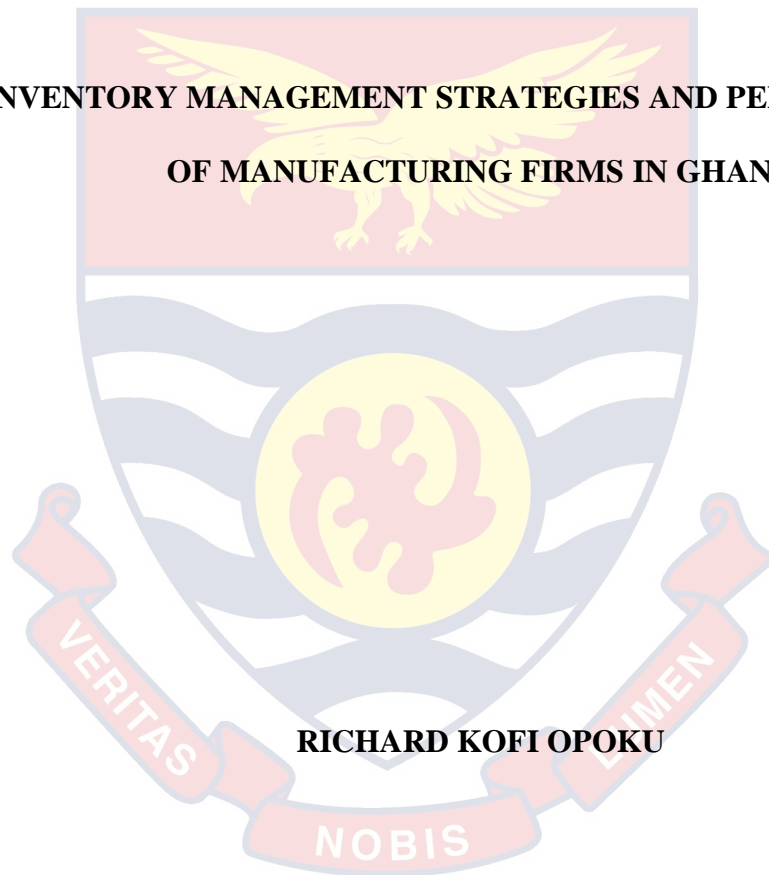


UNIVERSITY OF CAPE COAST

**INVENTORY MANAGEMENT STRATEGIES AND PERFORMANCE
OF MANUFACTURING FIRMS IN GHANA**



RICHARD KOFI OPOKU

2019

UNIVERSITY OF CAPE COAST

INVENTORY MANAGEMENT STRATEGIES AND PERFORMANCE OF
MANUFACTURING FIRMS IN GHANA

BY

RICHARD KOFI OPOKU

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.

SEPTEMBER 2019

DECLARATION

Candidate's Declaration

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

Candidate's Signature..... Date.....

Name: Richard Kofi Opoku

Supervisor's Declaration

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

Principal Supervisor's Signature..... Date.....

Name: Dr. Edmond Yeboah Nyamah

Co-Supervisor's Signature..... Date.....

Name: Mrs. Adwoa Yeboaa Owusu Yeboah

ABSTRACT

Inventory accounts for about 70% of Food and Beverage and Pharmaceutical firms most valuable current assets. Thus, adopting inappropriate strategies to managing inventory could have severe repercussions on the firms' performance levels. The study purposely examined the effect of different inventory management strategies on the operational performance of Food and Beverage and Pharmaceutical firms within the Accra, Tema, Kumasi and Sekondi-Takoradi metropolises in Ghana. More precisely, the study examined how Activity Based Costing, Economic Order Quantity, Just-In-Time, Strategic Supplier Partnership and Vendor Managed Inventory affect the operational performance of the firms' studied. The study was underpinned by the theory of constraints and network theory. The study adopted the positivism philosophy, quantitative approach and explanatory design. Using the census technique, structured questionnaires were administered to the 104 members of the Association of Ghana Industries and Pharmaceutical Manufacturing Association of Ghana. Out of this, a reliable data set of 85 respondents was processed using the IBM SPSS Statistics version 24 and SmartPLS 3 software. Using the Partial Least Square-Structural Equation Modelling, the study found inventory strategies including Activity Based Costing, Economic Order Quantity, Strategic Supplier Partnership and Vendor Managed Inventory to significantly improve operational performance, while Just-In-Time was found to have no significant relationship with operational performance. The study recommended that the Food and Beverage and Pharmaceutical manufacturing firms should pay more attention to Activity Based Costing strategy during inventory management because it was found to majorly improve the firms' operational performances.

KEY WORDS

Activity Based Costing

Economic Order Quantity

Just-In-Time

Vendor Managed Inventory

Strategic Supplier Partnership

Operational Performance

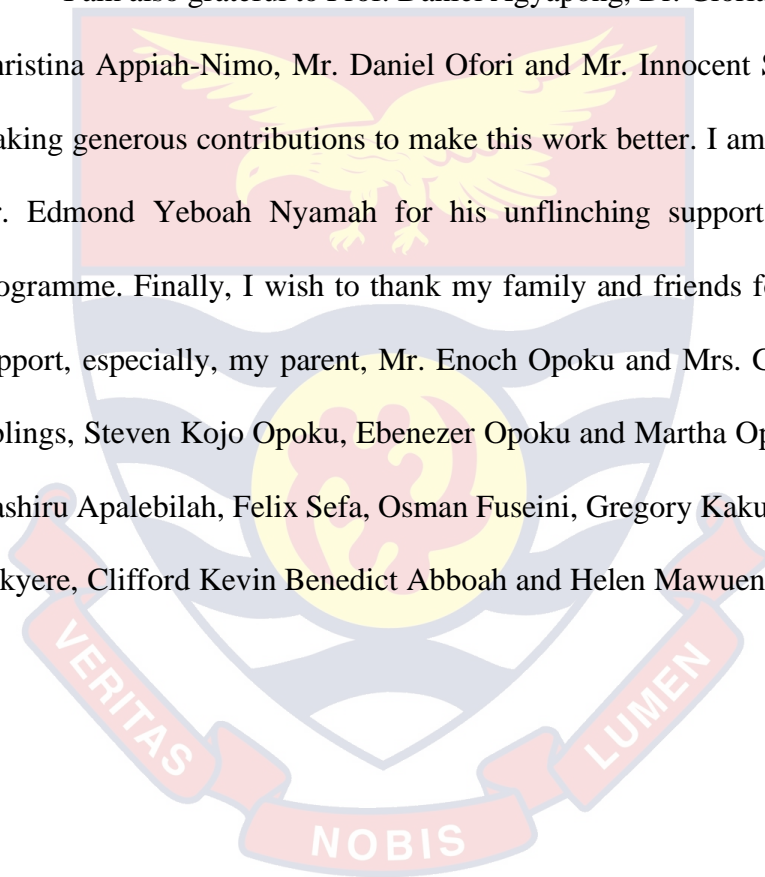
Food and Beverage and Pharmaceutical firms



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DEDICATION

To my family.



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ACRONYMS

IMS	Inventory Management Strategies
ABC	Activity Based Costing
EOQ	Economic Order Quantity
JIT	Just-In-Time
SSP	Strategic Supplier Partnership
VMI	Vendor Managed Inventory
OP	Operational Performance
GDP	Gross Domestic Product
AGI	Association of Ghana Industries
FDA	Food and Drugs Authority



CHAPTER ONE

INTRODUCTION

The Ghanaian manufacturing sector's contribution to economic growth through Gross Domestic Product (GDP) and job creation has stagnated for decades. Thus, the economy stands a risk of losing its industrial base if the sector's poor performances persist. Arguably, the sector's woeful performance could be attributed to poor inventory management. Inventory accounts for about 70% of manufacturing firms including Food and Beverage and Pharmaceutical firms most valuable current assets. The theory of constraints suggests that firms should adopt relevant strategies including Activity Based Costing, Economic Order Quantity among others in order to address their inventory constraints. However, the extent to which these different strategies improve firms' operational performances remain unclear. This study, therefore, examined the effect of different inventory management strategies on the operational performance of the Food and Beverage and Pharmaceutical firms in Ghana. The chapter specifically discussed the background to the study, statement of the problem, purpose, research objectives, hypotheses, significance, limitations, delimitations, definition of key terms as well as organisation of the study.

Background to the Study

The increasingly competitive nature of manufacturing industries championed by globalisation, technological advancements and demand fluctuations have highlighted the need for efficient inventory management (Talha, 2002; Nakano, 2009; Singh & Sharma, 2009; John, Etim & Ime, 2015). Inventory management has become a vital operational weapon for firms that

intend to survive competitive pressures in their manufacturing industries (Filberk & Krueger, 2005; Koumanakos, 2008; Kontuš, 2014). Inventory (either raw materials, semi-finished and or finished products) is key to manufacturing firms' survival as it constitutes about 70% of their current assets (Filberk & Krueger, 2005; Koumanakos, 2008). As such, failure to properly manage inventory could have severe consequences on firms' operational and financial performances (Bertolini & Rizzi, 2002; Panigrahi & Kumar, 2013).

Poorly managed inventory creates huge gaps in internal controls which could lead to financial risks: theft and fraud schemes (Rajeev, 2008; Weiss, 2014; Zakaria, Nawawi & Salin, 2016). It could also expose firms to production and delivery delays, countless faulty products and unnecessary product shortages (Chase, Jacobs & Aquilano, 2004; Koumanskos, 2008; Rajeev, 2008). Hence, the goal of inventory management is to strengthen internal controls to ensure optimal and quality inventory while providing value to customers (Brigham & Ehrhardt, 2005; Sitienei & Memba, 2015). Proper inventory management strikes a balance between too little and too much inventory (Elsayed & Wahba, 2013; Sitienei & Memba, 2015). Inventory below or above optimal levels could affect a firm's productivity by increasing production costs.

The theory of constraints suggests that manufacturing firms could be exposed to inventory constraints arising from thefts, expiries, shortages and long lead times which could obstruct their entire systems (Goldratt, 1990; Gupta & Boyd, 2008). Such firms can only overcome inventory constraints and improve performance by adapting to appropriate inventory management strategies (Flynn, Huo & Zhao, 1999; Chen & Paulraj, 2004; Stevenson, 2005). These strategies enable firms to monitor stock levels, forecast future demands and

make proper replenishment plans (Gooze & Harms, 2006). Research has revealed common inventory management strategies to include Activity Based Costing, Economic Order Quantity, Just-In-Time, Vendor Managed Inventory and Strategic Supplier Partnership (Christopher & Juttner, 2000; Timenes-Laugen, Acur, Boer & Frick, 2005; Al-Shbul, Garza-Reyes & Kumar, 2018).

Related studies have found inventory management strategies to relate with firm performance (Christopher & Juttner, 2000; Timenes-Laugen *et al.*, 2005; Mwangi & Nyambura, 2015). According to Telsang (2010), Activity Based Costing (ABC) strategy enables firms to categorise inventory items in order of importance to give room for proper monitoring and control. Economic Order Quantity strategy also enables firms to optimise their inventory at the least possible cost within a specified period (Heikkila, 2002; Lee, 2002). The network theory positions Just-In-Time (JIT), Strategic Supplier Partnership (SSP) and Vendor Managed Inventory (VMI) strategies among the common strategies (Freeman, 2004; Salancik, 2005). The theory stresses that establishing strong and long-term relationships with key actors including suppliers help focal firms to share risks and access valuable resources to enhance performance levels.

According to Slack, Chambers and Johnston (2007), firms that aim at producing goods to meet customer needs at the lowest possible costs give much emphasise to operational performance. Operational performance consists of strategic goals that firms need to achieve by relying on relevant resources and strategies (Slack *et al.*, 2007). These strategies could include inventory management strategies aimed at meeting critical factors such as product quality, operational speed, dependability, flexibility and production costs. These factors are strategically significant to determining organisations performance levels

(Slack *et al.*, 2007; Abdel-Maksoud, Asada & Nakagawa, 2008), thus the need for manufacturing firms especially Food and Beverage and Pharmaceutical firms to pay much attention to them.

Arguably, Food and Beverage and Pharmaceutical firms hold the most delicate inventory type in terms of the perishability nature of either raw materials, semi-finished and or finished products (Taylor, 2017; Chloe, Collart, Interis & Maples, 2018; Khan & Siddiqui, 2018). Given the relatively shorter shelf life and ease of contamination of their inventory, Food and Beverage and Pharmaceutical firms, in both developed and developing countries, are predominantly exposed to high product expiries and shortages (Hariga, 1997; Alfares, Khursheed & Noman, 2005; Khan & Siddiqui, 2018) as compared to other firms such as automobile and plastics/rubber firms. As a result, the inventories kept by such classes of require proper inventory strategies to protect them from bacterial contaminants and lead poisons to minimise production cost.

More precisely, the average shelf life of inventory kept by the Food and Beverage and Pharmaceutical firms in developing economies including Ghana ranges from 3 months to 2 years when kept under strict conditions amid adhering to health and safety standards (Taylor, 2017; Food and Drugs Authority (FDA), 2017). Clearly, improperly managed inventories are highly likely to go waste; increasing production costs. The Food and Drugs Authority has been established to regulate the activities of these firms to protect consumers (FDA, 2018). Arguably, this goal can only be achieved if firms adopt relevant inventory management strategies. However, the extent to which these strategies influence the performance of such Ghanaian firms remain scanty. The study, therefore,

examines inventory management strategies and operational performance of food and beverage manufacturing firms in Ghana.

Statement of the Problem

The sub-Saharan Africa's (SSA) manufacturing sector averagely grows at the fastest rate of 3.5% but woefully contributes just under 10% to Gross Domestic Product (GDP) and job creation respectively (KPMG, 2015; Balchin *et al.*, 2017). Comparatively, other growing economies such as Mexico, Brazil, Taiwan and India with lower average growth rates of 0.6%-3.2% contribute about 15%-35% and 30%-45% to GDP and job creation respectively (KPMG, 2016; Trading Economics, 2018). In Ghana, for instance, the manufacturing sector averagely contributes a meagre 5.5% and 8.2% to GDP and job creation respectively as compared to 47.4% and 45.24% by the services sector (World Bank, 2017; Trading Economics, 2018); indications of a stagnated and dying sector.

The shrinking of Ghana's manufacturing sector could be attributed to poor inventory management (Adu-Fosu, 2016; Bawa *et al.*, 2018; Jondhale & Khairnar, 2018). Inventory constitutes about 70% of manufacturing firms' most valuable assets (Filberk & Krueger, 2005; Koumanakos, 2008) thus improper management could have severe repercussions on their performance levels. Arguably, the Food and Beverage and Pharmaceutical firms hold the most delicate inventory type due to its perishability nature. However, none of the existing studies has revealed the specific types of inventory management strategies these categories of firms could rely on to improve their performance levels. This has misled firms into adopting irrelevant inventory management

strategies exposing them to high inventory wastages, unnecessary shortages and production delays (Bertolini & Rizzi, 2002; Koumanakos, 2008; Pillai, 2014).

Food and Beverage and Pharmaceutical firms could also be exposed to product quality issues, longer lead times and high production costs (Bertolini & Rizzi, 2002; Koumanakos, 2008; Mazanai, 2012); situations which could have rippling effects on their operational performances (Qrunfleh & Tarafdar, 2013; Efiok *et al.*, 2015; Sitienei & Memba, 2016). Evidences of the consequences of adopting irrelevant inventory management strategies have been witnessed in Ghana's manufacturing sector, more precisely among Food and Beverage and Pharmaceutical firms. In 2006, for instance, Eurofood (Gh) Limited lost over US\$ 10 million as results of poor inventory management which led to the production of biscuits with expired and maggot-infested flour (Association of Ghana Industries (AGI), 2008). The Coca Cola Ghana report (2018) revealed a loss of over GHS 1.7 million through inventory errors in 2018.

Similarly, a number of Ghana's leading pharmaceutical firms have witnessed the consequences of inventory errors (Food and Drugs Authority (FDA), 2018). Kinapharma Ltd lost over GHS 1.2 million in 2018 as a result of inventory issues in its Primadol 500mg and Paracetamol 500mg products (FDA, 2018). Also, Poku Pharma Ltd, Pharmanova Ltd and New Global Pharmaceuticals had a number of their products recalled by the FDA in the same year (FDA, 2018) due to inventory issues. Other notable firms such as Unicom Chemists Ltd, Dependable Pharmacy Ltd, Kenoga Company Ltd and Phyto-Riker (Ghana) Pharmaceuticals Ltd also faced similar product recalls due to inventory errors. Arguably, these consequences have severe rippling effect on the sector's overall performance levels. In 2017, for instance, the firms studied

contributed less than 30% to the sector's overall income; a decline from 34.7% and 36.2% in 2017 and 2016 respectively (AGI, 2018).

The Food and Beverage and Pharmaceutical firms would continue to underperform in the face of irrelevant inventory management strategies (Kuk, 2004; Panigrahi, 2013). Although inventory errors associated with Food and Beverage and Pharmaceutical products could negatively influence firm performance and invariably affect end-consumers' health, studies on inventory management strategies and firm performance in most developing economies including Ghana seem scanty. This is because, existing studies (Kuk, 2004; Szejczewski, Lemke & Goffin, 2005; Panigrahi, 2013; Munyao, Omulo, Mwithiga & Chepkulei, 2015; Efiok *et al.*, 2015; Mwangi & Nyambura, 2015; Al-Shboul *et al.*, 2017) have focused on the composite of firms within the manufacturing sector other than focusing on some classes of manufacturing firms including Food and Beverage and Pharmaceutical firms.

Also, previous studies have adopted weak analytical tools including correlation and regression in data analysis, thus, affecting their major findings, conclusions and recommendations (Panigrahi, 2013; Munyao, Omulo, Mwithiga & Chepkulei, 2015; Mwangi & Nyambura, 2015). In Ghana, Adu-Fosu (2016) and Bawa *et al.* (2018) identified commonly used inventory management strategies to include ABC, EOQ, JIT, SSP and VMI respectively. However, none of such studies have examined the extent to which these different strategies affect the operational performance of the Food and Beverage and Pharmaceutical firms in Ghana. The study addresses this gap by examining the effect of inventory management strategies on the operational performance of the Food and Beverage and Pharmaceutical manufacturing firms in Ghana.

Purpose of the Study

The purpose of the study was to examine the effect of inventory management strategies on the operational performance of Food and Beverage and Pharmaceutical manufacturing firms in some selected metropolises in Ghana. The following specific objectives were developed to:

1. examine the effect of Activity Based Costing strategy on operational performance of Food and Beverage and Pharmaceutical manufacturing firms in some selected metropolises in Ghana;
2. examine the effect of Economic Order Quantity strategy on operational performance of Food and Beverage and Pharmaceutical manufacturing firms in some selected metropolises in Ghana;
3. examine the effect of Just-In-Time strategy on operational performance of Food and Beverage and Pharmaceutical manufacturing firms in some selected metropolises in Ghana;
4. examine the effect of Strategic Supplier Partnership strategy on operational performance of Food and Beverage and Pharmaceutical manufacturing firms in some selected metropolises in Ghana
5. examine the effect of Vendor Managed Inventory strategy on operational performance of Food and Beverage and Pharmaceutical manufacturing firms in some selected metropolises in Ghana

Research Hypotheses

The study tested the following research hypotheses:

H₁: Activity Based Costing strategy significantly improves operational performance of the food and beverage pharmaceutical manufacturing firms in some selected metropolises in Ghana

H₂: Economic Order Quantity strategy significantly improves operational performance of the Food and Beverage and Pharmaceutical manufacturing firms in some selected metropolises in Ghana

H₃: Just-In-Time strategy significantly improves operational performance of the Food and Beverage and Pharmaceutical manufacturing firms in some selected metropolises in Ghana

H₄: Strategic Supplier Partnership strategy significantly improves operational performance of the Food and Beverage and Pharmaceutical manufacturing firms in some selected metropolises in Ghana

H₅: Vendor Managed Inventory strategy significantly improves operational performance of the Food and Beverage and Pharmaceutical manufacturing firms in some selected metropolises in Ghana

Significance of the Study

The outcome of this study would inform policies as it provides new insights into the phenomenon of inventory management strategies and operational performance of Ghanaian Food and Beverage and Pharmaceutical manufacturing firms. This is because, the study's outcome would expose these classes of firms to the specific inventory strategies which directly influence their operational performance levels. This would help management of such firms to implement relevant inventory management policies aimed at improving inventory management and invariably operational performance levels. Also, the study's outcome would inform the practices of the firms studied in terms of identifying and adopting appropriate inventory strategies that would directly improve their operational performance levels in areas of product quality, operational flexibility, speed, dependability and production costs.

Also, the study's outcome would contribute to current literature in the area of theoretical implications. This is because, the study would extend existing knowledge within the limits of critically bounding assumptions in terms of inventory management strategies and operational performance so far as the theory of constraints and network theory are concerned. In terms of theory of constraints, for instance, the study would justify the need for the firms studied to adopt specific strategies to addressing inventory constraints. On the other hand, the study's outcome would justify the need for such firms to develop strategic relationships with key actors during inventory management as suggested by the network theory. The study's findings would also help potential researchers identify appropriate theories to adopt when conducting studies in areas of inventory management and firm performance.

Finally, the study's outcome would expose researchers to the appropriate methodology to adopt when addressing issues related to inventory management strategies and firm performance. Specifically, the study would provide potential researchers with the necessary information to help them choose the appropriate research philosophy, approach and design that best fit their research needs. It would also expose researchers to the need to adopt more rigorous analytical tools especially structural equation modelling when examining inventory management strategies and firm performance. The study's outcome would also add to existing literature in the area of inventory management strategies to help address some existing gaps.

Delimitations

The study was conducted within the scope of examining inventory management strategies and operational performance of food and beverages and

pharmaceutical manufacturing firms registered with the Association of Ghana Industries (AGI) (2017) and the Pharmaceutical Manufacturing Association of Ghana (PMAG) (2018) respectively. The study was delimited to firms within the Accra, Kumasi, Tema and Sekondi-Takoradi metropolises in Ghana. This was due to the high concentration of such firms in these metropolises in the country. The study, therefore, excluded manufacturing firms in these two categories which are located outside the four major metropolises in Ghana. Finally, the study excluded other categories of firms such as timber/wood processors and plastics/rubber producers due to their heterogenous activities.

Limitations

The study was confined to the target population of Food and Beverage and Pharmaceutical manufacturing firms within four selected metropolises comprising Accra, Tema, Kumasi and Sekondi-Takoradi in Ghana. More precisely, only firms registered with the AGI (i.e. for food and beverage firms) and the Pharmaceutical Manufacturing Association of Ghana (PMAG) (i.e. for pharmaceutical firms) within the four selected metropolises were included in the study. As such, the study limits its findings, conclusions and recommendations mainly to these groups of manufacturing firms within the four major metropolises in Ghana.

