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The Impact of Information Sharing and Inventory Management Practices on Firms' Performance in Supply Chain Practices

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Abstract: This study's aim is to conduct an empirical investigation of the impact of supply chain practices on firm performance. The prime objective of the paper is to study the impact of information-sharing practices and inventory management on firm performance. To realize the specified objective of the study, data were gathered from 170 individuals who are familiar with the supply chain practices of the companies and analyzed using structural equation modeling (SEM). The result shows a significant direct and indirect effect of information sharing and inventory management practices on firm performance. Generally, the results show that higher information-sharing practices and better inventory management practices lead to greater firm performance; and higher information-sharing leads to improved inventory management, which in turn leads to greater firm performance. Theoretically, the result provides evidence of the effects of information sharing and inventory management on the supply chain practices' performance in a firm. The managerial implications of the results are enhancing information sharing and inventory management practices by adopting, internalizing, and building information technology into all the business operations to enhance information sharing and inventory management practices to enhance firm performance.

Keywords: information quality, information sharing, supply chain practices, inventory management
JEL Classification: M1, L1

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Introduction

It is well known that supply chain management is an integral part of most businesses and is essential to company success and customer satisfaction. Supply chain management is the management of how goods and services move in the process of value addition from the initial raw materials into final products to be consumed by consumers. As Naoui (2014) stated, the objective of supply chain management is to supply the right items to the right customers at the right time, and at the right price. The achievement of these objectives needs the efforts of different stakeholders in the supply chain's management. However, for a long period, companies worked alone so they could be profitable and competent; by operating alone they assumed close working and communication with supply chain partners would erode their profitability by exposing their sources of competitive advantage. These assumptions became a challenge to firm performance. Especially in this age of information, the success of every business heavily depends on the ability to share and utilize information. Particularly, in supply chain practices, information sharing is fundamental, since the success of the whole chain depends on the efficiency of every unit in the supply chain process. Therefore, for the success and integration of the whole supply partnership, it requires information sharing to be adopted as a culture of an organization.

As the theory of supply chain management suggests, close coordination and the integration of partners through information sharing is compulsory for cost reduction and quality enhancement for sustainable survival and the profitability of a firm (Handfield and Nichols, 2002), as well as to develop a sustainable competitive advantage for the supply chain's partners (Ross, 2002 and Taylor, 2003). The high availability of information at low cost to all people created both opportunities and threats to firms. To minimize the threats of information technology, an organization needs to build and enhance information technology facilities to share the right quantity and quality of information at the right time, as their competitors do. Moreover, an organization needs to utilize the opportunity information technology provides to make a marketable return by enhancing productivity, dropping processing and transaction costs, enhancing integration via enterprise resource planning (ERP) reducing inventory cost via just in time (JIT), instantly responding to the market via agility, and increasing customer satisfaction and the organization's profit. Generally, information can significantly increase the supply chain performance of firms (Cui et al., 2015); reduce the level of inventory (Sun & Yen, 2005; Lau et al., 2002); and reduce the bullwhip effect of inventory (Jauhari, 2009 and Li & Gao, 2011).

Inventory management is also a critical issue in supply chain management. The need for inventory management is critical and has multi-purposes, namely minimizing operational costs (Hollosi, et al. 2017); enhancing customer services (Cetinkaya & Lee, 2000); reducing inventory-related costs (Koumanakos, 2008); improving financial per-

formance (Koumanakos, 2008), and enhancing customer satisfaction and quality while lowering inventory costs and operating costs; better order fulfillment and lower order cycle time (Li et al., 2006). Mostly, the results of Dong et al., (2001); Boute et al., (2006); Pong & Mitchell, (2012); Prempeh, (2016); Luwumba, (2013) and Mwangi, (2016) reveal a positive relationship between inventory management and firm performance. In contrast, the results of Hornbrinck, (2013); Mensah, (2015) and Sitienei & Memba, (2015) report a negative relationship between inventory management and firm performance.

Generally, this paper investigated the effects of supply chain practices on firm performance based on some selected companies in Ethiopia. This paper is organized as follows: Section 2 provides the literature review. Section 3 presents the basic methodology used in this study. Section 4 presents the results and discussions of the study. Section 5 presents the conclusion of the study and finally Section 6 provides the basic limitation of the study.

