs.

Composite scores were calculated in two steps after cleaning and treating missing values. At the first level, responses to questionnaire items were averaged to create indicator (observed variable) scores, which represent each aspect of the corresponding constructs. The second level involved averaging the indicator scores to obtain the latent variable scores for GMPs, green innovation, organizational culture, and sustainability. This two-stage

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aggregation method minimizes measurement error while rendering a parsimonious and dependable description of all constructs, whereby each latent variable is a true reflection of the underlying theoretical dimension. Through this approach, the research augments the strength, validity, and meaningfulness of the consequent PLS-SEM tests.

4.3.2 Outlier Detection

Before undertaking advanced inferential analyses, it is important to remove and deal with the extreme values, which may have disproportionate effects on the statistical estimates as well as invalidate the findings. Outliers, if they exist, may distort parameter estimates, increase standard errors, and affect the reliability of the structural model. The Interquartile Range (IQR) technique was used in this research to systematically identify outliers across all indicators of the four latent constructs: GMPs, green innovation, organizational culture, and sustainability. According to this approach, any observations that fell more than 1.5 times the IQR below Q1 or above Q3 would be classified as outliers. The outcomes of this test are presented in Table 10.

Table 10: *Outlier Detection for Study Variables (IQR Method)*

Construct	Indicator	Q1	Q3	IQR	Lower Bound	Upper Bound	Outliers
Green Management Practices	Energy efficiency	4.0	5.0	1.0	2.5	6.5	None
	Waste reduction	3.6	4.75	1.15	1.875	6.475	None
	Air emission controls	3.0	4.25	1.25	1.125	6.125	None
	Recycling & Re-use	3.25	4.5	1.25	1.625	6.625	None
Green Innovation	Eco-friendly product development	4.0	5.0	1.0	2.5	6.5	None
	Green process innovation	4.0	5.0	1.0	2.5	6.5	None
	Investment in green R&D	4.0	5.0	1.0	2.5	6.5	None
	Renewable energy technology	4.0	5.0	1.0	2.5	6.5	None
Organizational Culture	Top management commitment	4.0	5.0	1.0	2.5	6.5	None
	Collaboration & teamwork	4.0	5.0	1.0	2.5	6.5	None
	Communication of environmental issues	4.0	5.0	1.0	2.5	6.5	None
	Reward system supporting green behavior	3.0	5.0	2.0	0.0	8.0	None
Sustainability	Economic	3.5	5.0	1.5	1.25	6.25	None
	Social	4.0	5.0	1.0	2.5	6.5	None

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Construct	Indicator	Q1	Q3	IQR	Lower Bound	Upper Bound	Outliers
	Governance	3.5	5.0	1.5	1.25	6.25	None

Note: Outliers were detected using the Interquartile Range (IQR) method, where any value that lies more than 1.5× the IQR below Q1 or above Q3 is considered an outlier.

The findings suggest that there were no extreme outliers on any of the indicators of the four constructs. Although in certain areas some responses were close to the upper or lower limits, the values were still within the tolerable range, thereby maintaining the natural variability of the data. The lack of influential outliers suggests that the data was statistically stable and appropriate for the PLS-SEM model, hence reducing the likelihood that individual observations would unduly bias the estimation of path coefficients. As a result, the data show high internal consistency and reliability, which guarantee that the relationships among the GMPs, green innovation, organizational culture, and sustainability are a true reflection of underlying patterns rather than a product of response bias. The result establishes a strong foundation for subsequent assessment of the measurement model and structural path analyses.

4.3.3 Diagnostic Tests and Model Assumptions

Before the structural model analysis and hypothesis testing, one must ensure the data satisfy the basic assumptions of trustworthiness and sound inferences of PLS-SEM. This is achieved by analyzing multicollinearity to determine whether predictor constructs are independent enough, testing heteroskedasticity to determine whether the variance of residuals is the same across levels of the predictors, and determining the presence of common method bias to establish whether the observed relationships are not artificially inflated by the method of measurement. The VIF was used to test multicollinearity, the Breusch–Pagan method was used to test heteroskedasticity, and common method bias was assessed with Harman's single-factor test.

It is essential to note that other classical assumptions such as normality and linearity were not tested. The reason is that PLS-SEM is a non-parametric, variance-based method, which does not presuppose multivariate normality or highly linear relationships among the variables. Rather, PLS-SEM uses bootstrapping procedures to produce robust estimates of

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standard errors and significance, which permit reliable conclusions even when the data are non-normal (Hair et al., 2022). Similarly, linearity is not necessarily required, since estimates of the latent variables are based on composite weights that represent the indicators, and the parameters are estimated using covariance approaches rather than a parametric approach. Hence, indicator reliability, multicollinearity, heteroskedasticity, and possible common method bias are the focus of the diagnostic evaluation and are most suitable to ensure the robustness and validity of the PLS-SEM output.

4.3.3.1 Assessment of Multicollinearity

Multicollinearity occurs when two or more predictor constructs in a structural model are highly correlated, leading to inflated standard errors, reduced reliability of path coefficients, and loss of interpretability of the results. PLS-SEM dictates that the extent of multicollinearity among predictor constructs should be evaluated, including assessing results before proceeding to test hypotheses. The most commonly used standard diagnostic tool is VIF, where values above 5 usually indicate multicollinearity (Hair et al., 2022). The VIF results for the structural model constructs are summarized in Table 11.

Table 11: *Assessment of Multicollinearity Using Variance Inflation Factor (VIF) for Structural Model Constructs*

Predictor → Endogenous	VIF
GI → SUS	2.389
GMP → GI	1.000
GMP → OC	1.000
GMP → SUS	2.451
OC → SUS	2.728

Note: VIF values below 5 indicate no serious multicollinearity in the outer or inner model, confirming the constructs are suitably independent for PLS-SEM analysis.

As shown in Table 11, all VIF values fall well below the threshold of 5, ranging from 1.000 for GMP → GI and GMP → OC to 2.728 for OC → SUS. The results above suggest that the predictor constructs are adequately independent and there is no risk of multicollinearity affecting the stability and interpretability of structural model estimates. The path coefficients therefore generated in the further analyses of the PLS-SEM may be understood with a certain degree of certainty, which justifies the trustworthiness of the results in terms

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of the direct, indirect, and combined effect of GMPs, green innovation, and organizational culture on sustainability.

4.3.3.2 Test for Heteroskedasticity

Heteroskedasticity is a condition in which the variance of the residuals in a regression model does not remain constant across levels of the predictor variables. Heteroskedasticity undermines the effectiveness of parameter estimation and causes standard errors to be biased, which consequently influences the accuracy of hypothesis testing. The Breusch Pagan test was used to test the hypothesis that the residual variance of the structural model predictors was constant. The results of this test are presented in Table 12.

Table 12: *Breusch-Pagan Test for Heteroskedasticity*

Test	Chi-square	df	p
Breusch-Pagan / Cook-Weisberg	0.16	1	0.692

*Note***:** The Breusch-Pagan test assesses heteroskedasticity in the regression residuals.

In Table 12, the Breusch Pagan test has a chi-square value of 0.16 and a p-value of 0.692, which is much higher than the standard value of 0.05. The implication of this outcome is that the null hypothesis of homoscedasticity is not rejected, and thus the residuals of the regression model are characterized by constant variance across all predictor constructs. As a result, there is no heteroskedasticity issue in the current dataset, and the parameter estimates and the inferential statistics obtained using the structural model can be considered robust and valid.

4.3.3.3 Assessment of Common Method Bias

Common method bias (CMB) arises when variance in the data is attributed to the measurement approach rather than to the constructs being measured, potentially inflating observed linkages between variables. In order to determine the level of CMB in this research, a Harman single-factor test based on principal component analysis (PCA) was used. Under this method, when one factor explains over 50 percent of the total variance,

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CMB may be a concern (Podsakoff et al., 2003). Table 13 summarizes the results of the PCA.

Table 13: *Assessment of Common Method Bias Using Principal Component Analysis (Harman's Single-Factor Test)*

Component	Eigenvalue	Variance Explained	Cumulative Variance (%)
1	7.695	49.8%	49.8%
2	1.125	7.5%	57.3%
3	0.946	6.3%	63.6%
4	0.806	5.4%	69.0%
5	0.700	4.7%	73.7%
6	0.613	4.1%	77.8%
7	0.496	3.3%	81.1%
8	0.482	3.2%	84.3%
9	0.447	3.0%	87.3%
10	0.410	2.7%	90.0%
11	0.341	2.3%	92.3%
12	0.282	1.9%	94.2%
13	0.234	1.6%	95.8%
14	0.221	1.5%	97.3%
15	0.200	1.3%	100%

Note. The first unrotated principal component explains 49.8% of the total variance, which is below the 50% threshold. This indicates minimal CMB. Nonetheless, further assessment using a common latent factor in SEM is recommended to ensure that CMB does not influence the model results.

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Table 13 shows that the first principal component has a value of 49.8 percent of total variance, less than the conventional threshold of 50 percent. This implies that common method bias is insignificant and will not have a meaningful impact on the observed relationships among GMPs, green innovation, organizational culture, and sustainability in the research. Overall, these results provide confidence that the associations established in the subsequent analyses reflect substantive relationships rather than being an outcome of the measurement method.

4.4 Descriptive Statistics of Study Variables

Descriptive statistics give a preliminary idea of how the data are distributed, their central tendencies, and the variability of the study constructs, giving invaluable insight into the patterns of behavior and practices observed in the organization. Descriptive analysis in this

study was done on GMPs, green innovation, organizational culture, and sustainability. The data were analyzed using both indicator-level and composite-level analyses using means, standard deviations, and coefficients of variation (CV %). These statistics serve as a preliminary assessment of the magnitude to which firms implement GMPs, pursue green innovation, nurture organizational culture, and achieve sustainability outcomes, hence providing context for subsequent PLS-SEM analyses. The descriptive statistics are displayed in Table 14.

Table 14: *Descriptive Statistics of Study Variables and Their Indicators*

Variable	Indicator	Mean	SD	CV (%)
Green Management Practices	Energy efficiency (gmp1)	4.228	0.724	17.1
	Waste reduction (gmp2)	4.228	0.582	13.8
	Air emission controls (gmp3)	3.417	0.534	15.6
	Recycling & Re-use (gmp4)	3.715	0.822	22.1
	Composite Score	3.897	0.677	17.4
Green Innovation	Eco-friendly product development (gi1)	4.109	0.714	17.4
	Green process innovation (gi2)	4.217	0.657	15.6
	Investment in green R&D (gi3)	4.272	0.677	15.9
	Renewable energy technology (gi4)	4.261	0.705	16.5
	Composite Score	4.214	0.682	16.2
Organizational Culture	Top management commitment (oc1)	4.250	0.746	17.6
	Collaboration & teamwork (oc2)	4.000	0.885	22.1
	Communication of environmental issues (oc3)	4.033	0.840	20.8
	Reward system supporting green behavior (oc4)	3.707	0.995	26.8
	Composite Score	3.998	0.867	21.7
Sustainability	Economic (sus1)	4.098	0.693	16.9
	Social (sus2)	4.228	0.693	16.4
	Governance (sus3)	4.065	0.673	16.6
	Composite Score	4.130	0.686	16.6

Note: The table presents the descriptive statistics for all study variables and their indicators. Each variable has a composite score of the mean of its individual indicators, which depicts the level of the construct.

The construct of GMPs indicates moderate to high involvement in sustainable operational practices. The consistently implemented practices are energy efficiency (M = 4.23, SD = 0.72, CV= 17.1) and waste reduction (M=4.23, SD=0.58, CV= 13.8), which signify that

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companies are more concerned with the approaches to the most effective use of resources and reducing the negative effects on the environment. Air emission controls (M = 3.42, SD = 0.53, CV = 15.6) and recycling and re-use (M = 3.72, SD = 0.82, CV = 22.1), although moderately embraced, are more varied, implying that not all firms apply some of the environmental measures. The GMP composite score (M = 3.90, SD = 0.68, CV = 17.4%) indicates an overall positive level of commitment to green management, but also highlights areas where strategic improvement is needed.

Green innovation exhibits relatively higher mean scores, which indicate strong implementation of environment-saving initiatives. Green R&D (M = 4.27, SD = 0.68, CV = 15.9) and renewable energy technology (M = 4.26, SD = 0.71, CV = 16.5) are the leading practices, which means that firms actively seek the innovation-driven sustainability approach. The composite mean score of 4.21 (SD = 0.68 and CV = 16.2) on the measure of green innovation supports the fact that innovation is a key feature of organizational strategies, and this can be explained by the fact that the dynamism capability framework proposes innovation as a key ability towards sustainable competitive advantage.

The construct of organizational culture scores displays moderate levels of involvement in green initiatives, with the top management commitment (oc1: M = 4.25, SD = 0.75, CV = 17.6) indicating strong support of green behavior by top management, and reward systems supporting green behavior (oc4: M = 3.71, SD = 1.00, CV = 26.8) expressing high variation, hence indicating lack of consistency in incentivization mechanisms. The results of the composite score of organizational culture (M = 4.00, SD = 0.87, CV = 21.7) indicate that culture has an enabling environment for sustainability, but practical implementation through systematic incentives is not consistent across firms.

Lastly, the outcomes of sustainability are favorable, and the social dimension (sus2: M = 4.23, SD = 0.69, CV = 16.4) is slightly higher than economic (sus1: M = 4.10) and governance dimensions (sus3: M = 4.07). The overall composite score (M = 4.13, SD = 0.69, CV = 16.6) indicated that the sustainability goals were not met in a highly uneven manner across sampled firms. Small values of the coefficient of variation imply small

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dispersion, which contributes to increased trust in the consistency and reliability of sustainability outcomes.

Overall, the descriptive statistics indicate a progressive adoption of GMPs and green innovation actions which are supported to varying magnitudes by organizational culture which are supported to varying degrees by organizational culture, resulting in consistent sustainability outcomes. These patterns provide a strong empirical basis for further analysis of measurement models and structural path analysis, which proves that the dataset has sufficient variability and stability to be analyzed with the help of PLS-SEM.

4.5 Latent Variable Correlations

Before evaluating structural models, analyzing correlations among latent constructs provides an initial understanding of the strength and direction of the relationship, as well as the statistical significance of the association in the hypothesized model. The latent variable correlations also provide the first test on the reality of assumptions on interdependence of GMPs, green innovation, organizational culture, and sustainability. Cohen (1988) suggests that the interpretation of correlation coefficients is as follows: 0.10 to 0.29 implies weak correlation, 0.30 to 0.49 implies moderate correlation, and 0.50 to 1.0 implies a strong correlation. The correlations for all the constructs are summarized in Table 15.