Additionally, the study was limited to the views and opinions of the key respondents. As such, possible false information from any respondent could lead to misleading results. Also, the study relied on close-ended and rating scale type question items which limited the amount of information to be obtained from respondents especially in relation to the key constructs of the study. This is because, the respondents responded to only the question items in the

questionnaire with no room for further suggestions or opinions. Finally, the study's findings could be affected by the non-responses, incompletely filled questionnaires and inaccessibility of some respondents.

Definition of Terms

Inventory refers to the raw materials, components or sub-components used in a production process.

Inventory management is the planning for optimum quantities of materials at each stage of the production cycle

Inventory management strategies are the various strategies, techniques, tactics or methods used by firms to ensure that inventory is kept at levels which provide maximum service levels at minimum costs.

Operational Performance refers to the measurement of a firm's performance against prescribed standards.

Organisation of the Study

The study comprised five chapters of which, chapter one presented the background to the study, statement of the problem, purpose of the study, specific objectives, research hypotheses, significance of the study, delimitations, limitations, definition of terms as well as organisation of the study. Chapter two presented the literature review section of the study. it specifically focused on theoretical review, empirical review and conceptual framework. Chapter three focused on the research methods which covered research philosophy, approach, design, population, sampling procedure, data collection instrument, data collection procedure, and data processing and analysis. Further, chapter four presented the results and discussion section and finally, chapter five discussed

the summary, conclusions and recommendations of the study. Also, suggestions for further research were presented in this chapter.



CHAPTER TWO

LITERATURE REVIEW

Introduction

The purpose of the study was to examine the effect of inventory management strategies on the operational performance of Ghanaian Food and Beverage and Pharmaceutical manufacturing firms. The chapter presented extensive reviews of literature in relation to the study's research objectives. The chapter specifically discussed the theoretical review, empirical review and presented the conceptual framework of the study.

Theoretical review

The study was underpinned by the theory of constraints and network theory due to their relevance to the research objectives of the study. This section, therefore, discussed theory of constraints and network theory and how they explain the study's research objectives

Theory of Constraints

The theory of constraints was developed by Eliyahu Goldratt in 1984 (Goldratt, 1990). The theory assumes that every firm has at least one constraint (limiting factor) which could inhibit its entire system from achieving set goals (Watson, Blackstone & Gardiner, 2007; Gupta & Boyd, 2008). The constraint or bottleneck is noted as the weakest link in a system (Kim, Mabin & Davies, 2008). The theory categorises constraints into four key elements: physical, policy, paradigm and market (Goldratt, 2000; Şimşit, Günay, & Vayvay, 2014). Physical constraint consists of tangible items such as lack of space, frequent

machine breakdowns and raw material shortages which affect firms' performances (Oglethorpe & Heron, 2013; Şimşit *et al.*, 2014). Raw materials shortages, for instance, resulting from excessive demand or lack of substitutes may lead to difficulties in meeting customers' demands.

Also, policy constraint focuses on the imposed directives for carrying out a firm's activities (Levinson, 2007; Inman, Lair Sale & Green, 2009). It includes company procedures, government regulations and union agreements. Arguably, unfavourable directives could disrupt the orderly flow of business activities (Oglethorpe & Heron, 2013). The paradigm constraint contains deep-seated habits and beliefs of a firm which could affect its performance (Oglethorpe & Heron, 2013). Finally, the market constraint occurs as a result of unfavourable market conditions including poor sales growth, reduced market share, fluctuating customer demands, among others (Inman *et al.*, 2009). This could lead to high storage costs, cash trapping and expiry of inventories.

The theory assumes that overcoming any constraint requires continuous systems improvement through implementation of appropriate strategies, policies and total quality management (Goldratt, 2000; Gupta & Boyd, 2008). The theory provides a systematic, clear and sustained focus on addressing any constraint until it is no longer a limiting factor (Gupta & Boyd, 2008). Further, it assumes that individuals, groups or firms can only overcome any constraint by adopting appropriate strategies (Stevenson, 2013). The theory, therefore, suggests that firms become effective when they eliminate any constraint while increasing value addition without disrupting production flow (Şimşit *et al.*, 2014; Trojanowska, Kolinski, Varela & Machado, 2017).

In relation to the study, the theory of constraints assumes that Food and Beverage and Pharmaceutical firms could be exposed to inventory constraints (bottlenecks). These inventory constraints could have severe impacts on firms' operating systems and overall performances if improperly managed. Inventory constitutes about 70% of firms' total assets thus failure to manage its constraints could have severe repercussions on firms' performances (Chase *et al.*, 2004; Torjanowska *et al.*, 2017). Inventory constraints could arise from large number of unfulfilled orders, wrong material ordering, storage issues and unstable power outages (Kamau & Kagir, 2015; Atnafu & Balda, 2018). The theory, therefore, proposes that firms can only overcome the capacity (impact) of any inventory constraint by implementing relevant strategies including ABC, EOQ, JIT, SSP and VMI (Deveshwar & Modi, 2013; Jondhale & Khairnar, 2018).

Network theory

The network theory was propounded by Jacob Mereno in 1930 to study interpersonal relationships (Salancik, 2005; Borgatti, Mehra, Brass & Labiana, 2009). The theory was later formalised to become pervasive in behavioural and social sciences (Bellamy & Basole, 2013). The network theory has been used extensively to study the structure of relationships between people, groups, teams and even organisations (Nagurney, Cruz, Dong & Zhang, 2005; Salancik, 2005; Bellamy & Basole, 2013). The theory basically describes the cooperation of firms with other actors notably suppliers and customers within their supply chains. It emphasises that relationships among key partners should be built on openness and trust through information sharing and relatively long-term agreements in order to obtain the best possible outcomes (win-win situation).

According to Freeman (2004), the network theory contributes immensely to understanding the dynamics of inter-organisational relationships by stressing on the significance of togetherness between parties through mutual adaptations of systems, strategies, processes and routines during the exchange processes. The theory further posits that partners can build strong relationships through effective communication, long-term mutual commitments, dynamism, development of relations and exchange of valuable resources owned by them (Scott, 2011). It also assumes that establishing close and long-term relationships enable parties to protect contractual agreements, minimise production costs, access vast resources, gain competitive advantages in order to enhance performance levels and remain highly competitive (Chang, Chiang & Pai, 2012).

The relevance of the theory to the study is that, firm performances do not only depend on how efficient their resources are, but also on how they effectively cooperate with other partners in their supply chains (Chang *et al.*, 2012). Establishing mutual relationships with partners, for instance, help focal firms to share responsibilities and risk, access valuable resources, build trust and commitment in order to improve upon existing performance levels. Focal firms including the Food and Beverage and Pharmaceutical manufacturing firms in Ghana can establish strong mutual relationships to effectively manage key assets especially inventory. Thus, to properly manage inventory, these firms can adopt strategies such as Vendor Managed Inventory, Just-In-Time and Strategic Supplier Partnerships. These strategies emphasise on building strong relationships highlighting the relevance of the network theory.

Concept of Inventory Management

This section discussed the concept of inventory management as per existing studies. Inventory is an indispensable asset to manufacturing firms (Koumanakos, 2008; Gupta, Garg & Tewari, 2012). It is basically kept as a safety stock to meet demand uncertainties, minimise lead times, enhance product quality, improve flexibility, dependability and production speed while minimising operating costs (Gupta *et al.*, 2012; Ogbo & Ukpere, 2014; Takim, 2014). However, poorly managed inventory could lead to obsolescence, pilferage, theft, damage and high costs (Gupta *et al.*, 2012; Panigrahi, 2013). Inventory constraints could also expose firms to high risks arising from excessive unfulfilled orders and frequent business interruptions through unnecessary stock outs (Deveshwar & Dhawal, 2013); the need for inventory management (Takim, 2014; Masudin, Kamara, Zulfikarijah & Dewi, 2018)

Inventory management has received tremendous recognition over the years due to the significant contributions of inventory to manufacturing industries across the globe (Deveshwar & Modi, 2013; Mogere, Oloko & Okib, 2013; Munyao *et al.*, 2015). Scholars have provided different definitions for inventory management and for instance, Deveshwar and Modi (2013) defined it as the maintenance of effective internal controls over inventory in order to protect it from theft, misuse or damage. Wanke (2014) defined inventory management as planning for optimum quantities of materials at each stage of the production cycle. Inventory management requires the use of methods, processes and strategies to ensure optimal inventory, proper storage in order to promote efficient production at lowest inventory costs (Adeyemi & Salami, 2010; Farzaneh, 2012; Jondhale & Khairnar, 2018).

Inventory management is primarily concerned with protecting a firm's production against random risks and disturbances associated with stock to ensure uninterrupted supplies for on-going operations (Chalotra, 2013; Takim, 2014; Chan *et al.*, 2017). It draws fine lines among replenishment lead time, physical inventory, asset management, inventory valuation, quality management, demand forecasting and inventory visibility (Obura, 2015; Agu, Ozioma & Nnate, 2016). These definitions clearly indicate that inventory management can never be achieved in isolation but rather through the adoption of various strategies, methods and/or practices (Lwiki, Ojera, Mugenda & Wachira, 2013; Dimitrios, 2014; Agu, Obi-Anike & Nnate, 2016; Agu *et al.*, 2016). The next section reviews inventory management strategies of manufacturing firms based on existing literature.

Inventory Management Strategies

This section discussed inventory management strategies in line with existing studies. Inventory management strategies refer to the various strategies, techniques, tactics or methods used by firms to ensure optimum inventory levels at the most competitive costs (Kontuš, 2014; Mukopi & Iravo, 2015; Muhayimana, 2015). It is primarily concerned with balancing demand and supply by controlling and monitoring manufacturing and purchasing orders to ensure uninterrupted material flow and value-adding activities (Mogere *et al.*, 2013; Kamau & Kagiri, 2015; Onyango, 2017). Inventory strategies ensure that manufacturing firms are able to effectively and efficiently manage their inventories (Otchere, Adzimah & Aikens, 2016; Amachree, Apkan, Ubani, Okorochoa & Eberendu, 2017). Thus, the absence of relevant inventory strategies could have severe repercussions on manufacturing firms' production capacities.

Existing studies have revealed common inventory management strategies to include Just-In-Time (JIT), Vendor Managed Inventory (VMI), Economic Order Quantity (EOQ), Activity Based Costing (ABC) and Strategic Supplier Partnerships (SSP) (Chu, Liang & Liao, 2008; Irungu & Wanjau, 2011; Kontuš, 2014; Hussain, Hussain, Akbar, Sulehri & Maqbool, 2014). These strategies have been found to significantly influence the performances of manufacturing firms. However, the extent to which these notable strategies influence the operational performances of Food and Beverage and Pharmaceutical firms in developing countries including Ghana appears scanty. This study, therefore, examines the effect of these common inventory strategies on the operational performance of these categories of firms.

Concept of Operational Performance

Manufacturing firms that aim at producing goods to meet customer needs at the lowest possible costs give much emphasise to operational performance (Slack, 2005; Stevenson & Spring, 2007). Operational performance consists of strategic goals that firms need to achieve by deploying relevant resources and strategies (Slack, 2005). Typically, operational performance dimensions are geared toward meeting customer requirements by measuring a firm's performance and its competitiveness using non-financial elements (Slack, 2005; Abdel-Maksoud & Asada, 2008). It, therefore, primarily consists of critical factors such as product quality, operational speed, dependability, flexibility and production costs which are strategically significant to determining organisations overall performance levels (Slack, 2005; Slack, Chambers & Johnston, 2007; Abdel-Maksoud & Asada, 2008; Hwang, Han, Jun & Park, 2014).

Control Variable

Control variable is a variable which is held constant in order not to affect a study's outcomes, conclusions and generalisations (Shah & Ward, 2003, 2007; Swink & Song, 2007). More precisely, the study controlled for firm size which could account for differences in operational performance measures (Swink & Song, 2007; Antonio, Yam & Tang, 2007). Firm size is the extent of expected growth based on the concept of economies of scale (Kartikasari & Merianti, 2016). Niresh and Thirunavukkarasu (2014) noted that, large firms are more likely to perform better than small firms because they can easily access more resources to adjust to changes in current competitive and dynamic market. Firm size was, therefore, controlled for in order not to influence the study's findings and aid generalisations to all Food and Beverage and Pharmaceutical firms in Ghana regardless of the firms' size.

Empirical review

This section presented extensive reviews of related literature on the study's research objectives. This was carried out in a bid to critique existing studies by comparing and contrasting their respective findings.

Activity Based Costing (ABC) Strategy and firm performance

Activity Based Costing (ABC) is an inventory strategy that deals with the classification of inventory on the basis of time, monetary value and annual usage (Telsang, 2010). According to Telsang (2010), the strategy divides a firm's inventory into 3 classes (A, B and C) to enable managers concentrate on items that account for the most inventory. Studies have revealed that each class has unique features (Telsang, 2010; Amachree *et al.*, 2017). The A items (most

valuable), for instance, contain only 20% of inventory but, accounts for about 70% of monetary value. The B items (second most valuable), contain 30% of inventory and account for about 20% of the monetary value. Finally, C items contain about 50% of inventory and account for only 10% of the monetary value. This categorisation ensures that the right attention and control are given to items based on their significance to the firm (Bakker, Riezebos & Teunter, 2012).

Activity Based Costing (ABC) has been found to relate with manufacturing firms' performance as it allows for the establishment of relevant policies and controls for each class of inventory (Krumwiede, Sheu, & Lavelle, 1998; Bescos, Cauvin, Gosselin, 2002; Chenhall, 2003; Baird, Harrison, Reeve, 2004; Chongruksut, & Brooks, 2005). For instance, A items can be given close, strict and tighter inventory controls such as increased security and procuring in lower quantities than the B and C items (Liw & Pan, 2007). This in turn leads to improved operational performances through better forecasting and supplier reliability. Krumwiede and Charles (2014) added that, ABC strategy also ensures proper utilisation of resources and physical control over inventory.

Earlier studies conducted among U.S. manufacturing firms by McGowan and Klammer (1997), Krumwiede (1998) and Innes Mitchell and Sinclair (2000) showed that the ABC strategy is positively associated with reducing production costs while improving product quality. However, Kennedy and Affleck-Graves's (2001) study on UK firms indicated that the ABC implementation has no significant impact on firm value in terms of asset utilisation and better cost controls. Their finding was supported by Cagwin and Bouwman (2002). On the other hand, Pizzini (2006) found the ABC strategy to increase firms' profitability and competitiveness. Banker, Bardhan and Chen (2008) did an

empirical study on 1250 U.S. companies and found the ABC strategy to indirectly affect industrial performance.

Byrne, Stower and Torry (2009) and Tse and Gong (2009) confirmed that the use of the ABC strategy results in a better overall performance for enterprises that have adopted it in Australia. Maelah and Ibrahim (2006) empirical results from manufacturing firms in Malaysia demonstrated a significant positive correlation between ABC implementation and firm performance (financial and non-financial) improvement. Another study by Elhamma and Fei (2013) among Moroccan enterprises found ABC strategy to result in better performances for firms that have implemented it. Krumwiede and Charles (2014) found a positive impact on financial performance when ABC is implemented by firms that prioritise customer service and profitability.

A descriptive study by Elhamma (2015) on enterprises in Morocco found that, a unit increase in ABC leads to an increase in operational performance by 0.11. Similarly, Pokorná (2016) found a statistically positive significant effect of ABC strategy on both financial and non-financial performances of manufacturing enterprises in Czech Republic. Contrastingly, a study on listed manufacturing firms in Jordan by Al-Qudah and Al-Hroot (2017) found little evidence suggesting that ABC strategy improves firms' profitability ratio by 47.22% while decreasing profitability ratios by 52.78%. They concluded that, there is no significant improvement in the profitability ratios of Jordanian firms that implement ABC.

Zhang, Namazi and Isa's (2017) study on 106 Chinese firms using SEM technique found the use of ABC to significantly improves quality while minimising production costs. Using correlation analysis, Albalaki, Abdullah and

Kamardin (2018) found ABC implementation and performance of Malaysian firms to be positively correlated. The study concluded that firms which aim at improving ABC implementation have a better chance of improving their performance levels in face of unhealthy competitions.

It could be deduced that, studies on ABC strategy and performance have largely been carried out on the composite of manufacturing firms with inconsistent results (Banker *et al.*, 2008; Krumwiede & Charles, 2014; Pokorná, 2016). Thus, generalising findings to specific classes of manufacturing firms could be misleading. Also, previous studies have largely focused on financial performance (Kennedy & Affleck-Graves, 2001; Pokorná, 2016; Al-Qudah & Al-Hroot, 2017) with little attention on operational performance. However, only Zhang *et al.* (2017) have employed a rigorous analytical technique (SEM) in their study. In Ghana, few studies by Adu-Fosu (2016) and Bawa *et al.* (2018) have confirmed ABC implementation by manufacturing firms but none of them investigated the extent to which it affects operational performances. The study hypothesises that ABC strategy significantly improves operational performance of the Food and Beverage and Pharmaceutical manufacturing firms in Ghana.

Economic Order Quantity and firm performance

Economic Order Quantity (EOQ) strategy is one of the oldest and widely used strategy for determining optimal inventory levels (Lee & Rosenblatt, 1986; Lee, 2002). It is generally seen as a model, method or strategy to identify the most appropriate quantity to order at least expenses (Heikkila, 2002; Lee, 2002). EOQ assumes that, within a given period, lead time and items demanded are known and constant, holding or storage cost for each unit is held while the receipt of an order occurs immediately (Heikkila, 2002; Lee, 2002; Wilson,

2007). The EOQ as a strategy uses carrying costs, stock-out costs and total costs to determine optimal inventory levels. This strategy focuses on the level of inventory that minimises inventory expenses through reduction in total inventory holding and ordering costs (Vörös, 2013).

Existing studies have found significant relationships between EOQ and operational performance of manufacturing firms across the globe (Anichebe & Agu, 2013; Mwangi & Nyambura, 2015; Atnafu & Balde, 2018). For instance, Anichebe and Agu (2013) did a descriptive study on inventory management and organisational performance of Bottling Companies in Enugu, Nigeria. Data were obtained from primary sources: questionnaires, interviews and observation. Analysing data using linear regression, the study found a significant positive effect of inventory management such as EOQ, MRP and ABC on organisational performance (profitability). It was concluded that, inventory management is key to the success and growth of the Bottling Companies.

A study by Mogere *et al.* (2013) confirmed the finding of Maddah and Jaber (2008) and Anichebe and Agu (2013) by examining the effect of inventory management on firm performance of Gianchore Tea Processing factory in Nyamira County, Kenya. Using the descriptive research design, the study employed multiple regression and found a positive effect of EOQ on operational performance of the manufacturing firms. It was concluded that, a unit increase in EOQ leads to a unit increase in operational performance in terms of meeting consumer demands, guaranteeing on-time delivery, ensures optimum production and improves product quality by 88 percent.

Similarly, Gitau (2016) investigated the effect of inventory management practices on productivity of 103 Parastatals including manufacturing firms in

Kenya. Using the census technique, data was obtained from all the 103 firms of which multiple regression for data analysis. EOQ was found to have a strong effect on the productivity of Parastatals in Kenya by 0.784. Atnafu and Balder (2018) examined the effect of inventory management practices on the competitiveness and performance of 188 manufacturing sub-sector in Ethiopia. The study specifically examined the effect of EOQ on firm competitiveness and organisational performance. Using the structural equation modelling (SEM) technique, the study found a significant positive effect of EOQ on firm competitiveness and organisational performance respectively.

From the foregoing, previous researches have largely focused on the composite of manufacturing firms with few of them addressing this issue within specific classes of manufacturing firms (Mogere *et al.*, 2013; Lwika *et al.*, 2013; Gitau, 2016; Atnafu & Balde, 2018). This could affect the accuracy and relevance of such results when relating them to specific classes of firms. In Ghana, for instance, Adu-Fosu (2016) and Bawa *et al.* (2018) identified EOQ as a key strategy used by manufacturing firms in managing their inventories. However, none of such studies have examined the effect of EOQ on operational performance of manufacturing firms especially Food and Beverage and Pharmaceutical firms. The study addresses this gap by hypothesising that Economic Order Quantity significantly improves operational performance of the Food and Beverage and Pharmaceutical manufacturing firms in Ghana.

Just-In-Time and firm performance

Just-In-Time (JIT) is a strategy that focuses on improving operational performances by eliminating possible wastes in a production system without compromising customer satisfaction (Eckert, 2007; Kaneko & Nojiri, 2008;

Mazanai, 2012). It emphasises on keeping only needed inventory, ensuring quality with zero defects and minimising lead times through reductions in set-up times, lot sizes and queue lengths (Abdallah & Matsui, 2007; Taj & Morosan, 2011; Danese, Romano & Bortolotti, 2012). JIT strategy also lays much emphasis on the production of items just when needed, neither earlier nor later (Singh & Singh Ahuja, 2014). The strategy works efficiently when there are clear agreements with suppliers for short cycle deliveries (Farzaneh, 2012). It thrives on quick communication among actors within a firm's supply chain coupled with having proper layout and processing plans (Farzaneh, 2012).

Previous studies have found a correlation between JIT strategy and operational performance of manufacturing firms (Eroglu & Hofer, 2011; Taj & Morosan, 2011; Farzaneh, 2012; Nawanir, Lim & Othman, 2016). A study by Eroglu and Hofer (2011), for instance, found JIT as the most preferred inventory strategy among US manufacturing firms due to its positive influence on their operational performances: speed of delivery, quality and dependability. Chavez *et al.*'s (2015) study concluded that internal lean practises improve the operational performance of 228 Irish manufacturing firms. Their assertion was supported by similar studies conducted in different economies (Danese *et al.*, 2012; Bortolotti, Danese & Romano, 2013; Ghosh 2013; Alcaraz, Macías & Cortes-Robles, 2014; Chen, 2015).

Danese *et al.*'s (2012) study, for instance, was carried out on 207 manufacturing firms operating in different countries: USA, Japan, Finland, Italy, Sweden, Australia and Germany because they contain a mix of high performing and traditional manufacturing firms. The study concluded that, JIT positively affects the operational performances of these firms in terms of efficiency and

delivery. Mazanai's (2012) study on small and medium-sized manufacturing firms in South Africa found JIT as key to improving operational performance in terms of product quality, flexibility and reduced operational costs. Kinyua (2016) also found that JIT increases the operational performance of large consumer goods manufacturing firms in Nairobi, Kenya by 16 percent. In Nigeria, studies by Takim (2014) and John *et al.* (2015) on flour mill firms support findings by Kinyua (2016).

