UNIVERSITY OF CAPE COAST

SUSTAINABLE SUPPLY CHAIN MANAGEMENT PRACTICES AND PERFORMANCE OF FOOD PROCESSING FIRMS IN SELECTED METROPOLISES IN GHANA

ALFRED ASIEDU

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BY

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Thesis submitted to the Department of Marketing and Supply Chain Management of the School of Business, College of Humanities and Legal Studies, University of Cape Coast in partial fulfilment of the requirements for the award of Master of Commerce degree in Procurement and Supply Chain Management

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature…… Date ……...

Name: Alfred Asiedu

Supervisor's Declaration

I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Supervisor's Signature …… Date ……

Name: Dr. (Mrs.) Gloria K.Q. Agyapong

ABSTRACT

The study investigated the effects of sustainable supply chain management practices comprising green, lean, inventory and supply management on sustainable performance by relying on the systems theory and theory of constraints. Twelve hypotheses were developed and tested to address the study's objectives. The quantitative approach and explanatory research design were employed; while primary data were gathered through structured questionnaires from 247 owners and or managers of the food processing firms. The IBM SPSS Statistics software (v. 26) and SmartPLS 3 were used for data processing. Data analysis was finally done to test for all the hypotheses using the partial least square-structural equation modelling (PLS-SEM) tool. It was discovered that all the SSCM practices play substantial roles in improving the SP of Ghanaian food processing firms. However, inventory management and green management significantly influenced all the three SP dimensions (i.e., economic, social and environmental), while lean management had no significant influence on economic performance. Finally, supply management had no significant influence on social and environmental performance. Conclusively, green and inventory management play crucial roles in improving the food processing firms' SP. It was recommended that policy makers, practitioners and management should continue to strengthen and invest in the SSCM practices in order to promote SP.

KEYWORDS

Sustainable Supply Chain Management

Sustainable Supply Chain Management Practices

Green Management

Lean Management

Supply Management

Inventory Management

Sustainable Performance

Economic Performance

Social Performance

Environmental Performance

Food Processing Firms

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DEDICATION

To my mother, Mary Frimpomaa and my uncles, Matthew Amponsah and Kwabena Adomah

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LIST OF ACRONYMS

SSCM	Sustainable Supply Chain Management
SSCMP	Sustainable Supply Chain Management Practices
GMP	Green management
LMP	Lean management
SMP	Supply management
IMP	Inventory management
SP	Sustainable Performance
EcP	Economic Performance
SP	Social Performance
EP	Environmental Performance

CHAPTER ONE

INTRODUCTION

Sustainability continues to generate much attention among researchers, policy makers and businesses. It focuses on holding individuals or firms accountable to actions which lead to social, environmental and economic-related issues. With food manufacturing supply chains (SC) continuing to endanger the environment and its dwellers with their questionable activities, the need for sustainable supply chain management (SSCM) practices have become inevitable. SSCM practices like green, supply, inventory and lean management are implemented to ensure that SC actors meet current consumer demands without comprising future generations. Ghana's food processing firms are critical to economic development; however, their activities threaten sustainability. This research, therefore, investigates how SSCM practices affect sustainable performance of food processing firms in Ghana.

Background to the Study

Globally, the food processing sector plays significant roles in economic development through employment creation, revenues and production of necessity products (Khouryieh, 2021; World Bank, 2021). It averagely contributes about 38% to job creation and Gross Domestic Products (GDP) to various economies (Khouryieh, 2021; KPMG, 2019). In advanced economies notably USA, UK and Germany, the sector racked over US$1.7 trillion in revenues in 2019 and contributed over 27% to GPD (Market Research Report, 2020). In USA alone, processed foods sales reached US$2tr in 2020; earning US$750 billion in revenues (Khouryieh, 2021). Also, in developing economies

like Africa, the sector contributes about 30% to GDP and 38% to employment creation (World Bank, 2021).

In 2019, the food processing sector accounted for about USD179bil and USD305bil of total revenues in Brazil and India alone (Oliveira, Ruffoni, Maçada & Padula, 2019). In Ghana, it averagely contributes about 11% and 15% to GDP and total jobs created (Ghana Statistical Service, 2020). With the continuous increase in global population, the sector looks promising with a global estimated growth of US$4.1tr by 2024 (Research and Markets, 2020). Food processing firms do not operate in isolation; thus, rely on several actors notably farmers, suppliers, investors, distributors and consumers in a supply chain (SC) network to achieve their set goals (Kumar, Singh & Modgil, 2020). Wijetunge (2017) stressed that the output of a poorly performing actor could have significant rippling effects on supply chains; thus, the need to embrace sustainable supply chain management (SSCM) practices.

SSCM emphasises that every actor is accountable for any negative impact or risk caused by varying actions along a chain network (Baliga, Raut & Kamble, 2019); only achievable through the implementation of SSCM practices notably green, lean, inventory and supply management (Ali, Zailani, Iranmanesh & Foroughi, 2019; Baliga et al., 2019; Wijetunge, 2017). Green management, for instance, emphasises environmental consciousness where the activities of supply chain actors would have little or no human and environmental-related consequences (Afum et al., 20120). Inventory accounts for over 70% of a company's total current assets (Atnafu & Balda, 2018); thus, its management is key to sustainability development.

The theory of constraints asserts that SCs can only overcome any constraint by implementing the appropriate SSCM practices (Mijović & Savković, 2019). These practices ensure that SCs satisfy current consumers' needs without compromising future generations. SSCM practices also ensure that food manufacturing SCs use resources prudently by reducing waste, pollution and other hazardous elements associated with their activities (Afum et al., 2020; Trading Economics, 2020). Similarly, the drive for sustainable practices in the sector has been strengthened by global warming, climate change and ozone depletion issues arising from their activities (United Nations Environment Programme (UNEP), 2020). Kumar et al. (2020) noted that, food processing firms consume large quantities of non-renewable, renewable materials and energy which lead to air, water and land pollution.

Studies have linked SSCM practices with sustainable performance in (economics, environment, social) (Afum et al., 2020; Dora et al., 2020; Baliga et al., 2019). In Ghana, a fast-growing economy, calls for food manufacturers to embrace sustainable practices amid the Millennium Development Goal 7 led to the amendment to its Public Procurement Act 2003 Act 663. Also, a 2018 report by Environmental Performance Index of Yale University found Ghana's manufacturing sector to significantly contribute to environmental degradation costs at US$ 850 million annually. These are clear indications that the Ghanaian economy would struggle if SSCM practices remain underdeveloped by the manufacturing sector notably food processing firms.

Undoubtedly, food manufacturers' inventory is easily contaminable, highly perishable and have short expiry dates; thus, failure to emphasise on SSCM practices would pose serious threats to both current and future

generations. Ghana's food market is the second largest within West Africa behind Nigeria (Trading Economics, 2020) and with a fast-increasing population dominated by the middle-class, it also looks very promising. Also, consumers' preference of foreign food products has increased drastically amid increased price, health and environmental consciousness. These situations have also pushed for more attention in the area of sustainable practices in the country. Therefore, with United Nations pushing food supply chains to meet its sustainable development goals; this study investigates how SSCM practices affect the sustainable performance of food processing firms in Ghana.

Statement of the Problem

Food Supply chains have grown in complexity and competitiveness; posing serious threats to food safety (Andam, Tschirley, Asante, Al-Hassan & Diao, 2018; Vijayvargy, Thakkar & Agarwal, 2017). Although, regulatory actions like SDGs, zero emissions and environmental protection are increasingly developed, food contamination coupled with environmental and health-related concerns continue to rise; especially in developing economies (UNEP, 2020; Andam et al., 2018). In Ghana, for instance, the food sector is noted for high energy consumption, unhygienic production, poor storage facilities and misuse of chemicals (Andam, Ragasa, Asante & Amewu, 2019). Other factors include poor preventive controls, uncertain demands, contaminated raw materials and unstable utility supply (Asante, Ragasa, & Andam, 2020). These factors have posed serious questions about the sustainable practices adopted by food manufacturers in the country.

Also, the connection between food processors and its upstream actors notably local suppliers have generally been weak; leading to raw material quality

issues, unnecessary supply delays, regular inventory shortages, post-harvest losses and high operational costs (Agyapong, 2020; Essegbey, Nutsukpo, Karbo & Zougmoré, 2015). A 2018 report by the Ministry of Food and Agriculture revealed that only 5% of raw materials produced meets the quality criteria and then processed; thus, 95% of post-harvest losses are recorded annually. These are indications of poor supply and inventory management in the food chain; contributing largely to the industry's imminent collapse (Chavez, Yu, Jajja, Song & Nakara, 2020). In the face of post-harvest losses; Ghana spends over US$1 billion annually on food imports to feed its ever-growing population (Ridolfi, Hoffman, & Baral, 2018).

Quartey and Darkwah (2015) found Ghana's food SCs to have low value addition; but, contributes about 65% to GHG emissions (United Nations Environment Programme (UNEP), 2020). UNEP also revealed that activities of these food chains lead to environmental costs of about 15% of GDP and contribute over 46% to air, land and sea pollution (Adom, 2018; Ridoff et al., 2018). Although, previous studies (Afum et al., 2020; Opoku et al., 2020) have found food SCs in Ghana to adopt sustainable practices: green, lean, supply and inventory management, their activities continue to affect human health, the environment and overall production costs. These situations are clear evidences of sustainability issues affecting the industry's performance. Afum et al. (2020) concluded that firms can only overcome its woes and achieve better sustainable performance by adopting green and lean management.

Although studies have linked SSCM practices with sustainable performance; they have focused on global manufacturing hubs like India, US, Malaysia and China (Chavez et al., 2020; Silvestre, 2015), with little focus on

Africa notably Ghana. Also, current studies have largely focused on the entire manufacturing sector other than the food industry (sub-sector). Clearly, sustainable practises and performance have not been fully investigated in Africa notably Ghana (Afum et al., 2020); their study on this subject focused on lean and green management in the manufacturing sector; leaving a paucity of gap in the food sub-sector. Also, Opoku et al. (2020) focused on inventory management in the food industry, but, emphasised on operational performance. This study addresses existing research gaps in literature by examining SSCM practices and sustainable performance of food processing firms in Ghana.

Purpose of the Study

This study investigated the effect of sustainable supply chain management practices on the sustainable performance of food processing firms in Ghana.

Research Objectives

The following research objectives were established to:

1. examine the effect of lean management on sustainable performance of the food processing firms within the selected metropolises
2. analyse the effect of green management on sustainable performance of the food processing firms within the selected metropolises
3. assess the effect of inventory management on sustainable performance of the food processing firms within the selected metropolises
4. test the effect of supply management on sustainable performance of the food processing firms within the selected metropolises

Research Hypotheses

The following research hypotheses were tested in this study:

H1a: Lean management significantly affects the environmental performance of food processing firms

H1b: Lean management significantly affects the social performance of food processing firms

H1c: Lean management significantly affects the economic performance of food processing firms

H2a: Green management significantly affects the environmental performance of food processing firms

H2b: Green management significantly affects the social performance of food processing firms

H2c: Green management significantly affects the economic performance of food processing firms

H3a: Inventory management significantly affects the environmental performance of food processing firms

H3b: Inventory management significantly affects the social performance of food processing firms

H3b: Inventory management significantly affects the economic performance of food processing firms

H4a: Supply management significantly affects the environmental performance of food processing firms

H4b: Supply management significantly affects the social performance of food processing firms

H4c: Supply management significantly affects the economic performance of food processing firms

Significance of the Study

This research's outcome would inform policies and practices of policymakers, industry players and practitioners in the food processing industry as it offers new understandings of SSCM and sustainable performance within a developing economy, Ghana. More precisely, the research would expose key stakeholders such as policy makers and industry players including management within the food processing industry to sustainable practices that would enhance their economic, environmental, and social performance significantly. This would, therefore, assist policymakers such as Ministry of Trade and Industry in developing and implementing applicable policies that would improve the long-term sustainability of the food processing industry's activities in Ghana and other related economies.

The research would also aid industry players in developing sustainability -related policies such as lean, inventory, and green practises in order to boost supply chain resilience and competitiveness in the food industry. The study would also provide a comprehensive framework to guide the sustainable practices of practitioners within the food processing industry. Also, the study's outcome would offer significant contributions to academicians in terms of theory and methodology. Theoretically, this study extends existing knowledge within the boundaries of critically bounding assumptions of sustainability in the areas of theory of constraints and systems theory. With respect to the theory of constraints, this study supported the necessity for businesses to implement important sustainable practises in order to overcome potential restrictions.

In terms of methods, the study exposed researchers to the most appropriate methodologies they can adopt when developing papers related to sustainable supply chains. For instance, this study adopted the structural equation modelling analytical tool and this would help potential researchers to conduct more rigorous studies. Finally, this study would contribute to previous literature on sustainable supply chain practices in developing economies notably Ghana. This would assist academicians to have adequate information to support or disapprove their findings related to this study.

Delimitations

Despite its substantial contributions, this study was geographically and thematically constrained. In terms of geography, the study focused on food processing companies in emerging economies, particularly Ghana. In Ghana, the study specifically focused on the Accra, Tema and Kumasi metropolises due to the highest concentration of firms. Also, only food processing firms currently registered and received certifications from the Food and Drugs Authority (FDA) within these metropolises were selected. Thus, food processing firms within these metropolises but yet to register with FDA were excluded. The study also excluded firms registered with these bodies but outside the three metropolises. In terms of focus, the study concentrated on only food processing firms and invariably excluded other classes of firms notably plastics, rubber and wood processors.

Limitations

The study made valuable contributions to policy development and practices within the food processing industry in a developing economy.

However, the study's quantitative approach exposed it to some limitations which could have affected the quality of its outcome. For instance, with this approach, the structured questionnaire was used which exposed the data obtained to non-responses, insufficient data, and missing values. These challenges were addressed by adopting several ethical practices such as anonymity, confidentiality and informed consent. These ethical considerations ensured that the respondents provided relevant information with confidence; thereby, minimising the issues associated with the use of questionnaires.

Definition of Terms

Sustainable supply chain management: It refers to the management of all SC actors to ensure that their activities do not have severe negative consequences for a community's or society's social, economic, or environmental well-being.

Sustainable performance: It measures a firm's total performance with respect to social, environmental and economic indicators.

Organisation of the Study

The study was organised under five chapters where Chapter one presented the introduction section comprising the background, statement of the problem, objectives, hypotheses and significance of the study. Chapter two was concerned with the literature review section, while the Chapter three focused on the research paradigm, approach, study design, data collection instrument, data processing and analytical tools. The fourth chapter addressed the results and discussion; while, Chapter five provided the study's summary and conclusions. It also presented valuable recommendations for policy formulation and further research.

CHAPTER TWO

LITERATURE REVIEW

This chapter extensively reviewed previous related literature with respect to SSCM practices and SP It specifically presented the theoretical review where relevant theories notably theory of constraints and systems theory were discussed. The chapter also included a conceptual review, an empirical assessment of relevant studies, and conceptual framework to provide a visual representation of the variables' interactions.

Theoretical Review

The theory of constraints and the systems theory were discussed in this section in relation to the study's research goals.

Theory of Constraints

The theory of constraints (TOC) was propounded by Eliyahu Goldratt in the year 1984 as scheduling software for simple production (Goldratt, 1990). It was inextricably tied to the Optimised Production Technology (OPT), a planning and control tool which was formalised by Goldratt. The OPT system was created to identify and manage possible limiting factors in any production processes (Cox III, CFPIM & Schleier Jr, 2010). It provided a vital tool for developing a restricted manufacturing schedule for bottleneck operations. The theory has evolved into an important managerial philosophy during the 1980s with its principles and practices spanning across several management areas (Şimşit, Günay & Vayvay, 2014). The TOC ideology focused on how firms can deal with constraints which represented anything that restricts a system from attaining expected higher performances.

Goldratt (1990) explained that the limiting factor is the weakest link in any system; thereby, exposing a firm's operational activities to severe threats from various environmental forces including suppliers, consumers and competitors. The TOC philosophy provided relevant suggestions for continuous improvement in a firm's manufacturing planning and control systems in order to limit the threats of the constraints or bottlenecks. The theory was developed under the following assumptions: assess the limiting factors; make decisions on how to exploit them; invest resources into those decisions made; elevate the constraints and finally, ensure that the limiting factors are continuously detected and eliminated (Cox III & Boyd, 2020; Goldratt, 1990).

According to Wu, Zheng and Shen (2020), overcoming any constraint necessitates continuous system improvement through the implementation of appropriate procedures, methods, and overall quality management. The theory practically offers clear and scientific processes for addressing any limiting factor until it ceases to exist. Mishra (2020) revealed that firms can only be efficient and effective when they eliminate bottlenecks in their production systems without compromising value addition to consumers. Cox III and Boyd (2020) also suggested that firms are likely to experience severe supply shortages, inventory-related issues, financial difficulties, poor demand forecasting, long lead times and consequently threaten their survival and competitiveness in the face of production bottlenecks.