Literature Review

2.1 Information sharing

Information sharing is considered an essential process for supply chain integration and transparency within the chain members. Information sharing can offer opportunities for managers to efficiently plan strategies and to react properly to the environment (Ali et al., 2017). Information sharing in the supply chain leads to better coordination and enhances control of supply chain processes; reducing product design times, reducing lead times and enhancing quality (Khurana et al., 2011). In supply chain practices, the significance of information sharing is crucial in the selection of the right suppliers, timely order fulfilling, holding an optimal inventory level, offering uninterrupted customer services and supplying the right quality and quantity of products, and getting constant feedback for proper product development or adjustment to meet the real consumers demand. As Lotfi et al., (2013) stated, in the dynamic and undefined global environment, the competitiveness and survival of organizations highly depend on their ability to share up-to-date and correct information.

For information sharing to be effective and to realize the anticipated goals, the information to be shared should own two important aspects, i.e., right quantity and quality (Moberg et.al 2002). The quantity aspect of information refers to the extent to which critical and proprietary information is communicated to one's supply chain partners (Monczka et al., 1998). As Petersen (1999) argued, information quality is the degree to which the information shared meets the needs of organizations; information quality covers the accuracy, timeliness, adequacy and reliability of information (Li and Lin 2006). Supply

chain partners who exchange quality information at regular times can work as a single entity with full integration (Sukati et al., 2012). Furthermore, the flow of information in the supply chain enables partners to collectively understand the needs of the end customer better, and to respond to market changes faster (Childhouse and Towil, 2003).

Similarly, the quality of information is another aspect of information for decision-makers. Petersen et al. (2005) found a direct effect of information quality on collaborative planning. The quality of information is measured from the dimensions of its accuracy, timeliness, adequacy, and credibility of information (Monczka. et.al; 1998); and its impact on the efficiency of the supply chain (Chizzo; 1998). The qualities of information in supply chain management are affected by the divergent interests and opportunistic behavior of supply chain partners, and information asymmetry across the supply chain. Sometimes firms intentionally distort the quality of information due to the perception of information disclosure as a takeover of market opportunities by competitors (Mason-Jones, Towill, 1997; Feldmann & Müller, 2003), thus ensuring the quality of the shared information becomes a critical aspect of effective supply chain management due to the perceived assumption of information disclosure by firms.

Ketchen et al., (2008) pointed out the potential that innovation and time have in information technology, in creating a sustainable competitive advantage as the next key areas of competitive advantage. Therefore, supply chain partners need to view information as a strategic asset that serves as a source of competitive advantage by improving performance, market responsiveness, better customer relationships, and customer satisfaction.

According to Mourtzis (2011), sharing the right quality and quantity of information within different units of organizations, and externally with supply chain partners, increases firm productivity and efficiency and improves customer services. Similarly, Lee & Whang (2004) argued that efficient information sharing can improve the capacity utilization of firms. The study made by Jauhari (2009) also described that information sharing can enable firms to detect and respond earlier to any problem along the supply chain, and allows firms to quickly respond to customers' orders and requests.

2.2 Inventory Management

Inventories are stocks of raw materials, supplies, components, work-in-process, and finished goods that appear at numerous points throughout a firm's production and logistics channel (Ballon, 2004). Inventory is usually a collection of raw materials, work-in-progress, and final goods (Cinnamon et al., 2010).

In logistics activities, having optimal inventory levels within the company and across all the supply chain partners is a crucial decision since inventory management can influence an organization's sources of competitive advantage for quality and the on-time

delivery of orders (Gunasekaran et al., 2005, Wang & Zhang, 2010). Palmer and Dean (2000) said that for effective firm inventory management, the selection of the right inventory management practice is essential. Therefore, effective inventory management is very critical for the success of supply chain performance.

As Koumanakos (2008) discovered in his investigation, inventory management can significantly enhance the financial performance of a firm. His analysis shows that effective inventory management can result in the reduction of inventory-related costs such as the carrying costs, ordering costs, purchase costs from economic ordering, and also minimize the amount of capital occupied by inventory. Likewise, Dong et al., (2001) demonstrated the direct association between the performance of an organization and its inventory management system.