Table 15: *Latent Variable Correlations*

Latent Variables	Pearson Correlation (r)	SE	t	p
GMPs ↔ GI	0.690	0.066	10.387	0.000
SUS ↔ GI	0.807	0.046	17.448	0.000
SUS ↔ GMPs	0.638	0.081	7.893	0.000
OC ↔ GI	0.727	0.062	11.642	0.000
OC ↔ GMPs	0.736	0.047	15.499	0.000
OC ↔ SUS	0.767	0.049	15.615	0.000

Note: The table presents correlations among the study's latent constructs.

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The results indicate that all latent constructs are positively and significantly correlated at $p < 0.05$, indicating meaningful linkages among them. GMPs have a positive and significant correlation with green innovation ($r = 0.690$, $SE = 0.066$, $t = 10.39$, $p < 0.05$) and organizational culture ($r = 0.736$, $SE = 0.047$, $t = 15.50$, $p < 0.05$), indicating that firms that implement green management strategies are more likely to adopt innovative green practices and foster an organizational culture conducive to sustainability.

GMPs also displayed a strong and significant relationship with sustainability ($r = 0.638$, $SE = 0.081$, $t = 7.89$, $p < 0.05$), indicating that although GMPs have a direct influence on sustainability outcomes, this influence can be strengthened or mediated by green innovation and organizational culture. Green innovation revealed the strongest correlation with sustainability ($r = 0.807$, $SE = 0.046$, $t = 17.45$, $p < 0.05$), underlining the essential role of innovative green actions in driving sustainable outcomes within multinational manufacturing firms.

In addition, organizational culture strongly correlated with green innovation ($r = 0.727$, $SE = 0.062$, $t = 11.64$, $p < 0.05$) and sustainability ($r = 0.767$, $SE = 0.049$, $t = 15.62$, $p < 0.05$), thus indicating the significance of a favorable organizational culture in the creation of green innovation and the eventual conversion of green innovation into real sustainability outcomes.

4.6 Measurement Model Assessment

Prior to estimating the structural relationships and testing the study hypotheses, it is necessary to assess the adequacy of the measurement model to ensure that the latent constructs are measured consistently and validly. The measurement model assessment in PLS-SEM involves testing the quality of the relationships between observed indicators and their latent variables, thereby ensuring that constructs are valid concepts with empirically valid measures. This test entails a visual examination of the structural equation model to verify proper model specification, after which systematic evaluation of indicator loading, indicator reliability, internal consistency reliability, convergent validity, and discriminant validity is done. All these procedures determine the extent to which the indicators measure

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their respective constructs and also the extent to which the constructs are clearly differentiated.

4.6.1 Graphical Representation of the PLS-SEM Measurement and Structural Model

The PLS-SEM used in this study is depicted in Figure 3, which shows both the measurement and structural components of the model. The diagram provides a holistic picture of the hypothesized linkages among the latent constructs: GMPs, green innovation, organizational culture, and sustainability, and the observed indicators of these constructs. The model follows the standards of PLS-SEM by presenting the outer (measurement) model, which establishes the relationships between the indicators and their latent variables, and the inner (structural) model, which establishes the directional relationships among the latent constructs.

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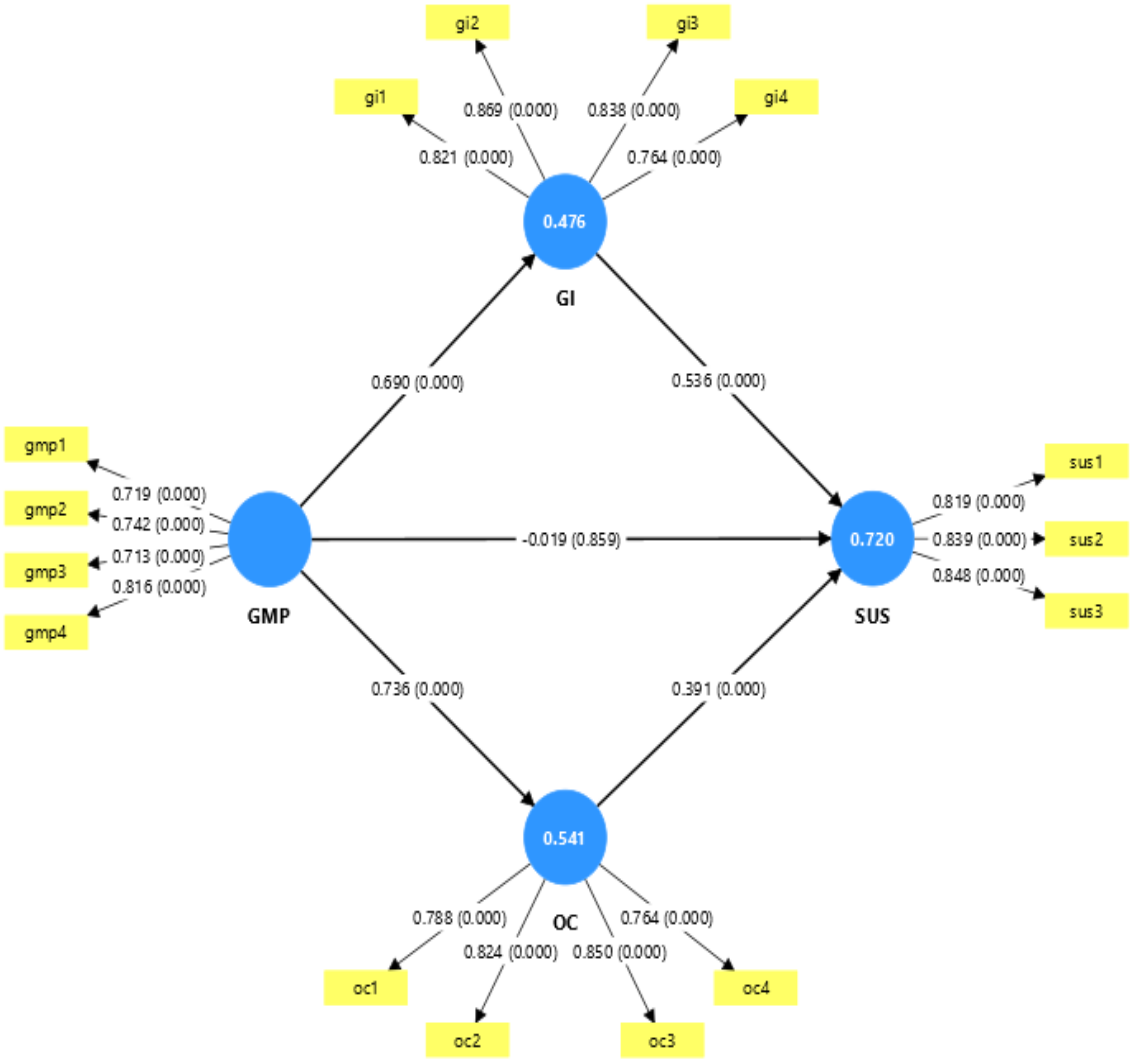


Figure 3: *PLS-SEM Measurement and Structural Model*

The measurement model is summarized in reflective indicator paths between each latent construct and observed variables. The standardized indicator loadings are presented with every path and accompanied by their respective p-values and are therefore represented visually, indicating the strength and statistical significance of the relationships between indicators and constructs. The high and statistically significant loadings of the indicators visible in the figure confirm that the observed indicators are good representations of their respective latent variables. This visual evidence complements the subsequent statistical assessment of indicator reliability, internal consistency, and convergent validity.

The structural model element shows the postulated causal relationships between the latent constructs and the path coefficients and the levels of significance are presented on each directional arrow. Their coefficients of determination (R^2) are also reported for the endogenous constructs and indicate the percentage of variance explained by the exogenous variables. R^2 values are included, enabling immediate visual evaluation of the model's explanatory power without considering green innovation, organizational culture, or sustainability. In general, the visual representation can be considered an integrative diagnostic instrument, which validates the correct model specification and offers an intuitive basis for the detailed measurement and structural model assessment that ensues.

4.6.2 Indicator Loading

The indicator loadings were analyzed to assess the extent to which each observed indicator was related to its respective latent construct in the reflective measurement model. The indicator (outer) loadings of PLS-SEM reveal how much an indicator is shared by its underlying construct and are among the most important measures of indicator reliability. In accordance with the established methodological guidelines, a loading of 0.70 and higher suggests that an indicator explains a minimum of 50% of the variance in the latent construct, thus showing sufficient reliability. Table 16 shows the outer loadings, along with their standard errors and t-statistics and level of significance obtained from the bootstrapping process.

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Table 16: *Outer Loadings of Constructs and Indicators*

Construct	Indicator Notation	Indicator Description	Outer Loading	SE	t	p
Green Management Practices	gmp1	Energy efficiency	0.719	0.076	9.491	0.000
	gmp2	Waste reduction	0.742	0.060	12.332	0.000
	gmp3	Air emission controls	0.713	0.068	10.452	0.000
	gmp4	Recycling & Re-use	0.816	0.062	13.118	0.000
Green Innovation	gi1	Eco-friendly product development	0.821	0.044	18.473	0.000
	gi2	Green process innovation	0.869	0.026	32.884	0.000
	gi3	Investment in green R&D	0.838	0.036	23.303	0.000
	gi4	Renewable energy technology	0.764	0.069	11.123	0.000
Organizational Culture	oc1	Top management commitment	0.788	0.045	17.515	0.000
	oc2	Collaboration & teamwork	0.824	0.042	19.429	0.000
	oc3	Communication of environmental issues	0.850	0.035	24.142	0.000
	oc4	Reward system supporting green behavior	0.764	0.061	12.445	0.000
Sustainability	sus1	Economic	0.819	0.041	19.991	0.000
	sus2	Social	0.839	0.036	23.625	0.000
	sus3	Governance	0.848	0.039	21.888	0.000

Note: Outer loadings represent the correlation of each indicator with its latent construct. Loadings ≥ 0.70 are considered reliable.

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As illustrated in Table 16, all indicators related to the GMPs show satisfactory loadings, ranging from 0.713 to 0.816. These values are above the suggested minimum of 0.70, indicating that energy efficiency, waste reduction, air emission control, recycling, and re-use are reliable manifestations of GMP within multinational manufacturing companies. The significance of these loadings ($p < 0.05$ in all instances) is also significant, which indicates the strength of the measurement and is an indication that each particular indicator meaningfully contributes to the operationalization of the construct.

Likewise, the indicators of green innovation have high outer loadings ranging between 0.764 and 0.869. Specifically, the loadings of green process innovation and investment in green research and development are considerably high, which means that these dimensions are regarded as the core elements of green innovation in the framework of the studied

problem. The fact that such indicators had consistently high t-values and significant p-values indicates the stability and reliability of these indicators and empowers the empirical soundness of the construct.

In the case of the organizational culture, all four indicators, that is, top management commitment, collaboration and teamwork, communication of environmental issues, and reward systems supporting green behavior, exhibited substantial loadings ranging from 0.764 to 0.850. These findings indicate that the indicators are a good measure of the construct under consideration and that cultural dimensions of leadership, communication, and incentive systems exhibit a high degree of conformity with the latent variable. The results support the fact that the concept of organizational culture as measured in the current research is coherent and reliable.

Lastly, the sustainability indicators, which include economic, social, and governance aspects, have their outer loadings also being high (0.819 to 0.848), which means a high level of association with the sustainability construct. The findings validate that the concept of sustainability among multinational manufacturing companies is a multidimensional concept and that all dimensions play a significant role in making up the whole construct. The statistical significance of all loadings provides further evidence that the indicators are reliable and suitable for subsequent structural model analysis.

Overall, the indicator-loading findings provide strong evidence of reliability for each construct, as all observed variables load strongly and significantly on their corresponding latent constructs. This provides an excellent basis upon which to continue further assessment of the measurement model, including internal consistency reliability, convergent validity, and discriminant validity, and also to test the hypothesized structural relationships.

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4.6.3 Internal Consistency Reliability

The internal consistency of the latent concepts was measured to assess the extent to which the indicators are consistent in measuring their underlying concepts. Following best

practices in PLS-SEM, construct reliability was measured in terms of Cronbach's alpha (α), construct reliability was assessed in terms of construct score (ρa), and construct reliability was assessed in terms of outer loading (ρc). Cronbach's alpha gives a more conservative measure of reliability, and composite reliability measurements are more fitting in PLS-SEM as they describe the variance in indicator loadings. In line with widely accepted methodological recommendations, a value of 0.70 or higher is considered indicative of good internal consistency in both exploratory and confirmatory research studies (Hair et al., 2017; 2022). Table 17 displays the findings of construct reliability test.

Table 17: *Construct Reliability*

Construct	Cronbach's α	Composite Reliability (ρa)	Composite Reliability (ρc)
Green Innovation	0.841	0.842	0.894
Green Management Practices	0.737	0.740	0.836
Sustainability	0.784	0.784	0.874
Organizational Culture	0.821	0.825	0.882

Note: Cronbach's α and composite reliability values ≥ 0.70 indicate good internal consistency.

The results in Table 17 suggest that green innovation exhibits strong internal consistency, with Cronbach's α = 0.841, composite reliability (ρa) = 0.842, and composite reliability (ρc) = 0.894. These values are much higher than the suggested value of 0.70, which indicates that the instruments for measuring green innovation are very consistent and have a high likelihood of reflecting the construct. The value of composite reliability (ρc) is especially large, which indicates the strong contribution of the individual indicators again, and it is in line with the pronounced outer loadings of the analysis above.

Likewise, there is sufficient reliability in the green management practices with Cronbach's α = 0.737, ρa = 0.740, and ρc = 0.836. Even though the alpha of Cronbach of this construct is relatively lower than the alpha of other constructs, it is still above the minimum acceptable value, which means that the internal consistency is satisfactory. Higher composite reliability values imply that, taking into account differences in indicator loadings, GMPs are assessed with a high level of reliability.

The construct of sustainability is also proven to be sound on internal consistency, as shown by the values of Cronbach's α = 0.784, ρa = 0.784, and ρc = 0.874, respectively. These

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findings affirm that the economic, social, and governance indicators are harmoniously aligned and together give an effective picture of sustainability among multinational manufacturing companies. This high composite reliability further indicates that the multidimensional nature of sustainability is well captured by the selected indicators.

Lastly, organizational culture documents Cronbach α = 0.821, ρa = 0.825, and ρc = 0.882, which were all above the recommended values. This illustrates a high degree of internal consistency among indicators concerning leadership commitment, collaboration, communication, and reward systems. The findings indicate that organizational culture is quantified in a steady, consistent manner within the suggested measurement model.