Mukopi and Iravo's (2015) study on Sugar manufacturing companies in the Western Kenya Sugar Belt found JIT as the most dominant inventory strategy and concluded that it has a significant positive relationship with their performance levels. Also, Nawanir *et al.* (2016) concluded that, JIT as a lean practice contributes significantly to the improvement of operational performances of large manufacturing firms in Indonesia. Panwar, Nepal, Jain, Rathore and Lyons (2017) study on Indian manufacturing firms found JIT to positively influence operational performance in terms of timely deliveries, waste elimination, increased productivity while improving demand management. An empirical quantitative study by Negrao, Filho and Marodin (2017) found that JIT leads to improved operational, financial and environmental performances.

Similarly, Atnafu and Balda (2018) found JIT strategy to positively affect firm performance and competitiveness in Ethiopia. Contrastingly, other studies have recorded insignificant relationships between JIT strategy and performance of manufacturing firms (Sakakibara, Flynn, Schroeder & Morris, 1997; Snell & Dean, 1992; Flynn *et al.*, 1999; Akpan & Amade, 2017; Bawa *et al.*, 2018). A study Akpan and Amade (2017), for instance, found no significant relationship between JIT and performance of Equipment manufacturing firms in

Nigeria. In Ghana, studies by Adu-Fosu (2016) and Bawa *et al.* (2018) found JIT among the common strategies for managing manufacturing firms' inventories. However, none of these studies examined the impact of JIT on the operational performances of Ghanaian manufacturing firms.

From the forgoing, it could be deduced that a number of studies across the globe have found inconsistent relationships between JIT and operational performance of manufacturing firms (Sakakibara *et al.*, 1997; Danese *et al.*, 2012; Bortolotti *et al.*, 2013; Panwar *et al.*, 2017; Negrao *et al.*, 2017; Akpan & Amade, 2017; Atnafu & Balda, 2018). Also, most of these studies have focused on the composite of manufacturing firms (Negrao *et al.*, 2017; Atnafu & Balda, 2018; Inman *et al.*, 2018) and thus, generalising findings could be misleading. Simply put, studies focusing on Food and Beverage and Pharmaceutical manufacturing firms appear to be scanty especially in developing economies like Ghana. The study, therefore, hypothesised that JIT strategy significantly improves operational performance of the Food and Beverage and Pharmaceutical manufacturing firms in Ghana.

Strategic Supplier Partnership (SSP) and firm performance

The roles of suppliers in modern supply chains are increasing in importance (Flynn *et al.*, 1997; Van der Vaart, & van Donk, 2008; Baird *et al.*, 2011). The nature of inventory is increasingly becoming complex thus difficult for only focal firms to properly manage. Suppliers primarily provide manufacturing firms with the most valuable asset (raw materials) in their entire system. As such, creating strong ties with them through strategic supplier partnerships (SSP) is key to inventory management (Supply Chain Management Institute, 2008; Van der Vaart & van Donk, 2008). Strategically collaborating

with suppliers allow firms to acquire high-value goods even in times of supply uncertainties (Mukopi & Iravo, 2015; Appelfeller & Buchholz, 2005; Ryu, Park & Soonhong, 2007).

Previous studies have found a relationship between SSP strategy and performance of manufacturing firms worldwide (Koh *et al.*, 2007; Agus, Makhbul & Hassan, 2008; Qrunfleh & Tarafdar, 2013; Mukopi & Iravo, 2015). Bicheno (2004), for instance, revealed that SSP focuses on improving operational performance by reducing wastes and lead times while enhancing product quality and simplicity. Agus *et al.* (2008) examined the importance of SSP on product quality and business performance in Malaysian manufacturing firms using SEM. The study found that SSP exhibits a direct positive impact on product quality and business performance. A similar study by Qrunfleh and Tarafdar (2013) on the influence of SSP on lean and agile supply chain strategies in USA. Using linear regression, the study found lean supply chain strategy and supply chain responsiveness to be fully mediated by SSP strategy.

Furthermore, studies by Lwiki, Ojera, Mugend and Wachira (2013) and Mukopi and Iravo (2015) on Kenyan sugar manufacturing firms established positive relationships between SSP strategy and operational performance using the correlation analysis. Hussain, Hussain, Akbar, Sulehir and Maqbool (2014) found SSP strategy to have a weak positive significant relationship with performance of Pakistanis' consumer goods manufacturing industry. Also, Al-Abdallah *et al.*'s (2014) study examined supplier relationship management and competitive performance of manufacturing firms in USA, Japan, Italy and Korea. The study found supplier partnership to positively affect the competitive performance of these manufacturing firms. Using linear regression, Onyango,

Onyango, Kiruri and Karanja (2015) found SSP to positively influence internal operational performance of East African Breweries Ltd, Kenya.

Khan, Liang and Sumaira (2015) stressed that strategically partnering with suppliers could have a positive impact on the supply chain performance of the Chinese manufacturing industry. However, a descriptive study by Tangus, Oyugi and Rambo (2015) examined the effect of supplier development on the performance of manufacturing firms in Kisumu County, Kenya. The study found no significant relationship between supplier development and firm performance. Contrastingly, a quantitative study on pharmaceutical manufacturing firms by Khan and Siddiqui (2018) was conducted in Pakistan with focus on financial performance indicators including return on assets, return on equity, net operating profitability and profit margin. Using linear regression, the study found that SSP has a positive effect on the performance of the pharmaceutical firms in Pakistan.

In Ghana, studies by Fosu (2016) and Bawa *et al.* (2018) found SSP as a growing strategy adopted by manufacturing firms in managing their inventories. However, there is little evidence of the effect of SSP on operational performance of manufacturing firms especially among Food and Beverage and Pharmaceutical firms. Also, none of the studies within the Ghanaian context adopted rigorous statistical tools including SEM in analysing their data. This could affect the reliability and generalisation of their respective findings.

From the reviews, it could be deduced that majority of the studies on SSP strategy and firm performance have been carried out on the composite of manufacturing firms (Agus *et al.*, 2008; Al-Abdallah *et al.*, 2014; Khan *et al.*, 2015; Obura, 2015; Tangus *et al.*, 2015; Onyango *et al.*, 2015). Few studies by Lwika *et al.* (2013), Hussain *et al.* (2014), Mukopi and Iravo (2015), Obura

(2015), Onyango *et al.* (2015) concentrated on food and beverage firms while Khan and Siddiqui (2018) focused on pharmaceutical firms. However, none of these studies were found within the Food and Beverage and Pharmaceutical firms in Ghana. Using the structural equation modelling, this study hypothesises that Strategic Supplier Partnership significantly improves operational performance of Food and Beverage and Pharmaceutical firms in Ghana.

Vendor Managed Inventory and firm performance

Vendor Managed Inventory (VMI) is a strategy where major inventory replenishment decisions are centralised with suppliers (Loughram, 2008; Irungu & Wanjau, 2011). Suppliers agree to take the responsibility for making key decisions on the amount and timing of inventory replenishment on behalf of the focal firm (Kazim, 2008; Stadtler, 2015). The VMI strategy creates a centralised link between manufacturers and suppliers to provide less complex and faster transactions (Stadtler, 2015). Vendor Managed Inventory and firm performance have been popularly discussed in literature (Irungu & Wanjau, 2011; Yao, Dong & Dresner, 2012; Govindan, 2013; Dong, Dresner & Yao, 2014; Ngumi, 2015; Radzuan *et al.*, 2015). Studies by Yao *et al.* (2012) and Govindan (2013), for instance, concluded that, this strategy reduces lead times, lost sales and demand uncertainties resulting from stock outs.

Dresner and Yao (2014) found the VMI strategy to minimise inventory costs and defective items while improving customer service. In a similar vein, Wambua, Okibo, Nyang'au and Ondieki (2015) found that VMI reduces inventory-carrying costs, stock out issues while ensuring better forecasts. Implementing VMI also reduces firm's overall product costs, lead times while improving overall performance levels. A study by Dong *et al.* (2014) report that

VMI helps manufacturing firms to counteract the bullwhip effect by minimising stockout by 31%, inventory by 7% and inventory variability by 9% on average. Obura's (2015) study on the influence of VMI strategy on the performance of Unilever Kenya Limited found a positive significant relationship between the variables. However, the study wrongly adopted the qualitative approach to examine cause and effect relationships in the study.

Another study by Obura (2015) found VMI to greatly influence the operational performance of Unilever Kenya Limited in the areas of improved product quality and reduced defects. The study noted that, product quality is improved as a result of VMI through reduced defects resulting from sharing inventory management roles with key suppliers. Kinyua (2016) did a descriptive study on consumer goods manufacturing firms in Kenya using multiple regression. The study found that, a unit increase in VMI increases operational performance by 0.7. Mwangi and Kitheka's (2018) study adopted the quantitative approach and found a positive significant relationship between VMI strategy and performance Supermarkets in Mombasa County, Kenya.

Studies within the Ghanaian context by Fosu (2016) and Bawa *et al.* (2018) have identified VMI as a key strategy used by manufacturing firms in managing their inventories. However, the extent to which VMI influences the operational performances of Ghanaian manufacturing firms remains unclear. It could be deduced that, majority of the studies on VMI strategy and firm performance have been carried out on the composite of manufacturing firms (Irungu & Wanjau, 2011; Dong *et al.*, 2014; Ngumi, 2015; Radzuan *et al.*, 2015; Mwangi & Ktheka, 2018), while Obura (2015) adopted the case study approach.

Generalising findings to specific classes of manufacturing firms could be misleading.

Also, previous studies have not employed rigorous analytical techniques such as Structural Equation Modelling in their respective studies. In Ghana, none of the previous have examined how VMI influences manufacturing firms' operational performance. Based on these gaps, the study hypothesised that Vendor Managed Inventory significantly improves operational performance of Food and Beverage and Pharmaceutical firms in Ghana.

Conceptual framework

Conceptual framework is a structure of concepts which are put together as a map for the study to show the relationship among the research variables (Mugenda & Mugenda, 2008). The framework was specifically designed to explain the relationship between the independent variable and the dependent variable of the study. The conceptual framework was represented in Figure 1.

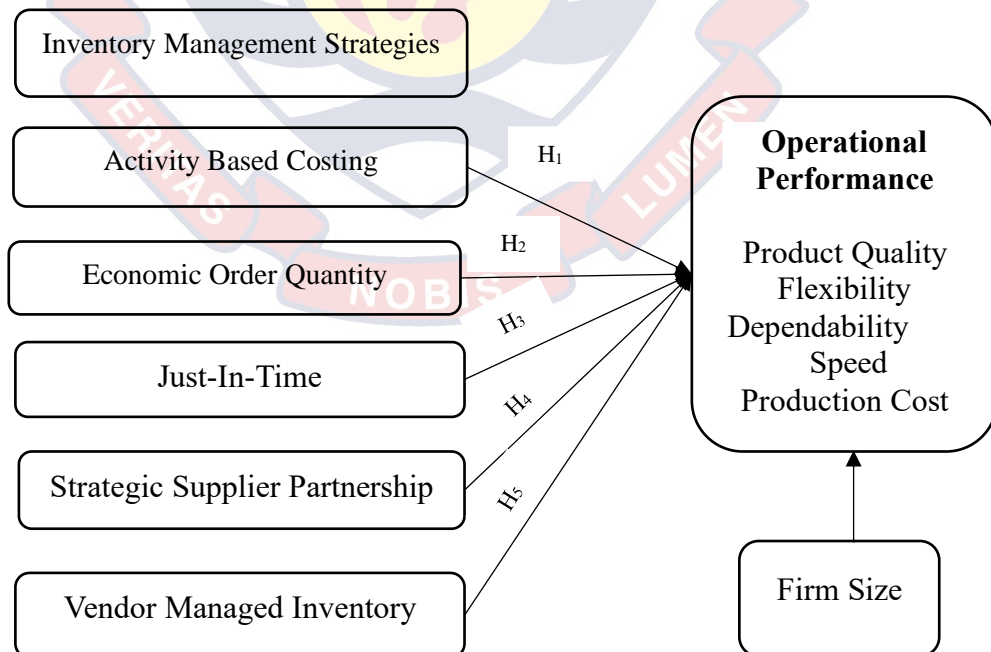


Figure 1: Conceptual framework on inventory management strategies and operational performance

Source: Author's own construct, Opoku (2019)

From Figure 1, the independent variable (inventory management strategies) predicts the amount of variation in the dependent variable (operational performance) (Kothari, 2008). Firm size controlled the relationship between the variables. The value of operational performance depends on any change in the inventory management strategies comprising Just-In-Time, Vendor Managed Inventory, Activity Based Costing, Economic Order Quantity and Strategic Supplier Partnership (Muhayimana, 2015; Amachree *et al.*, 2017). Operational performance (dependent variable) was measured using the five operational dimensions including quality, flexibility, speed, production cost and dependability propounded by Slack (2005) and widely used in studies by Naor, Goldstein, Linderman and Schroeder (2008), Fynnes, de Buřirca and Marshall (2010), Wong, Boon-itt and Wong (2011) and Mwangi (2016).

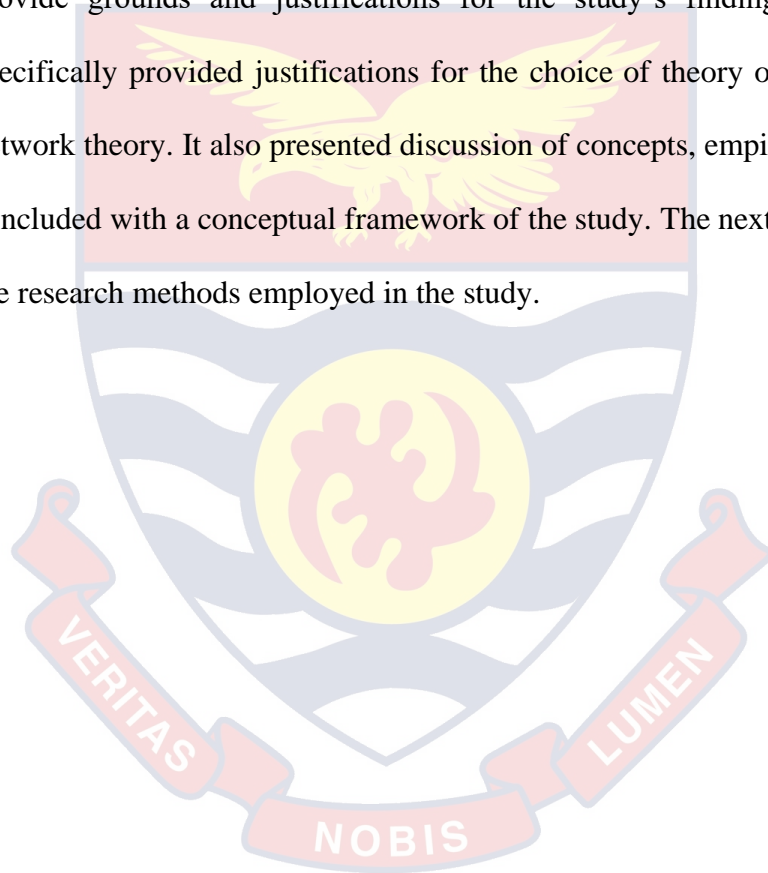
From Figure 1, operational performance of Food and Beverage and Pharmaceutical firms is dependent on the various inventory strategies they adopt and controlled by firm size. As such, a unit change, either positive or negative, in any of the inventory management strategies is likely to cause a unit change in operational performance in like manner. However, the framework does not provide the extent to which the various inventory management strategies influence operational performance.

The framework was supported by extensive reviews of previous studies by Abdallah and Matsui (2007), Ramanathan and Gunasekaran (2014), Cheng and Hua Tan (2011), Farzaneh (2012), Elhamma and Zhang (2013), Ngumi (2015), Kinyua (2016), Pokorná (2016), Bawa *et al.* (2018), Mwangi and Kitheka (2018) and Atnafu (2018). The framework was, therefore, developed to provide a pictorial view of the relationship between the various inventory

management strategies and operational performance of Ghanaian Food and Beverage and Pharmaceutical manufacturing firms. To aid better conclusions and generalisation of findings, firm size was used as a control variable in the relationship.

Chapter Summary

The chapter extensively reviewed literature related to the study to provide grounds and justifications for the study's findings. This chapter specifically provided justifications for the choice of theory of constraints and network theory. It also presented discussion of concepts, empirical reviews and concluded with a conceptual framework of the study. The next chapter presents the research methods employed in the study.



CHAPTER THREE

RESEARCH METHODS

Introduction

The chapter presented the methods adopted in carrying out the study. Research methods enable comparison with previous studies to expand the appreciation of work plan to enable possible replications of this study in future (Watson, 2015). The chapter specifically discussed the research philosophy, research design, study area, population, sampling procedure, data collection instrument, data collection procedure and data processing and analysis of the study. Other issues including validity, reliability and ethical considerations were also addressed in this chapter.

Research Philosophy

A research philosophy or paradigm was propounded by Guba and Lincoln in 1982. Appleton and King (2002: 645) defined a research philosophy as the, “basic belief system or world view that guides an investigation”. It focuses on the nature and development of knowledge. As such, choosing an appropriate research philosophy is key to any research methodology (Holden & Lynch, 2004; Saunders, Lewis & Thornhill, 2009). A research paradigm includes social constructivist paradigm and positivism or objectivism paradigm (Saunders et al., 2009; Creswell, 2014). The social constructivist paradigm favours the qualitative approach as it emphasises on the socially constructed nature of reality through complex understanding of people’s experience (Saunders *et al.*, 2009). It is, therefore, based on subjectivism created from one’s perception of the world through their interaction with the environment.

The positivism paradigm, on the other hand, involves the use of scientific processes intended to draw objective conclusions (Holden & Lynch, 2004; Sobh & Perry, 2006). The paradigm is concerned with obtaining facts about a phenomenon by involving hypothesis testing and quantitative tools (Saunders *et al.*, 2009). It assumes that there is one defined reality, fixed, measurable and observable (ontological assumption); genuine knowledge is quantifiable and objective. The philosophy aims to expand theory and ensure authentic knowledge is obtained only through scientific means. It further assumes that objectivity and precision are good while subjectivity is inherently misleading. Also, the use of quantitative methods is the only acceptable strategy to generate valid knowledge (Saunders *et al.*, 2009; Lincoln, Lynham & Guba, 2011). On the basis of these assumptions, the positivism paradigm underpinned the study.

Research Approach

Research approach is a plan and procedure that comprises the relevant steps of broad assumptions to detailed data collection methods, analysis and interpretation (Boohen. Sheridan & Kotey, 2008; Creswell, 2014; Creswell & Clark, 2017). The study adopted the positivism paradigm thus the quantitative approach. The quantitative approach allows the use of quantitative techniques in describing issues in the study to aid generalisation of outcomes (Creswell & Clark, 2017). The approach is scientific, fast and draws logical conclusions from numerical values obtained from surveys and questionnaires as data collection techniques (Crotty, 1998; Creswell, 2014). It is, therefore, relevant for examining cause and effect relationships between/among variables (Creswell & Creswell, 2017). More precisely, the study seeks to examine effects of inventory management strategies on operational performance.

However, the quantitative approach has been criticised for its inability to effectively gauge human behaviour (Crotty, 1998). Crotty (1998) added that, the approach is regarded as rigid, artificial and ineffective in generating theories. Despite these weaknesses, the quantitative approach was adopted due to the research philosophy and nature of the research objectives. Also, it is suitable for establishing cause and effect relationships among variables comprising inventory management strategies such as ABC, EOQ, JIT, SSP and VMI and operational performance.

Research Design

The choice of a research design is largely dependent on the approach to the study (Grove, Burns & Gray, 2012; Creswell, 2014). Based on the quantitative approach to the study, the explanatory research design was adopted. The explanatory design increases understanding of a given subject, provides better and objective conclusions to aid generalisation of findings (Burns *et al.*, 2011; Creswell, 2014). It is effective for providing factual information about a situation. The design collects and analyses large amounts of data from a sizeable target population using both descriptive and inferential statistical tools in the most economic manner (Tabachnick & Fidell, 2007). Saunders, Saunders, Lewis and Thornhill (2011) added that the explanatory design enables researchers to have more control over their research processes.

The explanatory design uses structured questionnaires to obtain data from respondents who are spread across a given area. As such, the design is appropriate for obtaining data from representatives of the manufacturing firms scattered across the four selected metropolises in Ghana. Also, this design uses statistical tools which involve a great amount of numerical data to analyse cause

and effect relationships between/among variables (Wahyuni, 2012; Beins & McCarthy, 2017). This design was, therefore, adopted because the study sought to establish cause and effect relationships between/among variables specifically inventory management strategies and operational performance. The design is suitable for testing its research hypotheses.

However, the explanatory design has some weaknesses which could affect a study's findings (Robson & McCartan, 2016; Wildemuth, 2016). According to Wildemuth (2016), ensuring a representative sample using this design can be time consuming. Robson and McCartan (2016) noted that, with this design, data are gathered based on respondents' views and opinions which could give room for biased responses. This could in turn affect the objectiveness of the results (Creswell & Creswell, 2017). However, the explanatory research design was more preferable due to the purpose of the study coupled with the research philosophy and approach to the study.

Study Area

The study was carried out within the scope of the Ghanaian manufacturing sector. The manufacturing sector is a key part of Ghana's industrial set-up (Ackah, Adjasi & Turkson, 2013). The sector is seen as the core of industrial activities which deal with a vast range of inventory (raw materials, parts, work in process, finished goods). The sector primarily converts raw materials or work in progress into finished goods to meet the needs of end users (Ackah *et al.*, 2013). The sector consists of various classes of firms including food and beverage processing, pharmaceuticals, timber/wood processing, textiles, rubber/plastics, aluminium/metal and electronics (Baah-Nuakoh, 1997;

Ackah, Adjasi & Turkson, 2014). Each of class of firm performs specific activities in order to meet the numerous demands of end-users.

The Ghanaian manufacturing sector including Food and Beverage and Pharmaceutical firms is a key contributor to economic growth through revenue generation (import and export duties, tax revenues, GDP), job creation, resource utilisation and innovativeness (Codoe, 2012; Achah *et al.*, 2014; Adu-Fosu, 2016). The Association of Ghana Industries (AGI) (2017) annual report revealed that these two classes of firms averagely contribute about 32%-43% of the total manufacturing sector's contribution to Ghana's GDP annually. This is a clear indication of their significant contributions to the growth of the Ghanaian manufacturing sector.

The study specifically focused on the Food and Beverage and Pharmaceutical manufacturing firms within the Accra, Tema, Kumasi and Sekondi-Takoradi metropolises in Ghana. The study focused on these metropolises because they have the highest concentration of the classes of manufacturing firms in the country (AGI, 2017). The AGI (2017) report revealed that 80 out of 91 registered food and beverage manufacturing firms were located within these metropolises. The Pharmaceutical Manufacturers Association of Ghana (PMAG) (2018) report also revealed that 24 out of its 27 registered pharmaceutical firms are located within these metropolises. These manufacturing firms generally rely on inventory to perform homogenous activities thus, focusing on metropolises with highly concentrated firms had a high tendency of obtaining adequate sample for better generalisation of the study's findings.