Numerous types of research have shown the effects of inventory handling techniques on customer satisfaction levels that in-turn affect firm performance levels. Lieberman et al., (1999) revealed the impact of inventory management in supply chain practices to overcome the problem of holding unbalanced inventory over the satisfaction levels of customers and the flexibility of services to meet unpredicted demand. Also, the study made by Cetinkaya and Lee (2000) revealed the effects of inventory management in the supply chain would decrease operating costs and improve customers' service levels.

Glasserman and Wang (1998) also discussed the relationship between the inventory level, lead time, and inventory cost. The result of Glasserman and Wang shows that the more lead time there is, the more inventory is required, and more inventory means the higher cost to hold it and more chance for depreciation and obsolesce. Therefore, an effective inventory management system has proven the reduction in delivery time, better customer satisfaction, and improved financial performance (Bowersox et al., 2007).

2.2.1 Inventory management techniques

Inventory is the unused raw materials, working process, inventory or finished goods kept in storage or warehouse for future reselling, consumption or additional processing. Inventory management also refers to a set of policies and controlling techniques that a firm uses to monitor and determine the level of inventory and the replenishment to be maintained (Prempeh, 2016). Inventory management needs to consider the trade-off between the cost to place an order and carry inventory with the opportunity cost of the stockout. For the optimum performance and operation of a supply chain, the trade-off of these costs needs consideration. The common inventory management techniques are economic order quantity (EOQ), just-in-time technique, vendor-managed inventory, and ABC analysis.

Economic Ordering Quantity (EOQ)

It is unquestionable that the EOQ technique is the best-known and most fundamental inventory decision model. It is a familiar and popular mathematical technique of determining the optimum order quantity that minimizes the annual holding cost and ordering cost of an inventory (Chopra & Medill, 2001); the EOQ level minimizes the trade-off of inventory carrying cost and reorder cost (Schroeder, 2000); EOQ estimate the economic order quantity by balancing the two conflict costs (Schaider, 2001), and EOQ also finds the quantity that minimizes the sum of the two variable costs of inventory (Lyson & Farrington, 2006). Therefore, the EOQ of inventory management techniques enables an organization to know rationally when to place an order and how much to order (Bowersox, 2002).

Just in Time Technique (JIT)

JIT is a philosophy that advocates the elimination of waste and improvement of quality by delivering materials just as the order is placed and cutting non-value-adding activities or parts (Drury, 2006; Harrison and Hoek, 2011). Just-in-time aims to hold the accurate level of inventory at the right time (Hazier and Render, 2014); and target inventory optimization by eliminating or holding excess inventory (Sungard, 2007).

JIT is also a strategy for reducing costs associated with purchasing, holding, ordering, and stocking out of inventory to improve customer service and the financial performance of firms (Shin et al., 2015). The implementation of a JIT inventory system requires a full facility, strong capacity, and a long-term relationship with suppliers to fill and deliver the order as soon as it is placed.

ABC Analysis

The ABC analysis is a systematic way of classifying inventory control differently based on their economic value as A, B, and C categories (Gupta, Jain & Garg, 2007). This technique is based on the principle that a percentage of items represent the majority of the economic value of the total inventory, while a large fraction of items account for a small financial value (Flores & Clay, 2012). It is a system of prioritizing inventory based on its value (Flores & Whyback, 2007). This technique assumes A category items account for 70-80% of the total inventory value but 10-20% of total inventory items; the B category items account for 15-25% of the total inventory value and 30% of the total items, and C category items account for 5% of the total inventory value and 50% of total inventory.

Material Requirement Planning (MRP)

MRP is a computer-based inventory management system based on production

planning and an inventory control system. MRP works backwards from a production plan for finished goods to develop requirements for components and raw materials. MRP begins with a schedule for finished goods that is converted into a schedule of requirements for the subassemblies, parts, and raw materials needed to produce the final product within the established schedule.

Material requirement planning is an automatic method of supply scheduling where the timing of the purchase or production output is synchronized to meet period-by-by-period operation requirements (Ballou, 1999). This technique tries to eliminate carrying more inventory than desired at a time. As Coyle et al. (2003) explained, the goals of MRP are ensuring the availability of inventory for planned purposes and maintaining the least possible inventory level.