The construct reliability findings, overall, demonstrate that all latent variables in the study are in line with the set standards of internal consistency reliability. The overlapping of evidence provided by Cronbach's alpha as well as both measures of composite reliability gives sufficient empirical evidence on the reliability of the measurement model, thereby justifying progression to the assessment of convergent and discriminant validity and subsequent structural model evaluation.

4.6.4 Convergent Validity

Convergent validity was evaluated to assess the extent to which indicators of each latent construct capture a high percentage of variance in common, indicating that the indicators measure their constructs. Convergent validity in PLS-SEM is usually assessed using the Average Variance Extracted (AVE), the mean variance explained by a construct's indicators relative to the variance attributable to measurement error. A value of 0.50 and above is often considered the lowest level of AVE for establishing sufficient convergent validity because a 0.50 or higher value implies that a construct explains over half of the variance in its observed measures (Hair et al., 2017). Table 18 shows the outcomes of the convergent validity test.

Table 18: *Assessment of Convergent Validity of Constructs Using Average Variance Extracted (AVE)*

Construct	AVE
Green Innovation	0.678

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Construct	AVE
Green Management Practices	0.560
Sustainability	0.698
Organizational Culture	0.652

Note: AVE values ≥ 0.50 indicate adequate convergent validity, showing that constructs explain more than half of the variance in their indicators.

Table 18 indicates that all of the study constructs achieved an AVE value of greater than the recommended value of 0.50, which offers strong evidence of convergent validity. Green innovation also had a high AVE of 0.678, meaning that about 67.8 percent of the variance in its indicators is explained by the construct, which reflects a high level of commonality within the indicators used to measure the practices of green innovation. In a similar vein, GMPs had an AVE of 0.560, indicating that the construct sufficiently explains the variance in indicators related to environmental efficiency, waste reduction, emission control, and recycling programs.

Moreover, sustainability, with a relatively high AVE of 0.698, suggests that almost 70 percent of the variation in its economic, social, and governance measures is explained by the latent construct. This observation highlights the strength of the sustainability measurement model. Similarly, organizational culture had an AVE of 0.652, indicating that indicators defining managerial commitment, teamwork, communication, and the reward system collectively converge on the underlying concept of organizational culture.

Generally, the convergent validity of all constructs of the measurement model was satisfactory based on the results of the AVE. This means that the indicators of each construct are sufficiently correlated and collectively provide an accurate representation of their respective latent variables, thereby supporting the adequacy of the measurement model for subsequent structural model analysis.

4.6.5 Discriminant Validity

Discriminant validity was assessed to establish the extent to which each latent construct is empirically distinct from the others within the measurement model. Establishing discriminant validity is critical in PLS-SEM, as it ensures that constructs intended to

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measure different theoretical concepts do not exhibit excessive overlap, which could compromise the interpretability and validity of the structural relationships. Consistent with best practice recommendations in PLS-SEM methodology, discriminant validity in this study was evaluated using three complementary and widely accepted approaches: the Heterotrait–Monotrait (HTMT) ratio, the Fornell–Larcker criterion, and the examination of indicator cross-loadings. Collectively, these approaches provide a robust and comprehensive assessment of discriminant validity by evaluating construct distinctiveness at both the construct and indicator levels.

4.6.5.1 HTMT Criterion

The Heterotrait-Monotrait HTMT ratio of correlations was applied to determine the discriminant validity (Henseler et al., 2015). The HTMT examines construct differentiation by comparing the correlations of constructs against correlations within constructs. A value of the HTMT that falls below 0.90 is normally treated as a sign of sufficient discriminant validity; that is, a construct has more variance with its indicators than with the rest of the constructs in the model. Table 19 summarizes the findings.

Table 19: *Assessment of Discriminant Validity of Constructs Using Heterotrait-Monotrait (HTMT) Ratios*

Construct Pair	HTMT
GMPs ↔ GI	0.876
SUS ↔ GI	0.993
SUS ↔ GMPs	0.840
OC ↔ GI	0.867
OC ↔ GMPs	0.941
OC ↔ SUS	0.953

Note: HTMT values < 0.90 indicate adequate discriminant validity between constructs.

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The analysis of HTMT showed that the majority of the constructs in the study had sufficient discriminant validity. Specifically, the HTMT values for GMPs and green innovation (0.876) and for sustainability and GMPs (0.840) were below 0.90, suggesting that both constructs are empirically distinct and that the indicators effectively capture unique aspects

of each. Similarly, the value of the HTMT (0.867) between organizational culture and green innovation was less than 0.90, and this also demonstrates that these two constructs are conceptually distinct.

Some pairs of constructs, however, had HTMT values above the suggested threshold. The HTMT values (0.993) between sustainability and green innovation, organizational culture and GMPs, and organizational culture and sustainability (0.953) were all above 0.90. These results indicate possible overlaps or high conceptual similarity of these constructs. Although these high HTMT values do not invalidate the measurement model, they reflect that there is a possibility that the constructs overlap in part, perhaps due to the integrative nature of organizational culture, sustainability practices, and green innovation in manufacturing companies.

Generally, the HTMT findings provide partial support for discriminant validity. Constructs that have HTMT less than 0.90 are empirically distinct, whilst those above the cut-off should be further evaluated by complementary measures, e.g., the Fornell- Larcker criterion and cross-loadings, to ensure that measures are not capturing other latent variables. This thorough analysis provides strong assurance of the measurement model and the validity of subsequent structural model analyses.

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4.6.5.2 Fornell–Larcker Criterion

Discriminant validity was further evaluated utilizing the Fornell–Larcker criterion, which compares the √AVE for each construct with the correlations between constructs. A construct proves sufficient discriminant validity when the square root of its AVE is more than the maximum value of correlation it has with any other construct in the model (Fornell & Larcker, 1981). Table 20 summarizes the results of this assessment.

Table 20: *Fornell-Larcker Criterion for Discriminant Validity*

Construct	GI	GMP	SUS	OC
GI	0.824			
GMPs	0.690	0.748		
SUS	0.807	0.638	0.835	
OC	0.727	0.736	0.767	0.807

Note: Diagonal values represent the square root of AVE, and off-diagonal values are correlations. Diagonal values exceed correlations, confirming discriminant validity.

The Fornell–Larcker criterion analysis showed that each of the constructs had a square root of AVE greater than its inter-construct correlations, suggesting that each construct shares more variance with its indicators than with other constructs. In particular, the √AVE (0.824) of green innovation was higher than its correlation with GMPs (0.690), sustainability, and organizational culture. Likewise, GMPs recorded a √AVE of 0.748, which is higher than its relationship with other constructs. The requirements were also met regarding the correlation between organizational culture and sustainability, with √AVE values of 0.807 and 0.767, respectively, both exceeding the highest inter-construct correlations.

These results suggest that the latent constructs are conceptually different in that each construct explains more variance in its indicators than it does with the other constructs in the model. The findings of the Fornell-Larcker assessment complement the HTMT analysis, which are indicative of extra evidence of the discriminant validity as well as evidence of the robustness of the measurement model. Taken together, such findings guarantee that the constructs: GMPs, green innovation, organizational culture, and sustainability are sufficiently distinguished, which is critical for proper structural model estimation and testing of the research hypothesis.

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4.6.5.3 Cross-Loadings

Discriminant validity was also assessed using cross-loadings, which indicate whether a given indicator loads better on its intended construct than on the other constructs in the model. This approach provides evidence of the uniqueness of constructs and reliability of their indicators. The results of this evaluation are outlined in Table 21.

Table 21: *Cross Loadings of Indicators on Constructs*

Indicator	Notation	GI	GMP	SUS	OC
Energy efficiency	gi1	**0.821**	0.566	0.612	0.530

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Waste reduction	gi2	**0.869**	0.537	0.725	0.613
Air emission controls	gi3	**0.838**	0.565	0.666	0.642
Recycling & Re-use	gi4	**0.764**	0.603	0.651	0.606
Eco-friendly product development	gmp1	0.549	**0.719**	0.505	0.515
Green process innovation	gmp2	0.537	**0.742**	0.445	0.555
Investment in green R&D	gmp3	0.457	**0.713**	0.464	0.510
Renewable energy technology	gmp4	0.518	**0.816**	0.496	0.616
Top management commitment	oc1	0.607	0.729	**0.567**	0.788
Collaboration & teamwork	oc2	0.663	0.546	**0.701**	0.824
Communication of environmental issues	oc3	0.621	0.538	**0.674**	0.850
Reward system supporting green behavior	oc4	0.438	0.551	**0.525**	0.764
Economic	sus1	0.649	0.478	0.819	**0.632**
Social	sus2	0.651	0.577	0.839	**0.703**
Governance	sus3	0.723	0.543	0.848	**0.586**

Note: Indicators load highest on their respective constructs relative to other constructs, confirming indicator reliability and discriminant validity.

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The results of the analysis indicated that all indicators loaded most strongly on their corresponding constructs, thereby supporting indicator reliability and discriminant validity. In the case of green innovation, energy efficiency (gi1), waste reduction (gi2), air emission controls (gi3), and recycling and re-use (gi4) had the highest loading on the green innovation construct and lower cross-loadings on GMPs, sustainability, and organizational culture.

The strongest loading in their target construct was indicators of the GMPs, such as eco-friendly product development (gmp1), green process innovation (gmp2), investment in green R&D (gmp3), and renewable energy technology (gmp4), which augment the

uniqueness of the measures associated with environmental efficiency, waste management, and green practices in innovation.

In the case of indicators of organizational culture, the indicators that showed the greatest loadings included: top management commitment (oc1), collaboration and teamwork (oc2), communication of environmental issues (oc3), and reward system supporting green behavior (oc4), although they had lower loadings on other constructs. Equally, sustainability indicators, i.e., economic (sus1), social (sus2), and governance (sus3), had the highest loading in the sustainability construct, reflecting its multi-dimensional nature, while cross-loadings were comparatively lower.

According to PLS-SEM standards, strong loadings are those that are equal to or above 0.70, whereas acceptable loadings range between 0.50 and 0.69, in particular, in the context of applied research (Hair et al., 2021). The majority of the indicators were within the 0.70 range, and cross-loadings were significantly lower compared to the intended construct loadings. These findings provide solid proof that the constructs: GMPs, green innovation, organizational culture, and sustainability, are empirically different. Altogether, the cross-loading test supplements the HTMT and Fornell-Larcker test, which ensures that the measurement model is sufficient, and further analysis of the structural model can be performed with validity.

4.7 Structural Model Assessment

The assessment of the structural model was done to test the hypothesized relationships between GMPs, green innovation, organizational culture, and sustainability of multinational manufacturing firms in Kenya. The purpose of this assessment was to evaluate the strength and significance of direct and indirect effects, assess the joint influence of multiple predictors, and evaluate the explanatory and practical power of the model.

The analysis proceeded in a systematic manner. First, the model fit was evaluated using standard fit indices to ensure that the estimated PLS-SEM model adequately represents the data. Thereafter, path coefficients and hypothesis testing were conducted to examine the

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direct relationships among constructs. The total effect of GMP on sustainability was assessed without mediators to establish baseline relationships. Mediation analyses were then conducted to determine whether the effect of green management practices on sustainability is mediated by green innovation and organizational culture, both in parallel and individually.

This was followed by the joint effects of all the predictors, whereby the combined effect of GMPs, green innovation, and organizational culture on sustainability was evaluated. The predictive power of the model was lastly evaluated using the coefficient of determination (R^2), and the effect size (f^2) was used to assess the practical significance of the individual variables used to predict the results. The findings of these analyses give a comprehensive understanding of the direct, indirect, and combined determinants of sustainability, in alignment with the study's objectives and hypotheses.

4.7.1 Model Fit Assessment

The goodness-of-fit of the estimated PLS-SEM model was evaluated using multiple indices, including the Standardized Root Mean Square Residual (SRMR), the Normed Fit Index (NFI), the discrepancy measures d_ULS and d_G, and the Chi-2 statistic. These indices provide complementary information on how well the hypothesized structural model represents the observed data (Hair et al., 2017). The results are highlighted in Table 22.

Table 22: *PLS-SEM Model Fit Indices*

Fit Index	Saturated Model	Estimated Model	Threshold / Note
SRMR	0.081	0.099	Values ≤ 0.08 indicate good fit (acceptable if ≤ 0.10)
d_ULS	0.792	1.188	Lower values indicate better fit; no strict threshold
d_G	0.425	0.469	Lower values indicate better fit; no strict threshold
Chi2	209.126	214.243	Smaller values indicate better fit; interpreted with caution
NFI	0.745	0.738	Values ≥ 0.90 indicate good fit; values ≥ 0.70 are acceptable

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Note: Model fit indices suggest the estimated PLS-SEM model has acceptable fit to the data, with SRMR close to the recommended threshold, and NFI indicating moderate fit.

The estimated model yielded an SRMR of 0.099, marginally above the threshold of 0.08 but within the acceptable range of ≤ 0.10. This implies that the model reasonably approximates the observed correlation matrix. The NFI was 0.738, which, although less than the optimal value of 0.90, is greater than the minimum accepted value of 0.70, indicating an average model fit.

The model was also adequate based on the measures of discrepancy. The dULS of 1.188 and the dG of 0.469 revealed that the estimated model does not deviate excessively from the saturated model; however, there are no strict cut-off values for these indices. The Chi-2 statistic of the estimated model was 214.24, which is marginally higher than the saturated model's 209.13, indicating a low discrepancy and offering additional support for the model. However, Chi-2 is a sensitive test in PLS-SEM because it depends on sample size and should therefore be interpreted with caution.

Cumulatively, the model fit indices indicate that the estimated PLS-SEM model shows that the data exhibit acceptable fit to the model. The SRMR is the recommended value, and the NFI shows a moderate fit, which supports the appropriateness of this model for subsequent structural analysis, including the assessment of path coefficients, mediation effects, and predictive power.

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4.7.2 Structural Model Path Coefficients and Hypothesis Testing

The direct relationships among GMPs, green innovation, organizational culture, and sustainability were examined using standardized path coefficients (β), bootstrapped standard errors (SE), t-values, and significance levels (p-values). The results are captured in Table 23.