Population

The study's target population was made up of key personnel such as Production or Operations managers/officers, Procurement or Purchasing managers/officers and Store keepers/officers of the Food and Beverage and Pharmaceutical firms in Accra, Tema, Kumasi and Takoradi metropolises in Ghana. These key personnel were chosen due to their philosophies, values and direct involvement in inventory related activities in their respective firms. Thus, their abilities to influence policies relating to inventory management would help in obtaining relevant information aimed at drawing objective conclusions. Also, the target population size for the two classes of manufacturing firms were obtained from the reports of two highly reputable bodies specifically the Association of Ghana Industries (AGI) (2017) and Pharmaceutical Manufacturers Association of Ghana (PMAG) (2018).

Table 1 presented the description of the target population of the study.

Table 1: Target population

Metropolis	Food and Beverage		Pharmaceuticals	
	Freq	Percent	Freq.	Percent
Accra	41	48.8	17	75.0
Tema	25	32.1	4	14.3
Kumasi	11	14.3	3	10.7
Sekondi-Takoradi	3	4.8	-	-
Total	80	100.0	24	100.0

Source: Association of Ghana Industries (2017) and Pharmaceutical Manufacturers Association of Ghana (PMAG) (2018)

According to the AGI (2017) report, 80 of its registered members are food and beverage manufacturing firms within the metropolises understudy. The PMAG (2018) report revealed a membership size of 27 pharmaceutical

manufacturing firms in Ghana of which 24 of them are located within the selected metropolises. In sum, the target population size of the study was 104 firms registered with the AGI and PMAG respectively. As such, the study obtained data from one representative of each of the 104 Food and Beverage and Pharmaceutical firms within the 4 selected metropolises in Ghana.

Sampling Procedure

The study employed the census technique wherein information was obtained from every unit (firm) of the target population. The census technique was chosen to provide a higher degree of accuracy and reliability of a study's findings (Creswell, 2014). Also, every firm within the study's target population was of prime interest to the study. Therefore, data was gathered from one (1) key representative of each of the 104 Food and Beverage and Pharmaceutical firms located in Accra, Tema, Kumasi and Takoradi metropolises in Ghana. The rationale for selecting key personnel as respondents was due to the fact that their philosophies, values and job positions directly influence their firms' strategic directions in relation to inventory management.

The study further assessed the sample size suitable for the PLS-SEM technique using Hair, Sarstedt, Ringle and Mena's (2012) formula. They suggested that the minimum sample size should be equal to or greater than ten times the largest number of structural paths directed at a given construct in the structural model. For this study, the largest number of structural paths pointing at a specific latent construct in the structural model was 6. As such, the minimum sample size was $6 * 10 = 60$. Hair *et al.* (2012) also stressed that the PLS-SEM mandates researchers to focus on the sample size against the background of the data characteristics and model. More precisely, they suggested that the expected

sample size should be obtained from power analysis using the part of the model which has the greatest number of predictors.

To meet this requirement, Cohen (1992) provided a sample size determination table suitable for obtaining the minimum sample size in PLS-SEM (Appendix B). This table has largely been used by researchers for determining the minimum sample sizes for their PLS-SEM models by satisfying some basic assumptions which include number of arrows pointing at a construct, sig. level, minimum R^2 and associated statistical power. Therefore, this study satisfied these assumptions by having the maximum number of arrows pointing at a given construct equal to 6, a sig. level of 0.05, minimum R^2 of 0.20 and a statistical power of 80%, the minimum expected sample size was 75 (Appendix B). Therefore, the study's minimum sample size for the PLS-SEM model was appropriately met since $85 > 75$.

Data Collection Instrument

A primary data collection instrument, specifically, a structured questionnaire was employed to collect data for the PLS-SEM technique. Saunders *et al.* (2009) posited that, with a structured questionnaire, each person is asked to respond to the same set of questions in a predetermined order. Structured questionnaire is suitable for a quantitative study because it helps in obtaining objective responses for statistical analysis (Saunders *et al.*, 2009). For the purpose of this study, only close ended and direct questions were used. This instrument was purely paper based which was administered to a representative of each of the firms' studied. Structured questionnaires guarantee greater uniformity to obtain objective and consistent data (Neelankavil, 2007). It also

guarantees greater anonymity, privacy and convenience for respondents during completion.

The questionnaire was structured in five (5) sections, A to E. Section A was divided into two parts with Part A containing question items on the profile of the manufacturing firms understudy. Part B contained question items on the firms' inventory profile. Section B contained question items (25) on all the independent variables of the study. This was done in bid to obtain relevant data to test the research hypotheses. Five question items were adapted for each of the study's five key inventory management strategies. Section C contained question items (10) aimed at measuring operational performance. Section D contained 5 question items aimed at measuring firm size (i.e. control variable). It is to note that, all the question items for the study's variables (constructs) were prompted by extensive reviews of previous studies.

Finally, Section E contained question items on the demographic characteristics of the respondents' who represented their respective firms. This was aimed at describing the respondents on the basis of gender, age and highest educational qualification in relation to Operations/Procurement and Supply Chain Management among others. The question items under Sections B, C and D were put on a 5-point Likert-like scale with 1 representing least agreement and 5 representing highest agreement. According to Yates (2003), this scale enables researchers to relate qualitative constructs with quantitative metrics analysis. He added that, the scale is most reliable for measuring opinions and beliefs of people. This scale was also appropriate as it allowed the use of both descriptive and inferential statistics tools for data analysis (Creswell, 2014).

Operationalisation of key variables

This section presented how the study's variables were measured to achieve the research objectives. All the measurement items were based on extensive reviews of related literature within the context of manufacturing firms. The independent variables, for instance, consisted of inventory management strategies specifically Activity Based Costing, Economic Order Quantity, Just-In-Time, Strategic Supplier Partnership and Vendor Managed Inventory. On the other hand, the dependent variable focused on operational performance, while firm size controlled the relationships between the variables. Table 2 presented the measurement items of each of the variables under study. Also, relevant sources of the items were also presented in the table.

Table 2 reveals that all the variables' indicators (measurement items) were based on extensive reviews of related literature. This is because, the various sources of which the indicators were obtained were presented in the table. However, the extent to which these measurement items truly measure each of the constructs within the study area remains unclear. As such, pretesting was carried out on some selected food and beverage manufacturing firms within the Greater Accra region of Ghana. This was done to assess whether the constructs' indicators are quality measures within the context of Food and Beverage and Pharmaceutical firms. The result was presented in the next section.

Table 2: Measurement of variables and sources

Variables	Measurement items	Sources
Activity Based Costing	Item classification, selective control, fund allocation, focus and periodic review	Zaman (2009), Telsang (2010), Kinyua (2016), Pokorná (2016)
Economic Order Quantity	Demand, lead time and fixed orders are known and constant, procedure for determining cost components, preparation toward inventory shortages	Hax and Candea (1984), Lee (2002), Jeang (2010), Gitau (2016)
Just-In-Time	Proper layout of production systems, on-time supplies, communication flow, adherence to production schedules, customers' specifications	Li, Rao, Ragu-Nathan and Ragu-Nathan (2005), Chen <i>et al.</i> (2011), Chavez, Gimenez, Fynes, Wiengarten and Yu (2013)
Strategic Supplier Partnership	Supplier involvement, information sharing, supplier agreement, frequency of meetings and supplier capacities	Agus and Hassan (2008), Lwiki <i>et al.</i> (2013), Qrunfleh and Tarafdar (2013)
Vendor Managed Inventory	Supplier agreement, supplier capacity, access to information, supplier review and supplier control	Ståhl Elvander, Sarpola and Mattsson (2007), Govindan (2013), Vigtil (2007), Mwangi and Kitheka (2018)
Operational performance	Quality, flexibility, speed, dependability and operational cost	Kagioglou, Cooper and Aouad (2001), Slack (2005), Abdel-Maksoud and Asada (2008)
Firm size	Management experience, policies, access to resources, number of employees and total assets	Hanson and Wernerfelt (1989), Orlitzky (2010), Zadeh and Eskandari (2012)

Source: Field survey (2019)

Validity and Reliability

Reliability and validity show how best a research instrument measures the parameters it was expected to measure (Saunders & Lewis, 2012). According to Berkowitz, Caner and Fang (2012), validity is the extent to which a research instrument measures its research objectives. In relation to the study, validity was carried out to validate and refine the content of the questionnaire. This was achieved through peer and expert reviews. An initial survey questionnaire was developed from extensive reviews of related literature and administered to four

research inclined peers for review. Appropriate corrections were made based on the comments from the peer review and the update draft was subjected to a five-panel team consisting of highly inclined academic researchers with relevant knowledge and expertise.

The drafted questionnaire was continuously assessed until the questionnaire was fully developed. Careful attention was given to key areas including research objectives, communication method, potential respondents, cost and time constraint. Also, attention was given to the layout structure (i.e. wording, ambiguities, sequence, length, structure, direction, language, etc), items design while stressing on good and relevant questions. It is to note that, the final version of the questionnaire consisted of five sections in four pages (see Appendix A).

A reliability test (Cronbach's alpha test) was further carried out to check for reliability of the research instrument. According to Sekaran and Bougie (2016), reliability is the extent to which a research instrument produces consistent results if repeated regardless of changing place and time. In relation to the study, internal consistency was tested using Cronbach's alpha (α) to obtain the reliability of the questionnaire items. Existing studies have found that, the closer the value of Cronbach's alpha (α) to 1, the more reliable its research instrument (Saunders *et al.*, 2012; Creswell, 2014; Beins & McCarthy, 2017). However, an α with threshold of 0.7 or more is generally acceptable.

More precisely, pretesting was carried out on 25 Food and Beverage and Pharmaceutical firms within the Greater Accra region which are not registered members of AGI and PMAG. According to Hunt, Sparkman and Wilcox (1982), a sample size between 12 and 30 is appropriate. Blumberg, Cooper and

Schindler (2008), on the other hand, proposed a sample size between 25 and 100. As such, the choice of a sample size of 25 members is appropriate for the pretesting exercise. The pretesting was done to check and address possible errors in each question item in the data collection instrument. Creswell (2014) revealed that pretesting a questionnaire is useful for providing information for carrying out situational analysis to uncover ambiguous and biased question items.

Pretesting is also suitable for testing validity, reliability and adequacy of the research instrument (Saunders *et al.*, 2009; Sekaran, 2010; Zikmund, 2012). More precisely, reliability was tested based on the result of the Cronbach's alpha test presented in Table 3. Hair, Black, Babin, Anderson and Tatham (2010) suggested that the coefficient alpha (α) of 0.60 or above implies that the question items truly measure a specific latent variable. From Table 3, the result revealed a α of (.848) based on the composite of the question items (40 items). This result ($\alpha = .848$) was greater than the generally acceptable threshold of 0.70. Thus, the overall coefficient alpha is within the acceptable threshold.

Table 3: Reliability of the Data Collection Instrument

Construct /Item	Cronbach's alpha
ABC analysis	0.873
Economic Order Quantity (EOQ)	0.838
Just-In-Time (JIT)	0.865
Strategic Supplier Partnership (SSP)	0.818
Vendor Managed Inventory (VMI)	0.833
Operational performance (OP)	0.853
All items	0.848

Source: Field survey (2019)

From Table 3, in terms of the study's variables, the independent variable (inventory management strategies) comprising ABC, EOQ, JIT, SSP and VMI

had α of 0.873, 0.838, 0.865, 0.818 and 0.833 respectively. Also, from Table 3, the dependent variable (operational performance) had a α of 0.853 while the control variable (firm size) had α of 0.822. These indicated that all the question items measuring each construct in the questionnaire met the acceptability criteria (>0.700) thus measured what they were intended to measure. Therefore, the questionnaire was reliable for collecting data for the study.

Common-method bias

Common-method bias has been found as a key concern to data obtained from single respondents (Podsakoff, MacKenzie, Lee & Podsakoff, 2003; Podsakoff, MacKenzie & Podsakoff, 2012). Common method bias defines the possible measurement errors which are compounded by the sociability of respondents who intend to give positive answers (Chang, Witteloostuijn & Eden, 2010). It is also seen as the variation in responses which could be caused by instrument (Sharma, Yetton & Crawford, 2009). Previous studies have provided some approaches (ex-ante and ex-post) to addressing the common-method bias (Rönkkö & Ylitalo, 2011; Jakobsen & Jensen, 2015). Ex-ante approaches include mixing the order of questions and introducing relatively irrelevant questions into the questionnaire (Podsakoff *et al.*, 2003; Rönkkö & Ylitalo, 2011; Jakobsen & Jensen, 2015). The study, therefore, addressed common - method bias by adopting these approaches.

For post-ante, Podsakoff *et al.* (2003) proposed the use of Harman's single factor test. This test has also been extensively explained in studies by Sharma, Yetton and Crawford (2009), Rönkkö and Ylitalo (2011) and Fuller, Simmering, Atinc, Atinc and Babin (2016). The test assumes that common method variance occurs when the total variance for one factor exceeds 50% and

vice versa. The study, therefore, carried out Harman's single factor test by loading all the question items measuring all the latent variables into one common factor. The result of the test revealed a total variance score of 19.224% < 50%. It was concluded that there is no common method bias (see Appendix C).

Data Collection Procedure

Before the data collection exercise, authority note was then obtained from the Head of Department of Procurement and Supply Chain Management, UCC, and sent to all the firms studied. This was done to obtain permission to carry out the data collection exercise. After permissions have been granted, the questionnaires were then distributed to the respondents. To ensure maximum and timely response rate, a period of 30 working days (25th February, 2019-5th March, 2019) was allocated for the data collection exercise. The data collection exercise was faced with key challenges including unwillingness of some respondents to partake in the exercise due to various reasons such as confidentiality issues and inflexible schedules.

Also, some respondents declined to partake in the exercise due to strict organisational policies and ethical code of conducts. However, these difficulties were minimised by providing assurances that the exercise was purely for academic purposes only. Respondents who requested to complete the questionnaires in their own conveniences were allowed to do so. These measures were put in place to encourage the respondents to partake in the exercise as their involvements were key to informing the study's outcome.

Due to the difficulties associated with locating some respondents (i.e. 6) within the firms studied, 98 questionnaires were practically administered to them. Out of this, 93 of them were retrieved from the respondents of which eight

were eventually excluded. This is because, they had severe incomplete and non-responses thus irrelevant for analysis. The study finally had 85 effective and reliable data to proceed with the analysis process. Simply put, the study relied on 85 data set with a response rate of 81.7%. Table 4 presented the response rate of the relevant data obtained for analysis.

Table 4: Response rate

Categories	Number of firms	Percent (%)
Target population	104	100.0
Accessible population	98	94.2
Total responses	93	89.4
Incomplete responses	8	7.7
Total usable responses	85	81.7

Source: Field survey (2019)

From Table 4, the result clearly indicated that the study's response rate fell within 50%, 60% and 70% as proposed by Babbie (2005). Babbie (2005) suggested that, 50%, 60% and 70% response rates imply adequate, good and very good responses respectively. It could be deduced that the study obtained total responses of 93 (89.4%) of which 8(7.7%) of them were unusable. This is because, these responses had severe incomplete and non-responses thus including them in the study's analysis could negatively affect its results. According to Babbie (2005), highly incomplete responses could lead to missing data which could affect a study's outcome if not properly handled. The decision rule was that incomplete responses could be excluded if the study obtains total usable response rate above 50%. More precisely, the study had a response rate of 81.7% thus justifying the need to exclude the incomplete responses.

Ethical Considerations

Neuman (2014) suggested some main rules of data collection to include informed consent, voluntary participation, right to privacy, plagiarism, anonymity and confidentiality issues. In terms of informed consent, the respondents were made aware of their involvement in the data collection exercise. This was practically achieved by initially obtaining permission from management of the various manufacturing firms studied. Also, copies of the authority note were attached to each of the questionnaire. In relation to voluntary participation, none of the respondents was forced to participate in the exercise against his/her free will. Also, right to privacy was achieved by allowing the respondents to fill the questionnaire through their own convenient medium.

Also, in terms of plagiarism, all relevant information obtained from various sources were paraphrased and appropriately referenced (in-text and end-text). A plagiarism test was then conducted to check for possible plagiarism in the study. Anonymity was ensured by excluding all personal details such as names and other sensitive personal information that could expose the respondents. These measures were carried out to ensure that the identities of the respondents were not exposed to the public. Confidentiality was also ensured by assuring respondents that all information provided would be kept confidential and thus none of them would be used for purposes other than this study. In summary, the study ensured that all possible ethical issues were appropriately addressed.

Data Processing and Analysis

Data obtained through survey-based researches require editing, sorting, coding, error checking and mathematical calculations (Sekaran, 1984; Zikmund,

2012). Blumberg *et al.* (2008) positioned that editing, sorting and coding are required to check and verify errors in raw data prior to conducting statistical analysis. Data editing and sorting processes, for instance, are relevant for checking and adjusting data for reliability, omissions and consistency before coding is done and subsequently transferred to data storage processes (Blumberg *et al.*, 2008). Data editing is also done to check for completeness of each questionnaire coupled with the eligibility of each respondent. The coding process, on the other hand, is used to identify and group each response with its associated numeric symbols and scores (Zikmund *et al.*, 2012).

Also, data cleaning and screening are done to check for missing values and consistency of the data to be coded (Tabachnick & Fidell, 2001). According to Tabachnick and Fidell (2001) and Hair, Ringle and Sarstedt (2011), these processes enhance the accuracy of data analyse while ensuring that the assumptions of data analysis techniques are not violated. They added that, checking for data accuracy is vital for verifying irregular responses, means, standard deviations and values for credibility purposes. The data was finally coded by assigning numbers to each statement on the questionnaire as required in quantitative research. The coded data was then processed using the IBM SPSS Statistics version 24 and SMART-PLS 3 software programs.

The processed data was then analysed using descriptive tools comprising frequencies, percentages, means, standard deviations, skewness and kurtosis and inferential tool specifically linear regression using the Partial Least Squares-Structural Equation Modelling (PLS-SEM) respectively. More precisely, the firms' business profile and respondents' demographic characteristics were analysed using frequencies and percentages. Prior to hypotheses testing, the

study described the various inventory management strategies using the mean score, standard deviation, skewness and kurtosis. The mean score, for instance, is widely used as a standard measure of the central tendency of a distribution (Creswell, 2014). The mean score was reported using a mean scale of 1 to 5 with mean scores of 1 to 2.9 indicating 'low', while 3 to 5 indicate high.

The standard deviation determines how the data is spread out from the mean, whereas the skewness and kurtosis statistics check for the normality of a data's distribution (Creswell, 2014). The skewness statistic measures the extent to which a construct's distribution is symmetrical (Hair, Matthews, Matthews & Sarstedt, 2017). The rule of thumb is that, values greater than +1 or less than -1 indicate a substantially skewed distribution. On the other hand, kurtosis measures the extent to which the shape of a normal distribution is 'flat' or 'peak'. The rule of thumb is that, values greater than +1 indicate a highly peaked distribution while a kurtosis value less than -1 indicates flattened distribution. A distribution is regarded as normal (very unlikely) when both skewness and kurtosis values of a given indicator are zero (0). The section, therefore, described each of the strategies' indicators based on the above criteria.

The study's research hypotheses were tested using the Partial Least Square in the Structural Equation Modelling technique (PLS-SEM) after meeting underlying assumptions including multicollinearity, reliability: indicator and construct, validity: discriminant and convergent and outer model significance. These underlying assumptions were met and discussed in the next chapter.

Data analysis methodology and justification

The Structural Equation Modelling (SEM) is a group of statistical models explaining relationships among multiple variables (Hair *et al.*, 2012). According to Andeev, Heart, Moaze and Pliskin (2009), there are two key approaches to structural equation modelling: variance based or Partial Least Squares (PLS) SEM and co-variance-based SEM (CB-SEM). CB-SEM models have parameters that reduce the variance between the calculated and observed covariance matrices leading to goodness-of fit indexes as a result of the magnitude of these differences. However, the PLS-SEM model is used to increase the variance of all dependent variables rather than using it to explain all the indicators covariances (Ringle *et al.*, 2009). PLS-SEM parameter estimates are produced based on its ability to reduce the residual variances of the endogenous variables (Henseler *et al.*, 2009; Esposito Vinzi *et al.*, 2010).

The PLS-SEM also has the ability to deal with normality violations (i.e. multivariate normality) and it does not require the hard assumptions of its distributional properties of raw data (Hair, Sarstedt, Hopkins, Kuppelwieser, 2014). According to Al-Ansari (2014), PLS-SEM is among the most important techniques used for applied multivariate statistical analysis. This technique applies a confirmatory (hypothesis-testing) approach to analysing structural theory of a given situation (Babin, Hair & Boles, 2008). It is a very complex statistical technique for examining relationships between/among constructs. and does not necessarily require large sample size before analysis (Henseler, Ringle & Sinkovics, 2009; Hair *et al.*, 2012; Rönkkö & Evermann, 2013). It also offers more rigorous and powerful statistical procedures to deal with complex models (Hair *et al.*, 2014).

Also, the PLS-SEM tool has the ability to handle normality violations and missing data, thus it does not require hard assumptions of the distributional properties of raw data (Hair *et al.*, 2012). This statistical tool combines regression and factor analysis within its measurement models (Ullman & Bentler, 2012). Ringle Sarstedt and Straub (2009) added that the PLS-SEM model maximises the variances of all the endogenous variables instead of explaining all the indicators' covariances. The PLS-SEM was, therefore, chosen for testing the study's hypotheses mainly due to its ability to handle normality violations. It also has the ability to test causal relationships between/among constructs with multiple measurement items. The outputs from this analytical tool were presented in tables and figures and discussed thereof.

Reflective and formative indicators

According to Navarro, Losada, Ruzo and Díez (2010), conventional measurement practices in business studies are mostly based on reflective indicators. This is because, the observed indicators are expected to reflect variations in latent variables. Diamantopolus, Riefler and Roth (2008) added that, the path of causality runs from the latent variable to the observed indicators. Thus, possible changes in the latent variable is likely to reflect the changes in all observed indicators including multi-item scale. Contrastingly, formative models have the opposite direction of causality such that the meaning of the latent variable is defined by the content of the indicators. This is because, the indicators cause the latent variable.