The theory has been updated in recent years to include the concept of supply chain sustainability. Mishra (2020) suggested that the activities of manufacturing supply chains have exposed the environment to numerous environmental, social and economic-related issues notably pollution, climate

change and global warming; subsequently threatening resources and value creation. Thus, TOC has become increasingly vital in modern business environments where the need to ensure environmental safety, social wellness and strong economic elements is synonymous to firm survival, growth and competitiveness (Balderstone, 2020; Cox III & Boyd, 2020). This is because, the theory proposes continuous systems development through implementation of relevant strategies, procedures, methods and practices notably SSCM practices such as lean, green, supply and inventory management.

With respect to this research, the TOC suggests that food processing supply chains, especially in developing economies, could be exposed to constraints such as inventory shortages, supply delays, large quantum of production waste, power outages, material ordering issues and resource scarcity which threaten their production quality, value addition to consumers, firm's overall survival and competitiveness. These constraints subsequently lead to anti-environmentally and socially friendly outcomes notably pollution (air, land, water), waste disposal issues and health-related issues. The TOC suggests that food processing firms in Ghana should embrace sustainable practices notably lean, green, inventory and supply management in order to overcome constraints and achieve better sustainable performance.

Systems Theory

The systems theory was developed by Ludwong Von Bertalanffy in 1973 by asserting that firms operate in open systems where they constantly interact with the environment within which they operate (Whitchurch & Constantine, 2009). Bertalanffy's theory was based on criticisms of Max Weber's position that corporations operate in closed systems and hence do not need to engage with

external players. Organisations can only exist, according to Von Bertalanffy (2010), if they operate as open systems rather than closed systems. According to Koontz, Weihrich, and Cannice (2020), no organisation operates in a vacuum since it receives inputs (people, management skills, capital, raw materials) from the outside world, changes them into outputs (completed products, parts), and then returns them to the outside world.

In a dynamic environment, open systems enable organisations to work successfully and efficiently. According to Chikere and Nwoka (2015), open systems are concerned with the interrelationships between a system and its environment, in which the former must constantly adapt to changing environmental conditions. According to the thesis, open-system organisations can promptly respond to challenges by utilising existing resources gathered from their surroundings. When people, processes, and structures are viewed as systems, organisations are able to find distinct themes that assist in explaining people's effectiveness and behaviour (Von Bertalanffy, 2010). Every organisation, according to the theory, operates within a global economy, society and an industry; as a result, effective procedures for obtaining feedback from their environments regarding their operational activities should be in place (Ghadge, Wurtmann & Seuring, 2020).

Systems are complicated elements that must be linked in space and time in order to make effective decisions (Sawyerr & Harrison, 2019). Teece (2018) discovered that systems are complex in nature, highly interconnected, and have synergistic features in which the greater whole is greater than the sum of its parts; as a result, several systems must work together to obtain the intended outcomes. The theory further suggests that as firms interact with their environment, their

activities should not negatively affect them. This is because, exposing a firm's environment to unfavourable conditions notably pollution, climate change, depletion of ozone layer, among others could have severe negative rippling effects on resource quality and adequacy; in turn affect overall firm performance.

As a result, the theory suggests that food processing companies operate in supply chains (large system), society (larger system) and an economy (largest system), in which a variety of autonomous sub-systems collaborate to achieve a common aim. These open systems arguably provide the focal firm and its supply chain actors with the necessary logistics notably raw materials; thus, the need to embrace sustainable practices in a bid to protect them. The theory, therefore, suggests that food processing supply chains in Ghana should adopt relevant SSCM practices notably lean, green, inventory and supply managements in carrying out their operational activities. The presence of these sustainable practices could improve resource quality; ensure value addition amid better sustainable performance in areas of economic, social and environmental successes (Das, 2018; Chesaro, 2016; Rajeev, Pati, Padhi & Govindan, 2017).

Conceptual Review

This section reviewed relevant concepts of the study in relation to sustainability, supply chain management (SCM), sustainable supply chain management, sustainable performance and firm size. It also extensively discussed the four key SSCM practices notably lean management, green management, inventory management and supply management.

Sustainable Supply Chain Management

Sustainability is increasingly growing in relevance due to the constant environmental and social threats posed by the activities of modern businesses especially manufacturing firms (Govindan, Rajeev, Padhi & Pati, 2020; Rajeev et al., 2017). As a result, there is no universally agreed definition for this concept leading to diverse definitions. For example, in quest of environmental safety, sustainability has been defined as the evasion of weakening natural resources to achieve ecological equilibrium (Rajeev et al., 2017). It also refers to meeting the one's present needs without compromising future generation's ability to address theirs (Clayton & Radcliffe, 2018). This notion can alternatively be characterised as a comprehensive method to meeting the current generation's social, ecological, and economic requirements without jeopardising future generations' needs (CIPS, 2020).

Sustainability also considers one's ability to persevere in a somewhat consistent manner throughout a variety of life domains (James, 2014). According to Epstein, Elkington and Herman (2018), it is a socio-ecological process characterised by the search of a common ideal long-term solution or method of doing things. The growing importance of sustainability in SCM and operations approaches can be attributed to the fact that, in addition to increased demands for strong financial performance, major stakeholders are increasingly holding companies accountable for environmental and social performance (Alshehhi, Nobanee & Khare, 2018). It could, therefore, be deduced that sustainability goes beyond environmentalism to emphasise socialism and economism; thus, captures the triple bottom line. This concept has promoted the development of sustainable supply chain management.

Supply chains (SC) are increasingly becoming wide and complex as they continuously pass-through different cultures and countries and work in widely diverse conditions (Hugos, 2018; Suryanto, Haseeb & Hartani, 2018). Ellinger et al. (2012, p.12) defined a supply chain as, "a general description of the process integration involving organisations to transform raw materials into finished goods and to transport them to the end-user". According to Stevens and Johnson (2016), SC is a network of actors participating in a variety of processes and activities that result in value in the form of products and services that are provided to the final customer or consumer via upstream and downstream links. Simply put, a supply chain contains a number of actors (individuals and/or firms) over several tiers who work independently and collaboratively to achieve a common purpose.

Chang, Ellinger, Kim and Franke (2016) stressed that managing the operations of supply chains have evolved significantly in recent times. As a result, focal firms have been forced to manage their supply networks in order to meet ever-increasing, uncertain and complex business demands. Supply chain management (SCM) focuses on improving corporate competitiveness in global markets despite the unhealthy competitive forces and demand fluctuations (Derwik & Hellström, 2017). It also refers to the management of information, materials and finance as they shift from one actor to another until it reaches the end user (Deshpande & Swaminathan, 2020). SCM represents a conjunct effort by actors in a chain network to develop and operate the network in an efficient and effective manner. It is a win-win relationship which ensures optimum inventory levels, improved revenues and value addition.

According to Deshpande and Swaminathan (2020), focal firms can never operate in isolation; thus, without support from other actors in a chain network. This implies that the activities of these actors could have direct or indirect effect on the survival of focal firms. In a typical food processing firm, for instance, focal firms require the contributions of upstream actors notably suppliers and downstream actors notably distributors and consumers in order to achieve set targets. Thus, the activities of these actors notably suppliers should be properly managed through SCM. Ensuring an effective SCM would address the complexities associated with business operations in order to improve overall firm performance without compromising sustainable practices.

Supply chain management (SCM) as evolved drastically to embrace sustainability (Deshpande & Swaminathan, 2020; Wamba & Queiroz, 2020). Modern SC operations have strengthened the relevance of SSCM. As such, recent scholars have moved beyond the concept of SCM to embrace SSCM (Khan, Yu, Z., Golpîra, Sharif & Mardani, 2020). SSCM refers to, "the strategic, transparent and attainment of a firm's social, environmental, and economic goals through a systematic coordination of key inter-organisational business processes for improving long-term economic performance of the firm and its supply chains" (CIPS, 2018). The concept of SSCM is increasingly been implemented by firms in recent times due to external pressures from consumers, pressure groups, competitive requirements and regulatory requirements.

Previous studies have suggested sustainability should be carried out in all supply chain activities (sustainable packaging and design, production, purchasing, finance, human resource management, marketing, sales, logistics) (Khan et al., 2020; Le, 2020). Developing sustainable designs, for instance,

include designing products such that they can be recycled, renewed, reused, refurbished, etc. in order to eliminate product waste. In terms of sustainable production, cleaner production through the use of technologies to improve resources, minimise pollution, material wastages and climate change has been suggested. SSCM, according to Micheli, Cagno, Mustillo, and Trianni (2020), focuses on managing financial flows, information, materials, and the corporation of supply chain participants without jeopardising the three elements of sustainable development (i.e., economic, environment, social).

SSCM also refers to the process of managing SCM activities while taking into account the triple bottom line (TBL), which includes environmental, social, and economic factors, in order to improve the long-term economic goals of individual companies within a chain (Jum'a, Zimon, & Ikram, 2021; Le, 2020). SSCM is, therefore, a key strategy that supports actors within a chain in enhancing their overall performances. Consequently, scholars have shifted attention from a close-loop or reverse supply chains to SSCM with reference to TBL (Das, 2018; Li, Fang & Song, 2019). SSCM is about how supply chains integrate TBL in order to remain competitive while improving value addition. Thus, ensuring SSCM helps supply chains to be socially responsible, improve product quality and minimise disposal costs (Khan et al., 2020).

Sustainable Performance

Henao, Sarache and Gómez (2019) and Gualandris et al. (2016) equate sustainable performance with measuring business performance by concentrating on the three essential components of sustainability: economic, environmental, and social dimensions. This component of evaluating firm performance is becoming increasingly relevant as organisations are required to monitor and

analyse the impact of their operations on the environment and people on a regular basis (Henao et al., 2019). With supply chains operating in open systems, their activities are likely to affect the environment; this can only be addressed by emphasising sustainable performance amid other performance elements such as financial, market and operational performance (Afum et al., 2020; Kamble, Gunasekaran & Gawankar, 2020). This section specifically discussed the three key dimensions of sustainable performance: environmental, economic and social.

The environmental performance (EP) dimension has gained attention since the 1980s as result of global warming (Niesten et al., 2017; Murphy & Poist, 2002). Its growing interest has led to the term, "eco-friendliness", which have been used to address how SCs affect the environment (Vaaland & Owusu, 2012). It measures firm performance by focusing on how its activities promote ecological friendliness. EP shows how firms reduce green-house emissions in order to adapt to climate change and protect the environment. Fonseca, Domingues and Dima (2020) stressed that EP ensures that firms adopt, implement and coordinate strategies, resources and values to connect all the various levels of corporate social responsibility to business processes. Firms which ensure better environmental performance overcome issues such as waste disposal, energy usage, pollution and environmental damages.

The social performance dimension focuses on measuring a firm's responsibilities to stakeholders in the environment (Mani et al., 2018). These responsibilities should be geared towards quality, human rights and safety issues by focusing on social welfare, labour condition, supplier's adherence to law and regulations and protecting the rights of humans (employees) within a chain network (Bai, Kusi-Sarpong, Badri Ahmadi & Sarkis, 2019; Gimenez, Sierra &

Rodon, 2012). The social perspective is also based on the human resource component of a traditional supply chain system, which focuses on the demands of both intra-organisational (workers within an organisation) and inter-organisational stakeholders (suppliers, customers, and communities) (Bai et al., 2019; Sancha, Longoni & Giménez, 2015).

Finally, economic performance (EcP) focuses on the traditional corporate responsibilities of businesses to stakeholders especially shareholders and/or business owners (Afum et al., 2020). Traditionally, businesses and associated SC actors emphasise production costs and profit margins when analysing their business performance levels (Jum'a et al., 2021). EcP, thus, focuses on measuring firm performance using financial indicators such as market share, return on assets, production costs, sales margins, among others (Sapukotanage, Warnakulasuriya & Yapa, 2018). EcP also focuses on how firms improve profit levels, handle economic fluctuations and production costs. It tackles responsiveness to customers demands, production costs, profit levels (sales margin, market share, profitability) and mobility (intensity of good transport) (Afum et al., 2020; Brandenburg & Rebs, 2015).

Control Variable

A control variable is kept constant throughout an investigation in order to ensure that the study's outcomes and generalisations are unaffected (Swink & Song, 2007; Shah & Ward, 2007). Firm size was controlled for in this study, and it accounts for variances in long-term performance indicators (Swink & Song, 2007). The size of a business determines its predicted growth, which is based on the principle of economies of scale (Kartikasari & Merianti, 2016; Antonio, Yam

& Tang, 2007). Large organisations, for example, are more likely than small enterprises to perform better, according to Niresh and Thirunavukkarasu (2014).

Large manufacturing enterprises, according to Niresh and Thirunavukkarasu (2014), have the potential to quickly obtain new resources in order to respond to changes in the current competitive and dynamic market. Unlike micro and small businesses, these firms also have a highly qualified and experienced management staff that ensures the firm's competitiveness. As a result, firm size was limited to prevent the study's findings from being skewed and to make generalisations to all Ghanaian food processing enterprises easier.

Empirical Review

This section focused on a comprehensive review of previous related literature on the research goals. This was done in order to compare and contrast previous studies' findings in order to criticise them.

Lean Management and Sustainable Performance

Previous studies have traditionally linked lean management with firm performance dimensions notably operational and financial; however, their focus on sustainable performance is growing in importance. This section specifically reviews studies focusing on lean management and sustainable performance. Pearce, Dora, Wesana and Gellynck (2018) conducted a quantitative study to examine the contribution of lean managements to sustainable performance in the horticultural primary production. The researchers found lean management to play a significant role in improving the sustainable performance of firms in the horticultural production industry. It was, therefore, concluded that lean management is crucial to improving the economic, social and environmental performance of firms in the horticultural industry.

This finding was supported by Ruiz-Benítez, López and Real (2018) in their study on how lean management and supply chain resilience affect the sustainable performance of aerospace manufacturers. This study analysed data through the interpretive structural modelling approach. The results revealed that lean management plays a significant role in improving the firm's sustainable performance metrics in the aerospace production industry in Spain. Similarly, Henao et al. (2019) analysed the effect of lean manufacturing on the sustainable performance of firms. The study actually conducted an extensive review on 69 papers using a five-step synthesis methodology. The study concluded that majority of the papers reviewed found lean manufacturing to significantly improve the tipple bottom line (i.e., economic, social and environmental). Thus, firms which embrace lean management are likely to experience growth in their sustainable performance dimensions.

Iranmanesh, Zailani, Hyun, Ali and Kim (2019) looked into the impact of lean manufacturing practises on the long-term success of Malaysian businesses. The researchers collected primary data through survey from 187 firms in Malayisa and subsequently analysed them through the partial least square approach. It was discovered that lean techniques, which include product design, customer relationships, process and equipment, and supplier relationships, have a considerable positive impact on long-term economic, social, and environmental performance. The study found that employing lean manufacturing principles is the most effective way to improve the long-term performance of Malaysian manufacturing companies.

Huo, Huo, Gu and Wang (2019) examined how green or lean managements contribute to the sustainable performance of supply chains.

Following the resource-based view theory, the study specifically investigated how lean management in supply chains influence social, environmental and economic performance. The study tested its hypothesis by gathering data through structured questionnaires from 171 manufacturing firms. It was found that lean management directly influences the environmental, social and economic performance of the firms' investigated. The researchers concluded that firms can improve sustainable performance by embracing lean management.

Alaaraj and Bakri (2019) examined how the financial performance dimension of sustainable performance is influenced by lean manufacturing. The study collected data through questionnaires from 152 managers of manufacturing firms situated at South Lebanon. The quantitative method was adopted and thus, the Pearson correlation and linear regression were employed to analyse data. Although, the adoption of linear regression as the analytical tool affected the quality of the study's findings, it was reported that lean management plays a significant role in improving financial performance. The researchers concluded that lean management is key to improving the financial performance aspect of sustainable performance of the manufacturing firms studied.

Focusing on the hotel supply chains, Hussain, Al-Aomer and Melhem (2019) examined how lean-green practices affected sustainable performance. The research looked at how lean techniques affected environmental, social, and economic performance, among other things. Detailed literature studies and exploratory analyses were used to construct the study's hypothesis. The structural equation modelling (SEM) tool was used to analyse primary data collected from hotel supply chains in the United Arab Emirates (UAE). The study found lean managements comprising productive maintenance and Kaizen

quality to significantly improve the sustainable performance of the hotel supply chains in UAE. The study found lean management to have the most effect on economic performance with environmental performance having the least impact.