Table 23: *Structural Model Path Coefficients*

Path	β	SE	t	p
GMPs → GI	0.690	0.066	10.387	0.000
GMPs → OC	0.736	0.047	15.499	0.000
GI → SUS	0.536	0.119	4.519	0.000

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Path	β	SE	t	p
OC → SUS	0.391	0.111	3.521	0.000
GMPs → SUS	−0.019	0.105	0.177	0.859

Note. β = standardized path coefficient; SE = bootstrapped standard error; t = |β/SE|. GMP = Green Management Practices; GI = Green Innovation; OC = Organizational Culture; SUS = Sustainability.

The estimation results suggested that GMPs have a strong, positive, and significant effect on green innovation (β = 0.690, SE = 0.066, t = 10.387, p < 0.05). This indicates that greater adoption of GMP is associated with higher levels of green innovation in multinational manufacturing firms in Kenya. Likewise, GMPs showed a strong, positive, and significant association with organizational culture (β = 0.736, SE = 0.047, t = 15.499, p < 0.05), indicating that effective environmental management practices strengthen organizational commitment, teamwork, communication, and green-oriented reward systems.

The mediating variables equally had significant direct effects on sustainability. Green innovation positively affected sustainability (β = 0.536, SE = 0.119, t = 4.519, p < 0.05), underscoring the role of innovative environmental practices in endorsing economic, social, and governance outcomes. Organizational culture also had a positive and significant influence on sustainability (β = 0.391, SE = 0.111, t = 3.521, p < 0.05), suggesting that a supportive, green-oriented organizational environment contributes to sustainable performance.

On the contrary, the direct effect of GMPs on sustainability was non-significant (β = −0.019, SE = 0.105, t = 0.177, p > 0.05). This indicates that GMPs do not directly affect sustainability when mediating variables are included, suggesting that the effect of GMPs on sustainability may be fully mediated by green innovation and organizational culture.

4.7.3 Total Effect of Green Management Practices on Sustainability (Without Mediators)

The total effect of GMPs on sustainability was examined without inclusion of the mediating variables in the form of green innovation and organizational culture. This analysis aimed to determine the baseline relationship between GMPs and sustainability, offering a

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reference point for subsequent mediation analysis. The findings of this evaluation are reported in Table 24.

Table 24: *Total Effect of Green Management Practices on Sustainability*

Hypothesis	Path	β	SE	t	p	Decision
H_{01}	GMPs → SUS	0.638	0.081	7.893	0.000	Rejected

Note. β represents the total (unmediated) effect of GMPs on sustainability.

The estimation results suggested that GMPs have a strong, positive, and significant total effect on sustainability (β = 0.638, SE = 0.081, t = 7.893, p < 0.05). This implies that without mediators, entities that adopt effective environmental management practices are likely to achieve greater sustainability outcomes across economic, social, and governance dimensions.

The magnitude of the total effect (β = 0.638) indicates a significant relationship, suggesting that nearly 63.8% of the variation in sustainability can be attributed to GMPs when mediators are not considered. The t-value (t = 7.893) exceeds the critical threshold of 1.96 for significance at the 0.05 level, and the p-value (p < 0.05) confirms that this effect is statistically significant.

These results support rejecting the null hypothesis (H_{01}), which posited that there is no significant relationship between GMPs and sustainability. The strong and significant total effect provides a foundation for exploring the indirect pathways through which green management practices influence Sustainability via mediators, as investigated in subsequent sections.

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4.7.4 Mediation Analysis

The mediation analysis was conducted to determine whether green innovation and organizational culture act as mediators between GMPs and sustainability, individually or jointly. A bootstrap sampling was applied using 5,000 replications, which offers a powerful way of analyzing indirect effects using PLS SEM (Hair et al., 2017). The results are presented in Table 25.

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Table 25: *Direct and Parallel Mediation Effects of Green Innovation and Organizational Culture on the Relationship between Green Management Practices and Sustainability*

H_0	Effect Type	Path	β	SE	t	p	Decision
H_{02}	**Indirect (Mediator: GI)**	GMPs → GI → SUS	0.370	0.090	4.100	0.000	Rejected
H_{03}	**Indirect (Mediator: OC)**	GMPs → OC → SUS	0.287	0.084	3.416	0.001	Rejected
	Total Indirect (Parallel)	GMPs → (GI, OC) → SUS	0.657	0.074	8.900	0.000	
	Direct Effect	GMPs → SUS	−0.019	0.105	0.177	0.859	

Note: Green Innovation (GI) and Organizational Culture (OC) were tested as parallel mediators using bootstrapping (5,000 resamples). The direct effect of GMP on Sustainability (SUS) becomes non-significant when mediators are included, indicating full mediation.

The indirect pathway from GMPs to sustainability via green innovation was significant ($\beta = 0.370$, $SE = 0.090$, $t = 4.100$, $p < 0.05$). This shows that GMPs improve sustainability by nurturing green innovation within the firm. Nearly 37% of the total effect of GMPs on sustainability is mediated by green innovation, underscoring the essential role of environmental innovation in translating managerial practices into quantifiable sustainable outcomes. The significance of the t-value and p-value confirms that this mediation pathway is robust and not ascribed to sampling variability, supporting the rejection of the null hypothesis H_{02}.

Likewise, the indirect pathway from GMPs to sustainability via organizational culture was equally significant ($\beta = 0.287$, $SE = 0.084$, $t = 3.416$, $p < 0.05$), signifying that GMPs encourage a green-oriented organizational culture characterized by managerial commitment, teamwork, effective communication of environmental issues, and reward systems aligned with sustainability. This pathway mediates about 28.7% of the total effect of GMPs on sustainability, providing strong support for the rejection of hypothesis H03 and underscoring the role of organizational culture as a conduit for sustainability outcomes.

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When both mediators were concurrently included in a parallel mediation model, the total indirect effect of GMPs on sustainability was extensive and significant ($\beta = 0.657$, standard error = 0.074, $t = 8.900$, $p < 0.05$). This suggests that the joint influence of green innovation and organizational culture explains the bulk of the effect of GMPs on sustainability, signifying a full mediation mechanism. In this structural model, the direct influence of GMPs on sustainability became insignificant ($\beta = -0.019$, SE = 0.105, $t = 0.177$, $p > 0.05$), affirming that the effect of managerial environmental practices on sustainability operates almost entirely via the augmentation of innovative practices and the establishment of a supportive organizational culture.

The insignificant direct relationship, in light of the mediators, highlights that the impact of GMPs on sustainability is not instantaneous but depends on the company's ability to innovate and sustain an environment that supports sustainability. These results demonstrate the critical and complementary roles of green innovation and organizational culture in translating managerial environmental initiatives into tangible sustainability outcomes, emphasizing that firms seeking sustainable performance must simultaneously invest in innovative processes and cultivate an organizational environment that reinforces sustainability-oriented behaviors.

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4.7.5 Joint Effects Analysis

The joint effects analysis was undertaken to assess whether green management practices, green innovation, and organizational culture collectively influence sustainability, hence testing the null hypothesis H_{04}, which posited that the combined effect of these predictors does not significantly impact Sustainability in multinational manufacturing firms in Kenya. The results are summarized in Table 26.

Table 26: *Joint Effects of Green Management Practices, Green Innovation, and Organizational Culture on Sustainability*

Hypothesis	Path	β	SE	t	p	Decision
H_{04}	GMPs → SUS	0.638	0.081	7.893	0.000	Rejected
	GI → SUS	0.536	0.119	4.519	0.000	
	OC → SUS	0.391	0.111	3.521	0.000	

Note: All predictors jointly have a positive and significant effect on Sustainability; H_{04} is rejected ($p < 0.05$)

The findings indicate that all three predictors jointly exert a strong, positive, and significant effect on sustainability, leading to the rejection of the null hypothesis H_{04}. Specifically, GMPs had a path coefficient of ($\beta = 0.638$, SE = 0.081, $t = 7.893$, $p < 0.05$), green innovation had ($\beta = 0.536$ SE = 0.119, $t = 4.519$, $p < 0.05$), and organizational culture had ($\beta = 0.391$ SE= 0.111, $t = 3.521$, $p < 0.05$). The significant t-values and p-values confirm that each predictor contributes meaningfully to explaining variations in sustainability.

These outcomes reveal that the joint influence of GMPs, green innovation, and organizational culture considerably improves sustainability results, demonstrating a synergistic effect where the presence of innovation and a supportive organizational culture amplify the impact of managerial practices. While GMPs display the major individual contribution, the joint effects highlight that sustainability is most effectively achieved when managerial, innovative, and cultural dimensions operate in concert.

The empirical evidence leads to the rejection of the null hypothesis H_{04}, indicating that sustainability in multinational manufacturing firms in Kenya is driven by the concurrent influence of GMPs, green innovation, and organizational culture. These results offer actionable insights for corporate leaders seeking to incorporate environmental management practices, foster innovation, and cultivate a sustainability-oriented culture to optimize organizational performance.

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4.7.6 Predictive Power and Effect Size

The analysis of predictive power and effect size was used to determine the explanatory and practical power of the structural model by assessing its ability to explain the variance of the endogenous constructs and the relative contribution of each predictor. The R^2 was used to determine the predictive power, as it depicts the percentage of change in an endogenous construct explained by its predictors, and the closer it is to 1 the greater the predictive power (Hair et al., 2017). This is complemented by effect size f^2, which measures the substantive contribution of each predictor to the R2 of the endogenous constructs, with values of 0.35, 0.15, and 0.02 being considered large, medium, and small effects, respectively (Cohen, 1988). The combination of R^2 and f^2 offers a powerful assessment of

the model's ability to predict sustainability results and the practical significance of GMPs, green innovation, and organizational culture, offering valuable insights into the structural relationships examined in this study.

4.7.6.1 Coefficient of Determination (R^2)

The predictive power of the structural model was evaluated using R^2, which measures the percentage of variation in each endogenous construct explained by its predictor constructs, hence indicating the model's explanatory aptitude. As suggested by Hair et al. (2017), R^2 values of 0.75, 0.50, and 0.25 are interpreted as substantial, moderate, and weak, respectively. The results of this assessment are presented in Table 27.

Table 27: *R^2 Values of Endogenous Constructs*

Endogenous Construct	R^2	Adjusted R^2
Sustainability	0.720	0.711
Organizational Culture	0.541	0.536
Green Innovation	0.476	0.470

Note: R^2 represents the proportion of variance in the endogenous construct explained by the predictor constructs. Adjusted R^2 accounts for the number of predictors in the model.

Table 27 also shows that sustainability has a high value of $R^2 = 0.720$ (adjusted $R^2 = 0.711$), which means that GMPs, green innovation, and organizational culture explain a high percentage of 72% of the variance in sustainability, and thus the explanatory power of these variables is very high and borders on the value of substantial effect. The R^2 of organizational culture was 0.541 (adjusted $R^2 = 0.536$), and 54.1% of the variance was accounted for by GMPs, which showed moderate predictive power. Likewise, green innovation has an $R^2 = 0.476$ (adjusted $R^2 = 0.470$), signifying that 47.6% of its variance is described by the green management practices, which also has moderate explanatory power.

All these findings suggest that the structural model has a high predictive potential, especially when explaining sustainability outcomes, highlighting the critical role of managerial practices, innovation, and organizational culture in improving sustainable performance in multinational manufacturing companies in Kenya.

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4.7.6.2 Effect Size (f^2)

The effect size (f^2) was computed to establish how significantly each predictor construct contributes to the endogenous constructs R^2 of the structural model, which gives an indication of the practical importance of the relationships. Cohen (1988) describes as large, medium, and small f2 of 0.35, 0.15, and 0.02, respectively. Table 28 shows the results of the analysis of effect size.

Table 28: *Effect Sizes (f^2) of Predictors on Endogenous Constructs*

Predictor → Endogenous	f^2
GI → SUS	0.430
GMPs → GI	0.908
GMPs → OC	1.179
GMPs → SUS	0.001
OC → SUS	0.200

Note: f^2 indicates the effect of each predictor on the R^2 of the endogenous construct. Values ≥ 0.35 are considered large, ≥ 0.15 medium, and ≥ 0.02 small.

Just as indicated in Table 28, GMPs → Green innovation yielded a very large effect size, f^2 = 0.908, signifying that GMPs had a significant influence on green innovation. Similarly, the large effect size of f2 = 1.179 in GMPs → Organizational culture showed that managerial environmental practices had a strong influence on the organizational culture of multinational manufacturing companies. The effect of green innovation → sustainability was also large (f^2 = 0.430), suggesting that environmental innovation strongly contributes to sustainable outcomes. Organizational culture → sustainability indicated a medium effect (f^2 = 0.200), indicating a meaningful but comparatively smaller contribution to sustainability. Conversely, the direct effect of GMPs → Sustainability was negligible (f^2 = 0.001), affirming that its influence operates principally via the mediating effect of green innovation and organizational culture.

Overall, the effect size analysis confirms that green management practices, green GMP innovation, and organizational culture have substantive effects on the model's endogenous constructs, with the largest practical effects observed in the pathways linking managerial

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practices to innovation and culture, and innovation to sustainability. The findings also underscore the need to develop both innovation-driven strategies and an organizational culture geared towards sustainability to ensure that environmental management practices are fully utilized.

4.7.7 Predictive Relevance of Endogenous Constructs (Q^2)

The Stone-Geisser Q^2 measure was employed to assess the predictive relevance of the endogenous constructs in the structural model resulting as a result of the blindfolding procedure. Predictive relevance (Q^2) indicates the model's capability to accurately predict the observed values of the endogenous constructs. Based on the determined guidelines, Q^2 above zero indicates predictive relevance for the construct, where values of 0.02-0.15, 0.15-0.35, and 0.35 are considered small, medium, and large predictive relevance, respectively (Hair et al., 2017). The findings of this evaluation are presented in Table 29.

Table 29: *Predictive Relevance (Q^2) of Endogenous Constructs*

Endogenous Construct	Q^2 (Predictive Relevance)	Interpretation
Sustainability	0.489	$Q^2 > 0$ indicates that the model has predictive relevance for Sustainability.
Organizational Culture	0.324	The model exhibits moderate predictive relevance for organizational culture.
Green Innovation	0.289	The model shows predictive relevance for green innovation.

Note. Predictive relevance (Q^2) was assessed using the blindfolding procedure.

The Q^2 values show that the structural model has adequate predictive relevance for all endogenous constructs. The Q^2 of sustainability was large (0.489), which means that the joint effects of GMPs, green innovation, and organizational culture could be used to predict sustainability outcomes with a high level of reliability among multinational manufacturing companies in Kenya. Green innovation and organizational culture had a medium predictive relevance (0.324 and 0.289, respectively), indicating that although this model predicts these variables reasonably well, there might be other variables outside the model that result in their variation. Overall, these results attest to the soundness of the model, which can not only account for the variance of the endogenous constructs (R^2) but also predict their values, which confirms the empirical validity of the study.