Vendor Managed Inventory (VMI)

VMI is defined as a cooperative agreement aimed to improve the availability of products and minimize costs among buyers and sellers. In a VMI system, the vendor is responsible for the management of the inventory within an agreed framework of targets, which are constantly monitored to continuously improve performance (Hines et al., 2000).

VMI benefits supply chain partners in many ways. The common benefits of VMI practice in supply chain activities are: Reducing costs and increasing service levels (Niranjan et al., 2012); cutting inventory, production, and transportation costs (Tang, 2006); resulting in cost reduction and service improvements (Claassen et al., 2008); increase inventory convenience at efficient cost (Hines et al., 2000); and the cooperative relations among partners in the supply chains can lead to strong competitive benefits and progress in firms' performance (Fawcett et al., 2008). The success of VMI practices is closely related to information technology and information sharing practices because, as Dyer and Chu (2003) revealed, an improved VMI results in quality information that lessens transaction costs, which in turn lead to greater perceptions of a firm's achievements (Yigitbasioglu, 2010).

2.3 Supply Chain Performance and its Measurement

Performance measures and metrics are crucial for the effective management of supply chain management practices since it's a fundamental activity for the evaluation and comparison of firm performance. Performance measurement is a systematic way of quantifying the productivity of all the efforts that lead to performance. The idea of measuring supply chain performance emerged a long time ago; however, it overlooked performance measurement in supply chain contexts (Gunasekaran & Kobu, 2007). As Tetik, (2003) indicated, performance is the degree of achievement attained by an enterprise within a spe-

cific period, whether expressed quantitatively or qualitatively. Performance measurement is always a challenging issue due to the lack of consensus on its measurement dimensions, due to the complex nature of supply chains (Kwak, 2016). Moreover Ibrahim & Ogunyemi (2012) and Flynn et al., (2010) indicated that there is no consensus among researchers regarding the best measures for supply chain performance.

Traditionally, the measurement of supply chain performance depended greatly on financial instruments, but modern supply chain performance measurement adopts multi-dimensional measurements to overcome the drawback of traditional supply chain performance measurement by incorporating nonfinancial performance indicators (Basat, 2010). Generally, different scholars used different techniques of the supply chain performance measurement; such as cost, activity time, customer responsiveness, and flexibility (Beamon, 1998); flexibility and customer service (Beamon, 1999); delivery reliability, responsiveness, cost reduction, and lead times (Panayides and Lun, 2009); delivery reliability, responsiveness, flexibility, cost, and efficiency (Jeong and Hong, 2007); cost, flexibility, relationship, and responsiveness (Vanichchinchai and Igel, 2009); flexibility and SC efficiency (Ibrahim and Ogunyemi, 2012). However, regardless of the variety and lack of consensus on supply chain performance measurement, performance measurement metrics need to be directly related to the firm's strategy, vary between locations (departments or companies), vary as situations do, be simple and easy, need to provide fast feedback and inspire continuous development.

2.4 Conceptual Framework and Hypothesis Development

The conceptual framework and the hypotheses are designed and developed based on the resource constraints and resource-based view theories. The resource-based view is centered on resources inside the entity, to recognize the way organizations can achieve an uninterrupted competitive advantage (Barney, 1991). From the concept of supply chain practices, a competitive advantage is gained and maintained if firms integrate their resources and work together, rather than running alone. In contrast to the theory of the resource-based view, the theory of resource constraints focuses on factors limiting a specific firm from achieving a higher performance by focusing on the implementation of a superior system. Also, from the angle of supply chain management, the success of the supply performance is highly dependent on the strength of the link between the supply chain partners (Goldratt, 1990a). Therefore, to realize a strong link among the partners in supply chain practices, to benefit from the theory of resource constraints, they need to adopt and implement effective information sharing along the supply chain and remove poor inventory management practices through effective communication. Therefore, this study is designed based on the two aforementioned theories by linking them to supply

chain management.

Information sharing practices and firms' performance

In modern supply chain practices, the activities of information sharing are the central instrument to enhance firm performance. Information sharing has the power to influence an organization's diverse functional units including marketing, financial, and economic performance that influence firm operating costs, flexibility, responsiveness, efficiency, and capacity optimization.