Similarly, Kovilage (2020) investigated how lean-green practices influence the sustainable performance of organisations using the interpretive structural modelling (ISM) tool. This study adopted the qualitative approach where focus group and unstructured interviews were employed to gather primary data from 15 experts. The study analysed the data using the ISM tool and found lean managements comprising continuous improvement, employee involvement, preventive maintenance and reduction in cycle times to significantly improve economic, social and environmental performance levels of firms in Sri Lanka. The study concluded that lean management plays a dominant role in ensuring better sustainable performance of the firms investigated.

Arguably, studies abound on lean management and sustainable performance; however, previous studies have largely focused on various economies including Sri Lanka; but, with less focus on countries within the Sub-Saharan Africa (SSA). In Ghana, for instance, studies focusing on how lean management affects sustainable performance remain scanty and unclear. Also, majority of the studies reviewed focused on the composite of manufacturing firms with none of them focusing on the individual classes of manufacturing firms. As such, generalising findings obtained from the composite of manufacturing firms on a particular class of firm, notably food processing firms, would lead to uncertain outcomes. Also, the Kovilage (2021) employed the qualitative approach; whereas, Alaaraj and Bakri (2019) relied on a weak analytical tool. These research gaps have necessitated this study's objective.

Green Management and Sustainable Performance

With green management been regarded as an important SSCM practice, researchers have tried to link it with sustainable performance. This section, therefore, reviews and critiques the relevant papers on green management and sustainable performance (economic, social and environmental).

Sezen and Cankaya (2013) examined the role of green manufacturing and eco-innovation in improving the sustainability performance. This study gathered primary data through questionnaires from 53 manufacturing firms in the chemistry, automotive and electronic industries in Turkey. Using the linear regression tool, this study found green manufacturing to significantly and positively improve social and environmental performance. However, the study found no significant effect of green manufacturing on the economic performance dimension of sustainable performance. It concluded that manufacturing firms which embrace green manufacturing applications are likely to improve environmental and social performance, while no significant change will be obtained in the economic performance dimension.

Abdul-Rashid, Sakundarini, Ghazilla and Thurasamy (2017) looked into whether sustainable manufacturing techniques, such as green manufacturing, have an impact on the long-term performance of Malaysian manufacturing enterprises. The SEM technique was utilised to analyse the association after collecting data from certified manufacturing enterprises in Malaysia via a questionnaire survey. Sustainable manufacturing techniques have a considerable favourable impact on long-term performance. The study found that adopting sustainable practises will help manufacturing companies enhance their long-term performance in economic, social, and environmental aspects.

Khan and Qianli (2017) have looked at how green supply chain management methods affect the performance of Pakistani manufacturing companies. The study sampled 218 firms and collected data through questionnaires from them. The green practices focused on green purchasing, manufacturing, customer cooperation, information system and eco-design and how they affect performance. The data was analysed using the simultaneous regression and exploratory factor analysis and it was found that green supply chain management leads to better manufacturing performance. Thus, green practices contribute significantly to improving the performance of manufacturing firms in Pakistan.

Zaid, Jaaron and Bon (2018) tested the effect of green supply chain management practices (GSCMP) on the sustainable performance of manufacturing sectors in Palestine. The study specifically focused on 121 chemical, food and pharmaceutical segments of manufacturing sectors in Palestine. The researchers used a quantitative technique to look into how internal and external green practises affect a company's social, environmental, and economic success. The GSCMP significantly and instantly improved the long-term performance of Palestine's most polluting manufacturing enterprises, according to the study, which used the SEM approach.

Zhan, Tan, Chung and Chiu (2018) looked into how green and lean sustainable development affects manufacturing firm performance in China. Among the study's goals, it looked into the impact of green sustainable development on long-term performance, gathering data from 172 respondents from various Chinese companies via questionnaires. Using the SEM analysis, the study found green sustainability to significantly improve all the sustainable

performance dimensions. It was, therefore, concluded that green sustainable development plays a vital role in ensuring better business, environmental and social performance of supply chains.

Setyadi (2019) analysed the influence of green supply chain integration (GSCI) on the sustainable performance of firms within the oil and gas industry of Indonesia. Adopting the survey questionnaire, a reliable data set of 201 were retrieved from 300 respondents and processed using the Smart PLS 3. This quantitative study revealed that GSCI significantly and positively contribute to improving the sustainable performance of the oil and gas firms. The study concluded that oil and gas companies which embrace green sustainable practices along their supply chains are likely to witness better economic, environmental and social performance which subsequently promotes competitiveness.

Afum et al. (2020) investigated the effect of green manufacturing practices on the sustainable performance of manufacturing SMEs in Ghana. The study employed the quantitative approach and explanatory design to clearly establish the relationship. Using 178 data set obtained through questionnaires, the study's hypotheses were tested with the help of the SEM analytical tool. The study found green manufacturing practice to significantly and positively improve sustainable performance. The study concluded that firms which adopt green manufacturing practices such as green supplier integration, green internal and green customer eliminate production wastes and in turn improve their economic, social and environmental performance levels.

Baah et al. (2019) explored the effect of green supply chain management (GSCM) on the performance of manufacturing and hospitality firms in Ghana. Among the various objectives, the study investigated how GSCM influences the

operational, financial, environmental, social and market performance of the manufacturing SMEs. The SEM analytical tool was employed to analyse primary data obtained from the manufacturing and hospitality firms. The study's outcome revealed that GSCM creates better operational, market, environmental, financial and social performance respectively. Simply put, a unit increase in GSCM is likely to cause a unit increase in sustainable and operational performance of the firms studied.

It could be deduced that previous studies have linked green management with sustainable performance among manufacturing industries in various economies including Ghana. However, majority of the studies have focused on the composite of manufacturing industries with only a few papers focusing specific classes of manufacturing firms. After extensive review, only Bon et al. (2018) focused on three classes of manufacturing industries; however, relying on its findings to make policies in the food processing industry could be misleading. Also, none of the limited studies in Ghana focused on the food processing industry; creating huge literature gap.

Inventory Management and Sustainable Performance

Studies abound on inventory management (IMP) and firm performance (FP) dimensions such as operational and financial performance; with limited focus on sustainable performance. With environmental and social performance related with operational performance; whereas, financial performance relates with the economic performance dimension of sustainable performance; this section reviews present literature related to IMP and FP. For example, in Delta State, Nigeria, Sunday and Eginiwin (2017) conducted research on inventory management and profitability of furniture and restaurant manufacturing

enterprises. The study employed a descriptive methodology and stratified sampling to pick 10 out of 30 businesses from each stratum. Structured questionnaires were also used to extract information, and the data was analysed using the multiple regression tool. Inventory management was found to have a detrimental impact on financial performance in the study.

In contrast, the impact of inventory management on the performance of listed manufacturing enterprises in Ghana was studied by Bawa, Asamoah, and Kissi (2018). The study used secondary data from 14 listed companies on the Ghana Stock Exchange during a 10-year period (2007-2016). Inventory management has little effect on the performance of manufacturing enterprises in Ghana, according to the study, which used Pearson correlation and multiple regression. This was due to the fact that the investigation discovered no meaningful link between them. When Atnafu and Balda (2018) looked at the impact of IMPs on the performance of Ethiopian manufacturing enterprises, they came up with a different conclusion. The researchers used the SEM technique to analyse data from 188 manufacturing MSEs. IMP was found to boost business performance and competitiveness significantly in the study.

Using the PLS-SEM approach, Orobia, Nakibuuka, Bananuka and Akisimire (2018) investigated the impact of managerial competency and inventory management on small firm financial performance. The survey data was collected from 304 small businesses in Uganda using correlational and cross-sectional methodologies. Inventory management was found to considerably increase the financial performance of small enterprises in Ethiopia, according to the study. The practise of inventory management was found to greatly improve the financial performance of small enterprises.

Muchaendepi, Mbohwa, Hamandishe and Kanyepe (2019) investigated the impact of inventory management on the performance of SMEs in the manufacturing sector of Zimbabwe. Primary data was collected at random from 244 key individuals of manufacturing SMEs using the purposive sampling tool and structured questionnaires. The study demonstrated that inventory management considerably improved the performance of SMEs in Harare, Zimbabwe, using the linear regression technique. It was determined that inventory management techniques such as just-in-time, supplier partnerships, and vendor-managed inventory play a significant influence in enhancing business performance.

In Ghana, Opoku et al. (2020) looked into inventory management practises and operational performance of manufacturing enterprises. The focus of this research was on manufacturing companies in Ghana's metropolises of Tema, Accra, and Kumasi. The ordinary least square regression approach was used in this investigation, which used a genuine data set of 114. Inventory management strategies considerably improved the operational performance of manufacturing enterprises in Ghana, according to this quantitative and explanatory study. Inventory management, according to the report, plays a critical role in improving manufacturing enterprises' operational effectiveness.

In the Nigerian state of Kogi, Yunusa (2021) looked at how inventory management techniques affect industrial enterprises' operational effectiveness. This study employed an unsuccessful qualitative technique and content analysis to analyse the cause-and-effect connection between the variables. Inventory management strategies were found to boost the performance of Nigerian manufacturing enterprises in the study. The study revealed that inventory

management strategies have an important role in improving manufacturing performance in Nigeria's Kogi State.

Previous studies have not convincingly linked inventory management with long-term success, according to the various reviews. Because the focus has been mostly on operational (Acho, 2021; Opoku et al., 2020), financial (Orobia et al., 2018), and overall business performance (Muchaendepi et al., 2019; Atnafu et al., 2019; Bawa et al., 2018). As a result, there is a void in the literature on how inventory management affects long-term performance (i.e., environmental, economic, and social) in emerging economies, particularly Ghana. Only a few studies have concentrated on a specific type of manufacturing firm, such as food processing firms, while the majority of previous research has focused on a composite of manufacturing enterprises.

Supply Management and Sustainable Performance

The role of suppliers in any SC network can never be overemphasised; thus, previous studies have linked supply management with sustainable performance. Gualandris et al. (2016), for instance, conducted a study on supply management; concluding that it ensures that focal firms develop strong relationships with their suppliers through information sharing and coordination. They added that supply chains can achieve high performance targets when they practice supply management. Hajmohammed et al. (2013) similarly revealed that supply management ensures suppliers feel socially responsible to their focal firms and the environment. The focal firms, in turn, achieve better economic, social and environmental performance rating through supply management.

Wu (2017) established how socially responsible supplier development affects the sustainable development of SMEs. The study's objectives were met

from a multifaceted standpoint, and it was discovered that supplier development is critical to boosting SMEs' long-term success. Also, SSCM practices and business performance in China was studied by Wang and Dai (2018). Using the resource-based view theory, the study looked into the impact of external supplier management on company performance, among other things. The data was analysed using the PLS-SEM tool, which looked at 172 industrial enterprises in China. Conclusively, supplier management comprising supplier monitoring, assessment and collaboration improves sustainable performance.

Baliga, Raut and Kamble (2019) investigated the role of sustainable supply chain management practises (SSCMP) in the performance of enterprises in emerging economies by quantitative research. This study looked at the impact of supply management practises (such as supplier selection, trust, supply base, and supplier recognition) on the long-term supply chain performance of manufacturing companies in India. The survey questionnaire was prepared after a thorough examination of literature and was used to collect primary data from 211 industry functional heads and supply chain managers. Amos 2.0 was used to process the data, and the structural equation modelling programme was used to analyse it. Supply management was found to considerably improve the social, environmental, and economic performance of Indian manufacturing enterprises.

Duque-Uribe, Sarache and Gutiérrez (2019) looked at the health industry's sustainable SCM methods and performance. The study focused on 12 SSCM practices such as warehousing, waste and supplier management and established their effects on sustainable performance (i.e., environmental, social, economic). From the extensive reviews, the study found supplier management to significantly improve sustainable performance of hospitals. This finding was

similar to that of Yang and Zhang (2017) which specifically examined how sustainable supplier practices notably supplier monitoring, selection, development and collaboration influence performance. Obtaining data from 256 Chinese manufacturing firms, the data was analysed using the PLS-SEM approach. It was found that sustainable supplier management plays valuable role in improving manufacturing performance in China.

Nguyen, Lam and Tran (2021) investigated the influence of buyer-supplier relationship, green design and sustainable supplier management (SSM) on the performance of firms in Vietnam. The study specifically tested the effect of SSM on firm performance, among other specific objectives. Primary data was collected from 156 manufacturing firms in Vietnam using the structured questionnaire. The PLS-SEM tool was then employed to test the causality of the framework. The study reported that SSM plays a crucial role in improving firm performance. Thus, firms which embrace sustainable supplier management are likely to experience high firm performance in Vietnam.

Deductively, empirical evidence exists on how supply management influences firm performance. However, studies focusing on manufacturing firms within the sub-Saharan Africa (SSA) notably Ghana remains scanty. More precisely, none of the studies reviewed have been conducted within Ghana; creating geographical gap. Also, majority of the studies focused on various sectors including manufacturing firms; however, those focusing on specific classes of firms notably food processing firms remain scantly and unclear. This could affect the food processing firms' ability to make relevant policies aimed at improving supply management and sustainable performance.

Conceptual Framework

The conceptual framework was offered in this section to help explain and connect the study's key variables. The framework included a graphical representation of the study's objectives, which is useful for organising empirical research. This graph was created using two variables: independent (i.e., SSCM practises) and dependent (i.e., sustainable performance). Firm size controlled the correlations between the study's variables to ensure that the findings can be applied to all food processing enterprises in Ghana, regardless of size. Figure 1 depicted the conceptual presentation.

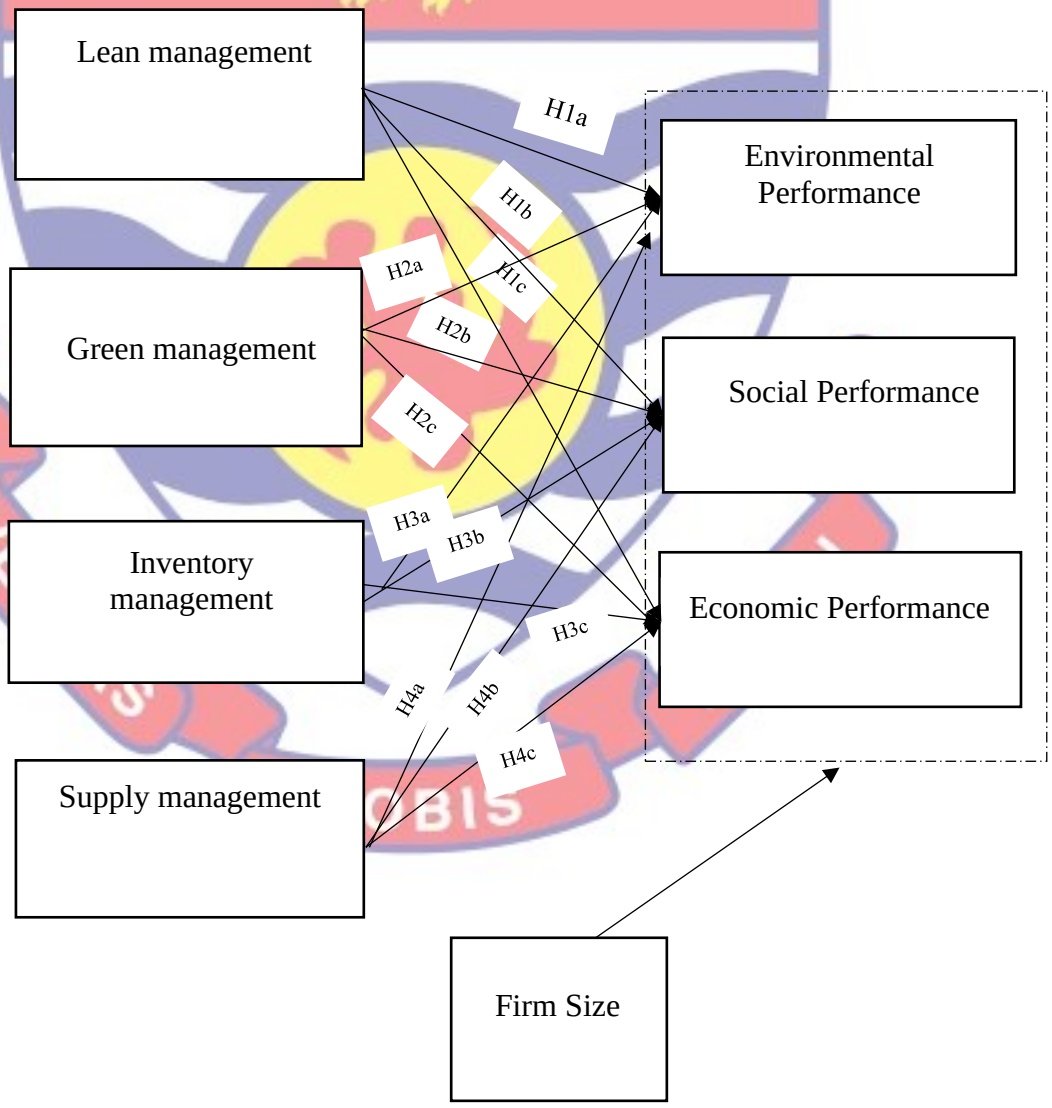

Figure 1: Conceptual Framework of the Study
Source: Author's own construct (2021)

From Figure 1, the exogenous variable, SSCM practices, was represented by green management, lean management, inventory management and supply managements. The endogenous variable, sustainable performance, on the other hand, was represented by the three key sustainable performance dimensions: environmental, social and economic dimensions. The framework emphasises the correlation between the study's exogenous and endogenous variables as seen in the various arrows pointing latter. For instance, green management correlated with the three sustainable performance dimensions, likewise lean, inventory and supply managements. Thus, a unit change in SSCM practices would lead to a significant change in the dimensions of sustainable performance. Firm size ensured that the relationships were controlled to improve the quality of findings.