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4.8 Discussion of the Empirical Findings

In this section, empirical findings of the study are discussed in a systematic manner, comparing them with previous empirical and theoretical studies that have been reviewed in Chapter Two. It is organized into a discussion of the key relationships that are explored in the study, with the purpose of determining whether the results converge, extend, or otherwise diverge from the current findings of the study. Through this, the section not only places the results within current theoretical perceptions and empirical studies, but also demonstrates the new understanding derived through the research when applied in the context of multinational manufacturing companies in Kenya. The discussion not only confirms the strength of the findings by the fact that they are consistent with the previous research, but also indicates the gaps in which the findings contribute to the existing body of knowledge by highlighting context-dependent dynamics and processes that can convert GMPs into sustainability.

4.8.1 Green Management Practices and Sustainability

The first objective of this research was to investigate the direct impact of GMP on the sustainability of multinational manufacturing companies in Kenya. The findings revealed that GMP has a positive and significant impact on sustainability, and the more systematic a firm is in adopting its energy efficiency, waste reduction, air emission regulations, and recycling and reuse, the better its sustainable performance. This empirical evidence led to the rejection of the null hypothesis H_{01}, which posited that GMP does not significantly affect sustainability. The findings confirm that environmental management initiatives at the managerial level are pivotal in driving ecological, social, and economic sustainability in the manufacturing sector.

The outcome of this study aligns with the results of Liu et al. (2024), who found that green supply chain management practices have a significant positive impact on environmental performance, and that these effects are reinforced by green innovation and zero-waste management. The findings of the present study are consistent with the findings of the reviewed study, as they prove that proactive environmental management practices have a direct impact on the results of sustainability. In addition, this study extends Liu et al. (2024)

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by incorporating a wider range of constructs of sustainability that involve both social and economic aspects, and by situating the analysis within Kenyan multinational manufacturing firms.

Likewise, the results of this empirical investigation concur with those of Okeke et al. (2025), who found that the implementation of structured GMPs leads to greater performance sustainability among SMEs in Nigeria. The findings of the current study reflect the findings of the reviewed study, which support the fact that managerial commitment to environmental practices has a positive impact on the level of sustainability of firms. Nevertheless, the presented research goes beyond these findings by showing that they can be manifested in the context of multinational organizations, indicating that the concept of GMP applies to organizations of various sizes and complexity levels.

The findings of this research are also consistent with those of Opoku (2025), who discovered that sustainable management practices increase operational and environmental performance in Ghanaian manufacturing companies. The results of the current research confirm this view and go even further by assessing the direct impact of GMPs, in combination with its mediations, on constructs such as green innovation and organizational culture to obtain a more detailed picture of the relationship between management practices and sustainability in multinationals.

Lastly, the findings of the current research confirm and augment those reported by Gelagay (2024), who demonstrated that green human resource management and internal green supply chain aspects have a strong positive effect on the performance of operations of the Ethiopian manufacturing companies. Although the reviewed study was mostly concerned with operational outcomes, the current study broadens this point of view by directly linking GMPs with multidimensional sustainability and also highlights that their effect is enhanced when innovation and a favorable organizational culture are incorporated.

These findings, taken together, indicate that GMPs are a critical cornerstone of sustainability among multinationals in the manufacturing sector. The study suggests that managerial environmental efforts directly and substantially influence sustainability

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performance, and their effectiveness is enhanced when combined with organizational capabilities and innovation processes. As a result, this study not only provides support to the findings of previous studies in other settings and industries, but also contributes to the state of theoretical and practical knowledge by aligning GMPs into a bigger, more sustainable framework that considers social, economic, and ecological aspects, thus emphasizing the strategic importance of managerial actions in producing holistic and long-term sustainability.

4.8.2 Green Management Practices, Green Innovation and Sustainability

The second objective was to probe the mediating effect of green innovation in the relationship between GMPs and sustainability among multinational manufacturing companies in Kenya. The findings showed that green innovation completely mediates the relationship between GMPs and sustainability, which implies that the managerial adoption of energy efficiency, waste reduction, air emission control, and recycling and reuse improves the sustainability of firms largely through generating innovative green products, processes, and technology. This finding led to the rejection of the null hypothesis H_{02}, confirming that the impact of GMPs on sustainability is transmitted through innovation pathways rather than solely through direct managerial practices.

This study documents similar results to those of Bindeeba et al. (2025), who reported in a two-phase meta-analysis SEM that green human resource management enhances sustainable business performance through the medium of green innovation. The findings of the present research are aligned with the reviewed study and add to the current evidence by showing that in a Kenyan manufacturing setting, green practices of managers also lead to sustainability via innovation. Although the synthesized cross-country evidence in the reviewed empirical investigation provides a superior understanding of the issue, the current study focuses on context-specific results by pinpointing innovation as the key mechanism by which GMPs yield sustainability results in multinational manufacturing companies.

Likewise, the results of the current study are consistent with Kanan et al. (2023), who established that GHRM practices significantly affect sustainable performance, but partly with the help of green innovation in the context of Palestinian manufacturing companies.

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The findings of the current research reflect those of the reviewed study, but go further by including expanded GMA constructs beyond HR practices, such as operational and environmental management initiatives like energy efficiency and recycling. This wider scope gives a more overall picture of the role of GMPs in the creation of innovation-based sustainability in the manufacturing industry.

The findings are also consistent with the empirical works of Islam et al. (2025), who discovered that green innovation mediated the association between GHRM practices and sustainability by increasing employee engagement and pro-environmental behavior in Bangladeshi manufacturing companies. The present research validates and generalizes these conclusions by demonstrating that innovation mediates GMPs' effects not only through employee-centered processes but also through structural and technological managerial processes, with an emphasis on organizational-level innovations being the key towards the achievement of sustainable results.

In addition, the results support those of Mahar et al. (2025) who established that the green supply chain management practices have a positive impact on sustainable performance due to the green technological and managerial innovations. The findings of the current research are aligned with the reviewed study and add to the implications of the current research by demonstrating that the implementation of holistic GMP programs results in increased sustainability via innovation, especially when a combination of product and process innovations is implemented in organizational procedures.

The results of the present study also confirm the results outlined by Garad and Khalifa (2024), who suggested that environmental management practices improve firm performance through green innovations. The evidence is in line with the current study but extends the literature by embedding the innovation mechanism in a multi-dimensional sustainability framework, such as economic, social, and governance performance in multinational manufacturing companies.

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Likewise, Ahakwa et al. (2024) also discovered that green HR practices have environmental performance effects via green innovation, but the most prominent effect is caused by compensation and training practices. These findings are congruent with those of the current study and extend them by incorporating broader GMP initiatives so that innovation mediates not only the HR-related practices, but also the operational and technological managerial practices, as innovation plays the central role in transforming GMP into sustainable results.

Collectively, these observations highlight the crucial role of green innovation in the pathway through which GMPs are converted to sustainability. The research ascertains that managerial environmental practices are inadequate to attain sustainability without the mechanisms that are innovation-based. By showing the full mediation, the research adds to the existing body of knowledge in that fostering of product, process, and technological innovations is one of the major strategic channels through which multinational manufacturing companies in Kenya can realize overall and sustainable sustainability results. This synthesis reflects not only consistency with previous studies, but also a continuation of the literature in suggesting that GMPs, green innovation, and sustainability are applied in a wider multi-dimensional context.

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4.8.3 Green Management Practices, Organizational Culture and Sustainability

The third objective of the study was to investigate how organizational culture mediates the relationship between the GMPs and sustainability of multinational manufacturing companies in Kenya. The findings of this study suggested that organizational culture fully mediates the influence of GMPs on sustainability, which means that the implementation of environmentally responsible managerial practices, including energy efficiency, waste reduction, and recycling, is translated into the improved sustainability results in the first place, through the creation of the organizational culture that prioritizes the importance of environmental responsibility, ethical behaviour, and the sustainability-focused norms. As a result, the null hypothesis H_{03} was rejected, suggesting that the effect of GMP on sustainability is more pronounced when organizational culture is strong than when managers simply take action.

The results of this research are consistent with the findings of Al Hakimi et al. (2022), who concluded that green manufacturing practices have a positive impact on corporate sustainable performance, and that the impact is increased in the presence of a favorable green organizational culture. In this case, the current study supports these findings, but extends them by presenting empirical evidence of multinational companies in Kenya, which shows that the cultural mechanism is a key channel through which GMPs can be converted into tangible sustainability outputs in the economic, social, and governance setting. Unlike the reviewed study, the current study also captures the wider scope of GMPs beyond SMEs, hence enhancing generalizability to bigger, globally integrated firms.

Likewise, the findings are in line with those of Junejo et al. (2025), which indicated a strong green culture leads to sustainable performance of logistics in manufacturing SMEs in Pakistan. The results of the current research echo this finding and extend it by demonstrating that the impact of GMPs in logistics-oriented functions is not the only case, and the effect of cultural alignment is cross-functional in manufacturing in terms of sustainability.

The results also concur with those of Mousa et al. (2025), who set out to determine whether adaptive green culture moderates the link between green supply chain management and environmental performance in Turkish textile companies. Although the reviewed study tested the moderating effects, the present study shows that organizational culture can be conceptualized as a complete mediator, which suggests that a sustainability culture that is deeply embedded in the organizational culture is critical in ensuring that managerial green practices translate into quantifiable sustainability results.

Also, Sobaih et al. (2024) established that the relationship between GHRM and green innovation is mediated by the green organizational culture in Tunisian export-oriented companies. The current research confirms these conclusions by showing that there is parallelism between the two, as culture mediates the GMPs-sustainability linkage, meaning that culture oriented towards sustainability offers a cognitive and normative paradigm through which green managerial practices can fulfill the sustainability objectives of the organization.

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The findings also extend the findings of Aloqaily et al. (2024), who demonstrated that green culture mediates the influence of GHRM on green sustainable performance among Jordanian logistics SMEs in a wholly green manner. The present research is a continuation of the same by placing the mediation into a wider manufacturing industry context in Kenya, with a focus on the applicability of the robust environmental culture in facilitating the effectiveness of various GMP programs on sustainability in multinational operations.

Moreover, the findings of the current study are consistent with those of Mohammed et al. (2019), who noted that organizational culture fully mediates the link between environmentally sustainable supply chain practices and performance of Kenyan manufacturing firms. This research further extends and strengthens the empirical evidence in this regard by showing how organizational culture is instrumental not only for supply chain sustainability initiatives but also for overall green management practices at an international level, emphasizing the crucial role played by a sustainability-oriented organizational culture for the success of managerial intentions.

On the same note, Permadi et al. (2024) and Awatara et al. (2024) suggest that the impact of green HRM practices on employee performance and commitment, respectively, is mediated by sustainability-oriented organizational culture. The current research is in line with such observations, but it goes a notch further by showing that, in multinational manufacturing companies, culture is a holistic process that connects a broader range of GMPs to more dimensional sustainability performance, such as environmental, social, and economic performance.

Furthermore, Gazi et al. (2024) also reported a chain-mediated impact of green culture and organizational agility in improving social and environmental performance. These results are also corroborated in the current study, which goes on to indicate that GMPs themselves, when inculcated into a supportive culture, is capable of having a full and entirely independent effect on sustainability results, which highlights the primary importance of cultural fit as a precondition of sustainability change in complex and multinational manufacturing environments.

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Finally, the works by Khawaja and Janjua (2025), Tamin (2024), and Delphinus and Mwita (2024) suggest that green HRM practices contribute to sustainability through mediators such as perceived organizational support, innovative culture, and knowledge sharing. The results of the current study are in line with these findings, extending their implications by showing that a holistic organizational culture, beyond specific HRM practices, is central to realizing sustainability from broader GMP initiatives in multinational manufacturing firms in Kenya.

Therefore, these results reveal that organizational culture is a key channel through which GMPs translate into sustainability outcomes. By establishing full mediation, the study emphasizes that managerial efforts alone are insufficient unless embedded in a strong sustainability-oriented culture. This review confirms the need to integrate sustainability values, norms, and practices at every tier of multinational manufacturing organizations, thereby contributing to the literature by placing the cultural context in the Kenyan manufacturing industry and highlighting its decisive role in the operationalization of GMP towards sustainable results.

4.8.4 Green Management Practices, Green Innovation, Organization and Sustainability

The fourth objective of this study was to examine the combined influence of GMPs, green innovation, and organizational culture on sustainability within multinational manufacturing firms in Kenya. These findings indicated that GMPs, green innovation, and organizational culture jointly and substantially contribute to the sustainability outcomes. This implies that the combination of managerial practices, innovation ability, and a favorable cultural setting has the largest impact on the economic, social, and governance aspects of sustainability. As a result, the null hypothesis H_{04} was rejected, confirming the collective influence of GMPs and green innovation and organizational culture on the sustainability of the multinational manufacturing firms.

The results of the present research are aligned with the results of Zihan and Makhbul (2024), whose findings showed that the GHRM practices contribute to sustainable performance, which is mainly due to green innovation in Malaysian SMEs, and the role of

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leadership makes the influence even stronger. Their evidence coincides with the result of this study but adds the extra cultural dimension since it shows that the combination of managerial practices, innovation, and culture delivers better sustainability results in multinational manufacturing companies in Kenya.

In a similar fashion, the findings of the current study align with those of Huynh et al. (2024), who noted that knowledge management, green transformational leadership, and green organizational culture have positive effects on green innovation, which subsequently affects sustainable performance of the Vietnamese companies. These findings are reflected in the current study, which supports the significance of organizational culture and innovation as the key processes that convey the influence of managerial practices on sustainability outcomes, and goes further to support these combined effects empirically in the Kenyan multinational manufacturing setting.

This study's results are also consistent with those reported by Mousa et al. (2025), who reported that green supply chain management has a positive effect on environmental performance and that adaptive green culture reinforces the effect. Their findings are consistent with the results and extend them by demonstrating that there is a synergistic effect of the combined influence of GMPs, green innovation, and organizational culture on sustainability. As a result, sustainability gains are maximized when all three mechanisms work together instead of acting independently.

Similarly, Bour (2023) established that the integration of environmental culture and green production practices helps companies to obtain better sustainability results. The findings of the current research correspond to the reviewed study's conceptual arguments; however, they extend further by using empirical support to prove that the incorporation of innovation in addition to management practices and culture greatly enhances sustainability in multinational manufacturing companies.