In supply chain practices, information sharing can help firms in several ways. Information sharing can reduce supply chain costs (Tan 1999); improve efficiency (Yeoh, 2017); lead to overall cost reduction (Zhao, 2002); improve performance and productivity (Mourtzis, 2011); enhance efficiency (Kumar and Pugazhendhi, 2012); and improve the financial performance of firms (Beduk 2009). Moreover, information sharing between the supply chain partners enables firms to detect and respond earlier to any problem along the supply chain (Jauhari, 2009); quickly respond to customers' orders and requests (Le et al., 2009); make better decisions (Thatte, 2007); and minimize delays and distortion that improve customer satisfaction (Suhong, et al., 2009).

The first hypothesis (H1) relates information sharing in the supply chain and its positive effects on firm performance; the positive effects, in this case, are a reduction in operational costs, enhancement of the firm's responsiveness, improved customer service, minimizing delivery times and enhanced product quality due to improved firm performance.

H1: Information sharing in the supply chain positively affects firm performance.

Inventory management practices and firms' performance

The relationship between inventory management practices and firm performance have been studied by different scholars. For example, Lin et al. (2017) recognized the positive impacts of effective inventory management on the quality of the product. The study added more to the positive impacts of inventory management on efficiency and productivity. Also, the investigation by Daniel & Assefa (2018) into the effect of inventory handling on the competitiveness and performance of Ethiopian micro and small-scale enterprises illustrated the positive relationship between inventory management and firm performance. Similarly, a study of manufacturing industries in Johannesburg, South Africa, by Mankazana et al. (2018) and Kinyua (2016) in Kenya on the effect of inventory handling techniques both show a positive and significant effect of inventory management techniques on the organization's performance.

Furthermore, the study made in Chinese firms by Chen & Tan (2011) on the effects of JIT on organizational performance illustrates the significant and positive effects of the JIT technique on the performance of a firm. In addition, the finding of Kinyua (2016) further shows the application of JIT, VMI, ABC analysis, EOQ, and bar-coding improved the operational performance of firms. Also, a study done in Kenya on the effects of the VMI technique on firm performance showed that the techniques influence quality control and minimize consumer complaints, create customer loyalty and enhance the profit margin of an organization (Mwangi & Kitheka, 2018). The second hypothesis (H2) relates improved inventory levels to improved organizational performance. Improved inventory management practices, in the context of this study, refer to the reduced level of inventory and its associated costs and minimized bullwhip inventory level; improved organizational performance, from the view of this study, refers to reduced operational costs, enhanced firm responsiveness, improved customer service, minimized delivery times and enhanced product quality due to improved firm performance.

H2: Firms with improved inventory management will have improved organizational performance in the supply chain.

Information sharing and inventory management practices in the supply chain practices

As earlier pointed out, in supply chain practices, information sharing has various benefits for organizations as well as for customers. For instance, effective information sharing reduces the number of wrong or defective products delivered to consumers. This directly reduces the carrying costs of inventory, the cost of recollecting and shipping back wrongly delivered or defective delivered products in a reverse way. Generally, flexible and speedy two-way communications enhance firm performance in supply chain practices by reducing inventory shortage shortages as a result of effective demand forecasting.

The implementation of different inventory management practice like JIT, bar-coding, VMI, and EOQ need the integration of all partners in the supply chain through effective information systems. Generally, prior research shows effective information sharing reduces inventory levels and results in the optimum inventory (Sun & Yen, 2005); it eliminates the bullwhip effect of inventory (Li, Gao, 2011); and cuts inventory and related cost (Zhao, 2002). H3 links information sharing in the supply chain with its positive effect on inventory management, and in this study the positive effect of information sharing on inventory management practices, in terms of reducing the inventory level and its associated cost and minimizing the bullwhip inventory level in the supply chain practices.

H3: Information sharing in the supply chain positively influences inventory management.