Chapter Summary

This chapter discussed relevant information that was needed to understand the study's objectives. It specifically presented the theories underpinning the study, conceptual and empirical reviews and concluded with a conceptual framework. In terms of theory, the study adopted and discussed the theory of constraints (TOC) and systems theory since it directly linked SSCM practices and sustainable performance. The empirical review section also revealed several research gaps which affected the quality of previous findings. The conceptual framework finally provided a clear picture of the study's hypotheses to aid testing and discussion. The next chapter presented the research methods, techniques and procedures for achieving the study's target.

CHAPTER THREE

RESEARCH METHODS

Introduction

The chapter extensively discussed the key methods adopted in this research. Research methodologies allow for comparisons with past studies, allowing for a better understanding of the work plan and the possibility of future replications. More precisely, this chapter discussed the study's philosophy, approach, design and data analysis, among others.

Research Paradigm

Guba and Lincoln proposed the concept of a research paradigm in 1982. Saunders and Lewis (2017) revealed that a research paradigm underpins any research and it includes the social constructivist and positivism or objectivism (Žukauskas, Vveinhardt & Andriukaitienė, 2018; Paul, 2017). The qualitative method is favoured by the social constructivist paradigm, which emphasises reality's socially constructed nature through a nuanced understanding of people's experiences (ukauskas et al., 2018). This philosophy is based on subjectivism, which states that one's perspective of the world is shaped by their experiences with it. The positivist paradigm involves the application of scientific methods to arrive at objective findings (Ryan, 2018). It uses quantitative tools to collect information to test a given hypothesis.

The positivist paradigm is founded on the concept that the world is one, fixed, quantifiable, and observable (ontological assumption); real knowledge is quantitative and objective (Ryan, 2019; Bell, Bryman & Harley, 2018). The philosophies broaden theories and ensure that only scientific methods are used

to achieve genuine knowledge. It also presumes that objectivity and precision are desirable qualities, whereas subjectivity is intrinsically deceptive (Ragab & Arisha, 2018). The positivists assume that this paradigm provides an appropriate strategy for generating reliable knowledge through quantitative methodologies (Belll et al., 2018).

The positivist paradigm was used to underlie the research as it seeks to understand the social world through an objective way. More precisely, the study seeks to understand supply chain management practices and how they influence sustainable performance through an objective and factual manner (Martelli & Greener, 2018). This philosophy also employs relevant methods such as correlation, linear regression and ANOVA analysis to explain real world events (Bell et al., 2018; Martelli & Greener, 2018). On the basis of these assumptions coupled with the study's nature, the positivism philosophy was employed.

Research Approach

From broad assumptions to precise data collection procedures, analysis, and interpretation, a research approach comprises everything (Martelli & Greener, 2018; Creswell & Clark, 2017). Because of the nature of this investigation, a quantitative method was adopted. This method permits quantitative methodologies to be used in the description of study concerns, which aids in the generalisation of outcomes (Creswell & Clark, 2017). Quantitative analysis is a type of data analysis that is scientific, quick, and draws reasonable conclusions from numerical principles acquired through data collection methods such as surveys and questionnaires (Creswell, 2014). As a result, it's useful for looking into cause-and-effect interactions among and between variables (Creswell & Creswell, 2017).

However, the approach has been criticised for its inability to accurately predict human behaviour (Kumar, 2018; Crotty & Crotty, 1998). According to Crotty and Crotty (1998), the approach is stiff, unnatural, and unproductive in producing hypotheses. Other critics have argued that the approach could make it difficult to establish a research model, reliance of numbers could limit the required information and its findings can be misleading if false information is provided by respondents (Ryan, 2019). Despite these criticisms and limitations, the quantitative approach was adopted due to its qualities. It is also the most suitable approach for investigating how SSCM practices affect SP.

Research Design

The way a study is approached has a huge influence on the research design that is chosen (Grove, Burns & Gray, 2012). Because of its importance in extending understanding of a subject, the explanatory research design was chosen based on this study's quantitative approach. The explanatory design allows for more objective and better conclusions, which aids in the generalisation of findings (Mohajan, 2018). It can be used to communicate facts about a scenario by gathering and analysing massive volumes of data from a broad target group in the most cost-effective way possible. In data analysis, the method uses both descriptive and inferential statistical methods, such as mean, standard deviation, correlation, t-test, and linear regression (Hox, Moerbeek & Van de Schoot, 2017).

When using an explanatory design, researchers might have better control over their study techniques, according to Babbie (2020). Structured questionnaires are also employed in the design to collect data from respondents who are spread out across a large area. As a result, the design is well adapted to

gathering information from representatives of food processing businesses across Ghana's three metropolises. Furthermore, this strategy is the most effective for determining cause and effect relationships between and among variables (Beins & McCarthy, 2016). As a result, this methodology was utilised to investigate the cause-and-effect relationships between supply chain management methods and long-term performance.

However, there are some flaws in the explanatory design that could distort the study's findings (Robson & McCartan, 2016; Wildemuth, 2016). Obtaining a representative sample, according to Wildemuth (2016), can take a long time. According to Robson and McCartan (2016), data is collected based on respondents' beliefs and ideas, which could lead to biassed responses and, as a result, influence the objectivity of the results (Creswell & Creswell, 2017). It was chosen because of the study's research paradigm and methodology, as well as the investigation's goal.

Study Area

The study was carried out in the context of Ghana's food processing sector. Given Ghana's relatively strong business environment and ever-increasing population, the industry is well positioned to meet its growth targets (Ackah, Adjasi & Turkson, 2014; Baah-Nuakoh, 1997). In the face of unclear SSCM practices, however, this goal will never be met. This study focused on the food processing industry in Ghana due to its urgent need to embrace and develop sustainable SCM practices. Emphasis was also given to food processing firms within the Kumasi, Accra and Tema metropolitan assemblies in Ghana; basically, due to the concentration of firms within these areas.

Population

The study's target demographic included key practitioners such as operations, purchasing, procurement officers, and/or owners of food processing firms in Accra, Tema, and Kumasi metropolises in Ghana. These prominent persons were picked based on their ideas, values, and direct involvement in SCM-related operations. As a result, their ability to influence regulations related to sustainable SCM would be useful in gathering relevant data for objective findings. The study's target population consisted of micro, small and medium-sized food processing firms within the three metropolises. According to the Food and Drugs Authority (FDA), over 300 food processing firms have duly registered and received certification to carry out businesses in Ghana as of 2019.

The FDA also revealed that majority (i.e., over 70%) of these registered firms are scattered across the Tema, Accra and Kumasi metropolises in Ghana. Simply put, 247 food processing firms within these three metropolises have registered and received certification to operate; thus, 247 key personnel from these firms represented the study's target population. The FDA report also revealed that about 45%, 35% and 20% of the firms are located within the Accra, Tema and Kumasi respectively and reported in Table 1.

Table 1: Target Population Size Based on Metropolitan Area

Metropolitan Area	Freq	Percent
Accra	112	45.34
Tema	86	34.82
Kumasi	49	19.84
Total	247	100.00

Source: Food and Drugs Authority (2019)

Sampling Procedure

The data was gathered from each unit (member) of the target population using the census approach. The census approach was used to verify that the findings of a study were more accurate and trustworthy (Creswell, 2014). Furthermore, the researchers placed a high priority on each unit in the study's target population. As a result, one (1) important representative from each of Ghana's 247 food processing enterprises, which are located in Accra, Tema, and Kumasi, participated in the data collection exercise using structured questionnaire. Because their ideas, experience, and work positions directly affect their firms' strategic directions in connection to sustainable SCM, key personnel were chosen as respondents.

The sample size needed for the PLS-SEM technique was determined using Hair, Sarstedt, Ringle and Mena's (2012) minimum sample estimate criterion, sometimes known as the "10-times rule." The minimal sample size should be 10 times the largest number of structural routes aiming towards a single construct in the structural model, according to the criterion. The structural model had the most structural routes pointing at a specific latent concept in this investigation (12). As a result, the least sample size possible was 12 * 10 = 120. Other academics have mostly endorsed the 10-times technique (Hair Jr, Hult, Ringle & Sarstedt, 2021; Hair, Sarstedt, Hopkin & Kuppelwieser, 2014; Goodhue, Lewis & Thompson, 2012). As a result, this criterion was used to establish the study's minimum sample size.

Data Collection Instrument

To acquire data for the PLS-SEM approach, a main data collecting tool known as the structured questionnaire was used. According to Marcoulides, Chin,

and Saunders (2009), each responder must answer the identical set of questions in a predetermined order on this instrument. A structured questionnaire is ideal for a quantitative study since it facilitates the collecting of objective responses that can be statistically analysed (Rahi, Alnaser & Abd Ghani, 2019). Only closed-ended and straightforward questions were employed in this investigation. This instrument was created in both paper and electronic (Google forms) formats and was given to a representative from each of the companies evaluated. Structured surveys guarantee that objective and reliable data is collected more consistently (Neelankavil, 2007). During the survey, it also ensures respondents' confidentiality, privacy, and convenience.

The questionnaire was structured into four (4) sections, numbered A through D. Section A featured twenty-one question items (20) to assess the four SSCM aspects; each element had five questions. Section B comprised fifteen question items (15) geared at assessing the three characteristics of long-term performance; each element had five questions. Section C featured five question items aimed at determining the size of the company (i.e., control variable). It's worth noting that all of the study's variables (constructs) were inspired by detailed assessments of past research. Finally, in Section D, there were questions about the demographic features of the respondents who represented their companies. This section included a profile of the food processing companies.

The question items were graded on a Likert-like scale of 1 to 5, with 1 indicating the least agreement and 5 indicating the most agreement. This scale, according to Harpe (2015), allows researchers to link qualitative dimensions to quantitative metrics analysis. He went on to say that the scale is the most accurate way to measure people's thoughts and beliefs. This scale was

particularly beneficial since it allowed data to be analysed using both descriptive and inferential statistics tools (Sartas, Schut, Proietti, Thiele & Leeuwis, 2020).

Operationalisation of Constructs

This section detailed how the study's variables were measured in order to meet the study's goals. The indicators for all of the constructs were created after a thorough analysis of similar studies. Sustainable supply chain management (SSCM) practices, such as LM, GM, IM and SM were included as independent variables. The dependent variable, on the other hand, was concerned with long-term performance and included economic, social, and environmental aspects. Finally, the size of the company was used to manipulate the variables' correlations. The measurement items for each of the variables under research, as well as the sources, were listed in Table 2.

The indicators (measurement items) for all of the variables were obtained from comprehensive literature reviews, as shown in Table 2. This is due to the table's presentation of the many sources from which the indicators were derived. However, it is uncertain to what extent these measurement items accurately measure each of the constructs in the research domain. As a result, several chosen food production enterprises in Ghana's Greater Accra region were subjected to pre-testing. This was done to see if the indicators of the constructs are quality metrics in the setting of food processing companies.

Table 2: Measurement of Variables and Sources

Variables	Measurement items	Sources
Lean management	Waste elimination, optimal supply base, reduction in work processes, material usage	Jakhar, Rathore and Mangla (2018), Thanki and Thakkar (2018)
Green management	Friendly materials, waste reduction, green material purchase, reduced toxic wastes	Raut, Luthra, Narkhede, Gardas and Priyadarshinee (2019), Thakur and Mangla (2019)
Inventory management	Lead time, inventory quality, inventory quantity, adherence to production schedules, customers' specifications	Opoku et al. (2020), Munny et al. (2019)
Supply management	Supplier involvement, information sharing, supplier agreement, supplier capacities, supplier control	Afum et al. (2020), Bour, Asafo and Kwarteng (2019)
Environmental performance	Energy intensity, monitoring energy consumption, residual reuse, recyclable materials, environmental audit	Govindan, Rajeev, Padhi and Pati (2020), Chavez et al. (2020)
Social performance	Employment of minority groups, number of social projects, regulatory requirement, vulnerability reduction, employee safety	Chavez et al. (2020), Baliga et al. (2019)
Economic performance	Return on investment, production costs, market share growth, net income growth, added economic value	Raza et al. (2021), Baliga et al. (2019), Wagner (2010)
Firm size	Management experience, policies, access to resources, total assets, number of employees	Zadeh and Eskandari (2012), Hanson and Wernerfelt (1989)

Source: Field Survey (2021)

Validity and Reliability

The reliability and validity of a research instrument reflect how well it measures the parameters it was designed to measure (Sürücü & MASLAKÇI, 2020). Validity, according to Bolarinwa (2015), refers to how well a research instrument measures its research objectives. Validity was carried out in relation to the study in order to validate and modify the questionnaire's content. Peer and expert reviews were used to accomplish this whereas a preliminary survey questionnaire was first created based on comprehensive reviews of related literature and given to four research-inclined peers. The revised text was then presented to a three-person panel of academic scholars with relevant knowledge and expertise in the field of sustainable SCM.

Based on the panel's suggestions, the researcher ensured that all necessary modifications were done. Finally, the questionnaire was forwarded to the researcher's supervisor for review. The research objectives, communication strategy, probable respondents, cost, and time constraints were all carefully considered. In addition, the layout structure (i.e., phrasing, ambiguity, sequence, length, structure, direction, language, etc.) and item design were given special consideration, with an emphasis on good and relevant questions. Validity was achieved by first developing the questionnaire instrument and assigned to peers, research experts and the researcher's supervisor for extensive assessment.

A reliability test (Cronbach's alpha test) was also performed to ensure that the study instrument was reliable. The degree to which a research instrument delivers consistent results when utilised several times in different locations and at different times, according to Beins and McCarthy (2019), is referred to as dependability. In accordance with the study, Cronbach's alpha was

used to determine the internal consistency of the questionnaire items. Previous study has shown that the closer the Cronbach alpha value is to 1, the more reliable the research instrument is (Beins & McCarthy, 2017; Bolarinwa, 2015). On the other hand, a threshold of 0.7 or greater is often seen as acceptable.

To test for reliability, a pre-testing was carried out. According to Ishtiaq (2019), pretesting a questionnaire can help find unclear and biased question items while doing situational analysis. In relation to the study, pretesting was carried out utilising 30 responses acquired from owners/managers of food processing companies in Cape Coast and Sekondi-Takoradi prior to the real data collection exercise. The data obtained was then processed using the IBM SPSS Statistics and analysed using the "reliability analysis" technique in the software. After that, the score was recorded and compared to the planned threshold. Table 3 revealed a result of (.918) based on the composite of the question items (40 items), which was greater than the allowed 0.70 criterion. As a result, the overall α was within acceptable threshold suggesting reliability of the instrument. Table 3, therefore, presented the reliability output of all the constructs.

Table 3: Reliability

Construct /Item	Cronbach's alpha
Lean management	0.907
Green management	0.836
Inventory management	0.811
Supply management	0.897
Environmental performance	0.881
Social performance	0.813
Economic performance	0.892
Firm size	0.769
All items	0.918

Source: Field survey (2021)

Common-Method Bias

Data received from single respondents has been proven to be prone to common-method bias (CMB) (MacKenzie & Podsakoff, 2012). It relates to the possibility of measuring errors, which are exacerbated by the sociability of respondents who wish to reply positively (Chang, Witteloostuijn & Eden, 2010). It's also referred to as the instrument's variety in answers (Sharma et al., 2009). Previous research has suggested various techniques to overcoming the common-method bias (Tehseen, Ramayah & Sajilan, 2017; Jakobsen & Jensen, 2015; Rönkkö &Ylitalo, 2011). One of the techniques deals with introducing unrelated questions and mixing them with the relevant ones. This is done to check whether the respondents actually read the questions before responding. Also, the VIF scores are used to check for CMB; where values > 5 suggests the presence of CMB. As a result, the study used these techniques to address CMB.

Data Collection Procedure

Before collecting data, the Head of the Department of Procurement and Supply Chain Management at UCC's School of Business issued an authority note, which was then distributed to the management of all of the companies analysed. This was done in order to get permission to gather data on their property. The note also provided awareness to the various respondents with respect to the relevance of their participation. After the approvals were granted, the questionnaires were distributed to the respondents with the help of three well trained and resourced research assistants. Simply put, the data collection exercise was carried out using a team. In order to obtain a high and timely response rate, a total of 14 working days were set aside for data collecting. Some respondents

were unable to participate in the data gathering activity for a variety of reasons, including confidentiality concerns and inconvenient schedules.