The findings are also in tandem with Al-Doghan et al. (2022), who demonstrated that organizational environmental culture affects sustainability through GHRM and green innovation in Saudi SMEs. This study's results align with theirs and extend the

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understanding by showing that the combined effect of GMP, green innovation, and organizational culture produces a more comprehensive influence on sustainability outcomes in Kenyan multinational firms, highlighting the importance of integrating managerial, innovative, and cultural mechanisms in complex industrial contexts.

Likewise, the present study reinforces the results of Wagan and Sidra (2025), who found that green organizational culture and entrepreneurial orientation positively affect firm performance through green business models among Chinese firms. The findings of this research are comparable to these results, with the outcomes of the joint application of culture, managerial practices, and innovation being more sustainable, which highlights the importance of a holistic approach in multinational companies that perform in dynamic and intricate environments.

However, the findings of the present research support the notion that sustainability can be best attained when GMPs are embraced in combination with innovation and favorable organizational culture. The results are consistent with and generalizable to the existing body of literature by showing stronger and more robust sustainability results for GMPs, green innovation, and organizational culture in combination than each mechanism alone. This synthesis highlights the fact that multinational manufacturing companies in Kenya can improve their environmental, social, and economic performance through a strategic alignment of managerial activities, innovative projects, and organizational culture, thus offering a strong platform for policy, managerial, and scholarly interventions towards the progress of corporate sustainability in multifaceted, globally integrated manufacturing industries.

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4.9 Summary of Hypotheses Testing Results

The hypotheses of this study were systematically tested to examine the relationships among GMP, green innovation, organizational culture, and sustainability in multinational manufacturing firms in Kenya. This analysis has taken into account the total effects, direct effects, indirect effects through the mediators, parallel mediation, and joint effects of the predictors. The conclusions give a detailed understanding of the ways and the extent to which the GMPS affect sustainability. A consolidated summary of the hypotheses testing

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results, including the observed effects and corresponding decisions regarding the null hypotheses, is presented in Table 30.

Table 30: *Summary of Hypotheses Testing Results*

Hypothesis	Path	Effect Type	Findings	Decision
H_{01}	Green Management Practices → Sustainability	Total Effect (Without Mediators)	GMPs positively influence sustainability	Rejected
H_{02}	Green Management Practices → Green Innovation → Sustainability	Indirect Effect	Green Innovation significantly mediates the effect of GMPs on sustainability.	Rejected
H_{03}	Green Management Practices → Organizational Culture → Sustainability	Indirect Effect	Organizational culture significantly mediates the effect of GMPs on sustainability.	Rejected
–	Green Management Practices → (Green Innovation, Organizational Culture) → Sustainability	Total Indirect (Parallel Mediation)	Combined mediation of green innovation and organizational culture fully transmits the effect of GMPs on sustainability.	Supported
H_{04}	Green Management Practices, Green Innovation, Organizational Culture → Sustainability	Joint Effects	The integrated influence of GMPs, green innovation, and organizational culture strongly enhances sustainability.	Rejected

Note. Green innovation and organizational culture were tested as parallel mediators. The table summarizes the total, indirect, direct, and joint effects, highlighting the mechanisms through which GMPs affect Sustainability.

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CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter gives a comprehensive synthesis of the study, drawing together the key empirical results, conclusions, contributions, and recommendations obtained from the analysis of GMP, green innovation, organizational culture, and sustainability in multinational manufacturing firms in Kenya. This chapter begins with a summary of the key findings in relation to the research objectives and hypotheses and then proceeds to the conclusions drawn from empirical findings. Afterward, the theoretical, empirical, policy, managerial, and methodological contributions of the study are documented to highlight its significance to academia, industry, and policy formulation. The chapter proceeds to provide policy recommendations derived from the research findings, highlights the limitations that were experienced during the research process, and ends with future research recommendations to enhance knowledge within the area of sustainable management practices.

5.2 Summary of the Major Findings

The research had a high response rate, where 92 out of 95 distributed questionnaires proved usable, which constituted 96.8 percent of the total population (Table 9). The low non-response (2.1%) and non-usable questionnaires (1.1%) guaranteed a strong representation of multinational manufacturing firms in Kenya. The IQR method used for outlier detection showed that all the variables of the study, namely, GMPs, green innovation, organizational culture, and sustainability, had no problematic values; therefore, the data were distributed very well and were suitable to be analyzed further. The measurement of multicollinearity based on the VIF indicated values of less than 5 for all structural model paths, indicating that the constructs were independent and were suitable to be analyzed using PLS-SEM. The heteroskedasticity test using Breusch Pagan additionally revealed that the data residues were homoscedastic, and Harman's single-factor test revealed low levels of common method bias since the first factor did not explain more than half of the total variance.

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Descriptive statistics revealed that the constructs had moderate and high mean scores with the highest composite mean of green innovation, followed by sustainability, GMPs, and organizational culture, which is generally positive in terms of perceptions of the environmental practices and organizational alignment to sustainability objectives. Correlations based on latent variables showed strong positive correlations between organizational culture and sustainability, and between GMPs and organizational culture, reflecting the interdependence of managerial practices, culture, and sustainable outcomes.

The measurement model was found to have a high level of reliability and validity. All outer loadings of indicators were above the recommended level and the construct reliability was ascertained through Cronbach alpha, composite, and rho coefficients, which were more than 0.70. Convergent validity was established, as all the constructs were found to have AVE scores of greater than 0.5, and discriminant validity was established utilizing the HTMT ratio and the Fornell-Larcker criterion. Cross loadings also confirmed that every indicator loaded the most on its respective construct, thus indicating the reliability of the indicators.

Both the structural model evaluation and assessment revealed that the estimated model had a reasonable fit with an SRMR value approaching the desired value and the NFI value representing a moderate fit. Path analysis revealed significant positive relationships between GMP and sustainability in the context of manufacturing firms in Kenya. This suggests that in the absence of mediators, a significant positive relationship still exists between GMPs and sustainability.

The mediation analysis showed that green innovation and organizational culture helped transmit the effects of GMP on sustainability. The mediators totally mediated the effects of managerial practices on sustainability when they are put in parallel, which validates the idea that sustainability is achieved mainly by improved green innovation and conducive organizational culture. It was observed that the combined effect of GMPs, green innovation, and organizational culture had a strong positive effect on sustainability, which is a synergistic mechanism by which the initiative of managers can be reinforced by innovation and culture.

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Moreover, the structural model had high predictive variance and R2S for sustainability, organizational culture, and green innovation, showing that the model explained a significant percentage of variance in the endogenous measures. Moreover, the model showed sufficient predictive relevance in the form of Q^2 results, which showed that the model can be used to predict sustainability, organizational culture, and green innovation reliably, not only based on the sample data but also in general. The effect size (f^2) measurements revealed that the GMPs influenced both green innovation and organizational culture significantly, and green innovation influenced sustainability and organizational culture significantly too. All these results highlight the need for a comprehensive strategy that incorporates managerial, innovative, and cultural strategies to maximize sustainable performance in multinational manufacturing companies in Kenya.

5.3 Conclusions of the Study

The results of this research give strong arguments about mechanisms through which GMPs, green innovation, and organizational culture influence sustainability among multinational manufacturing companies in Kenya. The analysis of the total effect of GMP on sustainability, without any mediators, revealed that there was a positive linkage, which validates the fact that managerial commitment to environmentally friendly practices such as energy efficiency, waste reduction, air emission regulation, and recycling activities directly influences the sustainability results. This indicates that companies that strategically incorporate environmental issues into their strategic and operational management systems are bound to improve the economic, social, and governance aspects of sustainability. Therefore, managerial initiatives form the basic foundation of sustainability performance promotion in these firms despite the lack of other mechanisms.

The mediation analysis further explained the processes through which GMPs influence the sustainability outcomes. Green innovation was identified to have a strong mediating effect between GMPs and sustainability, suggesting that managerial environmental programs can be translated into concrete sustainable achievements by the creation and introduction of environmentally friendly products, green process innovation, green research and development investment, and renewable energy technologies. The results confirmed that

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managerial intent is not enough; instead, sustainability is realized when firms take the initiative to translate environmental management practices into innovative solutions. This suggests the critical importance of green innovation in mediating between the actions of strategic managers and practical sustainability outcomes.

On the same note, organizational culture also emerged as a significant mediator, and this supports the view that the internal organizational environment is critical in conveying the influence of GMP on sustainability. A culture characterized by top management commitment, collaboration, effective communication of environmental issues, and reward systems that support green behavior strengthens the influence of managerial practices, translating them into measurable sustainability performance. Importantly, when green innovation and organizational culture were considered together in a parallel mediation model, they fully transmitted the effect of GMP on sustainability, emphasizing that the realization of sustainable outcomes depends on both technological and cultural pathways rather than managerial practices alone.

The joint effects analysis strengthened the conclusion that sustainability is optimized when GMPs, green innovation, and organizational culture operate in collaboration. Individually, all predictors positively affected sustainability. However, their combined effect was exceptionally high due to the synergetic approach where managerial efforts are magnified through innovation and organizational culture. This offers sufficient grounds to conclude that sustainability for multinational manufacturing companies is a multi-faceted concept, necessitating the convergence of strategic management, innovation potential, and organizational culture. Without combining these facets, sustainability will remain underdeveloped, regardless of how effective each individual strategy may be.

Finally, the collective evidence from total, mediated, and joint effects suggests that sustainability is not exclusively an outcome of managerial initiatives but rather depends on the firm's capacity for innovation and the cultivation of a sustainability-oriented culture. The rejection of null hypotheses H_{01}, H_{02}, H_{03}, and H_{04} together affirms that effective sustainability strategies must concurrently incorporate managerial, innovative, and cultural dimensions. In conclusion, the study noted that the pathway to sustainability in

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multinational manufacturing firms in Kenya is systemic: managerial practices offer the preliminary impetus, while green innovation and organizational culture are critical conduits that transform these practices into measurable and lasting sustainable outcomes.

5.4 Contribution of the Study

The research makes valuable contributions in various aspects, which include advancing knowledge, practice, and policy in the area of sustainable management in multinational manufacturing companies in Kenya. By systematically analyzing the relationship among GMP, green innovation, organizational culture, and sustainability, the study makes new contributions to understanding the processes by which managerial, innovative, and cultural factors combine to determine sustainable outcomes. The results do not just add to theoretical knowledge, but also provide empirical evidence and practical recommendations to policymakers, managers, and researchers. The subsections below elaborate on the concrete contribution of the study in terms of theoretical, empirical, policy, managerial, and methodological contributions.

5.4.1 Theoretical Contribution

The current study contributes to the body of theory by offering a refined integration of four underlying theories, such as natural resource-based, dynamic capability, institutional, and stakeholder theories. Concerning the natural resource-based theory, the findings explain that GMPs are rare organizational resources that are strategically valuable and inimitable. Most importantly, the research indicates that the presence of such resources does not necessarily produce sustainable results; rather, their efficiency depends on the firm's ability to utilize them through innovation and a culture oriented toward sustainability. The complete mediation of green innovation and organizational culture in the pathway between green management practices and sustainability further develops or extends the theory by emphasizing that the implementation of resource-based capabilities needs to be accompanied by the necessary organizational mechanisms to make a substantive change in refining the classical assumption of direct resource-to-performance translation.

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The study also makes valuable contributions to dynamic capability theory by showing that organizational competencies are empirically proven to be a dynamic mechanism that operationalizes and enhances the impact of GMPs on sustainability, through green innovation and supportive organizational culture. The results suggest that these capabilities help firms to keep on integrating, reconfiguring and adapting internal and external resources to fit new demands associated with changing environments and sustainability. By revealing the mediating and interactive functions of innovation and culture, the findings augment the dynamic capability theory by providing empirical evidence of the actual organizational processes through which strategic environmental initiatives can be transformed to sustained competitive and sustainable advantage.

From an institutional theory perspective, the study gives an understanding of how companies internalize normative, regulative, and cognitive pressures into practical action that drives sustainability. This influence of organizational culture implies that institutional compliance is not an abstract and passive process, but is operationalized through structured cultural and innovative processes that strengthen sustainability goals. This refines the theoretical discussion by showing the internal organizational channels through which the external institutional demands are converted into quantifiable sustainable performance, with a focus on the interdependence of institutional demands and organizational abilities.

Concerning stakeholder theory, the research findings emphasize that the overall and integrated influence of the GMPs, green innovation, and organizational culture enables the firms to respond to the multifaceted needs of the stakeholders, such as regulators and investors, employees, and local communities. The evidence of synergistic joint effects underscores that achieving stakeholder-aligned sustainability outcomes is mediated through internal innovation processes and cultural alignment, offering a more sophisticated understanding of stakeholder management in sustainability contexts. This contribution extends the tenets of stakeholder theory by demonstrating that the achievement of the value and legitimacy of stakeholders depends on the capacity of the firm to entrench managerial practices in the framework of innovation-based and culturally enabling programs.

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5.4.2 Empirical Contribution

This research significantly contributes empirically by developing strong empirical evidence about how GMP affects sustainability within multinational manufacturing organizations. The results support the proposed hypothesized relationships by empirically illustrating that GMP have a positive influence on sustainability, but mostly through the mediating effects of green innovation and organizational culture. The full mediation observed shows that solely implementing environmental management practices is not enough to bring about sustainability results, except when the same is done against a backdrop of an innovation-based process and a culture that cherishes sustainable initiatives. This empirical finding refines earlier assumptions in the literature, which usually assume the existence of a direct effect of GMPs on sustainability, and emphasize the essential internal processes required to successfully implement sustainability.

Besides, the research empirically supports the parallel mediation model, demonstrating that the proportion of green innovation as a factor explaining the impact of GMPs on sustainability is significant, and the proportion of organizational culture as a mediating variable is equally significant. The combined mediation analysis demonstrates that these constructs operate synergistically, fully transmitting the effect of GMPs on sustainability. These research findings contribute to the empirical research work through some subtle evidence of the organizational internal processes and relationships that support sustainable performance. This type of granular empirical knowledge fills a critical gap in the current literature that has often analyzed the influence of GMPs on sustainability outcomes individually or in the light of a single mediating variable.

The empirical evidence also affirms that joint application of GMP, green innovation, and organizational culture has a compounding effect that adds credence to the need to integrate strategies to develop sustainable performance of a significant magnitude. The study provides empirical evidence on multi-dimensional sustainability interventions by emphasizing the interconnected role of GMPs, innovation, and culture, therefore enriching theory and practice. The results may be generalized to sustainability models in the context

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of multinational manufacturing companies in Kenya and used as context-specific results to design comparative studies in emerging markets.