Coltman, Devinney, Midgley and Venaik (2008) stressed that, classical test theory requires reflective indicators to be internally consistent, while formative indicators do not have such requirement. As such, researchers are

expected to rely on these decision rules to decide whether to model its latent variables reflectively or formatively (Jahns & Moser, 2007). Based on these, the study adopted the reflective models and thus its constructs were measured using reflective indicators: inventory management strategies constructs (reflective) and operational performance (reflective). This implies that, any change in an observed indicator including a multi-item scale for the exogenous latent variables (ABC, EOQ, JIT, SSP and VMI) will reflect in the endogenous latent variable (operational performance).

Chapter Summary

The chapter discussed the key elements of research methods in relation to research philosophy, research design, study area, population, sampling procedure, data collection instrument, data collection procedure and data processing and analysis of the study. The study adopted the positivism paradigm and quantitative approach. Also, explanatory research design was adopted due to study's research objectives. Both descriptive and inferential statistical tools including frequencies, percentages and PLS-SEM were used for data analysis and the results were presented in tables and figures.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter discussed the study's findings in relation to the research objectives. The chapter specifically discussed the firms' business and respondents' demographic characteristics. The chapter further described the inventory management strategies and finally examined their effects on the operational performance of the firms' understudy. The study's research objectives were analysed using the partial least squares (PLS) approach to structural equation modelling (SEM).

Business characteristics of Food and Beverage and Pharmaceutical firms

This section presented the business characteristics of the Food and Beverage and Pharmaceutical manufacturing firms within 4 selected metropolises (Accra, Tema, Kumasi and Sekondi-Takoradi) in Ghana. The business characteristics focused on the nature of manufacturing firm, ownership type, firm age and size of firm in terms of number of employees and total assets. The result was presented in Table 5.

From Table 5, majority, 63(74.1%), of the firms studied are into food and beverage processing, while 22(25.9%) are pharmaceutical firms. It could be argued that high concentration of food and beverage processing over pharmaceuticals stem from availability and accessibility of raw materials coupled with the usage of the end-products. Arguably, end-products of food and beverage processors are consumed daily as they satisfy a basic need for human survival. Pharmaceutical products, on the other hand, are consumed on

purposely to address a specific need. It is, therefore, realistic to have highly concentrated food and beverage processing firms producing to meet the basic need of the ever-increasing Ghanaian populace.

Table 5: Business characteristics of Food and Beverage and Pharmaceuticals

Category	Frequency	Percent
Nature of manufacturing firm		
Food and Beverage processing	63	74.1
Pharmaceuticals	22	22.9
Total	85	100.0
Ownership type		
Private ownership	79	92.9
Joint state-private ownership	6	7.1
Total	85	100.0
Length of Existence		
< 10 years	8	4.5
10-20 years	29	34.1
21-30 years	28	32.9
> 30 years	20	23.5
Total	85	100.0
Firm size (Number of employees)		
< 100 employees	4	3.5
100 – 500 employees	44	51.8
501 – 1000 employees	32	37.9
> 1000 employees	4	4.7
Total	85	100.0
Firm size (Total assets)		
GHS50,000 – GHS 100,000	3	3.5
> GHS 100,000	82	96.5
Total	85	100.0

Source: Field survey (2019)

In relation to ownership type, Table 5 revealed that 79(92.9%) of the firms studied are owned by private individuals while 6 (7.1%) of them are joint state-private ownerships. This means that the firms' studied are dominated by private investors with minimal government involvement and this could threaten their survival in the long term. This is because, the nature and associated costs of inventories used by the firms' studied require huge financial commitments in order to constantly ensure optimal inventory levels. However, government can actively involve in this sector by implementing favourable policies in areas of flexible tax schemes, subsidizing farmers while reducing import tariffs.

It could be argued that, these policies would support the private investors address their financial constraints in order to ensure optimum inventory levels over a given period of time. This would invariably help the firms' studied to expand their current operations. Also, from Table 5, majority (29)(34.1%) of the firms studied have been operating for the past 10 to 20 years, 28(32.9%) of the firms have been operating for 21 to 30 years, 20(23.5%) of the firms have been operating for over 30 years while 8(4.5%) of the firms have been operating for less than 10 years. This gives a clear indication that majority of the firms studied have been operating for over 10 years thereby highlighting their increasing growth in the country.

Table 5 also presented the firm size of the Food and Beverage and Pharmaceutical firms based on the number of employees and total assets. In relation to number of employees, majority (44) (51.8%) of the firms' studied currently employ between 100 to 500 workers. Also, 32(37.9%) of the firms' studied have between 501 and 1000 employees, 5(5.9%) of the firms' studied have less than 100 employees, while 4(4.7%) of the firms' studied currently

employ over 1000 employees. This means that majority of the firms' studied currently employs over 100 employees. This is an indication that the firms' studied are relatively large in size in terms of number of employees (>100 employees). These firms, therefore, require relatively large inventories in order to continuously keep their employees productive.

Arguably, keeping large inventories expose the firms to various inventory errors especially in areas of thefts, poor handling and shortages if poorly managed. This implies that, the larger the firm's size in terms of number of employees, the larger the firm's inventory thus the need for proper inventory management. This requires the firms' studied to implement relevant strategies such as EOQ, ABC and SSP to properly manage their inventories to address possible inventory errors. The result also supports the argument that the firms' studied contribute to employment in the country. Thus, government support in areas of subsidies, reduced tariffs on import of key inventories and flexible loan schemes among others could help the firms expand their current operations. This would invariably induce them to employ more active labour force to reduce the current unemployment rate in the country.

Also, the firms' size in terms of total value of asset was presented in Table 5. It was revealed that, 82(96.5%) of the firms' studied have their total assets worth over GHS10,000, while 3(3.5%) of them have their total assets worth between GHS50,001 to GHS100,000. This means that majority of the firms' studied are worth over GHS100,000. This implies that the firms under study operates on a relatively large scale. They are, therefore, likely to keep high levels of inventory to meet customer demands consistently. According to Eisenberg *et al.* (1998) and Shang and Seddon (2002), inventory consists

about 70 percent of manufacturing firms’ most valuable current assets. As such, failure to adopt relevant strategies to properly manage inventories could have severe impact on total assets of the firms’ studied.

Demographic characteristics of respondents

The demographic characteristics of the managers/officers of the participating firms were discussed in this section. Major issues discussed were in relation to sex, age, academic attainment, job position and number of years worked in one’s current position. The result was presented in Table 6.

Table 6: Socio-demographic Characteristics of Respondents

Category	Frequency	Percent %
Sex		
Male	68	80.0
Female	17	20.0
Total	85	100.0
Age Group		
18-35	9	10.6
36-45	24	28.2
46-55	35	41.2
Over 55 years	17	20.0
Total	85	100.0
Qualification in Operations or Procurement and Supply Chain Magt.		
Yes	18	21.2
No	67	78.8
Total	85	100.0
Highest Educational Qualification		
HND/Equivalent	8	44.4
First degree	5	27.8

Table 6: Continued

Item	Frequency	Percent %
Postgraduate degree	5	27.8
Total	18	100.0
Professional certificate holders		
Yes	11	12.9
No	74	87.1
Total	85	100.0
Type of Professional certificate		
Institute of Supply Management	3	27.3
Ghana Institute of Procurement and Supply	2	18.2
Chartered Institute of Procurement and Supply	4	36.4
Others	2	18.2
Total	11	100.0
Job position		
Procurement/Purchasing officer	24	28.2
Production officer	19	22.4
Operations officer	42	48.8
Total	85	100.0
Number of years worked		
< 5 years	26	30.6
5 – 10 years	37	43.5
11-15 years	15	17.6
< 15 years	7	8.2
Total	85	100.0

Source: Field Survey (2019)

From Table 6, majority, 68(80%), of the respondents were males, while minority of them were females, 17(20%). This result implies that there is high gender disparity in terms of managerial positions in the firms' studied. This finding supports Boohene *et al.*'s (2008) argument that Ghana has a history of

restricting women from attaining higher education necessary to take managerial positions. They also added that, women face major challenges of balancing domestic roles with managerial duties which prevent them from taking key managerial positions.

In relation to age of the respondents, the result shows that majority, 35(41.2%), of them were between the ages of 46-55 years, 24(28.2%) of them were between the ages of 36 to 45 years, 17(20.0%) were over 55 years, while 9(10.6%) were between the ages of 18-35 years. This means that, majority of the respondents are over 35 years and as such fall within the active working periods. This implies that, the firms' studied currently have highly energetic and active personnel in key managerial positions.

On the issue of personnel with academic qualifications related to operations and/or procurement and supply chain management, majority, 67(78.8%) had no qualification, while minority, 18(21.2%), had qualifications. This implies that, intensive training through conferences, workshops and seminars should be organised for the officers in a bid to continuously enrich their level of knowledge on issues pertaining procurement, operation and supply chain management. This would help the officers to continuously build their capacities to address inventory issues arising primarily from supply and demand uncertainties.

Additionally, respondents with qualifications related to operations and/or procurement and supply chain management were asked to indicate their highest educational qualification. Table 5 revealed that, majority, 8(44.4%) have HND/equivalent certificates, while 5(27.8%) and 5(27.8%) have first degrees and postgraduate degrees respectively. This implies that, although these officers

have undergone tertiary education, they may require more educational packages in a bid to keep them abreast with issues related to management of inventories, procurement, operation/production and supply chain management.

Table 6 further obtained information in relation to the professional qualification of the respondents. It was revealed that, 11(12.9%) of them had professional certificates while 74(87.1%) of them did not have any professional qualification in operations and/or procurement and supply chain management. This means that, even though the officers attend to issues related to operations, procurement and/or production, they should be encouraged to undertake professional courses to strengthen their current capacities and qualifications. Also, in terms of type of professional certificates held by the officers, 4(36.4%), were Chartered Institute of Procurement and Supply (CIPS) certificate holders, 3(27.3%) of them had Institute of Supply Management (ISM) certificates. This was followed by 2(18.2%) of them with professional certificates from Ghana Institute of Procurement and Supply (GIPS) while 2(18.2%) had their professional certificates from other relevant bodies.

Table 6 presented the respondents' current job positions. It was revealed that 42(48.8%) of them were operations managers/officers, 24(28.2%) of them were Procurement/Purchasing managers/officers and 19(22.4%) of them were production managers/officers. This means that all the respondents held relevant positions thus gathering information related to inventory and its management strategies from them was appropriate. This implies that, the managers/officers who participated in the study were directly involved in inventory and thus arguably provided relevant information which could be relied on for policy making and generalisation purposes.

Finally, the respondents were asked to indicate the number of years they have worked in their current job positions. Table 6 revealed that, majority, 37(43.5%), of the managers/officers have worked for between 5 to 10 years, 26(30.6%) of them have worked for less than 5 years, 15(17.6%) have worked for between 11 to 15 years, while 7(8.2%) of them have worked for over 15 years. This means that, majority of the managers/officers have worked for over 5 years in their respective positions. This implies that they have garnered high levels of experience in handling issues related to inventory and its associated management. Thus, the managers/officers of the firms' studied arguably provided relevant information per their level of experience which could be relevant for policy making.

Description of inventory management strategies

The section described the various strategies adopted by the firms' studied when managing their inventories. These strategies specifically included Activity Based Costing (ABC), Economic Order Quantity (EOQ), Just-In-Time (JIT), Strategic Supplier Partnership (SSP) and Vendor Managed Inventory (VMI) respectively. The study described the variables by assessing the quality of the indicators measuring each of the strategies (constructs) understudy. This was done to identify whether the indicators are relevant for describing their specific inventory management strategies within the context of the firms' studied. The section, therefore, reported the mean score, standard deviation, skewness and kurtosis statistics of each construct's indicators.

Description of Activity Based Costing (ABC) strategy

Activity Based Costing (ABC) is an inventory strategy that deals with the classification of inventory on the basis of time, monetary value and annual usage. The strategy divides a firm’s inventory into 3 classes (A, B and C) to enable managers concentrate on items that account for the most inventory. The strategy has widely been described based on item classifications, selective control, allocation of funds, focus on valuable items and periodic review or re-categorisation. This section, presents how each indicator truly measures the strategy within the firms studied. The result of the mean, standard deviation, skewness and kurtosis statistics were discussed in Table 7.

Table 7: Description of Activity Based Costing (ABC) strategy

Item/Indicator	Mean	Std. Dev.	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	S.E.	Statistic	S.E.
Classification of items	4.16	.884	-.861	.261	.013	.517
Selective control	4.08	.889	-.788	.261	-.017	.517
Allocation of funds	4.27	.808	-.814	.261	-.148	.517
Focus on valuable items	3.47	1.019	-.022	.261	-.811	.517
Periodic review and re-categorisation	3.75	1.122	-.580	.261	-.262	.517
Overall average score	3.95	0.944	-.613	.261	-.250	.517

Note: S.E = Standard Error, Std. Dev. = Standard Deviation

Source: Field survey (2019)

From Table 7, all the firms, 85(100.0%) agreed that they strictly allocated funds for managing their inventories based on the value of each inventory item. This result was rated ‘high’ because it had a mean score of 4.27 which is between 3 and 5. The standard deviation statistic of 0.808 indicates that the data points are gathered closely around the mean value confirming it as a great value. The skewness and kurtosis statistics are -0.814 and -0.148 with standard errors of 0.2611 and 0.517 show that the indicator is approximately

normally distributed. This means that, allocation of funds based on item value is a true measure of the ABC strategy within the firms studied.

The result also indicated that, the firms' studied, 85(100.0%) classify their items in order of importance ($M=4.16$). The standard deviation score of 0.884 indicates that the mean value is great because its distribution is spread around it. The skewness and kurtosis statistics of -0.861 and 0.013 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed. The result indicates that classification of items in order of importance is a true measure of the ABC strategy within the firms studied. Also, all the firms, 85(100.0%), had selective control over their inventory items ($M=4.08$). The standard deviation score of 0.889 indicates that the mean value is great because its distribution is spread about it. The skewness and kurtosis statistics of -0.788 and -0.017 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed.

Table 7 further revealed that, the firms studied, 85(100.0%), periodically reviewed and re-categorised their inventory items ($M=3.75$). The standard deviation score of 1.122 indicates that the data's distribution is spread about the mean score. The skewness and kurtosis statistics of -0.580 and -0.262 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed. Finally, the firms agreed that they focused more on valuable items than other items based on the ABC strategy. This result had a high mean score of 3.47 (between 3 and 5). The standard deviation score of 1.019 indicates a greater spread in the data's distribution. The skewness and kurtosis statistics of -0.022 and -0.811 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed.

From Table 7, the overall mean score of 3.95 with a standard deviation score of 0.944 reveal that all the indicators truly measure the ABC strategy within the firms' studied. The result reveals that all the indicators clearly describe the strategy. This means that, all the firms, 85(100.0%), use item classifications, selective control, allocation of funds, focus on valuable items and periodic review or re-categorisation as good criteria for describing the ABC strategy.

Description of Economic Order Quantity (EOQ) strategy

Economic Order Quantity (EOQ) strategy is a widely used strategy for identifying the most appropriate quantity to order in a bid to minimise expenses. The strategy helps in determining the optimal inventory level comprising inventory carrying costs, stock-out costs and total costs which are helpful in determining appropriate inventory levels to hold. It has generally been described based on the following assumptions/criteria: demand is known and constant, Lead time is known and constant and fixed orders are always placed. Also, the procedure for determining cost components in addition to ensuring adequate preparation towards inventory shortages are other key criteria for describing this strategy. More precisely, this section presents how each indicator truly measures the strategy within the firms studied. The result of the mean, standard deviation, skewness and kurtosis statistics were discussed in Table 8.

From Table 8, all the firms, 85(100.0%), agreed that they place fixed orders whenever inventory is below the optimal level within a given period of time. This helps the firms to properly manage their inventories as fixed quantities are ordered at all times. This result was rated 'high' because it had a mean score of 4.38 which is between 3 and 5. The standard deviation statistic of

0.707 indicates that the data distribution is gathered closely around the mean value thus confirming it as a great value. The skewness and kurtosis statistics are -0.688 and -0.721 with standard errors of 0.261 and 0.517 show that the indicator is approximately normally distributed. This means that, the firms studied rely on this criterion to describe the Economic Order Quantity strategy.

Also, Table 8 indicated that, the firms' studied, 85(100.0%), have fixed procedures for determining cost components associated with managing their inventories over a given period (M=4.32). This is to ensure that these firms do not make unnecessary expenditure on their inventories as it could tie up a large portion (50%-70%) of their total current assets. The standard deviation score of 0.739 indicates that the mean value is great because its distribution is spread around it. The skewness and kurtosis statistics of -0.739 and 0.279 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed.

Table 8: Description of the Economic Order Quantity (EOQ) strategy

Items	Mean	Std. Dev.	Skewness	Kurtosis		
	Statistic	Statistic	Statistic	S.E.	Statistic	S.E.
Demand is known and constant	3.89	.900	-.389	.261	-.644	.517
Lead time is known and constant	4.24	.826	-.726	.261	-.409	.517
Place fixed orders	4.38	.707	-.688	.261	-.721	.517
Specific procedure for determining cost components	4.32	.694	-.739	.261	.279	.517
Preparation toward inventory shortages	3.94	1.106	-.747	.261	-.362	.517
Overall average score	4.15	.847	.658	.261	-.483	.517

Note: S.E = Standard Error, Std. Dev. = Standard Deviation
Source: Field survey (2019)

From Table 8, the firms describe the EOQ strategy by ensuring that lead time is known and constant over a specified period of time. This is because, the result had a high mean score of 4.24. This indicator helps the firms to ensure continuous production because they know when to place orders and receive them within a given time frame. The standard deviation score of 0.826 indicates that the mean value is great because its distribution is spread about it. The skewness and kurtosis statistics of -0.726 and -0.409 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed.

Table 8 further revealed that the firms studied, 85(100.0%), prepare adequately toward inventory shortages ($M=3.94$). The standard deviation score of 0.1.106 indicates that the mean value is great because its distribution is spread about it. The skewness and kurtosis statistics of -0.747 and -0.362 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed. Also, the firms ensure that customer demands for their products are known and constant over time. This criterion had a mean score of 3.89 indicating that it is a good measure of the Economic Order Quantity within the firms studied. The standard deviation score of 0.900 indicates that the data's distribution is spread about the mean score. The skewness and kurtosis statistics of -0.389 and -0.644 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed.

Finally, the overall mean score of 4.15 with standard deviation score of 0.847 reveal that all the indicators truly measure and thus describe the Economic Order Quantity strategy within the firms' studied. This means that, all the firms, 85(100.0%), describe the Economic Order Quantity by placing fixed orders whenever inventory is below a specified optimum level. They also have specific

procedure for determining cost components, ensure that lead time and customer demands are known and constant over time and finally prepare adequately toward inventory shortages.

Description of Just-In-Time (JIT) strategy

Just-In-Time (JIT) is a strategy that focuses on improving operational performances by eliminating all possible wastes in a production system while ensuring continuous improvement and customer satisfaction. JIT strategy also lays much emphasis on the production of items just when needed, neither earlier nor later. The strategy emphasises on on-time delivery from suppliers, proper layout of production systems, quick communication among chain actors, strict adherence to production schedules and reliance on customers' specifications. Using the mean scores, standard deviations, skewness and kurtosis, the study revealed how each indicator truly measures the JIT strategy within the firms' studied. The result was presented in Table 9.

Table 9: Description of JIT strategy

	Mean	Std. Dev.	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	S.E.	Statistic	S.E.
On-time delivery	3.65	1.088	-.559	.261	-.161	.517
Proper layout	3.52	1.191	-.670	.261	-.263	.517
Communication flow	3.61	1.059	-.702	.261	.284	.517
Adherence to production schedules	3.75	1.164	-.706	.261	-.194	.517
Customers' specifications	2.68	1.293	-.449	.261	-.767	.517
Overall average score	3.44	1.159	-.617	.261	-.334	.517

Note: S.E = Standard Error, Std. Dev. = Standard Deviation

Source: Field survey (2019)

In terms of the Just-In-Time (JIT) strategy, all the firms agreed that they strictly adhered to production schedules which is aimed at avoiding production

delays, wastages while ensuring customer satisfaction. This result was rated 'high' because it had a mean score of 3.75 which is between 3 and 5. The standard deviation statistic of 1.293 indicates that the data points are gathered closely around the mean value thus confirming it as a great value. The skewness and kurtosis statistics are -0.706 and 0.194 with standard errors of 0.261 and 0.517 show that the indicator is approximately normally distributed.

All the firms' studied, 85(100.0%), agreed that they have a proper layout (men, machine, material, information) that supports their production systems (M=3.65) while eliminating waste. The standard deviation score of 1.088 indicates a good mean value because its data points are gathered close to it. The skewness and kurtosis statistics of -0.559 and -0.161 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed. The firms also ensured quick communication with their key suppliers to promote the JIT strategy (M=3.61). The standard deviation of 1.059 indicates that the mean score is a great score because its data points are clustered close to it. The skewness and kurtosis distribution are -0.702 and -0.284 with standard errors of 0.261 and 0.517 indicating that the data obtained for this indicator are approximately normally distributed.

Table 9 further revealed that the firms relied on on-time supplies from their key suppliers for smooth production (M=3.52). The standard deviation score of 1.191 indicates that the mean value is great because it has its distribution gathered close to it. The skewness and kurtosis statistics of -0.670 and -0.263 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed. However, the table revealed that the firms' studied do not rely on customer specifications when making production plans.

This is because, it had a low mean score of 2.68. On the other hand, the standard deviation score of 1.293 indicates that the mean value is great because its distribution is spread around it. The skewness and kurtosis statistics of -0.449 and -0.767 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed.

Finally, the overall average mean score of 3.44 with standard deviation of 1.159 reveal that the indicators truly measure the JIT strategy within the firms' studied. This means that, the firms studied describe the JIT strategy by strictly adhering to production schedules, ensuring quick communication, on-time supplies while properly laying out their production systems. Although producing based on customer specification is widely recognised as a key criterion of the JIT strategy, its mean score (low) had a contrasting result. Simply put, the Food and Beverage and Pharmaceutical firms in Ghana do not view customer specification as a criterion for describing the JIT strategy.

Description of Strategic Supplier Partnership (SSP) strategy

The nature of inventory is increasingly becoming complex thus difficult for only focal firms to properly manage. This requires firms to integrate key suppliers in its management by creating strong bonds them through strategic supplier partnership strategy. This strategy has been found to positively affect the performance levels of both actors. Manufacturing firms have been found to describe this strategy based on supplier involvement, information sharing, supplier agreement, frequency of meetings and supplier capacities. Using the mean scores, standard deviations, skewness and kurtosis, the study revealed how each indicator truly measures the SSP strategy within the firms' studied. The result was presented in Table 10.