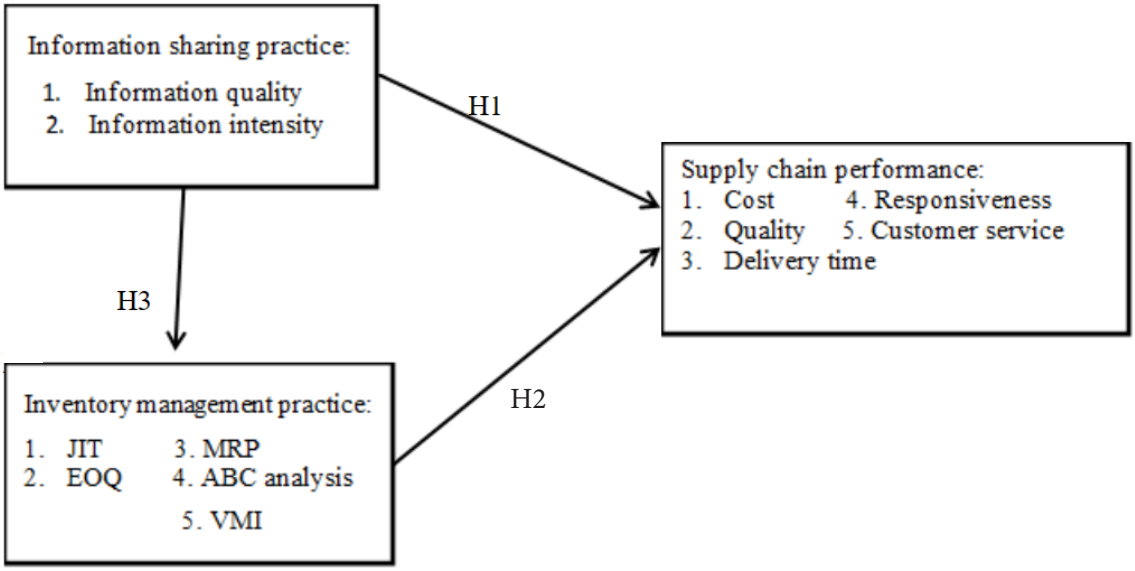

Figure 1. Conceptual framework of the study

Method

3.1 Population

This study targeted six different companies, their suppliers and distributors in three types of industries. The targeted industries were the cement industry, beer industry, and the dairy industry operating in and around Addis Ababa, the capital city of Ethiopia. The cement industry was selected because there is a large amount of production and demand for cement in the country but most of the time the user faces acute shortages and high price fluctuations for the product. Similarly, the dairy industry was selected due to an alarming price increase in milk and milk products in the country, especially in and around the major cities of the country, but the country has the largest livestock population in Africa and the fifth largest in the world (Lemma et al., 2015). Also, the researcher selected the beer industry because competition within this beverage industry has recently been growing at an alarming rate and the shocking profitability of the beer companies, due to the recent direct foreign investment and mergers with domestic companies.

Finally, the specific companies were primarily selected based on their years in operation, those companies operating for at least ten years were selected. The second criteria for selecting these six companies were their size (capital), and lastly, the popularity of the company's product in society, relative to those of the other competing firms considered.

3.2 Sample Size and Sampling Technique

In this study the researcher was determined to gather data from 182 respondents; however, only 170 respondents or 94% of the response rate correctly filled and returned the dispatched questionnaire. Specifically, the samples included executives, marketing managers, purchasing managers, production managers, supply & logistics managers, major suppliers and distributors of the companies under analysis that worked in the companies for more than two years. The respondents were purposively selected by the researcher to get relevant and reliable data from the right respondents who had adequate information about the issue to be investigated.

3.3 Sources of Data and Data Collection Technique

This study was exclusively based on the primary source of data that were collected by a structured questionnaire from 170 respondents. The questionnaires were measured by a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The questionnaire was partly adopted and partly designed by the researcher based on an intensive literature review. The instruments used for measuring the constructs of information-sharing practices and organizational performance were adopted from Zhang (2001) and Li et al. (2002). The items for the constructs of inventory management techniques in the SCM practice were generated based on previous SCM literature (Tan et al., 1998; Stuart, 1997).

Data were gathered by structured questionnaires for both the independent and dependent variables. The information sharing practices were measured from two dimensions, i.e. information quality and information intensity and inventory management practices from five dimensions; i.e. EOQ method, ABC analysis, JIT technique, MRP analysis, and VMI method; whereas firm performance was measured by five dimensions; i.e. quality, customer responsiveness, cost, service level and delivery time.