In addition, due to strong organisational regulations and ethical codes of behaviour, some respondents rejected to participate in the exercise. However, by ensuring participants that the exercise was primarily for academic objectives, these difficulties were alleviated. Respondents who requested that the questionnaires be completed at their leisure were granted their request. These methods were implemented to encourage respondents to complete the survey because their opinion was critical to the study's outcome.

Response Rate

Due to difficulty in reaching some respondents inside the companies analysed, only 226 of the 247 questionnaires were actually distributed to them. Out of these, 204 were obtained from respondents, with 8 being rejected at the initial editing stage due to significant incompleteness and non-responses, rendering them unfit for analysis. Also, 9 of the responses were further removed because they were deemed unacceptable for analysis. After collecting 187 valid data, the team was able to begin the analysis procedure. Simply expressed, 187 data sets were used in the study, with a response rate of 75.71 percent. Table 4 displays the response rate for the relevant data collected for analysis.

Table 4: Response Rate

Categories	Number of firms	Percent (%)
Target population	247	100.00
Accessible population	226	91.50
Total responses	204	82.60
Incomplete responses	17	6.90
Total usable responses	187	78.50

Source: Field Survey (2021)

According to Table 4, the study's response rate was between 50% and 70%, as Babbie predicted (2005). According to Babbie (2005), response rates of 50%, 60%, and 70% indicate satisfactory, good, and very good responses. The survey received a total of 194 (88.58%) replies, with 6 (2.73%) of those being useless. Incorporating these responses in the study's analysis could distort the results due to the high frequency of incomplete and non-responses. Significantly incomplete responses, according to Babbie (2005), may result in missing data, which, if not managed properly, can change the results of a study. If the study's overall useable response rate was greater than 50%, incomplete replies were allowed to be removed. The response rate for this study was 78.54 percent, explaining the requirement to eliminate the incomplete responses.

Ethical Considerations

Informed consent, voluntary participation, right to privacy, plagiarism, anonymity, and confidentiality difficulties are among the fundamental rules of ethics in data gathering proposed by Neuman and Robson (2014). Respondents were made aware of their involvement in the data gathering method as far as informed consent was concerned. In practise, this was accomplished by first obtaining consent from the several manufacturing companies under scrutiny. A copy of the authority notification was also sent with each questionnaire. In terms of voluntary participation, none of the respondents were coerced into taking part in the survey against their will. Furthermore, the respondents' right to privacy was maintained by giving them the option of participating or not participating in the survey.

To avoid plagiarism, all relevant information was paraphrased and properly referenced from a variety of sources (in-text and end-text). The study

was then subjected to a plagiarism check to see whether any evidence of plagiarism was discovered. To ensure anonymity, all personally identifying information such as names and other sensitive personal data that could identify the respondents was eliminated. These measures were put in place to keep the identities of the responders hidden from third parties. Respondents were further assured of confidentiality by promises that all information provided would be kept private and used only for the objectives of this study. Finally, the researcher ensured that all relevant protocols with respect to the Covid-19 pandemic were adhered to. For instance, wearing of nose masks, use of hand sanitizers, ensuring social distancing, among others were all strictly adhered to.

Data Processing and Analysis

Before processing, the data acquired through survey-based research requires "editing, sorting, coding, error checking, and mathematical calculations" (Zikmund, Babin, Carr & Griffin, 2003, p34). McNabb (2017) argues that editing, sorting, and coding are required before statistical analysis to investigate and validate problems in raw data. Data editing and sorting processes, for example, are necessary before coding and transferring data to data processing in order to evaluate and correct data for omissions, dependability, and consistency. Data editing is also done to ensure that each questionnaire is complete and that each respondent is eligible. The coding procedure, on the other hand, is used to identify and group each response, along with the numeric symbols and scores that go with it.

Additionally, data cleaning and screening are performed to guarantee that no missing values exist and that the data to be coded is consistent (Treiman, 2014). According to Treiman (2014) and Hair, Ringle and Sarstedt (2011), these

procedures improve data analysis accuracy while guaranteeing that data analysis methodologies' assumptions are not violated. They went on to say that confirming data accuracy is critical for ensuring the credibility of irregular replies, means, standard deviations, and values. They went on to say that confirming data accuracy is critical for ensuring the credibility of irregular replies, means, standard deviations, and values. Finally, as is required in quantitative research, data was coded by assigning numbers to each statement on the questionnaire. The data was then processed using IBM SPSS Statistics version 26 and SMART-PLS 3 software.

The information was then analysed using descriptive statistics such as frequencies and percentages, as well as an inferential statistical tool known as Partial Least Squares-Structural Equation Modelling (PLS-SEM). The firms' business profiles and the demographic characteristics of the respondents were described using frequencies and percentages. The PLS-SEM was utilised to test the study's hypotheses. The PLS algorithm as well as the PLS-SEM model's bootstrapping outcomes were extensively addressed. Multicollinearity, reliability: indicator and construct, validity: discriminant and convergent, and outer model significance were all indicated in the PLS method output (Hair et al., 2014). Before bootstrapping, which emphasised the test findings and was explained, these fundamental assumptions were met and discussed.

Data Analysis Methodology and Justification

SEM (Structural Equation Modelling) is a collection of numerical models that describe interactions between various variables (Hair et al., 2012). There are two main approaches to structural equation modelling, according to Samani (2016), covariance-based SEM (CB-SEM) and variance-based or

Partial Least Squares (PLS-SEM). CB-SEM models have parameters that lower the variance between the computed and observed covariance matrices, resulting in goodness-of-fit indexes, due to the amount of these differences. The PLS-SEM model is used to increase the variance of all dependent variables (Samani, 2016; Hair et al., 2014). To create parameter estimates, PLS-capacity to minimise the residual variances of endogenous variables is applied (Hair et al., 2021; Vinzi, Chin, Henseler & Wang, 2010).

The PLS-SEM can also handle normality violations (multivariate normality), and it doesn't require any hard assumptions about the raw data's distributional features (Hair et al., 2014). According to them, this is one of the most important methodologies for multivariate statistical analysis in practise. This method examines a situation's structural theory using a confirmatory (hypothesis-testing) approach (Babin, Hair & Boles, 2008). It's a complicated statistical technique for evaluating correlations between/among constructs that doesn't always necessitate a big sample size prior to analysis (Rönkkö & Evermann, 2013; Henseler, Ringle & Sinkovics, 2009). It also includes more sophisticated and rigorous statistical algorithms for dealing with complex models (Hair et al., 2014; Hair et al., 2012).

In addition, because the PLS-SEM tool can manage normality violations and missing data, no significant assumptions about the raw data's distributional features are required (Hair et al., 2012). Within its measurement models, this statistical tool uses both regression and factor analysis (Ullman & Bentler, 2012). The PLS-SEM model, according to Ringle Sarstedt and Straub (2012), maximises the variances of all endogenous variables rather than explaining the covariances of all indicators. The PLS-SEM was employed to evaluate the

study's hypotheses because of its capacity to deal with normality breaches. It can also investigate causal relationships between and among components using a variety of evaluation items. Tables and figures were used to present the findings of this analytical tool, which were then debated.

Reflective and Formative Indicators

Traditional measurement approaches in business research are primarily based on reflecting indicators, according to Hair et al. (2014). This makes sense because visible indicators are supposed to depict hidden variable swings. The path of causality, according to Diamantopolus, Riefler and Roth (2008), runs from the latent variable to the observed indicators. As a result, changes in the latent variable, including the multi-item scale, are predicted to reflect changes in all observed indicators. The content of the indicators defines the meaning of the latent variable in formative models, on the other hand, with the opposite direction of causation. Because the hidden variable is caused by the indicators, this is the case.

Reflective indicators, according to Coltman, Devinney, Midgley, and Venaik (2008), are required to be internally consistent in classical test theory, whereas formative indicators are not. As a result, while deciding whether to model latent variables reflectively or formatively, researchers should follow these decision guidelines. As a result, the study employed reflective models, and its constructs were assessed using reflective indicators. Any change in an observed indicator, such as a multi-item scale for external latent variables (LM, GM, IM, SM), will reflect in the endogenous latent variable (LM, GM, IM, SM) (sustainable performance).

Chapter Summary

The important features of research methodologies were examined in this chapter. The positivist paradigm and a quantitative methodology were used in the research was used. Primary data was collected using a structured questionnaire and processed using IBM SPSS Statistics (v. 26) and Smart PLS3. Finally, the data was analysed with the PLS-SEM, and the results were reported in the following chapter as tables and figures.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

The results and discussion of the research aims and hypotheses were presented in this chapter. It explicitly addressed the respondents' socio-demographic details, while discussing all the four research objectives with respect to how SSCM practices affect SP of Ghanaian food processing firms.

Respondents' Socio-Demographic Features

This section depicted the socio-demographics of respondents working in food processing enterprises in Ghana's metropolises of Kumasi, Accra, and Tema. This section detailed the respondents' gender, age, highest educational level, job title, number of years in business, firm age, and total assets of the companies under investigation. This outcome was based on the 187 legitimate responses collected during the data gathering exercise, as shown in Table 5.

Table 5 displays the gender-related socio-demographic characteristics of the respondents. The majority (72.7%) were males, while 27.3 percent were females, according to the findings. This indicates that there is a significant gender gap in management roles within the companies analysed. As a result, more women are being encouraged to take on leadership roles in the food processing business. In addition, the majority of the respondents (32.1%) were between the ages of 41 and 50, with 28.3 percent between the ages of 31 and 40, 20.9 percent above 50, and 18.7 percent between the ages of 18 and 30. The majority of the business owners and managers were in their prime working years.

Table 5: Respondents' Socio-demographic Features

Item	Frequency	Percent (%)
Sex		
Male	136	72.7
Female	51	27.3
Total	187	100.0
Age		
18-30	35	18.7
31-40	53	28.3
41-50	60	32.1
Over 50	39	20.9
Total	187	100.0
Level of Education		
No formal education	42	22.5
HND or lower	70	37.4
Degree	75	40.1
Total	187	100.0
Current Job Position		
Owner	35	18.7
Manager	116	62.0
Owner/Manager	36	19.3
Total	187	100.0
Number of years worked		
Below 5	28	15.7
5– 10	42	22.5
11 – 15	34	18.2
16 – 20	34	18.2
>20	49	26.2
Total	187	100.0
Age of Firm		
< 10 years	43	23.0
10-20 years	64	34.2
21-30 years	48	25.7
>30 years	32	17.1
Total	187	100.0

Continued

Firm's total asset (GHS)		
< 10,000	39	20.9
10,000-50,000	54	28.9
50,000-100,000	63	33.7
>100,000	31	16.6
Total	187	100.0

Source: Field Survey (2021)

Also, majority (40.1%) were degree holders; 37.4% had HND or lower and 22.5% had no formal education. In terms of current job position, 62% were managers; 19.3% were owner/managers while, 18.3% were owners of their firms. It was also revealed that, majority (26.2%) of them have worked for over 20 years; (22.5%) have worked for between 5-10 years; (18.2%, 18.2%) of them have worked for 15-20 years and 11-15 years respectively and finally, (15.7%) of them had worked for less than 5 years". Given the ages of the firms, majority (34.2%) had operated for 10 to 20 years; (25.7%) have operated for between 21 and 30 years; (23%) have operated for less than 110 years and finally, (17.1%) have operated for over 30 years. Finally, 33.7% of the firms had total assets between GHS50,000 and GHS100,000; 28.9% had total assets between GHS10,000 and GHS50,000; 20.9% had total assets less than GHS10,000 and 16.6 percent of them had total assets worth over GHS100,000.

Diagnostics Test of the PLS-SEM

This section presented the discussion of the research's outcomes based on the PLS-SEM output. The model was first assessed and after attaining the quality requirements, the hypotheses were then tested and their findings were discussed extensively.

PLS-SEM Model Assessment

Prior to the actual hypotheses testing, the qualities of the PLS-SEM were first assessed using item loadings, indicator reliability (IR), convergent validity (CV), construct reliability (CR), multicollinearity (i.e., inner VIF) and discriminant validity (i.e., HTMT). Hair et al. (2019) and Henseler et al. (2017) stressed that these model qualities are assessed to make meaning out of the structural model results. They also ensure that the model meets the expected criteria and thus, its findings could be relied upon to influence policies and practices of food processing firms in developing economies notably Ghana.

Table 6 presented the model quality output comprising "internal consistency reliability (indicator reliability (IR) and construct reliability (CR)), construct validity (CV) using average variance extracted (AVE) values and multicollinearity (i.e., inner VIF values)" (RIngle, Wende & Becker, 2015, p12).

Table 6: Assessment of Indicator and Construct Reliability and Validity

Items	rho_A	CR	CV
EP	0.675	0.829	0.709
EcP	0.680	0.800	0.669
GMP	0.672	0.841	0.726
IMP	0.763	0.810	0.685
LMP	0.728	0.852	0.743
SMP	0.791	0.833	0.716
SP	0.747	0.830	0.620

IR (rho_A) – Indicator reliability; CR – Construct reliability; AVE – Convergent validity
Source: Field Survey (2021)

Internal Consistency Reliability

Table 6 first presented the indicator reliability of the model using the rho_A scores. The indicator reliability, according to Hair et al. (2017), describes "the portion of an indicator's variance that is explained by its associated latent variable". To test for indicator reliability, the rho_A scores were reported instead of the Cronbach Alpha (CA) scores because it provides a much better and reliable outcome as compared to the latter (Henseler, Hubona & Ray, 2016; Ringle et al., 2015; Hair et al., 2014). The rule for assessing IR suggests that the rho_A values should be > 0.60 (Wong, 2019; Hair et al., 2017; Ringle et al., 2015). According to Wong (2019), IR offers a vital tool for evaluating the uni-dimensionality of scale items to ensure internal consistency reliability. From the model's rho-A scores, all the constructs had values > 0.6; thus, suggesting reliability. More precisely, GMP had the lowest rho_A value of 0.672 while SMP had the highest rho_A score of 0.791.

The construct reliability (CR) scores of each construct were also reported in Table 6. CR explains the degree to which a particular variable is properly measured by its assigned measurement constructs when summed. According to Hair et al. (2019), attaining CR means that all the indicators of a particular construct have strong correlations among them. The rule proposes that a construct's CR score should be >0.70 (Ringle et al., 2015; Ringle et al., 2012). From Table 6, all the constructs had CR outcomes >0.7; with the least value of 0.800 (EcP) and the highest value of 0.852 (LMP). This result implies that all the indicators assigned to their constructs had strong correlations; thus, suitable for further analysis.

Convergent Validity

The result of the model's convergent validity (CV) was also assessed and reported in Table 6. CV is generally described based on the average variance extracted (AVE) values (Hair et al., 2017; Ringle et al., 2015; Henseler et al., 2014). The AVE values show the degree to which an indicator's variance is captured by the latent construct with respect to the sum of variance and its resulting measurement error. The study complied with the rule that all AVE values should be > 0.50 for CV to occur (Ringle et al., 2015; Bagozzi & Yi, 1988). It could be deduced from the table that all the AVE scores were > 0.50 with the lowest value of 0.620 (SP) and the highest value of 0.743(LMP). Simply put, the model's validity was convergent; thus, meets the quality criteria.

Multicollinearity among Exogenous Variables

Table 6 also reported both inner and outer VIF scores to specifically help in testing for possible multicollinearity. It is also useful for reducing common method bias in any research. Hair et al. (2019) noted that multicollinearity is evaluated to check whether the "path coefficients are bias free". It also ensures that the significant points of possible collinearity among the exogenous variables are minimised drastically. The rule for checking for multicollinearity is that all the VIF values should be < 10 (Pallant & Manuel, 2007). According to Pallant and Manuel (2007), multicollinearity exists when the VIF scores > 10 and this could affect the quality of the PLS-SEM. On the other hand, Hair et al. (2019) recently proposed a VIF value < 5 to indicate absence of multicollinearity. Table 7 presented the inner VIF scores of the model.

Table 7: Inner VIF

	EP	EcP	SP
GMP	1.223	1.223	1.223
IMP	1.216	1.216	1.216
LMP	1.040	1.040	1.040
SMP	1.087	1.087	1.087

Source: Field survey (2021)

From Table 7, it could be deduced that all the inner VIF scores were well below 5 suggesting absence of multicollinearity. The inner VIF scores of 1.223 was obtained in the relationships between GMP and EP, EcP and SP; inner VIF values of 1.216 was obtained in the relationships between IMP and EP, EcP and SP; a value of 1.040 was found in the association between LMP and EP, EcP and SP and finally, SMP's relationship with EP, EcP and SP had a score of 1.087. More precisely, the inner VIF values ranged between 1.040and 1.087to show no multicollinearity among the constructs.