Lastly, empirical evidence of predictive validity and explanatory power of the suggested model is revealed through the high value of the coefficient of determination of sustainability. This further proves the strength of the found relations and confirms the effectiveness of combined management, innovation, and culture-based interventions towards sustainability. Together, the empirical contributions contribute knowledge by going beyond descriptive and correlational evidence, and providing causal and mechanism-based evidence that can be used to make strategic decisions and conduct more empirical research on the subject of sustainability in management practices.

5.4.3 Methodological Contribution

The present study has some methodological implications in that it illustrates a rigorous and multi-faceted method of analyzing the effects of GMPs on sustainability through the mediating effect of green innovation and organizational culture. By using PLS-SEM, the study not only tested the direct and indirect impacts of managerial, innovative, and cultural variables on sustainability outcomes, but also allowed complex relationships, such as parallel mediation effects, something that is usually ignored in traditional regression-based analyses. PLS-SEM was used to estimate both measurement and structural models simultaneously, which offers strong validation of both indicator reliability and the interrelationships between latent constructs, enhancing the overall inferential validity of the study.

In addition, the study employed superior quality diagnostic tests, such as outlier analysis using the IQR technique, multicollinearity test using VIF, examination of heteroskedasticity with the Breusch-Pagan test, and examination of common method bias with the Harman single-factor test. This thorough methodology ensured that the data fulfilled the high assumptions of multivariate modeling and that the results were not biased by measurement and sampling artifacts. This methodological rigor makes the results of the study more reproducible and reliable, offering a blueprint for future empirical research on sustainability in organizational settings. In addition, the study's methodology involved

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thorough consideration of model fit statistics, such as the SRMR and NFI, in addition to the assessment.

5.4.4 Contribution to New Knowledge

This research is significant because it adds to existing knowledge about the mechanism through which GMPs contribute to the creation of sustainable business practices in multinational manufacturing firms in an emerging economy setting. Contrary to the previous studies where much more attention was given to the direct impact, the results of the current study show that the GMPs have no immediate or independent impact on sustainability when analyzed in a complex structural context. Rather, they can entirely be passed on through green innovation and organizational culture. This subtlety contributes to the current body of knowledge by demonstrating that sustainability performance is relative to the firm's internal ability to innovate and its capability to institutionalize environmental values in organizational culture. Therefore, this changes the analytical orientation from isolated managerial acts to organizational processes.

Moreover, the current study generates new knowledge by empirically establishing the concurrent and complementary mediating roles of green innovation and organizational culture. Although in the past, these mediators have commonly been studied separately, the current study presents new empirical evidence that these two factors acting together exhaustively justify the relationship between the GMPs and sustainability. This parallel mediation model identifies a synergistic pathway in which GMPs are reshaped into sustainable outcomes, providing a more focused explanation of sustainability creation that embodies both technological and socio-cultural aspects of organizational change.

Moreover, the current investigation adds contextual insights by expanding on sustainability studies in multinational manufacturing organizations based in Kenya, a less-explored geographical location in empirical research. By placing the analysis in the context of a developing economy, where institutional demands and resource-based limitations are changing, the work adds to the discourse on sustainability worldwide with insights that challenge the applicability of findings from the developed world. It suggests that in such situations, sustainability results are not achieved through official policies or compliance

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procedures, but through the capability of the firm to incorporate innovation and sustainability-focused values in the daily organizational operations.

Lastly, the research makes contributions to knowledge by empirically confirming a holistic sustainability model that incorporates managerial, innovative, and cultural aspects into one explanatory model. The fact that sustainability is best realized through the synchronization of the actions of these dimensions adds an added layer of theoretical and empirical perspective for future studies. This integrative approach adds to the academic knowledge of sustainability as a dynamic organizational competence and not a fixed performance and thus provides a useful base to further research on the topic to untangle the complicated processes through which organizations attain long-term sustainable performance.

5.5 Recommendations of the Study

Based on the findings and conclusions of this research, which are empirical, this section contains specific recommendations that would help to increase the level of sustainability among multinational manufacturing companies in Kenya. The recommendations are organized at policy and managerial levels so that the study's insights can be applied in the form of an action plan to be taken by major stakeholders such as policymakers, regulators, and firm management. Since the study confirms that sustainability results are attained due to an effective mediation process between green innovation and organizational culture, the recommendations underline that an integrated strategy is needed to match regulatory frameworks, organizational strategies, and operational practices to sustainability goals.

5.5.1 Policy Recommendations

Drawing from the findings of this study, policy interventions in Kenya's manufacturing industry, especially for multinational manufacturing firms, should focus on institutionalizing GMPs as a foundational driver of sustainability. Given the strong impact that introducing GMP practices can have on sustainability, national policies relating to the environment and industry should reinforce the need to implement environmental management systems. Regulatory agencies like the National Environment Management Authority (NEMA) ought to go beyond minimum levels of compliance by pushing companies to incorporate environmental targets in corporate plans, performance

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agreements and reporting systems. Integration of environmental laws with long-term sustainability objectives will make GMPs a part and parcel of the operational model of multinational firms in Kenya.

The results also highlight how green innovation plays the key role in converting GMPs into actual sustainability results. Since the relationship between GMPs and sustainability was identified to be completely mediated by green innovation, policy frameworks must clearly provide incentives to encourage environmental behavior based on innovation. The Kenyan government needs to increase both fiscal and non-fiscal incentives that favor investments in clean technologies and eco-friendly production processes, as well as sustainable product development in the manufacturing industry. This involves special tax incentives, accelerated depreciation allowances on green capital investments, and higher government resources on green research and development. These policy actions are particularly essential to multinational corporations that have access to technological and financial resources to scale green innovations and spread them out to local supply chains.

More importantly, the study notes the decisive influence of organizational culture in realizing sustainability, given that the organizational culture was established to fully transmit the effects of GMPs on sustainability outcomes. The policymakers should come up with interventions that encourage organizational values and behaviors that are sustainable in the manufacturing companies. This is made possible by integrating organizational and human-capital aspects into environmental policy tools, such as imposing sustainability training programs, motivating employees to participate in environmental programs, and providing rewards to companies that have successfully embraced a high level of internal sustainability culture in the form of national awards and certification programs. For multinational manufacturers with operations in Kenya, these policies would promote the localization of global sustainability values in their Kenyan subsidiaries, helping ensure consistency between corporate environmental commitments and local operational practices.

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Moreover, the combined and substantial effect of the GMPs, green innovation, and organizational culture on sustainability indicates the necessity of policy interventions that are integrated and coordinated. Instead of viewing environmental regulation, innovation policy and industrial development as distinct areas, policymakers ought to adopt a comprehensive policy structure that aligns these elements. These green manufacturing centers, sustainability-oriented industrial parks, and organized public and private alliances can offer platforms upon which multinational companies are encouraged to concurrently reinforce managerial behaviors, invest in innovation, and develop sustainability-oriented organizational cultures. Such combined policy efforts would increase the synergies between companies and fast-track sustainability change within the sector.

Lastly, the Kenya industrial and investment policies ought to expressly make sustainability a strategic parameter for attracting and retaining the multinational manufacturing firms. The strategic significance of GMPs, green innovation, and organizational culture should be strengthened by linking sustainability performance and access to government-sponsored infrastructure to investment approvals and export incentives. The government of Kenya can use multinational enterprises not only as driving forces of the national economy but also for sustainable industrialization and environmental management in the country by integrating sustainability requirements into the general manufacturing policy framework.

5.5.2 Managerial/Practical Recommendations

On the basis of the findings of this study, GMPs should be institutionalized as strategic priorities by managers of multinational manufacturing companies that conduct their operations in Kenya, instead of being considered as some peripheral compliance activities. The top management ought to incorporate environmental goals in corporate vision statements, strategic plans, and key performance indicators in all functional units. This strategic alignment ensures that the sustainability considerations make an impact at both operational and strategic levels, hence augmenting the overall sustainability performance of the firm. Managers are also required to invest sufficient research and resources in environmental programs, which sends a message to the top management on seriousness

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about the environmental performance and at the same time ensures that accountability to the end results of the sustainability process is maintained throughout the organization.

Since the relationship between the GMPs and sustainability is mediated exclusively by green innovation, the environmental strategies pursued by the managers should be focused on innovation. Emphasis should be placed on practical, ongoing investment in better production technologies, eco-friendly processes, waste-reduction systems, and eco-friendly product design. Managers of multinational firms should leverage their global knowledge networks and technological capabilities to transfer best practices and green technologies to their Kenyan operations. The partnership with local research institutions, technology providers, and suppliers can also help to support innovation capacity and encourage localized solutions, that react to regulatory, environmental, and market conditions in Kenya.

The findings also indicate that organizational culture is a determining factor towards transforming GMPs into sustainable results. Managers are therefore advised to instill a good organizational culture that is sustainability-oriented by incorporating environmental values into employees' daily work practices and behaviors. This can be done through consistent sustainability training, internal messages about environmental objectives, and incentive systems where employees are rewarded for environmentally friendly behavior. Sustainability engagement efforts among employees through the encouragement of green team activities and continuous improvement programs enhance the levels of ownership and commitment on the part of the employees to sustainability efforts, making sure that sustainability is not pushed but learned within the organization.

Moreover, the combined impact of GMPs, green innovation, and organizational culture on sustainability underscores the need to have an integrated management strategy. Managers must not implement environmental initiatives in bits; instead, they ought to embrace integrated models that align managerial systems, innovation initiatives, and cultural transformation. Cross-functional sustainability committees can provide consistency across production, procurement, human resource management, and innovation functions. Such a

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type of integration improves the level of synergy and decreases the duplication of efforts as well as maximizes the sustainability implications of managerial interventions.

Lastly, the multinational manufacturing managers should go beyond organizational sustainability by including the suppliers, distributors, and other stakeholders in their value chains. By encouraging green procurement, supplier environmental auditing, and joint sustainability initiatives, companies are able to enhance sustainability results and strengthen their competitive franchise. In the Kenyan manufacturing context, such proactive managerial practices not only enhance firm-level sustainability but also contribute to broader industrial transformation, environmental protection, and long-term socio-economic development.

5.6 Limitations of the Study

Notwithstanding the rigor employed in the design and execution of this research, numerous limitations should be acknowledged to offer context for the interpretation of the findings and to guide subsequent scholarly inquiry. First, the research applied the cross-sectional research design and, as such, this design captures the relationship among GMPs, green innovation, organizational culture and sustainability at one point in time. Although this design is suitable for forming associations and measuring mediation effects, it does not support strong causal conclusions or the observation of causal relationships across time. The practices and outcomes related to sustainability are dynamic in nature, and longitudinal shifts in the nature of managerial practices, innovation processes, and organizational cultures might not be entirely captured in the cross-sectional dimension of the framework.

Second, the research was mostly based on self-reported data gathered through managers who were the key respondents in multinational manufacturing companies. Even though measurement scales and stringent validity and reliability evaluation were used, self-reported responses are prone to method bias and social desirability. Respondents can exaggerate the scope of their company's green practices or sustainability performance in order to conform to perceived regulatory or normative demands, especially when the world increasingly puts more focus on environmental responsibility. Although diagnostic tests

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indicated negligible bias, the likelihood of residual perceptual distortion cannot be entirely ruled out.

Third, the scope of the study was restricted to multinational manufacturing companies operating in Kenya. Although this focus enhances contextual relevance and depth, it constrains the generalizability of the findings to other sectors, such as services or extractive industries, as well as to domestic manufacturing firms or multinational firms operating in different institutional environments. The regulatory framework and market structure in Kenya, as well as the socio-environmental conditions, can influence sustainability practices in a different way compared to other developing or developed economies.

Lastly, the research focused on the GMPs, green innovation, and organizational culture as the key explanatory variables of sustainability outcome. Although these constructs were conceptually based and empirically tested, sustainability is a complex phenomenon that depends on other issues like leadership style, the corporate governance framework, financial ability, stakeholder pressure, and technological infrastructure. The exclusion of these variables may limit the explanatory breadth of the model, suggesting that the findings represent a partial, albeit robust, account of the determinants of sustainability in multinational manufacturing firms.

5.7 Suggestions for Further Research

Based on the findings and limitations of this research, there are a number of research directions that are suggested to contribute to the academic knowledge regarding sustainability in the manufacturing industry. To begin with, future research can be designed using a longitudinal design to investigate the interactions of GMPS, green innovation, and organizational culture over time to determine their effects on sustainability. A longitudinal approach will allow the researchers to infer dynamic developments and causality in a more robust way, and whether the mediating functions of green innovation and organizational culture are reinforced, diluted, or changed as the firms evolve in their sustainability processes.

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Second, future studies might extend the scope beyond the multinational manufacturing firms to domestic manufacturing firms, small and medium-sized firms, and firms in other industries like the energy, agriculture, construction, and services industries. Cross-firm and cross-industrial comparative research would improve the external validity of the results and indicate that the processes by which sustainability is realized vary according to firm size, ownership or shareholding, industry or sector features. Comparative studies across countries or regions in East Africa, or even in emerging economies, would also shed more light on how institutional and regulatory context affect sustainability practices.

Third, Second, future research should consider incorporating additional explanatory and moderating variables to enrich the analytical model. Variables like management style, corporate governance structure, digitalization, regulatory pressures related to environmental concerns, stakeholder pressure, and financial capacity could all potentially interface with GMP and affect innovation, organizational culture, and sustainability. Reviewing these variables may help provide a more integrated picture of the collective role of internal and external forces in promoting sustainable performance in manufacturing companies.

Lastly, future studies are encouraged to have methodological diversification. Mixed methods research that involves quantitative modeling and qualitative case studies or interviews would offer more information on how the processes of translation of GMPs into innovation and cultural change take place. Qualitative data would be useful in unbundling contextual, implicit, and managerial decision-making, and organizational forces that cannot be entirely explained by the survey data, thus supplementing and enhancing quantitative data.

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APPENDICES

Appendix I: Introduction Letter

Brian Hobson Munialo
P.O. Box 4316-0010
Nairobi.
November 2025

Dear Sir/Madam

REF: DOCTORAL RESEARCH

I am a Doctorate Student at St Paul's University, undertaking a Doctorate Degree in Business Administration majoring in Strategic Management. As part of my requirements for the course, I am conducting research on Green Management Practices, Green Innovation, Organizational Culture, and Sustainability in Multinational Manufacturing Organizations in Kenya. I have completed the development of the research proposal and I am currently preparing for data collection in the field.