Table 10: Description of Strategic Supplier Partnership strategy

Item/indicator	Mean	Std. Dev	Skewness	Kurtosis		
	Statistic	Statistic	Statistic	S.E.	Statistic	S.E.
Early supplier involvement	4.27	.585	-.124	.261	-.483	.517
Complete information sharing	4.26	.675	-.602	.261	.332	.517
Long-term agreements with suppliers	4.14	.758	-.746	.261	.573	.517
Frequency of meetings	3.79	1.001	-.653	.261	.348	.517
Supplier capacities	3.84	1.089	-.739	.261	-.078	.517
Overall average score	4.06	0.822	-.573	.261	-0.363	.517

Note: S.E = Standard Error, Std. Dev. = Standard Deviation

Source: Field survey (2019)

From Table 10, all the firms, 85(100.0%), agreed that they use early supplier involvement as a key criterion for describing the Strategic Supplier Partnership strategy. With this, the firms ensure that some key suppliers are involved right from the product design stage through to its final production. This is to ensure that their key suppliers have in-depth knowledge about the nature of inventory needed and its associated quantity, quality and even place of delivery. This is because, the result had a high mean score of 4.27. The standard deviation statistic of 0.585 indicates that the mean score is great because its data distribution is gathered closely around it. The skewness and kurtosis statistics are -0.124 and -0.483 with standard errors of 0.261 and 0.517 show that the indicator is approximately normally distributed.

Also, Table 10 indicated that, the firms' studied, 85(100.0%), emphasise on complete information sharing when describing the SSP strategy (M=4.26). This criterion ensures that key suppliers have complete description of the inventory needed thus reducing possible wastages and/or shortages during production. The standard deviation score of 0.675 indicates that the mean value is great because its distribution is spread around it. The skewness and kurtosis

statistics of -0.602 and 0.332 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed.

Table 10 further indicates that, the firms' studied, 85(100.0%), ensure that they establish long-term agreements with their key suppliers. This leads to efficient integration of assets between the actors thus promoting the exchange of valuable resources aimed at inventory management (M=4.14). The standard deviation score of 0.758 indicates that the mean value is great because its distribution is spread around it. The skewness and kurtosis statistics of -0.746 and 0.573 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed.

From Table 10, the firms studied also consider the capacities of their key suppliers as a criterion for describing the SSP strategy. The result had a high mean score of 3.84. The standard deviation score of 1.089 indicates that the mean value is great because its distribution is spread around it. The skewness and kurtosis statistics of -0.739 and 0.078 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed. Also, the frequency of meetings by the actors is another key criterion for describing the SSP strategy within the firms studied (M=3.79). The standard deviation score of 1.001 indicates that the mean value is great because its distribution is spread around it. The results of the skewness (-.653) and kurtosis (0.348) with associated standard errors 0.261 and 0.517 show that the data obtained are approximately normally distributed.

Finally, the overall average mean score of 4.06 with standard deviation score of 0.847 reveal that all the indicators truly measure and thus describe the strategic partnership strategy within the firms' studied. This means that, all the

firms, 85(100.0%), describe the strategy using the following criteria: supplier involvement, complete information sharing, agreements with suppliers, supplier capacities and frequency of meetings. Thus, relying on these indicators to describe the SSP strategy within the firms studied was appropriate.

Description of Vendor Managed Inventory (VMI) strategy

Vendor Managed Inventory (VMI) is a strategy where inventory major replenishment decisions are centralised with suppliers. Suppliers agree to take the responsibility for making major inventory decisions on behalf of the focal firm. The strategy creates a centralised link between manufacturers and suppliers to provide less complex and faster transactions. It has, therefore, been found to positively influence the operational performances of both actors. This strategy has largely been described using the following criteria: agreement with suppliers, supplier capacity, complete access to information, periodic review by suppliers and supplier control over inventory. Using the mean scores, standard deviations, skewness and kurtosis, the study assesses how each indicator truly measures the strategy. The result was presented in Table 11.

From Table 11, all the firms, 85(100.0%), agreed that they consider supplier capacity as a key criterion for describing the VMI strategy ($M=4.35$). Knowledge of suppliers' operational capacity promotes confidence and trust in their abilities to properly manage inventories on behalf of the focal firm. The standard deviation statistic of 0.612 indicates that the mean score is great because its data distribution is gathered closely around it. The skewness and kurtosis statistics are -0.373 and -0.634 with standard errors of 0.261 and 0.517 show that the indicator is approximately normally distributed.

Table 11: Description of Strategic Supplier Partnership strategy

Item/Indicator	Mean	Std. Dev.	Skewness	Kurtosis		
	Statistic	Statistic	Statistic	S.E.	Statistic	S.E.
Agreement with suppliers	3.74	1.207	-.524	.261	-.720	.517
Supplier capacity	4.35	.612	-.373	.261	-.634	.517
Complete access to information	3.88	1.062	-.858	.261	.506	.517
Periodic review by suppliers	3.49	1.191	-.310	.261	-.767	.517
Supplier control over inventory	3.78	1.228	-.665	.261	-.671	.517
Overall average score	3.85	1.06	-.546	.261	.660	.517

Note: S.E = Standard Error, Std. Dev. = Standard Deviation

Source: Field survey (2019)

Also, from Table 11, all the firms, 85(100.0%), agreed that they give key suppliers complete access to information (M=3.88). This exposes the suppliers to the nature of inventory to be kept and how to properly manage them. The standard deviation statistic of 1.062 indicates that the mean score is great because its data distribution is gathered closely around it. The skewness and kurtosis statistics are -0.858 and -0.506 with standard errors of 0.261 and 0.517 show that the indicator is approximately normally distributed.

Furthermore, Table 11 indicated that, the firms' studied, 85(100.0%), allow the suppliers to have complete control over the inventories they keep at their premises (M=3.78). This criterion allows the suppliers to properly manage inventory with minimal interferences from the focal firm. The standard deviation score of 1.228 indicates that the mean value is great because its distribution is spread around it. The skewness and kurtosis statistics of -0.665 and -0.671 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed.

Table 11 further indicates that, the firms' studied, 85(100.0%), ensure that they establish long-term agreements with their key suppliers. This leads to

efficient integration of assets between the actors thus promoting the exchange of valuable resources aimed at inventory management ($M=4.14$). The standard deviation score of 0.758 indicates that the mean value is great because its distribution is spread around it. The skewness and kurtosis statistics of -0.746 and 0.573 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed.

From Table 11, the firms studied also consider the level of supplier agreement as a criterion for describing the SSP strategy. The result had a high mean score of 3.74. The standard deviation score of 1.207 indicates that the mean value is great because its distribution is spread around it. The skewness and kurtosis statistics of -0.524 and -0.720 with standard errors of 0.261 and 0.517 indicate that the data obtained are approximately normally distributed. Periodic review by suppliers is another key criterion for describing the SSP strategy within the firms studied ($M=3.49$). The standard deviation score of 1.191 indicates that the great mean value because its distribution is spread around it. The results of the skewness (-.310) and kurtosis (0.634) with associated standard errors 0.261 and 0.517 show that the data obtained are approximately normally distributed.

Finally, the overall average mean score of 3.85 with standard deviation score of 1.060 reveal that all the indicators truly measure and thus describe the Vendor Managed Inventory strategy within the firms' studied. Simply put, all the firms, 85(100.0%), describe the strategy using the following criteria: supplier capacity, accessibility of information by suppliers, supplier control over inventory, agreements with suppliers and periodic review by suppliers.

Therefore, the reliance on these criteria/indicators in describing the VMI strategy within the firms studied was appropriate.

Assessment of the PLS-SEM

The study's research objectives were analysed using the Partial Least Square (PLS), a structural equation modelling technique. Key underlying assumptions or model qualities such as item loadings, indicator reliability (IR), construct reliability (CR), convergent validity (average variance extracted), multicollinearity (VIF) and discriminant validity were first assessed to basically obtain satisfactory validity and reliability of the study (Hair *et al.*, 2014). Also, these model qualities were tested to make meaning out of the structural model results (Henseler *et al.*, 2009; Ringle *et al.*, 2011).

Model specification (structural and measurement)

The section specified the model's structure by indicating the study's exogenous and endogenous variables and their associated indicators. The study's model was structured with five exogenous variables, one endogenous variable and one control variable. Figure 2 presented the structure of the model.

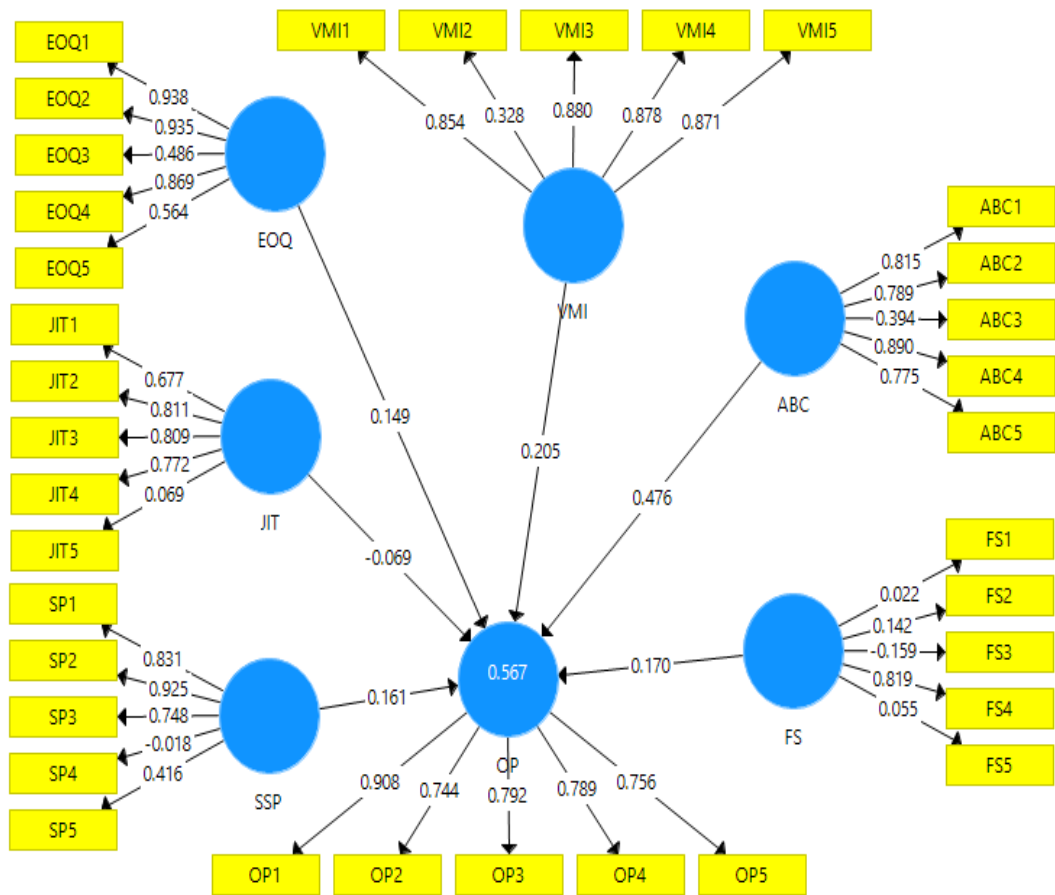


Figure 2: Outer and inner model results
Source: Authors' own construct (2019)

From Figure 2, the exogenous variables had five indicators each and they consisted of Activity Based Costing (*ABC1, ABC2, ABC3, ABC4 and ABC5*), Economic Order Quantity (*EOQ1, EOQ2, EO3, EOQ4 and EOQ5*), Just-In-Time (*JIT1, JIT2, JIT3, JIT4 and JIT5*), Strategic Supplier Partnership (*SSP1, SSP2, SSP3, SSP4 and SSP5*) and Vendor Managed Inventory (*VMI1, VMI2, VMI3, VMI4 and VMI5*). Also, firm size (*FS1, FS2, FS3, FS4 and FS5*) represented the control variable. Finally, the endogenous variable was represented by operational performance (OP) with five indicators including *OP1, OP2, OP3, OP4 and OP5*.

From Figure 2, the latent variables were used to draw five paths hypotheses in the model. These path hypotheses anticipate positive relationships between the exogenous variables and the endogenous variable with firm size control these relationships. Specifically, the path hypotheses anticipated the following relationships: ABC strategy and OP; EOQ strategy and OP; JIT strategy and OP; SSP strategy and OP and VMI strategy and OP respectively. It is to note that, firm size was held constant in all the relationships established.

The model's structure was further assessed by evaluating the item loadings (indicators) of each construct. This was done to assess the quality of the indicators (item loadings) measuring each construct within the context of the study. The rule of thumb is that, an item or indicator with a loading ≥ 0.70 is a quality measure of its construct (Henseler *et al.*, 2009). On the other hand, an item or indicator with a loading < 0.70 is not a quality measure of its construct thus removed from the model. The model after the assessment was presented in Figure 3. From the figure, some of the item loadings of each construct were below the 0.70 threshold suggested by Henseler *et al.* (2009). This is an indication that such items (indicators) obtained from literature did not actually measure the study's constructs within the firms' studied.

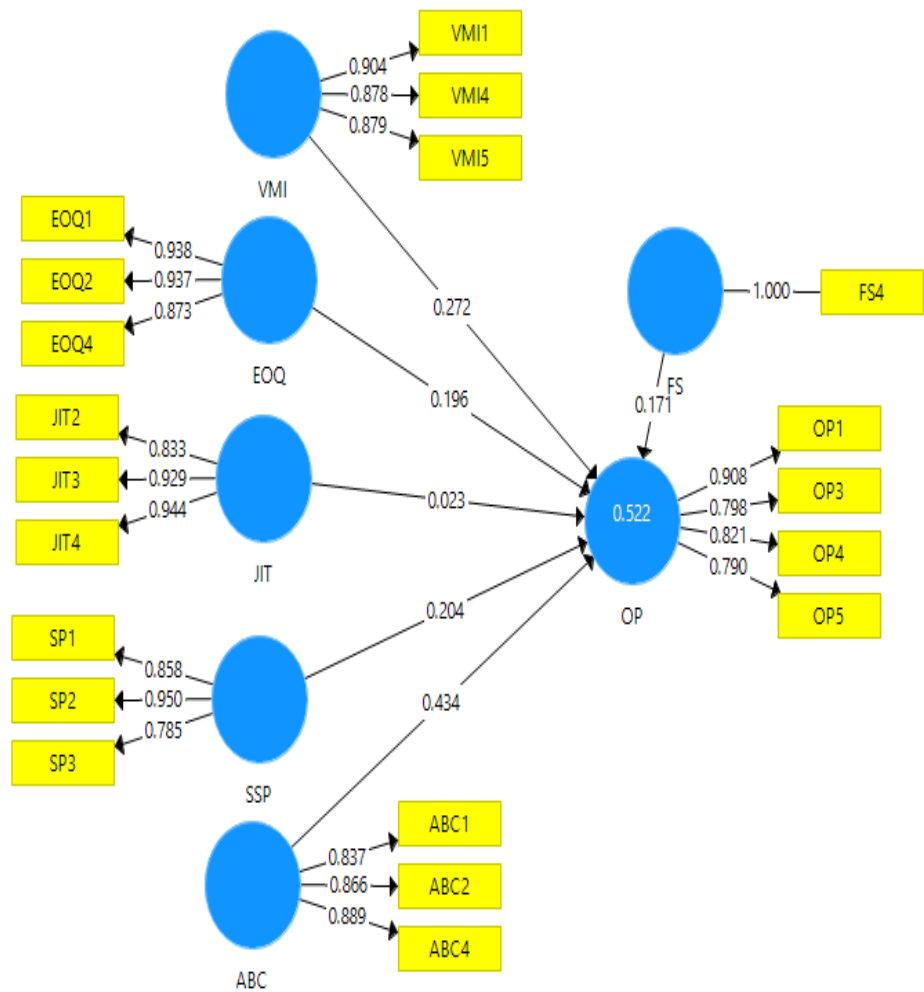


Figure 3: Final model extracted
Source: Authors' own construct (2019)

From Figure 3, a closer look at the item loadings proved indicator reliability per the minimum cut-off of 0.7 as suggested by Henseler *et al.* (2009). In terms of each construct, some of their respective item loadings were < 0.7 thus removed from the model because they do not truly measure that construct. More precisely, the ABC strategy, for instance, had *ABC3* and *ABC5* removed; EOQ strategy had *EOQ3* and *EOQ5* removed; JIT had *JIT1* and *JIT5* removed; SSP had *SSP4* and *SSP5* removed while VMI had *VMI2* and *VMI3* removed. In terms of FS, only *FS4* had its loading > 0.7 , thus maintained as a true measure

of firm size. Finally, OP had *OP2* removed from the model. It is to note that, the study’s research hypotheses were tested based on the final model in Figure 3.

Measurement model assessment

Table 12 presented the results of the model qualities comprising internal consistency reliability (indicator reliability (IR), construct reliability), convergent validity (average variance extracted) and multicollinearity (Inner VIF values).

Table 12: Assessment of indicator and construct reliability and validity

Items	CA	rho_A	CR	CV	Inner VIF values
ABC	0.833	0.862	0.898	0.747	1.247
EOQ	0.904	0.910	0.940	0.840	1.461
FS	1.000	1.000	1.000	1.000	1.076
JIT	0.797	0.783	0.868	0.687	1.317
OP	0.851	0.874	0.899	0.690	
SSP	0.834	0.930	0.900	0.752	1.089
VMI	0.872	0.959	0.917	0.787	1.486

IR (CA and rho_A) – Indicator reliability; CR – Construct reliability; AVE – Convergent validity
 Source: Field survey (2019)

Internal consistency reliability

Table 12 presented the indicator and construct reliability of the study. Indicator reliability (IR) shows the portion of variance of an indicator that can be described by its underlying latent variable (Hair *et al.*, 2012). The rule of thumb for IR is that the threshold value of any given indicator should be > 0.7 (Chin, 2010; Hair *et al.*, 2011; Latan & Ghazali, 2013; Wong, 2013). According to Vinzi, Trinchera and Amato (2010), the threshold value is an indication that

the variance of the measurement error is less than the shared variance between a construct and its indicator. As such, indicator reliability (IR) is effective tool for assessing uni-dimensionality of a set of scale items. This was achieved using the Cronbach alpha (α) and rho_A (ρ) results.

From Table 12, the indicator reliability result of each latent variable based on the α showed the following: ABC (0.833); EOQ (0.904); FS (1.000), JIT (0.797); OP (0.851); SSP (0.834) and VMI (0.872) respectively. The results mean that each of the latent variables' thresholds (>0.70) met the acceptability criteria thus indicating that they were reliable for the model. Also, other studies have suggested the use of rho_A for assessing indicator reliability (Chin, 2010; Hair *et al.*, 2014; Henseler, Hubona & Ray, 2016). This is because, rho_A is a much more accurate measure for the indicator reliability. Chin (2010) suggested that Joreskog's rho_A (ρ) scores should be > 0.70 . The result ranged from 0.783 to 1.000 indicating satisfactory and acceptable results. Specifically, ABC strategy ($\rho = 0.862$), EOQ ($\rho = 0.910$), FS ($\rho = 1.000$), JIT strategy ($\rho = 0.7830$), OP ($\rho = 0.874$), SSP ($\rho = 0.930$) and VMI ($\rho = 0.959$) respectively.

Table 12 also presented the result of the construct reliability of the study. Bagozzi and Yi (1988) and Ringle *et al.* (2012) explained that construct reliability (CR) assesses the extent to which a specific construct is adequately measured by its indicators when put together. This means that, CR requires all the indicators assigned to a given construct to have a strong mutual correlation. The construct reliability result was obtained using the composite reliability as it is appropriate for assessing how well assigned indicators measure a construct (Bagozzi & Yi, 1988). The rule of thumb is that the CR value should be 0.70 or higher (Bagozzi & Yi, 1988; Ringle *et al.*, 2012). The results showed that all the

CR values were > 0.70 with the least equal to 0.898. This means that all the assigned indicators had strong mutual relationships with their respective constructs.

Convergent Validity

Table 12 further presented the result of the convergent validity (CV) of the study. the Average Variance Extracted (AVE) is commonly used to measure convergent validity (CV) in PLS-SEM models (Hair *et al.*, 2011, 2012). Hair *et al.* (2011) posits that the AVE explains how an indicator's variance is captured by the construct relative to the total amount of variance and the variance as result of measurement error. The study tested CV by examining the AVEs of all the variables in the SEM model. An AVE with a minimum threshold of 0.5 for a construct to show convergent validity has been recommended by Fornell and Larcker (1981), Bagozzi and Yi (1988) and Hair *et al.* (2011). The results revealed that the AVEs of all the latent variables ranged from 0.687 to 1.000 thus > 0.5 ; indication that the validity of the measurement scale was convergent.

Multicollinearity among exogenous variables

The study further checked multicollinearity using both the inner (Table 12) and outer (Table 13) variable inflation factor (VIF) values. Hair *et al.* (2014) noted that multicollinearity diagnostics is assessed to ensure that the path coefficients are free from bias while minimising the significant levels of collinearity among the predictor constructs. Pallant and Manuel (2007) stressed that VIF values > 10 indicated multicollinearity among the independent variables thus affecting the development of a good PLS-SEM model. Hair *et al.* (2014) suggested that the VIF values of each construct should be less than the

cut of point of 5.0. From the table, the inner VIF values of the exogenous variables were as follows: ABC (1.247), EOQ (1.461), FS (1.076), JIT (1.317) SSP (1.089) and VMI (1.486) respectively. This showed the absence of multicollinearity between the exogenous variables.

Table 13: Multicollinearity among the constructs

Indicators	VIF
ABC1	1.960
ABC2	1.927
ABC4	1.893
EOQ1	3.957
EOQ2	3.954
EOQ4	2.216
FS4	1.000
JIT2	2.943
JIT3	3.716
JIT4	2.505
OP1	2.756
OP3	1.889
OP4	2.308
OP5	2.004
SP1	3.212
SP2	3.947
SP3	1.560
VMI1	1.861
VMI4	2.901
VMI5	2.991

Source: Field survey (2019)

Table 13 indicated that the outer VIF values of the respective indicators ranged between 1.000 and 3.957. These are clear indications that all the VIF values are less than the cut point of 5 suggested by Hair *et al.* (2014). This result

further indicates the absence of multicollinearity among the indicators measuring the various exogenous variables. The study’s result has, therefore, been supported by Ringle, Weade and Becker (2015).

Discriminant Validity

The study further assessed the quality of the model by testing for discriminant validity as suggested by Hair *et al.* (2011). The discriminant validity was tested using Fornell and Larcker (1981) criterion and more recently the Heterotrait-Monotrait (HTMT) ratio. Fornell and Larcker (1981), for instance, explained that discriminant validity ensures that the study’s latent variables are independent from one another. Discriminant validity can be used to assess the structural model for collinearity issues (Hair *et al.*, 2014). According to Hair, Sarstedt, Ringle and Gudergan (2017), discriminantly valid constructs do not typically have significant levels of collinearity.