The outer VIF values were also reported in Table 8 to further check for multicollinearity. Table 8 reported the outer VIF scores of the individual indicators and they ranged between 1.142 and 1.485. These values are clearly less than the cut-off point of 5 or 10 as proposed by Hair et al. (2014). The results indicate that no multicollinearity exists among the indicators assigned to the various constructs. This implies that there is no multicollinearity among the construct's indicators; thus, appropriate for further analysis.

Table 8: Outer VIF values

Indicators	VIF values
EP4	1.229
EP5	1.229
EcP2	1.142
EcP3	1.142
GMP3	1.256
GMP5	1.256
IMP3	1.198
IMP5	1.198
LMP3	1.329
LMP4	1.329
SMP3	1.270
SMP5	1.270
SP2	1.266
SP4	1.485
SP5	1.480

Source: Field survey (2021)

Discriminant Validity

The study also assessed the quality of the model by testing for discriminant validity as proposed by Henseler et al. (2012). Discriminant validity (DV) is basically used to check for possible collinearity issues in a model (Hair et al., 2017). Hair et al. (2017) proposed that models that are discriminantly valid mostly lack significant levels of collinearity.Previous studies (Hair et al., 2019; Henseler et al., 2012; Fornell & Larcker, 1981) have offered three major approaches for checking for discriminant validty in a PLS-SEM model. These approaches included Fornell and Larcker (FL), cross loadings and Heterotrait-Monotrait (HTMT) ratio. However, the HTMT approach was discussed because it shows superior output over the other approaches. This is also because, it has

stronger strength in easily detecting absence of discriminant validity in basic research than the cross loadings and FL. Table 9, therefore, presented the result of the HTMT ratio.

Table 9: Heterotrait-Monotrait (HTMT) Ratio

	EP	EcP	GMP	IMP	LMP	SMP	SP
EP							
EcP	0.747						
GMP	0.463	0.686					
IMP	0.634	0.796	0.686				
LMP	0.309	0.225	0.094	0.158			
SMP	0.234	0.443	0.313	0.285	0.252		
SP	0.799	0.818	0.577	0.780	0.419	0.316	

Source: Field survey (2021)

The rule of thumb for assessing the HTMT ratio is that "the correlation values among the constructs should be < 0.90" (Wetzels, Odekerken-Schroder & Vab Oppen, 2009). Simply put, discriminant validity is achieved if the HTMT scores are < 0.90. It could, therefore, be deduced from Table 9 that all the HTMT values for the constructs are < 0.90 with the highest value of 0.818 in the relationship between SP and EcP. This result suggests that the constructs are clearly different from each other. It could, therefore, be seen that the model met the quality criteria; thus, the significance of the path coefficients was then discussed.

Item Loadings (Structural and Measurement)

This section presented the item loadings of the study's constructs. The model was developed using four exogenous variables under sustainable supply chain management practices (SSCMP) comprising lean management (LMP), green management (GMP), inventory management (IMP) and supply

management (SMP); whereas, the endogenous variable was sustainable performance with three indicators (environmental performance (EP), social performance (SP) and economic performance (EcP)). Finally, firm size (FS) represented the control variable of this research. The structure of the model comprising the constructs and their associated item loadings were shown in Figure 2.

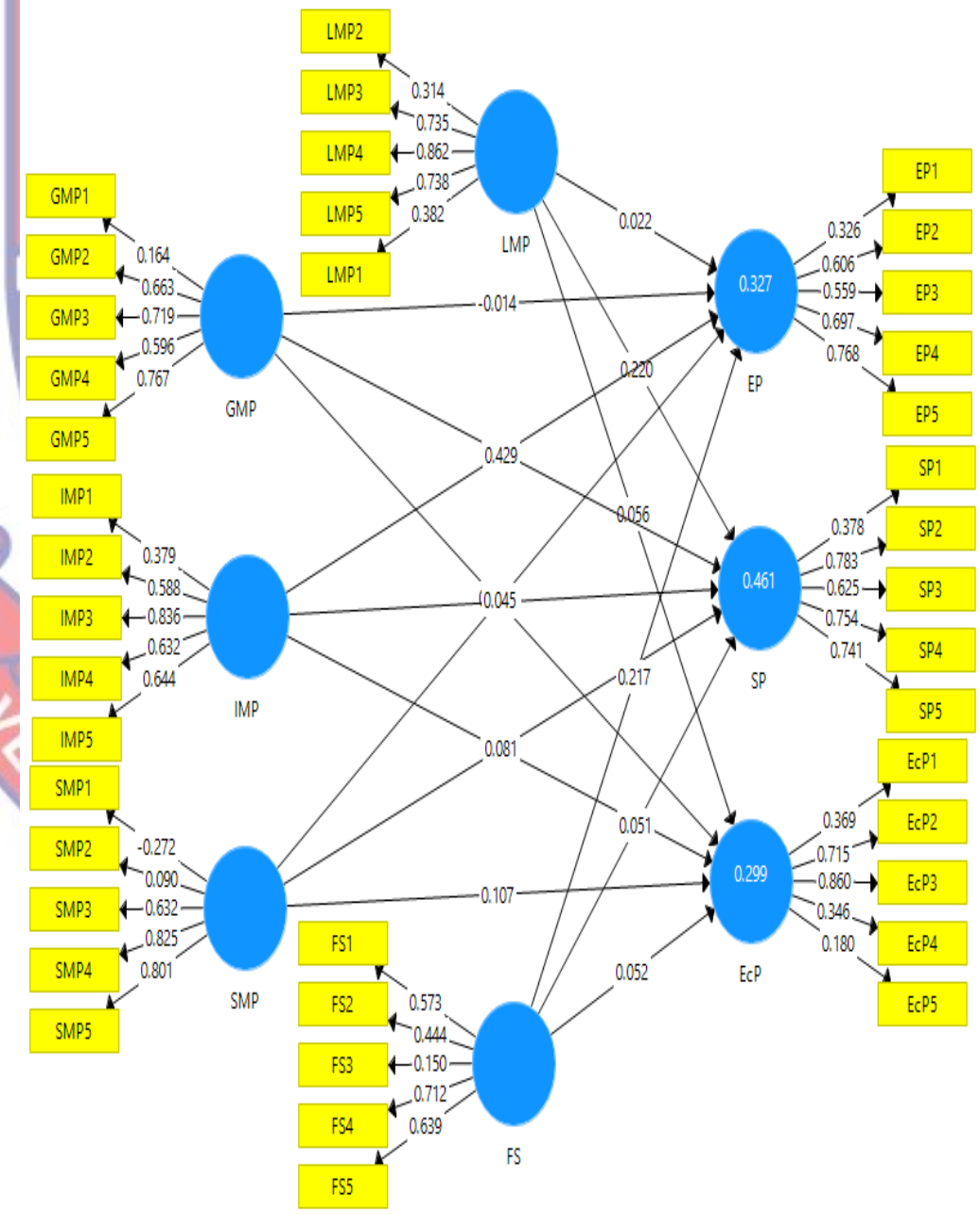

Figure 2: Inner and Outer Model Output
Source: Field Survey (2021)

Figure 2 showed that all the exogenous and endogenous constructs had five indicators each; whereas, the control variable also had five measurement indicators. More precisely, lean management (LMP) comprised LMP1, LMP2, LMP3, LMP4 and LMP5; green management (GMP) comprised GMP1, GMP2, GMP3, GMP4 and GMP5; inventory management (IMP) comprised IMP1, IMP2, IMP3, IMP4 and IMP5; supply management (SMP) also had SMP1, SMP2, SMP3, SMP4 and SMP5; firm size (FS) had loadings: FS1, FS2, FS3, FS4 and FS5. Also, the sustainable performance dimensions comprised: environmental performance (EP) (EP1, EP2, EP3, EP4 and EP5); social performance (SP) (SP1, SP2, SP3, SP4 and SP5) and economic performance (EcP) (EcP1, EcP2, EcP3, EcP4 and EcP5) respectively. These constructs together with their indicators were used to draw ten (15) paths using arrows to signify relationships among them.

From Figure 2, the arrows moved from the endogenous variables and pointed at the exogenous variables to show that LMP, GMP, IMP and SMP could have significant individual relationships with the SP dimensions (EP, SP, EcP). Simply put, the path arrows offered the following correlations based on the research hypotheses: LMP and EP, LMP and SP and LMP and EcP; GMP and EP, GMP and SP and GMP and EcP;IMP and EP, IMP and SP and IMP and EcP and finally, SMP and EP, SMP and SP and SMP and EcP. Finally, firm size (FS) played a controlling role in the relationships established in the model.

This model was then assessed by evaluating the constructs' indicator loadings. The assessment was done to ensure that each indicator provides a quality measure of its assigned construct (Hair et al., 2019; Henseler et al., 2009). The rule suggests that, each indicator's loading should be > 0.70 to signify a

quality measure of its constructs. Thus, item loadings of each construct < 0.70 were removed from the original model (i.e., Figure 2) since they were assumed to be inferior measures of their assigned constructs in this study. Hair et al. (2019) suggested that item loadings that are removed from the model do not provide true and quality measures of their assigned constructs. As such, failure to remove them could affect the quality of the model's outcome. Therefore, all item loadings < 0.7 in Figure 2 were duly removed; indicating that not all the items obtained from previous studies were quality measures of their assigned constructs within the context of this study.

Figure 3 presented the final model structure after all indicator loadings < 0.70 were removed as suggested by Hair et al. (2017) and Henseler et al. (2009). It is to note that, the firm size (FS) was removed from the final model because it played no significant role in controlling the relationships established in this research. This means that, the presence of firm size does not play any crucial role in the relationships between sustainable supply chain management practices and sustainable performance so far as food processing firms in Ghana are concerned.

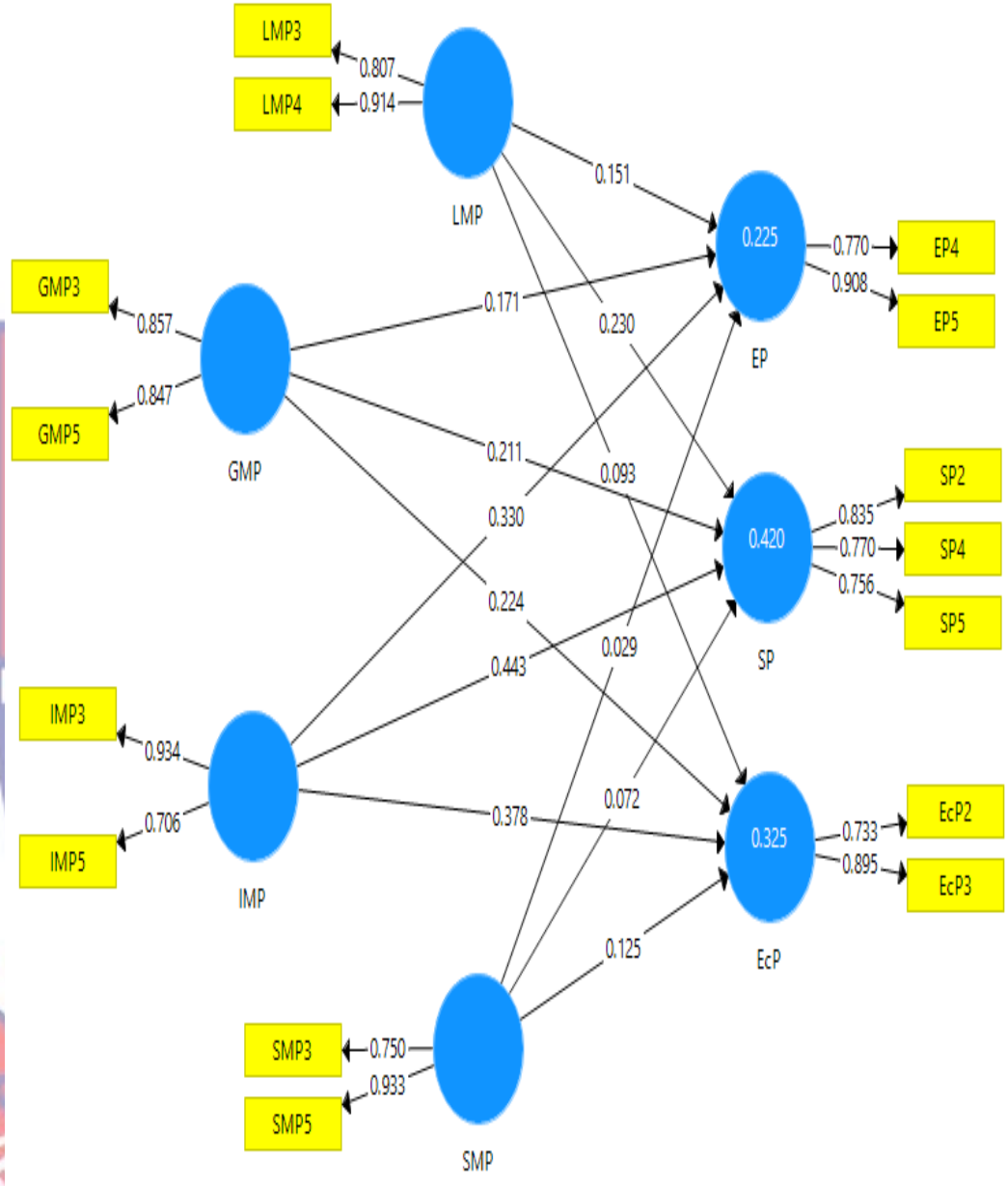

Figure 3: Final Model Structure
Source: Field Survey (2021)

It could be deduced from Figure 3 that all the constructs' indicators had item loadings > 0.70. This means that indicators with loadings < 0.70 were all deleted from the initial model as proposed by Hair et al. (2019). This was done to ensure that all the indicators are quality and true measures of their underlying constructs. More specifically, in terms of LMP, items such as LMP1, LMP2 and LMP5 were removed; GMP also had GMP1, GMP2 and GMP4 removed; IMP

had IMP1, IMP2 and IMP4 removed; SMP had SMP1, SMP2 and SMP4 removed. Also, EP had EP1, EP2 and EP3 removed; SP had SP1 and SP3 removed and finally, EcP had EcP1, EcP4 and EcP5 removed respectively. This implies that the items maintained were quality measures of SSCM and SP within the food processing industry of Ghana. Therefore, the study's hypotheses were tested based on the final model structure.

Explanation of Target Endogenous Variable Variance

This section reported the model's predictive accuracy by reporting the coefficient of determination (R^2) scores. It also reported other key estimations such as, "predictive relevance (Q^2) based on the Stone-Giesser's test, effect size (f^2) and the model's relative impact score (q^2)". The output of these elements was displayed in Table 10 and discussed.

Table 10: Explanation of Target Endogenous Variables' Variance

L.V	R^2			f^2			Q2			q^2		
	EP	SP	EcP	EP	SP	EcP	EP	SP	EcP	EP	SP	EcP
GMP				0.031	0.063	0.061	0.120	0.195	0.172	0.013	0.019	0.030
IMP				0.116	0.279	0.174	0.076	0.210	0.123	0.065	0.115	0.090
LMP				0.028	0.088	0.012	0.121	0.136	0.182	0.012	0.039	0.017
SMP				0.001	0.008	0.021	0.122	0.215	0.186	0.012	0.013	0.012
SP	0.225	0.420	0.325									

Note: L.V. = latent variable, R^2 = R squared, f^2 = effect size, Q^2 = predictive relevance, q^2 = model's relative impact
Source: Field survey (2021)

Coefficient of Determination (R^2)

The coefficient of determination represented by the R^2 values were first reported. Hair et al. (2017) proposed that R^2 represents the collective

contributions of the independent constructs (LMP, SMP, GMPP and IMP) on the dependent construct (SP, EP and EcP). Simply put, the R^2 suggests the change in sustainable performance that is linearly accounted for by the combination of the four SSCM practices. Henseler et al. (2009) and Cohen (1988) offered that R^2 values <0.29, 0.29 - 0.67 and >0.67 signify weak, moderate and strong contributions of the predictor constructs to the dependent constructs.

From Table 10, the R^2 values were 0.225 (EP), 0.420 (SP) and 0.325 (EcP); meaning that when the four SSCM practices are combined, they linearly account for about 22.5%, 42.0% and 32.5% of change in environmental, social and economic performance of the food processing firms respectively. This means that for any change in the sustainable performance (EP, SP, EcP) of the food processing firms, SSCM practices with respect to lean management, green management, inventory management and supply management combine to contribute about 22.5%, 42% and 32.5% of such change. Among the sustainable performance dimensions, it could be deduced that the four SSCM practices contribute moderately to social performance (42%) and economic performance (32.5%) but weakly to environmental performance (22.5%). The implication is that SSCM practices play marginal roles with respect to any change in the sustainable performance dimensions.