To investigate information quality's effects on firm performance, five survey items were used, and for the measurement of information intensity, four items were used. Hence, for inventory management practices, 23 items categorized under five dimensions were used. These comprised of four items each for the ABC analysis and VMI techniques; and five items for each technique of MRP, JIT, and EOQ. Lastly, 25 questions under the five dimensions of organizational performance, namely, organization responsiveness, customer service level, delivery time, product quality, and cost, were used; where each of the five dimensions individually holds five items.

3.4 Data Analysis

To analyze the collected data, the Statistical Package of Social Science Version 23 was used for the analysis of the descriptive statistics. Similarly, for comparative analysis

of the industries' supply chain practices and supply chain performance, one-way ANOVA with a 0.05 significance level was used; whereas to test the hypotheses proposed and to see the relationship between variables under the analysis, an exploratory factor analysis (EFA) of structural equation modeling (SEM) was used and the AMOS software package version 23 was used in testing the proposed model.

The researcher also employed EFA because 17.5% of the items, or 10 questionnaires, used under the ABC and VMI technique were designed by the researcher based on an intensive literature review, with no prior knowledge of the extent to which the items met the expectation in inventory management.

Before the analysis, the researcher checked for accuracy, normality and outliers. The normality of the data was evaluated and confirmed from the coefficients of skewness and kurtosis of the data collected that ranged within ±2 (Garson, 2012).

Moreover, under the issue of outliers, the Z values or the standard score for all items ranged between ±4, signifying no existence of the issue of outliers in the collected data. Hence, the data were confirmed for further analysis as there was no significant issue that hindered further analysis.

Additionally, to see the dimensions of this study and to identify the groups of items having a satisfactory ordinary variation to explain their grouping together as a factor, an EFA analysis was conducted. The results of the EFA are shown in Table 3, and Table 5 shows the result of the factor loading for each item on their respective constructs, and all the constructs on their respective dimensions, respectively. All the 11 constructs had significant loading on their dimensions with Eigen values above a value of one, cumulative variance ranging from 33.21% to 54.53%, and loading factors above 0.4. Additionally, the researcher checked the suitability of the sample size, where the sample was 182; Hair et al. (2010) suggested that the sample for SEM should exceed 100. Hence, based on this argument, the sample size used was suitable.

Moreover, to assess the measurement model's validity and reliability, factor analysis was conducted for all the dimensions. For the two-dimension supply chain management practices, a factor analysis was conducted, with two constructs for information practice (ISP) and five constructs for inventory management practices (IMP). For information sharing practices, factor analysis for five items of information quality (IQ) and four items of information intensity (II) was made and resulted from three items above factor loading of 0.4 for each construct of information sharing practice, and the results of all the items loaded on their respective factors are displayed in Table 3a.

Similarly, the inventory management dimension was represented by five constructs and 23 items, and factor analysis was made for these items by removing seven items whose factor loadings were below 0.4; the results are revealed in Table 3b. Finally, for the five

constructs of the firm's performance (FP), factor analysis was made for the 25 items under the five constructs and resulted in only 18 items with a significant loading above 0.4, these details are displayed in Table 3c. Generally, all the constructs under investigation proved to have a high factor loading.

Finally, in addition to the validity test, the reliability of the constructs was assessed with Cronbach's alpha values and displayed in the last column of Table 3 for all the constructs. The reliability values for all constructs were measured and resulted in values above 0.7, which is normally acceptable (Nunnally, 1978).

Result and Discussion

In total 182 questionnaires were distributed for the total determined sample size of the study. However, only 94%, or 170 questionnaires, were returned, while the remaining 6%, or 12 questionnaires, were not received by the researcher. Table 1 shows the demographic characteristics of the respondents used.

Table 1. Profiles of the respondents' and company's background

Demographic profile of respondents	**Frequency**	**Percentage**
Served for at least five years in the supply chain area	124	72.94
Company has at least 10 years of business experience	158	92.94
Education levels		
Diploma	62	36.47
Degree	80	47.06
Others	28	16.47
Employees IT skill level		
Low	16	9.41
Medium	53	31.17
High	101	59.47
Levels of the company's IT infrastructure		
Low	-	-
Medium	42	24.71
High	128	75.29
Respondent's Department		
Corporate executive	6	3.53
Material management/Purchasing section	42	24.71
Production section/ Manufacturing	35	20.58
Distribution/ Marketing	36	21.17
Major suppliers	28	16.47
Major distributors/ Wholesalers	11	6.47