The rule of thumb for discriminant validity using Fornell and Larcker’s (1981) criterion is that the factorial loadings in their respective constructs should be larger than all the other correlation values among the latent variables (Fornell & Larcker, 1981; Chin, 2010). The result was presented in Table 14.

Table 14: Fornell-Larcker criterion for checking Discriminant validity

	ABC	EOQ	FS	JIT	OP	SSP	VMI
ABC	0.864						
EOQ	0.374	0.916					
FS	0.009	0.069	1.000				
JIT	0.118	-0.208	-0.107	0.903			
OP	0.576	0.492	0.141	-0.116	0.831		
SSP	0.073	0.001	-0.195	-0.120	0.193	0.867	
VMI	0.181	0.465	-0.018	-0.391	0.424	-0.027	0.887

Note: Diagonal elements in bold = square root of AVE; Off-diagonal elements = correlation between constructs

Source: Fornell and Larcker (1981)

The discriminant validity result in Table 14 shows that all the factorial loadings in their respective constructs are higher than all the other correlation values among the latent variables. The implication is that each latent variable is truly different from the other. This means that there is uniqueness in the measurements of the constructs. Therefore, the rule of thumb proposed by Fornell and Larcker (1981) was met.

Finally, discriminant validity was tested using the Heterotrait-Monotrait (HTMT) ratio. This is a relatively new measure for evaluating discriminant validity in variance-based structural equation modelling (Rigdon 2014; Sarstedt, Ringle, Smith, Reams & Hair, 2014). Sarstedt *et al.* (2014) suggested that the HTMT ratio has become a generally accepted criterion for assessing relationships among latent variables. They recommended the use of HTMT ratio for assessing discriminant validity instead of the previously used Fornell-Larcker criterion and cross-loadings. This is because, the HTMT ratio shows superior performance by having the ability to detect a lack of discriminant validity in common research scenarios as compared to the Fornell-Larcker criterion and cross-loadings. Table 15, therefore, presented the result of the HTMT ratio.

Table 15: Heterotrait-Monotrait (HTMT) ratio

	ABC	EOQ	FS	JIT	OP	SSP	VMI
ABC							
EOQ	0.430						
FS	0.028	0.111					
JIT	0.144	0.216	0.106				
OP	0.650	0.548	0.156	0.146			
SSP	0.085	0.069	0.233	0.107	0.216		
VMI	0.195	0.500	0.038	0.478	0.444	0.081	

Source: Field survey (2019)

According to Wetzels, Odekerken-Schröder, and Van Oppen (2009), the HTMT values (correlation values among the latent variables) should be < 0.85 in order to achieve discriminant validity. From Table, all the values for each of the constructs were below HTMT^{0.85}. This indicates that each construct is truly distinct from the other.

Significance of Path Coefficients

After assessing the measurement model to ensure it meets the PLS-SEM criterion, the study continued with testing the five research hypotheses. The hypotheses specifically focused on examining the effects of ABC analysis, Economic Order Quantity (EOQ), Just-In-Time (JIT), Strategic Supplier Partnership (SSP) and Vendor Managed Inventory (VMI) on operational performance (OP) of Food and Beverage and Pharmaceutical firms within some selected metropolises in Ghana specifically Accra, Tema, Kumasi and Sekondi-Takoradi metropolises. The hypotheses were tested by assessing the direction and strength using the path coefficient (β) and level of significance with t-statistics obtained through 5000 bootstraps as suggested by Hair *et al.* (2014). Results of the hypotheses tested using PLS-SEM were presented in Table 16.

Table 16: Result of structural equation model and hypothesis testing

Structural path	(β)	t-stats	p-values	Decision Rule
ABC → OP	0.434	5.457	0.000*	P<0.05 H ₁ (supported)
EOQ → OP	0.196	2.331	0.020*	P<0.05 H ₂ (supported)
FS → OP	0.171	2.097	0.036*	P<0.05
JIT → OP	0.023	0.207	0.836	P>0.05 H ₃ (not supported)
SSP → OP	0.204	2.105	0.035*	P<0.05 H ₄ (supported)
VMI → OP	0.272	2.666	0.008*	P<0.05 H ₅ (supported)

Note: * = P<0.05

Source: Field survey (2019)

The result of firm size, as a control variable, was first reported in the study. Firm size was found to significantly and positively influence the operational performance of the manufacturing firms under study. This is because, the result of the t-stat of firm size was $2.097 > 1.96$ ($\beta = 0.171$). It is to note that, further analysis was not done on this result because it was not part of the study's research hypotheses.

The study's research hypotheses were tested based on the values of the t-stats as prescribed by Hair *et al.* (2014). They suggested that t-stat values above 1.96 correspond to p-values < 0.05 and vice versa. Thus, the decision rule is that, the null hypothesis (H_0) is rejected (supported) when the t-stat is < 1.96 while one fails to reject (does not support) the H_0 when the t-stat is > 1.96 .

Effect of Activity Based Costing strategy on operational performance

Research objective one focused on the effect of ABC analysis strategy on operational performance. The study hypothesised (H_0) that: ABC analysis strategy does not significantly influence the operational performance of Food and Beverage and Pharmaceutical manufacturing firms within the selected metropolises in Ghana.

From Table 16, the result revealed that ABC analysis strategy has a significant positive effect on operational performance ($\beta = 0.413$; $t = 5.457$; $p < 0.05$). This is because, the t-stat of the model was 5.457 which is less than 1.96. As such, the direction of the result was in line with the hypothesis thus the null hypothesis was rejected. Hence, the hypothesis that "ABC analysis strategy significantly influences operational performance" was supported. From the β , the study found a positive between the exogenous and endogenous variables. This means that a unit increase in ABC analysis by 43.4% will lead to a unit

increase in operational performance by the same margin (i.e. 43.4%). This implies that the ABC strategy plays a key role in ensuring effective inventory management; invariably leading to an increase in the operational performances of the Food and Beverage and Pharmaceutical manufacturing firms.

The study's result has been supported by the theory of constraints. The theory posits that Food and Beverage and Pharmaceutical firms could be exposed to various constraints including inventory constraints which could only be addressed when appropriate strategies are implemented (Goldratt, 1990). This means that, the firms studied can overcome their inventory constraints by adopting relevant strategies including the ABC strategy. This is because, the study found ABC strategy to effectively manage inventory and subsequently improves operational performance in terms of product quality, operational speed, flexibility and production costs. In line with the theory of constraints, ABC strategy could be implemented by the firms studied to constantly address their inventory constraints until they are totally addressed.

Also, the finding is in line with earlier studies by Krumwiede (1998), Chongruksut, and Brooks (2005), Maelah and Ibrahim (2006) and Sartorius, Eitzen Kamala (2007) who found that the use of ABC is positively associated with reducing production costs while improving product quality among manufacturing firms in developed and developing economies. Studies by Zaman (2009) and Telsang (2010) confirmed that the use of ABC strategy results in better overall performance. Elhamma (2015) and Amachree *et al.* (2017) posited that Activity Based Costing as an inventory strategy enables manufacturing firms to classify their inventories on the basis of time, monetary value and annual usage. This enables the firms to establish relevant policies and control measures

for each class of inventory which enhances inventory management and invariably firm performance.

Also, studies by Elhamma and Zhang (2013) and found ABC implementation to decrease manufacturing process, manufacturing costs while improving product quality among Moroccan manufacturing firms. Pokorná (2016) found a statistically positive significant effect of ABC strategy on the organisational performance of manufacturing enterprises in Czech Republic. A study by Zhang *et al.* (2017) on Chinese manufacturing firms found that successful implementation of ABC significantly improves product quality while minimising production costs. It could, therefore, be argued that the ABC analysis strategy plays a key role in improving the operational performance of manufacturing firms across the globe including Food and Beverage and Pharmaceutical firms in Ghana.

Effect of Economic Order Quantity strategy on operational performance

Research objective two focused on the effect of Economic Order Quantity (EOQ) strategy on operational performance. The null hypothesis (H_0) was that Economic Order Quantity (EOQ) does not significantly influence the operational performance of Food and Beverage and Pharmaceutical manufacturing firms within the selected metropolises in Ghana. From Table 16, the result revealed that Economic Order Quantity (EOQ) strategy had a significant positive effect on operational performance (OP) ($\beta = 0.355$; $t = 3.899$; $p < 0.05$). This is because, the t-stats of 2.331 was > 1.96 . As such, the direction of the result was in line with the alternate hypothesis thus the null hypothesis was rejected. Hence, the hypothesis that “Economic Order Quantity strategy significantly influences operational performance” was supported.

The study's result is an indication that a unit increase in the EOQ strategy by 19.6% will lead to a unit increase in operational performance of the firms studied by the same margin (i.e. 19.6%). This implies that the operational performances of Food and Beverage and Pharmaceutical firms improves when they implement a strategy which helps them to keep optimal inventory levels over a specified period of time. The EOQ strategy plays a vital in inventory management as it enables firms to meet customer demands devoid of shortages. This could in turn lead to increase in product quality while ensuring flexibility and speed within the firms' operational systems.

The study's finding was in line with a study by the theory of constraints. The theory posits that Food and Beverage and Pharmaceutical firms could be exposed to various constraints notably inventory constraints which could only be addressed by implementing appropriate strategies (Goldratt, 1990). This means that, the firms studied can overcome their inventory constraints by adopting relevant strategies including the EOQ strategy. This is because, the study found this strategy is a proper inventory management and subsequently improves operational performance in terms of product quality, operational speed, dependability, flexibility and production costs. In line with the theory of constraints, EOQ strategy could be implemented by the firms studied to constantly address their inventory constraints until they no longer exist.

The study's finding was in support of existing studies by Schwarz (2008) who found that the EOQ strategy improves the performances of manufacturing firms because it induces them to forecast the total costs associated with managing inventory. This could induce management of the firms to spend within a well-structured budget over a given period of time while optimising inventory.

Anichebe and Agu (2013) concluded that EOQ significantly influences the organisational performance of Bottling Companies in Enugu, Nigeria. As such, the strategy is key to inventory management and firm performance. Studies by Gitau (2016) and Atnafu and Balda (2018) also supported the study's finding by reporting that the EOQ strategy plays significant roles in ensuring optimal inventory levels which in turn lead to improved performances of manufacturing firms in Kenya and Ethiopia respectively.

Effect of Just-In-Time on operational performance

Contrary to the previous findings, the third hypothesis that Just-In-Time significantly influences operational performance was not supported. This is because, the result had a t-stat value of 0.207 which was less than 1.96 ($\beta = 0.023$; $p > 0.5$). Thus, the study failed to reject the H_0 that JIT does not significantly influence OP of Food and Beverage and Pharmaceutical firms. This means that a unit increase in JIT strategy by 2.3% will not cause any change in the OP of the firms studied. This implies that JIT strategy does not play any significant role in managing the inventories of Food and Beverage and Pharmaceutical firms within the metropolises understudy. Thus, the implementation of the JIT strategy would not significantly influence the operational performances of the manufacturing firms understudy.

Arguably, the Food and Beverage and Pharmaceutical industry would struggle to operate effectively on the basis of customer specification which emphasises on customisation. This could be because of the how delicate their inventories are coupled with the high perishability rate if not consumed within a limited time period. These factors could make adopting the JIT strategy to managing inventories extremely difficult especially for firms in this industry.

Producing foods and drugs solely on customer demands and requirements, for instance, could have severe health implications on end users. These factors probably explain the industry's preference to Just-In-Time strategy.

According to Brown and Mitchell (1991) and Biggart and Gargeya (2002), Just-In-Time traces its origins from the automobile industry specifically the Toyota production system (TPS). It, therefore, inherits tools and techniques comprising Kanban, setup time reduction (or SMED) and waste elimination from automobile, electronic and or cellular industries. As a result, some researchers have found no significant relationships between the Just-In-Time inventory strategy and performance of manufacturing firms in other industries (Flynn *et al.*, 1999; Snell & Dean, 1992; Sakakibara *et al.*, 1997).

The study's finding is also in line with previous studies by Shah and Ward (2003) and Bortolotti *et al.* (2013) who posited that the JIT strategy emphasises on product customisation where goods are only produced based on customers specifications in terms of quality, quantity, price, among others. Amade *et al.* (2017) also found no significant relationship between JIT and performance of manufacturing firms in Nigeria. Similarly, Fosu (2016) and Bawa *et al.* (2018) found no significant relationship between inventory management strategies including JIT on firm performance.

It can, therefore, be argued that although Just-In-Time has been recognised as a key strategy to managing inventory in various industries (Eroglu & Hofer, 2011; Chaves *et al.*, 2013; Danese *et al.*, 2012; Bortolotti *et al.*, 2013), the extent to which it affects a firm's performance could be influenced by the specific industry within which the firm operates. As such, the implementation of the JIT strategy by the Food and Beverage and Pharmaceutical industries

would not necessitate any significant positive change in their operational performances in Ghana.

Effect of Strategic Supplier Partnership on the operational performance

In terms of the fourth research objective on the effect of Strategic Supplier Partnership on the operational performance of Food and Beverage and Pharmaceutical firms, the study hypothesised that, 'Strategic Supplier Partnership has a significant positive relationship with operational performance'. From Table 16, the path coefficient between Strategic Supplier Partnership and operational performance ($\beta = 0.204$) was significant at 5% sig. level with a t-stat of $2.105 > 1.96$ ($p = 0.008 < 0.05$). The H_0 was, therefore, rejected indicating that a unit increase in SSP by 20.4% will cause a unit increase in OP by 20.4%. This implies that, managing inventories by building strategic partnerships with suppliers through open and transparent information sharing, long-term agreements while ensuring early supplier involvements during product design stages help the firms to enhance their operational performances.

It could be established that, having strategic partnerships with suppliers enable them to have in-depth knowledge about the essential materials needed to produce the quality products expected of the firms' customers. This strategy enables suppliers to ensure constant supply of needed materials even in the face of material shortages which in turn help the focal firms to increase the flexibility and speed of their production systems. According to the theory of constraints, the firms studied should implement strategies including Strategic Supplier Partnerships in order to effectively manage their inventories (Goldratt, 1990). Similarly, the network theory posits that the firms studied can address their

operational challenges by developing long term mutual relationships with their key actors notably suppliers (Freeman, 2004; Salancik, 2005).

This finding is in line with a study by Srinivasan *et al.* (2011) who concluded that the higher supplier partnership (SSP), the higher the performance benefits of manufacturing firms. Other quantitative studies by Qrunfleh and Tarafdar (2013), Lwika *et al.* (2013) and Mukopi and Iravo (2015) and Hussain *et al.* (2014) had similar findings. Obura (2015) found SSP to greatly influence the operational performance of Unilever Kenya Limited in the areas of improved product quality and reduced defects. The study noted that, product quality is improved as a result of SSP through reduced defects resulting from early supplier involvement in the design process.

Also, an explanatory study by Khan and Siddiqui (2018) on Pharmaceutical manufacturing firms in Pakistan found significant positive relationships to exist among SSP, product quality and business performance. These findings are clear indications that SSP as a strategy is vital to inventory management and operational performance of Food and Beverage and Pharmaceutical firms across the globe including Ghana.

Effect of Vendor Managed Inventory on operational performance

The fifth research hypothesis was formulated to identify whether Vendor Managed Inventory (VMI) strategy significantly influences the operational performance (OP) of Food and Beverage and Pharmaceutical manufacturing firms within some selected metropolises in Ghana. The formulated hypothesis read, 'Vendor Managed Inventory (VMI) positively influences operational performance of Food and Beverage and Pharmaceutical manufacturing firms within some selected metropolises in Ghana'. From Table 16, it could be

deduced that Vendor Managed Inventory (VMI) strategy significantly and positively influences operational performance (OP) ($\beta = 0.272$; $t = 2.666$; $p = 0.008 < 0.05$). This is because, the t-stat of 2.666 was larger than 1.96. As such, the direction of the result was in line with the hypothesis thus the null hypothesis was rejected.

Hence, the hypothesis that the “Vendor Managed Inventory strategy positively influences operational performance” was supported. This implies that for Food and Beverage and Pharmaceutical manufacturing firms to increase their overall performance levels through operational performance, the VMI strategy should also be given much attention. This is because, a unit increase in the use of the VMI strategy by 27.2% would result to an effective inventory management which will invariably led to an increase in operational performance by 27.2% and subsequently overall performance levels of the firms studied.

According to the theory of constraints, the firms studied should implement strategies including Vendor Managed Inventory in order to effectively manage their inventories (Goldratt, 1990). Similarly, the network theory posits that the firms studied can address their operational challenges by developing long term mutual relationships with their key actors notably suppliers in order to share inventory management responsibilities with them (Freeman, 2004; Salancik, 2005). Also, Irungu and Wanjau (2011) found that, with the VMI strategy, replenishment decisions are centralised with suppliers which enable them to make inventory decisions on behalf of the focal firms. This could in turn improve production speed and flexibility.

This finding is in line with previous studies by Munyao *et al.* (2012) and Govindan (2013) who concluded that the VMI strategy reduces lead times and

demand uncertainties arising from stock outs. In a similar vein, Jepchumba and Ismail (2015) found that VMI strategy helps to reduce inventory-carrying costs, stock out issues while ensuring better forecasts. It also helps to reduce product costs; minimise lead times and enables improved overall performances. Also, Mwangi and Kitheka (2018) on the effect of VMI on organisational performance found a positive significant relationship between VMI and organisational performance. The study’s finding discloses that the VMI strategy is important for ensuring effective inventory management when the Food and Beverage and Pharmaceutical firms aims at improving their operational performance levels.

Explanation of target endogenous variable variance

The PLS-SEM estimation for the predictive accuracy of the model using the coefficient of determination (R^2) was reported in this section. Also, other relevant estimations including effect size (f^2), predictive relevance (Q^2) using the Stone-Giesser’s test criterion and the relative impact of the model (q^2) were reported. The results were presented in Table 17.

Table 17: Explanation of target endogenous variable variance

L.V	R^2	f^2	Q^2	q^2
ABC	0.413	0.316	0.221	0.131
EOQ	0.258	0.055	0.301	0.015
FS	1.000	0.057	0.299	0.174
JIT	0.099	0.002	0.307	0.006
SSP	0.177	0.080	0.288	0.033
VMI	0.252	0.104	0.278	0.048
OP	0.522			

Note: L.V. = latent variable, R^2 = R squared, f^2 = effect size, Q^2 = predictive relevance, q^2 = relative impact of the model
 Source: Field survey (2019)

Coefficient of determination (R^2)

The section discussed predictive accuracy of the model in relation to the R^2 results. Hair *et al.* (2011) explained that R^2 shows the combined effect of the exogenous variables (ABC, EOQ, JIT, SSP, VMI) on the endogenous variable (OP). Also, R^2 explains the variation in the dependent variable which is caused by the independent variables (Cohen, 1988; Chuan, & Penyelidikan, 2006). Using the Thalheimer and Cook (2002) and Henseler *et al.*'s (2009) criterion, exogenous variables in the inner path with R^2 results of > 0.67 , $0.67 < p < 0.29$ and < 0.29 imply that the model is substantial, moderate and weak, respectively.

Table 17 showed that the coefficient of determination, R^2 for Activity Based Costing (ABC) strategy latent variable was 0.413. This means that the ABC strategy moderately explains 41.3% of the variation in operational performance (OP). Also, the Economic Order Quantity (EOQ) strategy has a coefficient of determination, R^2 , of 0.258 meaning that EOQ accounts for 25.8% of the variance in operational performance. Additionally, JIT, SSP and VMI inventory strategies had weak coefficient of determination, R^2 , of 0.099, 0.077 and 0.252 respectively. This means that these exogenous variables weakly account for 9.9%, 7.7% and 25.2% of the variance in operational performance.

The model finally suggested that the endogenous latent variable, operational performance (OP), had a coefficient of determination, R^2 , of 0.522. It was deduced that the five exogenous variables comprising ABC, EOQ, JIT, SSP and VMI inventory strategies moderately explain 52.2% of the variation in operational performance. Simply put, the inventory management strategies cause 52.2% of change in the operational performance of the Food and Beverage and Pharmaceutical manufacturing firms within the selected metropolises in

Ghana. It could, therefore, be argued that these classes of firms should pay much attention to inventory management strategies as they account for 52.2% of change in their operational performances.

Effect size (f^2)

The effect size (f^2) of each exogenous variable was assessed using Cohen's (1988) impact indicator criterion where values 0.35 (large), 0.15 (medium) and 0.02 (small) respectively. Table 17 revealed that, Activity Based Costing (ABC) with f^2 of 0.316 implies that it has a medium effect on operational performance. On the other hand, EOQ, JIT, SSP and VMI were found to have small effects on operational performance in the model. This is because, the effect sizes (f^2) of EOQ, JIT, SSP and VMI were 0.055, 0.057, 0.002 and 0.104 respectively. Based Cohen's (1988) criterion, all the f^2 values were < 0.35. Among these strategies, ABC had a relatively higher effect on operational performance, followed by VMI, SSP and EOQ respectively.

However, JIT had the smallest effect size and this could be because it had no significant effect on the operational performances of the Food and Beverage and Pharmaceutical manufacturing firms within the selected metropolises in Ghana. The result implies that, when these strategies are implemented by the Food and Beverage and Pharmaceutical firms during inventory management, the ABC strategy has a relatively higher effect on product quality, operational speed, flexibility, dependability and production costs as compared to the other strategies. The strategy is followed by VMI, SSP and EOQ respectively, implying that, among the different strategies, EOQ has the smallest effect on operational performance of the firms studied.

Predictive relevance (Q^2)

The predictive relevance of the predictor exogenous latent variables was also assessed using the Stone-Geisser's Q^2 test (Roldán & Sanchez-Franco, 2012). According to Hair *et al.* (2014), predictive relevance (Q^2) is assessed by omitting part of the data matrix, estimating the model and predicting the omitted part using the estimates. The rule of thumb is that, Q^2 value > 0 for a particular exogenous variable (Henseler *et al.*, 2009; Chin, 2010). Henseler *et al.* (2009) suggested that $0.02 \leq Q^2 < 0.15$ (weak effect), $0.15 \leq Q^2 < 0.35$ (moderate effect) and $Q^2 > 0.35$ (strong effect). Rigdon (2014) and Sarstedt *et al.* (2014) argued that although comparing the Q^2 value to zero indicates that the endogenous variable can be predicted, it does not indicate the quality of the prediction.

From Table 17, it could be deduced that all the exogenous variables were able to moderately predict the model. This is because, the Q^2 of the exogenous variables were as follows: ABC (0.221), EOQ (0.301), JIT (0.307), SSP (0.288) and VMI (0.278) respectively. All these Q^2 values were $0.15 \leq Q^2 < 0.35$ thus indicating moderate predictive relevance.