Effect Size (f^2)

Table 10 also reported the effect size (f^2) of each independent construct by adopting Cohen's (1988) impact criterion. Cohen (1988) suggested that values of 0.02 signify small, 0.15 signify medium and 0.35 indicates large effect size (f^2) respectively. From the table, GMP, for instance, reported the following f^2s: 0.031 (EP), 0.063 (EcP) and 0.061 (SP) respectively. This means that GMP

had small effect sizes on the three sustainable performance dimensions. Thus, should there be any change in sustainable performance, GMP plays small roles in triggering changes in social, environmental and economic dimensions. However, among the dimensions, GMP had higher effect sizes on EcP; followed by SP and EP respectively. Also, LMP had the following effect sizes: 0.028 (EP), 0.088 (SP) and 0.012 (EcP) respectively. This means that LMP has small f^2 on the sustainable performance dimensions. however, it had higher f^2 on social performance; followed by environmental and economic performance.

Also, the f^2 of IMP on EP, SP and EcP were 0.116, 0.279 and 0.174 respectively. This result means that IMP had medium f^2 on sustainable performance with SP being the highest; followed by EcP and EP respectively. Thus, for any change in sustainable performance, the inventory management has a medium effect size in contributing to the change. Finally, the f^2 of SMP were reported as follows: 0.001 (SP), 0.008 (EcP) and 0.021 (EP). This result means that SMP has small f^2 on the sustainable performance dimensions; with SP recording the lowest f^2. It could be deduced that IMP has a better f^2 on the three sustainable performance dimensions; followed by GMP, LMP and SMP respectively. Deductively, ensuring proper inventory management plays a better role in attaining sustainable performance than lean, green and supply managements within the food processing firms in Ghana.

Predictive Relevance (Q^2)

The next element discussed was the model's predictive relevance based on Stone-Geisser's (Q^2) test (Hair et al., 2014). Q^2 is analysed by removing a portion of the data matrix, analyse the model and predict the removed part based on the estimations (Roldán & Sanchez-Franco, 2012). Chin (2010) suggested

that predictive relevance is achieved if its value is greater than 0 for the construct. Henseler et al. (2009) proposed that, $0.02 \leq Q^2 < 0.15$ shows weak effect, $0.15 \leq Q^2 < 0.35$ indicates moderate effect and $Q^2 > 0.35$ signifies strong effect. Sarstedt et al. (2014) also revealed that Q^2 is only used for prediction purposes but does not show the quality of the prediction. It could be deduced that all the Q^2 values were > 0 but < 0.35 showing either weak or moderate predictive relevance.

More precisely, GMP had the following Q^2: 0.120 (EP), 0.195 (SP) and 0.172 (EcP). Based on Henseler et al.'s (2009) criteria, GMP is a weak, moderate and moderate predictor of EP, SP and EcP respectively. Thus, GMP predicts any change in SP better than EcP and EP respectively. Also, Table 10 reported the Q^2 of IMP as follows: 0.076 (EP), 0.210 (SP) and 0.123 (EcP). These results suggest that IMP is a weak, moderate and weak predictor of EP, SP and EcP respectively. Simply put, IMP is a moderate predictor of any change in SP but a weak predictor of changes in EP and EcP respectively. The study further reported theQ^2 of LMP: 0.121 (EP), 0.136 (SP) and 0.182 (EcP); suggesting weak, moderate and moderate predictive relevance. More precisely, LMP predicts EcP better than SP and EP respectively.

Finally, the Q^2 of SMP was reported in this section. Table 10 revealed that SMP predicts 0.122 (EP), 0.215 (SP) and 0.186 (EcP); signalling weak, moderate and moderate Q^2 respectively. The results mean that, SMP predicts any change in SP better than EcP and EP. Thus, any change in SP is better predicted by SMP as compared to EP and EcP. In summary, SMP (0.215) is a better predictor of SP; followed by IMP (0.210), GMP (0.195) and LMP (0.136) respectively. This means that, any change in social performance is better

predicted by supply management. In terms of EcP, SMP (0.186) was a better predictor; followed by LMP (0.182), GMP (0.172) and IMP (0.123) respectively. This outcome implies that, for any variation in economic performance, supply management plays a better role in predicting such variation.

Furthermore, SMP also a better predictor of change in EP; followed by LMP (0.121), GMP (0.120) and LMP (0.076) respectively. It could, therefore, be deduced that SMP is an accurate predictor of change in any of the sustainable performance indicators. Thus, for any modification in sustainable performance, supply management plays a better role in predicting such change. This SSCM practice was followed by LMP, GMP and finaly, IMP. Therefore, IMP had the lowest predictive relevance when the four SSCM practices are combined to predict changes in any of the sustainable performance elements.

Predictive Relevance (q^2)

The quality of the predictive relevance of the constructs was assessed by reporting the q^2 values. The q^2 value was achieved by relying on the formula: "q^2 = (Q^2 included - Q^2 excluded) / (1 - Q^2 included)". The results were also interpreted based on Henseler et al.'s (2009) criterion. From Table 10, allthe q^2 values > 0 suggesting that they are quality predictors of change in any of the sustainable performance elements. With respect to EP: the followingq^2 values were reported for each SSCM practice: GMP (0.013), IMP (0.065), LMP (0.012) and SMP (0.012). These results imply that all the SSCM practices have small quality predictive relevance; with LMP and SMP recording the lowest. In terms of SP, the following q^2were reported: GMP (0.019), IMP (0.115), LMP (0.039) and SMP (0.013). This outcome means that IMP provides a quality predictor as compared to LMP, GMP and SMP respectively.

Finally, the q^2 of each SSCM practice for EcP was reported and it was found that GMP (0.030), IMP (0.090), LMP (0.017) and SMP (0.012). This result implies that inventory management offers quality prediction with respect to environmental performance than the other SSCM practice. However, GMP offered a higher quality predictor of any change in EP than LMP and SMP; with SMP being the lowest. Therefore, for any change in sustainable performance, IMP offers quality prediction: followed by GMP, LMP and SMP respectively. Conclusively, the results show that the q^2 values were > 0; thus, generally good since all the exogenous variables (LMP, IMP, SMP, and GMP) can clearly explain the endogenous variables (EP, EcP, SP).

Main Analysis

This section presented the main analysis of the study and begun with a sub-section titled, significance of the path coefficient.

Significance of Path Coefficients

After quality assessment of the PLS-SEM coupled with determining its predictive relevance, the study finally reported the hypotheses results. The hypotheses specifically focused on examining the effects of sustainable supply chain management practices (SSCMP) comprising LMP, GMP, IMP and SMP on sustainable performance (EP, SP and EcP) of food processing firms in Ghana with particular focus on those within the Tema, Accra and Kumasi metropolises. It specifically tested whether SSCM practices comprising lean management, green management, supply management and inventory management play any significant roles in improving the sustainable performance dimensions.

The hypotheses were tested and their scores were reported to show whether significant effects exist among these relationships. It also provided the strength and direction of each relationship using 5000 bootstraps in the SmartPLS 3 software as proposed by Hair et al. (2021). Table 11 presented the results after testing the hypotheses. The table specifically contained five columns representing structural paths, path coefficients, t-stats, p-values and decision rule of each hypothesis.

Table 11: Structural Equation Model Output and Decision Rule

Structural Path	T Statistics (|O/STDEV|)	P Values	β-value	Decision Rule
LMP -> EP	2.288	0.022	0.151	$H1_a$ (supported)
LMP -> SP	3.343	0.001	0.230	$H1_b$ (supported)
LMP -> EcP	1.330	0.184	0.093	$H1_c$ (not supported)
GMP -> EP	2.235	0.025	0.171	$H2_a$ (supported)
GMP -> SP	3.290	0.001	0.211	$H2_b$ (supported)
GMP -> EcP	3.000	0.003	0.224	$H2_c$ (supported)
IMP -> EP	4.309	0.000	0.330	$H3_a$ (supported)
IMP -> SP	7.142	0.000	0.443	$H3_b$ (supported)
IMP -> EcP	4.764	0.000	0.378	$H3_c$ (supported)
SMP -> EP	0.381	0.703	0.029	$H4_a$ (not supported)
SMP -> SP	1.207	0.227	0.072	$H4_b$ (not supported)
SMP -> EcP	1.984	0.047	0.125	$H4_c$ (supported)

Note: * = $t > 1.96$; $p < 0.05$

Source: Field survey (2021)

The outcome the control variable (i.e., firm size) was first reported in this section. Initial analysis found firm size to have no significant influence in

the relationships established in the study. This means that, the size of the firms in terms of managerial experience, total assets and number of employees, for instance, plays crucial roles in affecting the outcome of the relationships established. As such, firm size does not control any of the established relationships. Thus, further analysis excluded firm size since it played no key role in this research. The research hypotheses were then tested with respect to the t-stat scores as proposed by scholars (Hair et al., 2021; Henseler et al., 2015; Ringle et al., 2015). They specifically proposed that t-stat scores ≥ 1.96 matches with p-values < 0.05; implying that a significant association exists.

According to Hair et al. (2021), for any significant association to exist between the variables understudy, its t-stat scores should be ≥ 1.96 (p=0.05). This rule means that the directional hypothesis (as shown in the study) is supported if its t-stat is ≥ 1.96; indicating that the link between the constructs is significant. Therefore, "no significant relationship between the variables exists" if the model's t-stat is < 1.96 (i.e., rejecting the directional hypothesis). The hypotheses outcomes were reported and discussed in the following sections.

Lean Management and Sustainable Performance

The study's objective one investigated the effect of lean management (LMP) on the sustainable performance of food processing firms in Ghana. To achieve this, three hypotheses were tested to find out whether LMP contributes to any change in the sustainable performance dimensions. Hypothesis 1a, 1b and 1c, for instance, hypothesised that "LMP significantly affects environmental performance", "LMP significantly affects social performance" and "LMP significantly affects economic performance" within the study area. With H1a, a t-stat value of 2.288>1.96 (p=0.022) was obtained; supporting the hypothesis.

This result means that LMP has a significant influence on EP; suggesting that any change in LMP leads to a significant change in EP. With a β score of 0.151, it could be deduced that about 15.1 percent of change in environmental performance (EP) is predicted by the lean management.

Also, after testing H1b, a t-stat value of 3.343 ($p=0.001<0.050$) was obtained to suggest that LMP plays a significant role in improving SP. This result supported the hypothesis that "LMP significantly improves social performance" of the food processing firms in Ghana. With a β value of 0.230, it could be deduced that about 23 percent of change in social performance is significantly contributed by lean management. Thus, for any unit increment in LMP, SP also increases significantly by 23 percent. However, H1c was not supported because its t-stat was $1.330<1.96$ ($p=0.184>0.050$). This result means that LMP does not play any significant role in causing a change in EcP. Thus, for any unit increase in economic performance, lean management does not play any significant contribution to it.

In summary, the results reveal that LMP plays significant roles in improving the environmental and social performance; however, it plays no significant role in improving economic performance. As such, the implementation of lean management is key to promoting sustainable performance with respect to social and environmental performance. This means that, for food processing firms to ensure better environmental and social performance, the lean management needs to be adopted and implemented. This finding explains that lean management traditionally focuses on environmental performance with respect to waste management, pollution reduction and addressing energy inefficiencies. This, in turn, helps the food processing firms

to address pollution issues, product design issues and ensuring the health and safety of people.

This finding is in line with a study by Thanki et al. (2016) who concluded that the LM enables firms to have higher control over environmental and social issues. Pearce et al. (2018) also established the influence of LMP on sustainable performance of horticultural firms. The study found LMP to significantly improve sustainable performance in terms of the economic, social and environmental dimensions. However, this study contrasted their finding that, economic performance is significantly improved by LMP. It is to note that, this study focused on food processing firms while their study focused on horticultural firms; justifying the differing outcomes. Hussain et al. (2019) similarly concluded that LMP plays valuable roles in improving sustainable performance of hotel supply chains in UAE. However, LMP was found to have the most effect on economic performance as opposed by this present study.

Green Management and Sustainable Performance

The significant effect of green management on the sustainable performance of food processing firms was also investigated under three hypotheses. This research specifically hypothesised that: "GMPsignificantly affects environmental performance (H2a)", "GMP significantly affects social performance (H2b)" and "GMP significantly affects economic performance (H2c)". The hypotheses were tested based on the t-stat scores and it revealed that, H2a, for instance, had a score of 2.235>1.96 (p=0.025<0.05). Based on the t-stat, the decision rule supported that hypothesis; indicating that GMP plays a significant role in improving environmental performance of the food processing firms. Table 11 also revealed a β score of 0.171 to suggest that about 17.1 percent

of change in environmental performance is significantly contributed by green management.

The t-stat after testing H2b was 3.290>1.96 (i.e., p=0.001<0.050); thus, supporting the hypothesis. This result means that, for any change in social performance, green management plays a significant role. Table 11 also revealed a β value of 0.211; implying that about 21.1 percent of variation in social performance is significantly contributed by GMP. Therefore, GMP predicts about 21.1 percent of any variation in the social dimension of sustainable performance. Finally, the outcome of H2c revealed a t-stat of 3.000>1.96 (i.e., p=0,003<0.05). This outcome suggests that GMP is a key predictor of the economic performance of the food processing firms studied. A β score of 0.224 suggested that about 22.4 percent of change in economic performance is significantly contributed by green management.

These results mean that green management plays crucial roles in improving sustainable performance with respect to social, environmental and economic performance. As such, for food processing firms to improve their sustainable performance output, they need to implement green management. Green management is generally associated with eliminating harmful activities from supply chains in order to control their possible negative outcomes. It specifically relates with promoting efficient production processes devoid of environmental wastages. It also places emphasise on waste elimination and environmental protection; contributing to higher sustainable performance. In relation to the study's outcome, green management ensures that food processing firms improve their economic, environmental and social performance elements.

This finding is supported by Khan et al. (2018) who asserted that implementing green management helps firms to achieve their operational outcomes without compromising the safety of the environment. Abdul-Rashid et al. (2017) similarly explored the influence of green manufacturing on the sustainable performance of Malaysian manufacturing companies. It was concluded that sustainable performance (economic, social and environmental) could significantly be influenced by green management. Similarly, Zhan et al. (2018) concluded that green management leads to improved sustainable performance of manufacturing firms in China. Afum et al. (2020) also buttressed this finding by concluding that any unit increase in green manufacturing leads to improved sustainable performance of Ghanaian manufacturing SMEs. Baah et al. (2019) concluded that any increase in sustainable performance is contributed by green management of manufacturing and hospitality firms.

Inventory Management and Sustainable Performance

The third research objective was also tested and its output was reported in Table 11. Three hypotheses were developed: "IMP significantly affects environmental performance (H3a)", "IMP significantly affects social performance (H3b)" and "IMP significantly affects economic performance (H3c)". With respect to H3a, a t-stat value of 4.309>1.96 (p=0.000<0.050) was achieved; thus, supporting the hypothesis. This result means that IMP plays a vital role in improving the environmental performance of food processing firms in Ghana. Also, β value of 0.330 indicates that about 33 percent of any change in environmental performance is significantly contributed by inventory management. This result implies that for any unit increase in environmental

performance, about 33 percent of it is significantly contributed by the adoption of inventory management.

Also, the t-stat for H3b was 7.142>1.96 (p=0.000<0.050); thereby, supporting the hypothesis. This means that a significant association exist between IMP and SP; thus, any increment in IMP leads to a significant increment in SP. With a β value of 0.443, the result suggests that about 44.3 percent of change in social performance is significantly contributed by inventory management. Simply put, inventory management is a significant predictor of the social sustainable performance of food processing firms in Ghana by 44.3 percent. Finally, the t-stat of H3c was 4.764>1.96 (i.e., p=0.000<0.050) and this outcome suggests that IMP plays a vital role in promoting EcP. Table 11 also revealed a β score of 0.378; indicating that about 37.8 percent of change in economic performance is significantly contributed by inventory management. conclusively, any unit rise in inventory management contributes about 37.8 percent rise in economic sustainable performance of the food processing firms.

Inventory management is one of the crucial SSCM practices adopted by firms in controlling their inventories. It is a known fact that inventory is inevitable; thus, its management is key to food processing firms' ability to achieve sustainable outcomes. Inventory management ensures that firms ensure optimal inventory at all times while minimising lead times and inferior material usage. As such, inventory management promotes economic, social and environmental performance of food processing firms across the globe including Ghana. The study's finding is supported by Sunday and Eginiwin (2017) who concluded that inventory management promotes the economic performance (i.e., profitability) dimension of sustainable performance. similar finding was

obtained by Orobia et al. (2018) in their study on inventory management and financial performance. Opoku et al. (2020) found inventory management to improve operational performance of food processing firms in Ghana.