This letter is to humbly request for your participation in the study as a respondent. You are required to complete the questionnaire attached. You are not required to provide your personal or contact information in the questionnaire. Participation is entirely voluntary, and you may withdraw at any stage without any penalty. All responses will be treated with strict confidentiality, with data stored securely and accessible only to the researcher. Findings will be reported in aggregate form to ensure anonymity, and the information collected will be used solely for academic purposes and will not be shared with unauthorized individuals.

Thank you.

Yours Faithfully

Brian Hobson Munialo

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Appendix II: Questionnaire

This questionnaire has statements regarding the ***Green Management Practices, Green Innovation Organizational Culture and Sustainability in Multinational Manufacturing Organizations in Kenya***. Kindly take few minutes to complete the questionnaire as guided. Your responses will be handled confidentially and ethically.

Thank you for agreeing to participate in this academic study.

SECTION A: GREEN MANAGEMENT PRACTICES

This section seeks to examine the influence of green management practices in the context of Multinational Manufacturing organizations in Kenya.

Please tick the answer that reflects your opinion in the following statements where 1=strongly disagree; 2= disagree; 3=neither disagree nor agree; 4=agree; 5=strongly agree.

	Item	**1**	**2**	**3**	**4**	**5**
a	**Energy efficiency**					
1	Our firm has adopted policies that promote energy conservation in daily operations.					
2	Energy-efficient equipment and machinery are prioritized in production processes					
3	Regular audits are conducted to identify and reduce energy wastage.					
4	Employees are trained on energy-saving techniques within the workplace					
5	Our firm continuously invests in technologies that enhance energy efficiency.					
b	**Waste reduction**					
6	Waste reduction is a key focus area in our production and operational planning.					
7	Materials are utilized efficiently to minimize production waste					
8	Employees are encouraged to adopt waste minimization behaviors					

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9	We regularly review waste management strategies to enhance environmental performance					
10	Suppliers are required to adhere to waste reduction guidelines in supply contracts					
c	**Air emission controls**					
11	Our organization monitors air emissions to comply with environmental standards					
12	Measures are in place to minimize harmful air pollutants in production.					
13	Air quality control systems are maintained and regularly inspected.					
14	Our facility uses energy-efficient lighting (e.g., LED) and equipment.					
15	We report air emission performance in our sustainability reports.					
d	**Recycling and Re-use**					
16	Our company promotes the recycling and reuse of production materials.					
17	Recyclable waste is separated and processed systematically					
18	Employees participate in programs that promote reuse and recycling					
19	Partnerships have been established with firms that specialize in recycling					
20	Our company designs products that facilitate recycling at end-of-life stages					

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SECTION B: GREEN INNOVATION

Kindly indicate the degree to which the following statements regard to the green innovation in Multinational manufacturing firms.

Please **TICK** as appropriate, using the key provided below. 1=strongly disagree; 2= disagree; 3=neither disagree nor agree; 4=agree; 5=strongly agree

	Statement	**1**	**2**	**3**	**4**	**5**
a	**Ecofriendly product development**					
21	Environmental impact assessments are conducted during the initial product design phase					
22	We prioritize biodegradable or compostable materials in product development.					
23	We use recycled/recyclable materials in our products whenever possible.					
24	Our manufacturing processes minimize energy and water consumption.					
25	Our product packaging is minimal and uses eco-friendly materials.					
b	**Green process innovation**					
26	Our organization has a clear strategy for implementing green process innovations.					
27	We have dedicated teams or roles focused on sustainable process improvement.					
28	We invest in clean technologies (e.g., renewable energy, energy-efficient machinery) to reduce environmental impact.					
29	Our processes are designed to minimize waste generation (e.g., lean manufacturing, zero-waste initiatives)					
30	We collaborate with suppliers to develop greener raw materials or processes.					
c	**Investment in green Research and Development**					

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	(R&D)					
31	We allocate budget for R&D in sustainable product innovation.					
32	Investing in green R&D is a top priority for our organization's long-term strategy					
33	Employees are incentivized to participate in green R&D initiatives.					
34	We develop products/processes that reduce waste or enable circularity.					
35	Emerging technologies (e.g., AI, biotech) will play a key role in our green R&D.					
d	**Renewable energy technology**					
36	Renewable energy (e.g., solar, wind) contributes significantly to our power supply.					
37	My organization has installed renewable energy systems (e.g., solar panels, wind turbines).					
38	Government incentives (tax credits, subsidies) strongly influence renewable energy adoption.					
39	The environmental benefits of renewables outweigh their manufacturing/installation impacts.					
40	Local policies strongly support renewable energy adoption (e.g., net metering, green tariffs).					

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SECTION C: ORGANIZATIONAL CULTURE

Please indicate your level of agreement on the statements on how organizational culture. **TICK (√)** as appropriate using the key below.

Key: 1=strongly disagree; 2= disagree; 3=neither disagree nor agree; 4=agree; 5=strongly agree

	Statement	**1**	**2**	**3**	**4**	**5**
a	**Top management commitment to environmental values**					
41	Environmental sustainability is a formal part of our organization's mission/vision statement.					
42	Top management allocates sufficient budget to achieve environmental goals					
43	CEO/executives publicly champion environmental initiatives (e.g., speeches, reports).					
44	Environmental compliance is treated as rigorously as financial compliance.					
45	Management communicates environmental goals clearly to all employees.					
b	**Collaboration and teamwork**					
46	Collaboration across departments enhances implementation of green initiatives					
47	Teams work jointly to identify and implement eco-friendly solutions					
48	Employees are encouraged to share innovative ideas on green improvements					
49	Teamwork is recognized as essential for achieving organization culture					
50	Joint environmental projects foster strong cross-functional cooperation					
c	**Communication of environmental issues**					

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51	Environmental messages from my organization are clear and easy to understand					
52	The communication channels used (email, intranet, posters) are effective for sharing environmental info.					
53	Communications highlight how environmental issues affect our local community/operations.					
54	Employees/stakeholders can ask questions or give feedback about environmental topics.					
55	Management responds to concerns/suggestions about environmental issues.					
d	**Reward system supporting green behavior**					
56	My organization has a formal reward system to recognize eco-friendly behaviors					
57	Employees view environmental responsibility as a source of professional pride					
58	Employees who demonstrate sustainable practices are publicly acknowledged.					
59	The current reward system motivates me to adopt greener habits at work.					
60	The rewards offered are desirable and meaningful to employees.					

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SECTION D: SUSTAINABILITY

Please indicate your level of agreement on the statements on sustainability of multinational manufacturing firms. **TICK (√)** as appropriate using the key below.

Key: 1=strongly disagree; 2= disagree; 3=neither disagree nor agree; 4=agree; 5=strongly agree

	Statement	**1**	**2**	**3**	**4**	**5**
a	**Economic sustainability**					
61	Cost savings are achieved through efficient use of resources					
62	Environmental investments contribute to competitive advantage					
63	Sustainable practices attract investors hence improving market reputation					
64	Our economic growth strategy integrates environmental considerations					
65	Eco-efficient operations have reduced operational risks alongside costs					
b	**Social sustainability**					
66	The firm upholds employee health, safety and well-being in its sustainability agenda					
67	Our company actively engages with local communities to promote social welfare					
68	CSR programs support community development					
69	We measure the social impact of our sustainability initiatives					
70	The company maintains strong relationship with customers and suppliers based on ethical values					
c	**Governance sustainability**					
71	Governance structures ensure corporate accountability for					

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72	Compliance with governance regulations is strictly enforced					
73	Risk management includes assessment of environmental and social issues					
74	Decision making processes integrate governance principles					
75	Sustainability performance is periodically reviewed by management					

THANK YOU FOR YOUR PARTICIPATION IN THIS STUDY

END

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Appendix III: Approval ISERC Letter

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Private Bag 00217 Limuru,
Kenya
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Website: www.spu.ac.ke

Tel Office: +254 (0) 20-2020505/10
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(0) 736-424440

REF: SPU/614/2026 **Date: 26th January 2026**

TO: Brian Munialo
St. Paul's University

Dear Brian,

==========

REF: Green Management Practices, Green Innovation, Organizational Culture and Sustainability of Multinational Manufacturing Firms in Kenya

==========

Greetings,

This is to inform you that SPU- Institutional Scientific Ethics Review Committee has reviewed the above-named research proposal. **Your ERB approval number is 624, for the period between 26th January 2026 – 26th January 2027 (1 year).**

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SPU- Institutional Scientific Ethics Review Committee.
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SPU- Institutional Scientific Ethics Review Committee within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to *SPU- Institutional Scientific Ethics Review Committee* within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.

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vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to SPU- Institutional Scientific Ethics Review Committee.
viii. Should there be any publications from your research, note that you are supposed to anonymize the particulars of the respondents, the identifiers and the name of institution (s) where you collected data.
ix. Please note that it is within the ISERC's mandate to monitor your research and to do random visits to the site. All research is subject to post approval monitoring. Kindly provide a closure report after the research.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) if you are collecting data in the country - https://research-portal.nacosti.go.ke **or obtain other clearances needed in the country where you will collect your data from.**

Yours sincerely,



Dr. Daniel Nzengya, PhD
Chairperson
SPU- Institutional Scientific & Ethics Review Committee



Appendix IV: NACOSTI Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **402495**

Date of Issue: **07/February/2026**

RESEARCH LICENSE



This is to Certify that Mr.. BRIAN HOBSON MUNIALO of St. Pauls University, Kenya, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kajiado, Kiambu, Kisumu, Machakos, Mombasa, Nairobi, Nakuru, Uasin-Gishu on the topic: Green management practices, green innovation, organizational culture and sustainability of multinational manufacturing firms in Kenya for the period ending : 07/February/2027.

License No: **NACOSTI/P/26/4183952**

402495

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THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013 (Rev. 2014)
Legal Notice No. 108: The Science, Technology and Innovation (Research Licensing) Regulations, 2014

The National Commission for Science, Technology and Innovation, hereafter referred to as the Commission, was the established under the Science, Technology and Innovation Act 2013 (Revised 2014) herein after referred to as the Act. The objective of the Commission shall be to regulate and assure quality in the science, technology and innovation sector and advise the Government in matters related thereto.

CONDITIONS OF THE RESEARCH LICENSE

1. The License is granted subject to provisions of the Constitution of Kenya, the Science, Technology and Innovation Act, and other relevant laws, policies and regulations. Accordingly, the licensee shall adhere to such procedures, standards, code of ethics and guidelines as may be prescribed by regulations made under the Act, or prescribed by provisions of International treaties of which Kenya is a signatory to.
2. The research and its related activities as well as outcomes shall be beneficial to the country and shall not in any way;
    i. Endanger national security
    ii. Adversely affect the lives of Kenyans
    iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
    iv. Result in exploitation of intellectual property rights of communities in Kenya
    v. Adversely affect the environment
    vi. Adversely affect the rights of communities
    vii. Endanger public safety and national cohesion
    viii. Plagiarize someone else's work
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13. The Licensee shall disclose to the Commission, the relevant Institutional Scientific and Ethical Review Committee, and the relevant national agencies any inventions and discoveries that are of National strategic importance.
14. The Commission shall have powers to acquire from any person the right in, or to, any scientific innovation, invention or patent of strategic importance to the country.
15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

National Commission for Science, Technology and
Innovation(NACOSTI),
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Appendix V: List of Multinational Manufacturing Organizations in Kenya

	Organizations
1	Orbit Chemicals
2	Kings Manufacturers
3	Cosmos Pharmaceuticals
4	Propack Kenya
5	Kapa Oil Refineries
6	African Cotton Industries
7	Biodeal Laboratories
8	Blowplast Limited
9	Laboratory & Allied
10	Premier Foods Limited
11	Kenafric Industries Limited
12	Super Manufacturers
13	Malbros(Mjengo Limited) -Food
14	Ardagh Glass Packaging
15	Nestle Kenya Limited
16	Haco Industries
17	Pharmaceutical Manfucturers Ltd
18	Sphinx Pharmaceuticals Limited
19	Regal Pharmaceuticals
20	Dawa Pharmaceuticals
21	Kulal International Ltd (Pharmaceuticals)
22	Metal Crowns Limited
23	GlaxoSmithkline
24	Central Electricals International
25	Roche Kenya
26	Bayer EastAfrica
27	Magadi Soda Co Ltd
28	Chem-Lab Ltd
29	Bata shoe Company
30	Bidco Africa
31	Bidcoro Africa
32	Evereday East Africa
33	EABL
34	CCBA Group
35	Kim-Fay East Africa
36	Chandaria Industries

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37	Mzuri Sweets Limited
38	Nyungu Africa
39	Mabati Rolling
40	Pwani Oil Group
41	Tropikal Brands Afrika Limited
42	United Millers
43	PolyTanks & Containers Kenya
44	Patco Industries
45	Kenya Sweets
46	Matermind Tobacco Kenya Limited
47	BAT
48	Jubilee Tissue Industries
49	Dodhi Group
50	Osho Chemicals
51	BURN manufacturers - Jiko Okoa
52	Unga Group
53	Pembe Floor Millers
54	Apex Steel
55	GELX Industries
56	Tarpo Industries
57	Kevian Kenya
58	Carton Manufacturers
59	Dodhia Packaging
60	Nails & Steel Products Ltd
61	Spectra Chemicals
62	Associated battery manufacturers
63	StatPack Industries
64	Dawn Industries - (Cosmetics)
65	Neopack Limited
66	Manchester Outfitters
67	Kenya Leather Industries
68	Alpharama
69	LyonnMaid
70	Tri-Clover Industries
71	Vaja's Manufactureres
72	General Plastic
73	AllPack Industries
74	Polythene Industries

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75	Menengai Oil refineries
76	Kibo Sugar
77	Twiga Chemicals
78	Ashut Engineering
79	Solai Paints Limited
80	Shrink Pack Limited
81	General Mortors East Africa
82	Unilever Kenya Ltd
83	Procter & Gamble
84	L'Oreal East Africa
85	Heineken East Africa
86	Brookside Dairy Ltd
87	Toyota Kenya Ltd
88	BASF East Africa Ltd
89	Kenpoly Manufacturers
90	DST East Africa
91	Bamburi Cement
92	Henkel Kenya
93	Associated Vehicle Assemblers
94	East African Portland Cement Company
95	Kenya Wine Agencies Limited

Source: *KAM* (2025)

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Appendix VI: List of Manufacturing Organizations in Kenya

1	Blowplast Limited
2	Premier Foods Limited
3	Kenafric Industries Limited
4	Chandaria Industries Limited
5	Kevian Kenya Limited
6	Carton Manufacturers
7	Kenya Leather Industries
8	Excel Chemicals
9	Butali Sugar
10	Kenpoly Manufacturers

Source: *KAM* (2025)

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