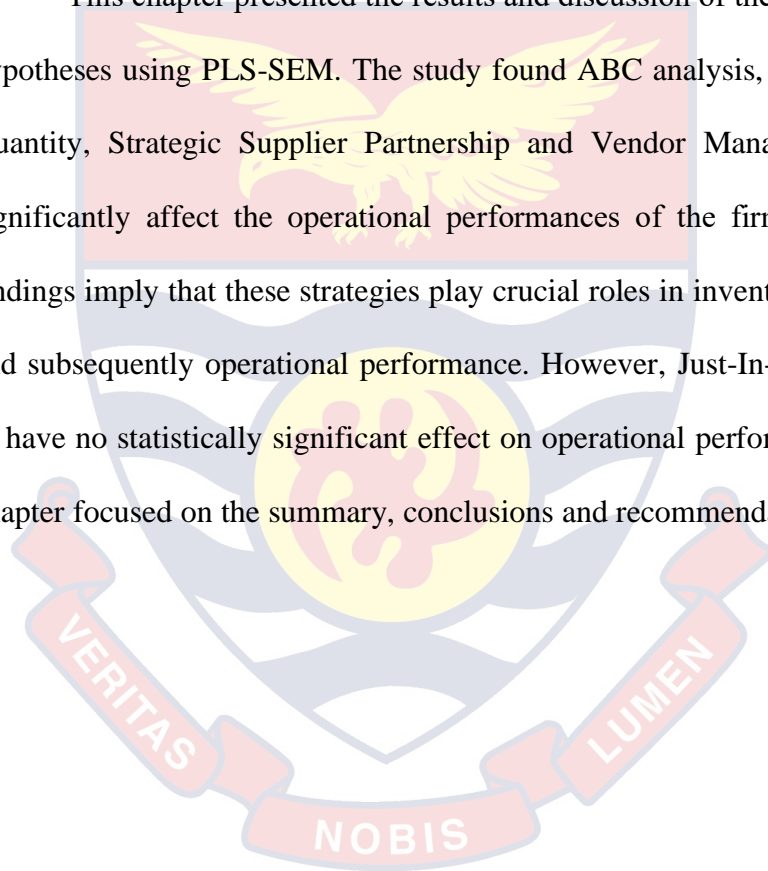
Predictive relevance (q^2)

The quality of the predictive relevance of each exogenous construct for a specific endogenous construct was also assessed. This was done by using the formula: $q^2 = (Q^2 \text{ included} - Q^2 \text{ excluded}) / (1 - Q^2 \text{ included})$. The decision rule is that, q^2 values of 0.35 represent large, 0.15 represent medium and 0.02 represent small effect sizes respectively (Henseler *et al.*, 2009). Based on this, all the q^2 values (ABC = 0.131; EOQ = 0.015; JIT = 0.006; SSP = 0.033; VMI = 0.048) were < 0.15 , thus depicting small effect sizes. Simply put, the effect sizes of the various structural paths in the model were small. The result of the

predictive relevance (q) means that, the model is generally good, because all the independent variables (ABC, EOQ, JIT, SSP and VMI) can explain the dependent variable (operational performance). According to Henseler *et al.* (2009), q^2 values of all the independent variables > 0 to indicate predictive relevance of the model.

Chapter Summary

This chapter presented the results and discussion of the study's research hypotheses using PLS-SEM. The study found ABC analysis, Economic Order Quantity, Strategic Supplier Partnership and Vendor Managed Inventory to significantly affect the operational performances of the firms' studied. The findings imply that these strategies play crucial roles in inventory management and subsequently operational performance. However, Just-In-Time was found to have no statistically significant effect on operational performance. The next chapter focused on the summary, conclusions and recommendations.



CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter presents the summary of the research objectives of the study, conclusions drawn from the findings and recommendations for policy considerations. The chapter concluded with suggestions for further research.

Summary

The study is abounded with conceptual arguments in relation to the significant contributions of inventory management strategies to the operational performances of Food and Beverage and Pharmaceutical firms. The purpose of the study was to examine the effect of inventory management strategies on the operational performance of Food and Beverage and Pharmaceutical manufacturing firms in some selected metropolises in Ghana. Specifically, the examined the following research objectives in order to:

1. examine the effect of Activity Based Costing on operational performance of Food and Beverage and Pharmaceutical manufacturing firms
2. examine the effect of Economic Order Quantity on operational performance of Food and Beverage and Pharmaceutical manufacturing firms
3. examine the effect of Just-In-Time on operational performance of Food and Beverage and Pharmaceutical manufacturing firms

4. examine the effect of Strategic Supplier Partnership on operational performance of Food and Beverage and Pharmaceutical manufacturing firms
5. examine the effect of Vendor Managed Inventory on operational performance of Food and Beverage and Pharmaceutical manufacturing firms

The study developed and tested five hypotheses to help achieve the research objectives. The study adopted the positivism philosophy thus relying on the quantitative approach and explanatory research design. A structured questionnaire was developed from extensive reviews of previous studies to gather data from 104 Food and Beverage and Pharmaceutical manufacturing firms within the Accra, Tema, Kumasi and Sekondi-Takoradi metropolises in Ghana. Using the census technique, 85 valid responses with a response rate of 81.7% was used for data analysis. The data was then processed using the IBM SPSS Statistics (version 24) and SmartPLS (version 3) software. Both descriptive and inferential statistics were used to address issues in the study.

More precisely, frequencies and percentages were used to analyse data on business and personal characteristics of the respondents. Also, the inventory profile of the firms was analysed using these tools. On the other hand, the inventory management strategies were described using the means, standard deviations, skewness and kurtosis statistics. In terms of testing the study's hypotheses, the partial least squares structural equation modelling technique was employed. The test of significance was based on the assumption that the t-statistics should be greater than 1.96 thus its p-value < 0.05 . This section finally presented the major findings of the study in relation to the research hypotheses.

In relation to the first research objective, the study found that Activity Based Costing strategy has a positive significant effect on the operational performance of Food and Beverage and Pharmaceutical manufacturing firms within the selected metropolises in Ghana. This means that the strategy plays significant roles in improving the operational performance levels of the firms studied. The result implies that the more this strategy is adopted by the firms studied in managing their inventories, the higher their operational performances and invariably overall firm performances.

The study also examined the effect of Economic Order Quantity on the operational performance of Food and Beverage and Pharmaceutical manufacturing firms within the selected metropolises in Ghana. The finding indicated that Economic Order Quantity as a strategy for managing inventory has a significant positive effect on the firms' operational performance levels. This implies that, a unit increase in the Economic Order Quantity strategy leads to a unit increase in the operational performances of the firms' studied. As such, the strategy is key to the improving the operational performances of the firms studied in relation to product quality, dependability, speed and flexibility of operational systems. The strategy is also key to minimising the production costs of the firms studied.

The third research objective focused on examining the effect of Just-In-Time on operational performance of Food and Beverage and Pharmaceutical manufacturing firms within the selected metropolises in Ghana. The study found no significant effect of the Just-In-Time strategy on the operational performance of the firms studied. This implies that, a unit increase in the strategy does not lead to any significant increase in operational performance. Thus, the strategy

does not play any significant role when the firms intend to improve their operational performance levels.

In relation to the fourth research objective, the Strategic Supplier Partnership strategy for managing inventory was found to have a positive effect on the operational performance of the Food and Beverage and Pharmaceutical manufacturing firms within the metropolises studied. This implies that the strategy is effective in improving the operational performance levels of the firms studied. This means that early supplier involvement during product design stage, sharing relevant and detailed information with key suppliers and establishing long term relationships with suppliers, for instance, are vital to helping the firm improve upon their overall operational performance levels and invariably firm performance.

Finally, the fifth research objective on the effect of Vendor Managed Inventory on operational performance of Food and Beverage and Pharmaceutical manufacturing firms within the study area was examined. The study found that Vendor Managed Inventory as a strategy had a positive significant effect on the operational performance of Food and Beverage and Pharmaceutical manufacturing firms within the selected metropolises in Ghana. This means that the strategy plays significant roles in improving the operational performance levels of the firms studied. The result implies that the more the firms studied adopts this strategy in managing their inventories, the higher their operational performances and invariably overall firm performances.

Conclusions

The study aimed at examining the effect of inventory management strategies on the operational performance of Food and Beverage and

Pharmaceutical manufacturing firms within the major metropolises in Ghana specifically Accra, Tema, Kumasi and Sekondi-Takoradi respectively. The following conclusions were, therefore, drawn based on the study's key findings.

For the first research objective, the study's result practically implies that, management of the Food and Beverage and Pharmaceutical manufacturing firms should consider the Activity Based Costing strategy as the best strategy for managing inventory. This is because, this strategy is likely to highly to minimise the firms' inventory costs, delivery time while improving product quality. The result has been largely supported by previous empirical studies by indicating that firms that prioritise on categorising their inventory items are mostly able to properly manage them which subsequently improves their operational performance levels. The study concluded that management should develop deeper understanding and knowledge of the strategy in order to continuously overcome possible difficulties associated with its usage.

In terms of the second research objective, the result had practical implications for management of the Food and Beverage and Pharmaceutical firms. The result implies that management of the firms' studied should view the Economic Order Quantity as a strategy that could help them reduce production costs while improving product quality, operational speed, flexibility and dependability. The strategy could invariably enable management to improve customer satisfaction and competitiveness as they would be able to minimise delivery delays without compromising on customer value. The study provided empirical evidence that the implementation of EOQ strategy is likely to improve operational performance. The study, therefore, concluded that Economic Order

Quantity is a key strategy for managing inventories to promote the operational performance levels of the Food and Beverage and Pharmaceutical firms.

For the third objective, the Just-In-Time strategy was found to have no significant effect on the operational performance of the firms studied. This result also had practical implications for management of the Food and Beverage and Pharmaceutical firms. The study practically implies that, management should avoid the misconception that the JIT strategy can be considered among the best strategies in every category of manufacturing firm. This is because, some contextual factors including nature of inventory and organisational culture could hinder the adoption of the JIT strategy. Thus, management should consider various factors prior to the implementation of the JIT strategy. On this note, the study concluded that Food and Beverage and Pharmaceutical firms that emphasise on the Just-In-Time strategy would struggle to enjoy any significant improvement in the operational performances of their businesses.

In terms of the fourth research objective, the study revealed that the Strategic Supplier Partnership strategy has a positive significant effect on the operational performance of Food and Beverage and Pharmaceutical manufacturing firms within the metropolises studied. The practical implication of this finding is that, management should emphasise on developing and strengthening relationships with key actors including key suppliers during inventory management. This is because, such relationships could help these firms to obtain relevant resources from their suppliers to aid inventory management and invariably increase operational performances. This finding has been supported by existing related literature by indicating that firms that focus on supplier integration from product design through to product development are

able to improve their product quality without compromising the speed, flexibility, dependability of their operational systems.

Finally, the study's finding on research objective five revealed a positive significant effect of Vendor Managed Inventory on the operational performance of Food and Beverage and Pharmaceutical manufacturing firms within the metropolises studied. The practical implication is that, VMI strategy should be viewed by management of the firms' studied as an effective strategy for managing inventory. This is because, the strategy has been empirically considered as effective for managing inventory even in a much more unstable economic environment typically present in developing countries including Ghana. The study, therefore, concluded that sharing inventory management responsibilities with key suppliers is likely to reduce production costs while improving the speed, delivery and flexibility of their operational systems without compromising product quality.

In summary, the study concluded that inventory management strategies generally have positive influence on the operational performance levels of the food and beverage firms within the four selected metropolises of Ghana. More precisely, strategies such as Activity Based Costing, Economic Order Quantity, Strategic Supplier Partnership and Vendor Managed Inventory all had significant positive effect on operational performance, whereas Just-In-Time had no significant positive effect on operational performance.

Recommendations

On the strength of the research findings and conclusions made, the following recommendations are hereby made. The study recommended that manufacturing firms, especially the Food and Beverage and Pharmaceutical

firms should pay more attention to Activity Based Costing (ABC) during inventory management. More precisely, firms should invest massively into acquiring modernised software capable to automatically and easily categorising inventory in order of importance for easy monitoring and control. Also, officers associated with inventory management should be well trained and equipped in order to properly manage the categorised inventories. These measures would invariably help improve overall business performance levels.

The study also recommended that management of the firms studied should develop and strengthen their competitive inventory management strategies based on the Economic Order Quantity strategy because it is crucial in achieving sustainable operational performances. This can be successfully achieved by emphasising on inventory optimisation within any given period. This would enable the Food and Beverage and Pharmaceutical firms to easily detect shortages and excess inventory during inventory management.

The study further recommended that management of the firms studied should place less emphasise on the Just-In-Time strategy when managing inventory because it was found to have no influence on their operational performance levels. Management should, therefore, adopt and invest in inventory management strategies other than the Just-In-Time. This is because, continuous investment in this strategy would only increase operating or production costs without consequently improving product quality, speed, flexibility and dependability of the firms' operational systems.

It is recommended that, management should continue to strategically partner and integrate key suppliers into their inventory management functions and activities. The partnership should be built on complete information sharing,

effective communication and establishment of long-term agreements (contracts) between the parties. By doing so, personal trusts, commitments and loyalty would be strongly built between these parties which would help them to jointly manage inventory with high levels of professionalism, efficiency and effectiveness. These would in turn better operational performance and invariably improve overall business performance levels.

The study finally recommended that, management of the firms studied should continue to share inventory management responsibilities with some of their key and willing suppliers. This is because, Vendor Managed Inventory was found to better operational performances of the firms studied. Allowing key suppliers to manage inventory would enable firms to share probable inventory management risks with them. It would also allow firms to concentrate on other relevant activities aimed at improving product quality, speed, flexible and dependable business operations. However, management should establish clear procurement guidelines highlighting the specific nature of inventories their suppliers can fully and/or partially control. This would in turn enable management to properly manage their inventories.

Suggestions for Further Research

The study focused on how inventory management strategies affect the operational performance of Food and Beverage and Pharmaceutical manufacturing firms within some selected metropolises in Ghana. As such, further research can extend the study to cover other metropolises in Ghana and/or to cover other countries, especially those in the developing economies. This will help expand existing knowledge and aid generalisation of findings. The study was also limited to only the operational performance dimension of

firms' overall business performance. Further research can, therefore, be carried out to examine other performance dimensions including financial, market-based and sustainable performance. This will help extend existing knowledge on how inventory management strategies affect the other dimensions of firm performance within the Food and Beverage and Pharmaceutical firms.



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APPENDICES

Appendix A

Dear Sir/Madam,

I am a Master student from the **Department of Marketing and Supply Chain Management**. I am carrying out my thesis work on the topic **“Inventory Management Strategies and Performance of manufacturing 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.

Please tick where appropriate

SECTION A: PROFILE OF MANUFACTURING FIRM

1. What is the nature of your manufacturing firm?
 Food and Beverage processing [] Pharmaceuticals/Chemicals []
 Timber/Wood products [] Textiles [] Aluminium/Metal smelting []
 Electronics []
2. What is your business' ownership type?
 Private Ownership [] Wholly State owned []
 Joint state-private ownership []
3. Kindly indicate the age of the firm
 < 10 years [] 10-20 years [] 21-30 years [] > 30 years []
4. How many employees do you have?
 < 100 [] 100– 500 [] 501-1000 [] > 1000 []
5. What is your firm's total value of assets?
 < GHS10,000 [] GHS10,000-GHS50,000 [] GHS50,001-GHS100,000 []
 > GHS100,000 []

SECTION B: INVENTORY MANAGEMENT STRATEGIES

6. 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**

No.	Inventory Management Strategies	1	2	3	4	5
ISJ1	The firm's key suppliers have the needed capacity to deliver our orders on time					
ISA2	The firm periodically reviews and re-categorises its inventory items					
ISJ3.	The nature of my job is very demanding					

ISJ4	There is constant flow of information between our suppliers, the firm and our key customers					
ISV5	The firm's key suppliers periodically review and place orders to ensure optimum levels					
ISJ6	I feel engaged and committed with my organisation					
ISA7	All the firm's inventory items have been classified according to their order of importance					
ISJ8	The firm has proper layout (material, machinery, people) that supports its production flow					
ISJ9.	Working for long hours have an effect on my performance					
ISV10	Our suppliers have access to information concerning our inventory items whenever they need them					
ISV11.	Unsupportive work culture in the organisation makes me intend to quit					
ISV12	The firm allocates funds based on the value of the inventory item					
ISV13	Our suppliers agree to keep some of our inventory items when we are out of space					
ISS14	There are frequent meetings between the firm's inventory staff and its suppliers					
ISA15	The firm exercises selective control over its inventory items					
ISV16	The firm's key suppliers have adequate control over our inventory items and replenishment decisions					
ISJ17	The firm strictly adheres to its production schedules on a daily basis					
ISA18	The firm gives special attention to valuable or costlier inventory items					
ISS19	There is complete information sharing between the firm and its suppliers					
ISE20	The firm prepares adequately towards inventory shortages					
ISJ21.	The firm sometimes produces based on customers' requirements and specification					
ISV22	Our suppliers are able to replenish our stock because there is constant flow of information between us					

ISE23	There is a specific procedure for determining the cost components of the firm's total inventory costs.					
ISE24	The firm places orders at specific time intervals to minimise ordering cost					
ISS25	The firm ensures early supplier involvement in all inventory-related activities including product designs					
ISS26.	There are enough monetary incentives available in my organization					
ISE27	Demand for the firm's product is known and constant over a given period					
ISS28	The firm has long-term agreements with some of its suppliers					
ISE29	The firm places a fixed order anytime inventory reaches its predetermined level					
ISS30	The firm's suppliers have the needed capacities to meet demands/expectations					

SECTION C: OPERATIONAL PERFORMANCE

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

No.	Operational Performance	1	2	3	4	5
OPQ1	The firm's inventory strategy ensures that's its products meet various environmental conditions (endurance to physical and weather conditions)					
OPQ2.	My firm employs a market orientation strategy					
OPQ3	The firm's inventory strategy ensures consistent faultless production and deliveries to its customers					
OPS4	The firm's inventory strategy ensures timely production and delivery of customer's orders					
OPS5	The firm's inventory strategy ensures that information and materials move rapidly within the firm's operations					
OPS6.	I am able to plan and implement regular savings					
OPD7	The firm's inventory strategy ensures that its operational systems are compatible with its core activities					

OPD8	The firm's inventory strategy prioritises product standardisation (produce uniform and consistent products)					
OPF9	The firm's inventory strategy ensures that its production capacities can be quickly adjusted within the shortest time periods to meet current demands					
OPF10.	I keep track of my daily expenditure					
OPF11	The firm ensures that the waiting time between product order and delivery is minimised					
OPF12.	I am mindful of present interest rates before investing/saving					
OPC13	The firm's inventory strategy ensures minimisation of production costs					
OPC14	I have developed a comprehensive retirement plan					
OPC15	The firm's inventory strategy ensures minimisation of inventory wastages					

SECTION D: 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
F1	The firm's management has the required experience to manage inventory-related issues					
F2	The firm has the needed resources to handle its inventory issues					
F3.	I pay more attention to my income when preparing towards retirement					
F4	The firm has adequate policies to manage inventory-related issues					
F5	The firm has sufficient number of employees to handle issues related to its inventory					
F6	The firm's total assets are enough to handle inventory issues					

SOCIO-DEMOGRAPHIC INFORMATION OF RESPONDENTS

8. Sex: Male [] Female []
9. Age bracket: 18-35 years [] 36-45 years [] 46-55 years []
Over 55 years []

10. a. Do you hold a degree in Operations/Procurement and Supply Chain Management? Yes No

b. If yes, indicate your highest educational qualification in relation to Operations/Procurement and Supply Chain Management.

Below Higher HND HND/Equivalent First Degree

Post Graduate Degree

11. a. Do you have a professional certificate in Operations/Procurement and Supply Chain Management? Yes No

b. If yes, indicate your Operations/Procurement and Supply Chain Professional Certificate.....

Institute of Supply Management (ISM)

Ghana Institute of Procurement and Supply (GIPS)

Chartered Institute of Purchasing Supply

American Production for Inventory Control Society

Council of Supply Chain Management Professionals

Other (Please specify)

12. What is your current position in the firm?

Procurement/Purchasing officer Production/Operation officer

Stores Officer Other managers

13. How many years have you been working in your position?

< 5 years 5-10 years 11-15 years > 15 years

THANK YOU FOR PARTICIPATING

NOBIS

Appendix B

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.336	20.961	20.961	6.728	19.224	19.224
2	4.455	12.730	33.691			
3	3.331	9.517	43.208			
4	3.036	8.674	51.882			
5	2.571	7.346	59.228			
6	1.792	5.120	64.349			
7	1.521	4.347	68.696			
8	1.241	3.547	72.242			
9	1.090	3.114	75.356			
10	.982	2.806	78.162			
11	.878	2.508	80.670			
12	.651	1.861	82.531			
13	.584	1.668	84.200			
14	.583	1.665	85.865			
15	.567	1.621	87.486			
16	.522	1.492	88.978			
17	.446	1.275	90.253			
18	.378	1.080	91.333			
19	.356	1.018	92.351			
20	.331	.945	93.296			
21	.310	.885	94.181			
22	.281	.804	94.985			
23	.237	.678	95.662			
24	.207	.593	96.255			
25	.197	.563	96.818			
26	.183	.523	97.341			
27	.175	.499	97.840			
28	.149	.425	98.265			
29	.121	.346	98.611			
30	.112	.319	98.930			
31	.103	.293	99.223			
32	.091	.260	99.483			
33	.074	.212	99.695			
34	.067	.191	99.886			
35	.040	.114	100.000			

Extraction Method: Principal Axis Factoring.

Appendix C

Cohen's table for determining sample size in PLS-SEM

Sample size recommendation in PLS-SEM												
Maximum number of arrows pointing at a construct	Significant level											
	1%				5%				10%			
	Minimum R ²				Minimum R ²				Minimum R ²			
	0.1	0.2	0.5	0.75	0.1	0.2	0.5	0.75	0.1	0.2	0.5	0.75
2	158	75	47	38	110	52	33	26	88	41	26	21
3	176	84	53	42	124	59	38	30	100	48	30	25
4	191	91	58	46	137	65	42	33	111	53	34	27
5	205	98	62	50	147	70	45	36	120	58	37	30
6	217	103	66	53	157	75	48	39	128	62	40	32
7	228	109	69	56	166	80	51	41	136	66	42	35
8	238	114	73	59	174	84	54	44	143	69	45	37
9	247	119	76	62	181	88	57	46	150	73	47	39
10	256	123	79	64	189	91	59	48	156	76	49	41

Source: Cohen, 1988