Supply Management and Sustainable Performance

The final objective investigated the influence of supply management (SMP) on the sustainable performance of food processing firms in Ghana. This objective was achieved with respect to three hypotheses (H4a, H44b and H4c). In terms of H4a, a t-stat of 0.381<1.96 (0.703>0.05) was reported; thereby, failing to support the study's hypothesis. This result means that supply management does not play any significant role in contributing to any change in environmental performance. Thus, for any unit change in environmental performance, managing suppliers plays no significant role.

Also, a t-stat score of 1.207<1.96 (i.e., p=0.227>0.050) was reported in Table 11. This result failed to support the hypothesis that, "SMP plays a significant role in promoting social performance". This means that there is no statistically significant effect of SMP on SP; thus, any increase or decrease in SMP does not lead to any significant change in SP. Simply, social sustainable performance will remain the same whether supply management is practiced by the food processing firms or not. Finally, the t-stat of 1.986>1.96 (p=0.047<0.050) was revealed in Table 11; thereby, supporting the final hypothesis that "SMP significantly contributes to improvement in EcP" of the food processing firms. The implication is that, food processing firms that ensure proper supply management are able to achieve better economic performance by 12.5 percent (i.e., based on β score of 125).

It could be deduced that supply management significantly contributes to only the economic performance dimension of sustainable performance of the food processing firms in Ghana. As such, any unit increase in supply management plays no significant role in causing any change in social and environmental performance of the food processing firms. Thus, food processing firms need to invest in supply management if they intend to improve only the economic dimension of sustainable performance. Simply put, improving SMP does not offer any crucial contributions to sustainable performance in terms of environmental and social performance of the food processing firms. However, supply management emphasises supplier relationship development to guarantee consistent inventory inflows even in tricky periods; thus, need to adopted by the food processing firms despite the study's outcome.

The study's finding is partially supported by Wang and Dai (2018) in their research on "responsible supplier development and sustainable development of SMEs". The study found that supplier development leads to a significant improvement in the SMEs sustainable performance. It is to note that the study focused on SMP and combined the three sustainable performance dimensions; thus, could not inform readers about the contributions of SMP to the individual sustainable performance elements. Baliga et al. (2019) concluded that supply management improves all the three dimensions of sustainable performance among manufacturing firms in India. However, the study supported only the economic performance while contrasting that of the social and environmental performance outcomes of this current research. The differences in finding could be contributed by the geographical and scope differences of the two studies.

More precisely, Baliga et al.'s (2019) focused on manufacturing firms in India; while, this present study focused on only the food processing firms in Ghana. Additionally, Duque-Uribe et al. (2019) found supply management to promote sustainable performance of hospitals based on extensive empirical reviews. Nguyen et al. (2021) concluded that supplier relationship significantly affects the firm performance of manufacturing firms in Vietnam. Supply management was also found to improve the manufacturing performance of Chinese firms. As such, this present study offers valuable insight into supply management and its influence on sustainable performance of food processing firms; revealing that the former only improves the economic dimension of the latter among food processing firms in Ghana.

Chapter Summary

The chapter discussed the results after testing the hypotheses using the PLS-SEM. The model was first assessed for quality purposes and its outcome were extensively discussed. After meeting all the quality criteria, the hypotheses were then tested and the findings were extensively discussed. The study found sustainable supply chain management (SSCM) practices to significantly improve the sustainable performance of the food processing firms within the three selected metropolises. Conclusively, inventory management had the highest influence on sustainable performance; followed by green management, lean management and supply management respectively. In general, SSCM practices had positive significant effects on sustainable performance of the food processing firms investigated.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The chapter emphasised on the research's summary, conclusions made, and recommendations. It concluded with some proposals for further research.

Summary

The study purposely investigated the effects of sustainable supply chain management (SSCM) practices on the sustainable performance of food processing firms in Ghana. The research was directed by the succeeding specific objectives to:

1. examine the effect of lean management on sustainable performance of the food processing firms
2. examine the effect of green management on sustainable performance of the food processing firms
3. examine the effect of inventory management on sustainable performance of the food processing firms;
4. examine the effect of supply management on sustainable performance of the food processing firms

With reference to the study's purpose, 12 hypotheses were developed and tested using the quantitative approach and explanatory research design. Adopting the census technique, the study's target population consisted of 247 owners and or managers of food processing firms within three selected metropolises in Ghana comprising Tema, Accra and Kumasi. The study specifically used structured questionnaires during the data collection and

obtained a valid data set of 187 with a response rate of 78.50 percent. The study then processed the primary data using the IBM SPSS Statistics version 26 and Smart-PLS 3. The hypotheses were tested using the "partial least square-structural equation modelling (PLS-SEM) analytical tool and the results were extensively discussed in Chapter four. The ensuing sections focused on the study's summary of major findings.

In terms of objective one, the study analysed the effect of lean management (LMP) on the sustainable performance of the food processing firms. The result revealed that lean management has a significant and positive effect on sustainable performance with respect to environmental and social dimensions. However, this practice had no significant effect on economic performance. The result implies that the environmental and social dimensions of sustainable performance can be improved if food processing firms implement lean management. The result also implies that adopting the lean management helps the food processing firms to achieve better environmental and social performance while playing no significant role in improving economic performance. In view of this, the study found lean management to predict any change in the food processing firms' sustainable performance with respect to the social and environmental dimensions.

The second objective explored the effect of green management (GMP) on the sustainable performance of food processing firms within the Kumasi, Tema and Accra metropolises in Ghana. The study's result revealed that lean management plays key roles in achieving better sustainable performance in terms of economic, environmental and social dimensions. This result implies that any unit increase in green management would lead to a significant but

moderate unit increase in the food processing firms' sustainable performance. The result also implies that the green management of SSCM plays an important role in promoting all the sustainable performance dimensions within Ghana's food processing industry. Thus, food processing firms can achieve waste minimisation, reduce production costs and patronise green inventories that focuses on environmental and human protection.

Research objective three examined the effect of inventory management on the food processing firms' sustainable performance. The study's finding on this objective revealed a positive significant effect of inventory management on all the three sustainable performance dimensions with respect to social, environmental and economic. This result implies that any unit increment in inventory management leads to a unit increase in the economic, social and environmental performance. In view of this, the study found sustainable performance to significantly improve by adoption of inventory management.

Finally, the research investigated the effect of supply management on the sustainable performance of food processing firms in Ghana. The result after the PLS-SEM analysis revealed that supply management plays a weak significant role in improving sustainable performance. This is because, supply management was found to improve only the economic dimension of sustainable performance. As such, it plays no significant role in causing any change in social and environmental performance among the food processing firms. Thus, any unit change in supply management leads to a unit change in economic performance; while failing to predict any change in the environmental and social performance of the firms.

Conclusions

The study's goal was to examine how sustainable supply chain management practices affect the sustainable performance of food processing firms in Ghana. The study attained this goal by developing four key objectives and twelve hypotheses which were largely achieved. The ensuing conclusions were drawn from the key findings:

In terms of objective one, the study found lean management to significantly improve food processing firms' sustainable performance with respect to the environmental and social dimensions. This finding was largely supported by related studies that suggested that lean management plays crucial roles in ensuring production of environmentally friendly products devoid of harmful effects on human health and safety. They also added that lean management traditionally concentrates on waste elimination while addressing energy, product design and global warming issues. Thus, lean management places much emphasis on the social and environmental performance of manufacturing firms; as found in this study. Therefore, the study concluded that adoption of the lean management leads to significant improvement in the environmental and social performance of the food processing firms in Ghana.

The study also found the green management to significantly improve the sustainable performance of the food processing firms in Ghana. This outcome has principally been buttressed by empirical studies which revealed that green management focuses on embracing green activities (i.e., green purchasing, green inventory, green production, green consumption, etc.) throughout the firm's manufacturing processes; in turn, achieving environmental friendliness, social safety and better economic (i.e., financial) outcome. The study concluded that

adoption of green management plays a vital role in promoting high levels of sustainable performance among the food processing firms studied.

In terms of research objective three, the study found inventory management to improve the sustainable performance of food processing firms in Ghana. This finding has largely been supported by related studies which found that inventory is an inevitable asset to every manufacturing enterprise across the globe; thus, its proper management leads to better sustainable performance with respect to environmental, economic and social performance. Proper inventory management, for instance, helps firms to overcome unnecessary wastages arising from contaminations, expiries and surpluses. This, in turn, helps the food processors to minimise production costs while improving the production and consumption of friendly products. In view of this, the study concluded that, adopting the inventory management is a key predictor of sustainable performance among food processing firms in Ghana.

Finally, supply management was found to play a weak significant role in predicting all the sustainable performance dimensions of the food processing firms in Ghana. This result has marginally been in line with previous studies which found that supply management is key to ensuring better environmental, social and economic outcomes of manufacturing enterprises that practice it. As such, this study offers a different dimension by revealing that supply management only improves the firms' economic performance; thereby, playing no significant role in improving the social and environmental performance of the firms studied. The study concluded that supply management predicts any change in economic performance but plays no significant role in improving the

social and environmental performance of the food processing firms within the three selected metropolises in the country.

In summary, the study concluded that sustainable supply chain management practices generally improve the sustainable performance of the food processing firms in Ghana. Among these practices, inventory management had the highest influence; followed by green management, lean management and supply management respectively. More precisely, the study found inventory management and green management to significantly improve all the three dimensions of sustainable performance while lean and supply management only improved some sustainable performance dimensions. specifically, lean management improves the social and environmental performance while supply management improves economic performance of the food processing firms in the country.

Recommendations

The research presented the following recommendations based on the conclusions' drawn:

The study recommended that, policy makers including the government, designated ministries, institutional bodies and trade unions should strengthen existing policies on lean management within the food processing industry in Ghana. These policies should particularly provide clear paths and directions with respect to how food processors can operate sustainably without compromising lean management. Policy makers should offer lucrative rewards to award firms that operate in line with the lean management policies; thereby, influencing others to implement it. Also, firms that fail to comply with the policies should be given the necessary punishments such as revoking of licenses to operate,

payment of penalties, among others. The study also recommended that the management of the food processing firms should emphasis on lean management in all the production activities in order to achieve high sustainable performance, especially in areas of social and environmental outcomes.

The study also recommended that policy makers should continue to revise and strengthen the current policies associated with green management. The policies should, for instance, mandate the food processing firms to procure only green raw materials for production, while producing food consumables under strict adherence to international standards. Achieving this would help the food processing firms to improve their green production capabilities; thereby, improving the acceptability of their products in international markets for higher economic performance. The study further recommended that management of the food processing firms should offer proper training packages to their employees in order to improve their knowledge and skills with respect to practicing proper green management. The training should clearly highlight the importance of green management and how it can be properly implemented. Complying by these recommendations would help the food processors to implement green management and enjoy better sustainable performance.

The study also recommended that policy makers including the Food and Drugs Authority should provide clear and comprehensive policies that ensure that food processors adopt inventory management mandatorily and also the consequences of non-compliance should be well documented and properly communicated to the food processors. The food processing firms, on the other hand, should strengthen inventory management by investing in technologies and other resources needed to achieve it. Practically, management needs to channel

the necessary resources including technologies, information and finance to strengthen inventory management in order to achieve higher sustainable performance in areas of economic, environmental and social output. It is to note that, food processing firms can never operate sustainably in the absence of inventory; as such, its management should be of prime interest to management and in turn, contribute significantly to improving sustainable performance.

Finally, the study recommended that supply management should be of keen interest to management of the food processing firms in the country. Although supply management had no significant effect on the environmental and social performance of the food processing firms, it played a crucial role in contributing to economic performance. As such, investing in supply management through long term supplier development and collaborations would assist the food processors to improve their economic performance by becoming more profitable. In view of this, the study also recommended that food processors should manage their suppliers by involving them in decision making processes, offering financial and other support services to them in order to help improve economic performance; in turn, contribute to improving the other sustainable performance dimensions.

Suggestions for Further Research

This study investigated the contributions of sustainable supply chain management practices on the sustainable performance of food processing firms within the Tema, Kumasi and Accra metropolises of Ghana. However, the study was limited in geographical scope; thus, further studies could address this limitation by including food processing firms across the country. This would help enrich the current data and in turn, promote generalisation of findings

across all food processing firms in Ghana. Also, this study relied on the quantitative approach; thus, future researchers could adopt the mixed approach in a bid to obtain both qualitative and quantitative outcomes. Finally, researchers could also improve current literature by focusing on other classes of manufacturing enterprises including paper and plastic processors, metal smelters, sachet water producers, among others, across the country or other developing economies. These suggestions would help expand existing literature on SSCM practices and sustainable performance; thereby, strengthening policies.

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APPENDIX

University of Cape Coast

School of Business

Department of Marketing and Supply Chain Management

Dear Sir/Madam,

I am carrying out my thesis work on the topic ***"Sustainable supply chain management practices and sustainable performance of food processing firms in Ghana***". Your views are very much important to the study. Every information you provide would remain highly confidential. Thanks for accepting to participate in the study.

Kindly tick in the box

PART A: SUSTAINABLE PROCUREMENT PRACTICES

7.On a scale of 1 – 5, please rate the extent to which you agree with each statement. **With 1 – Least agreement and 5 – Highest Agreement**

No.	Factors	1	2	3	4	5
Lean management						
1	The firm ensures total productive maintenance during production					
2	I feel satisfied and willing to work					
3	We use appropriate raw materials during production					
4	We have a comprehensive approach to minimizing waste during and after production					
5	The firm emphasizes continuous flow of production					
6	The firm actively involves employees during decision making					
Green management						
1	The firm purchases only raw materials which are environmentally friendly					
2	We emphasize environmentally friendly products during its product design stage					

3	We ensure decreased consumption of harmful/toxic materials during production					
4	The firm constantly observes decreased liquid and solid waste generations in its production processes					
5	I am able to balance my work with personal issues					
6	The firm deals with suppliers who provide sustainable materials					
Inventory management						
1	We maintain optimum inventory levels at all times					
2	The firm ensures short lead times					
3	We ensure that only green inventory (raw materials) with eco-friendly designs are used in production					
4	The firm puts in necessary efforts to minimize inventory wastages arising from expiries and contaminations					
5	My job stress level has reduced in recent times					
6	The firm has clearly defined approaches and strategies to managing its inventories					
Supply management						
1	We emphasize on supplier development to achieve our established standards					
2	The firm has outmost trust in its suppliers in the supplier base					
3	I feel motivated to work					
4	The firm involves its suppliers throughout its product life cycle stages					
5	The firm ensures an optimal supplier base					
6	The firm adopts a strategic approach during purchasing					

PART B: SUSTAINABLE PERFORMANCE

On a scale of 1 – 5, please rate the extent to which you agree with each statement.
With 1 – Least agreement and 5 – Highest Agreement

Statement		**1**	**2**	**3**	**4**	**5**
Environmental Performance						
We have projects to improve/recover the environment						
The firm uses recyclable materials during production						
We reuse our production residuals						
We feel energized at work						
The firm monitors the volume of energy consumption						
The firm has low level of energy intensity						
Social Performance						
We employ more people from minority groups						
The firm has a number of social and cultural projects						
The firm engages the people before carrying out some health-related projects						
I am highly committed and ready to put in my all to achieve expected firm targets						
The firm meets the regulatory agencies requirements						
The firm works to reduce vulnerability in our community						
Economic Performance						
We experience increase in economic value						
Our return on equity has improved overtime						
The firm's net income has been increasing steadily						
We have adequate information to complete our work roles						
The firm is experiencing positive changes in market value						
The firm is experiencing increasing value addition						

PART C: FIRM SIZE

On a scale of 1 – 5, please indicate your level of agreement to each of the following statements. **With 1 – Least Agreement and 5 – Highest Agreement**

	FIRM SIZE	1	2	3	4	5
1	The firm's management has the required experience to ensure sustainable business processes					
2	The firm has the needed resources to handle its sustainability issues					
3.	I pay more attention to my income when preparing towards retirement					
4	The firm has adequate policies to manage sustainability-related issues					
5	The firm has sufficient number of employees to handle issues related to sustainable practices					
6	The firm's total assets are enough to ensure better implementation of sustainable practices					

PARTD: SOCIO-DEMOGRAPHIC INFORMATION

Sex: Male [ ] Female [ ]

Age: 18- 30 years [ ] 31-40 years [ ] 41-50 years [ ]
over 50 years [ ]

Level of education

No formal education [ ] High School/ Diploma [ ] Degree [ ]

Current job position:

Owner [ ] Manager [ ] Owner/Manager [ ]

Number of years working with the firm

< 5 years [ ] 5-10 years [ ] 11-15 years [ ]
16-20 years [ ] Over 20 years [ ]

Kindly indicate the age of the firm

< 10 years [ ]10-20 years [ ] 21-30 years [ ] > 30 years [ ]

What is your firm's total value of assets (GHS)?

< 10,000 [ ] 10,000-50,000 [ ] 50,001-100,000[ ] > 100,000 [ ]