Others	12	7.06
Type of industry		
Beverage	2	33.33
Cement	2	33.33
Dairy	2	33.33

For this investigation, data were collected from 170 individuals selected from six companies; and the six companies were selected from three different industries. Regarding the demographic characteristics of the respondents, Table 1 exhibits that 84% of them were male and 16% of them were female. Moreover, concerning their educational status, 83.53% of the respondents had a minimum of diploma level. Regarding the supply chain experience of the respondents, 72.94% of them had at least 5 years of supply chain area working experience. Moreover, concerning the respondents' IT skill levels 90.59% of them jointly replied that their IT skill levels were from medium to high; similarly, the response to the IT infrastructure level of the company showed that 75.29% said that the IT infrastructure level within the company was high and the remaining 24.71% replied that IT infrastructure level of the company was at a medium level. Finally, Table 1 also shows that out of the total respondents, 3.53% were company top executives, 20.58% were from the production section, 24.71% from the purchasing section, 21.17% from the distribution and marketing section, 6.47% were major wholesalers, 16.47% were major suppliers and 7.06% were from others. Generally, from the analysis made in Table 1, one can generalize that the respondents had adequate supply chain experience and IT skills to carry out supply chain practices. Moreover, the IT infrastructure levels within the companies were sufficient for them to practice supply chain activities, since supply chain activities are based on IT.

Table 2. Descriptive statistics of IS, IM and SCPs of the industries

Variable	Industry	Mean	Std. Deviation	F	Sig.
Information Sharing practices (ISP)	Beer	3.006	0.6932	11.365	0.000*
	Cement	2.684	0.5138		
	Dairy	2.875	0.4601		
	Total	2.855	0.5556		
Inventory management practices (IMP)	Beer	2.875	0.6932	6.033	0.000*
	Cement	2.684	0.5138		
	Dairy	3.012	0.4601		
	Total	2.855	0.5556		
Supply chain performances (SCP)	Beer	3.02	0.55934	11.365	0.000*
	Cement	2.887	0.38332		
	Dairy	2.907	0.46052		
	Total	2.938	0.47348		

Table 2 shows the assessment of the supply chain practices of the sampled industries from the side of ISP, IMP and SCP. The descriptive results of ISP in the supply chain practices of the selected industries showed that the beer industry ranked top with the highest mean response of 3.00, followed by the dairy industry with a mean value of 2.87, and the cement industry ranked last with the lowest mean value of 2.68 among the industries under the investigations. Further, the F-statistics and the p-value from one-way ANOVA given in Table 2 show that there was a statistically significant difference among the three industries in ISPs.

The highest mean score of ISPs by the beer industry, relative to the other two industries, might be due to better awareness and understanding by the companies' administration and employees of the mutual benefit of sharing quality information, the better interest of managers, suppliers and distributors to share adequate, high quality information to eliminate misunderstandings with their supply chain partners, and better information technology facilities within the industry. Furthermore, the higher mean value of ISP in the beer industry might also be due to the daily distribution of the product and recollection of its packaging due to the mass production, distribution and consumption of the product.

Similarly, Table 2 shows IMP in the SCPs of the three industries under investigation. From Table 2, the dairy industry is top-ranked with the highest mean score of 3.01; followed by the beer industry with a mean of 2.82 and the cement industry last with the lowest mean value of 2.78. The mean difference observed among the industries was also statistically significant from the F-statistics and p-value of one-way ANOVA given in Table 2. From this analysis, the difference in the IMPs among the three industries might be due to the nature of the product, and the infrastructure levels of the information technology facilities in the companies to adopt and use various IM techniques. For example, the higher mean value of IMPs in the dairy industry might be due to the nature of the product, i.e. the difficulties or impossibility of the milk and milk output being maintained for long as an inventory item. Therefore, such products need better IM practices like JIT to avoid or minimize the loss of the product's value. Similarly, the lower mean result of IM practices in the cement industry might be the reflection of the nature of the product, i.e. it cannot easily lose its value relative to dairy products and beer products.

In the end, as shown in Table 2, the mean values of the SCPs of the three industries show that the beer industry was the leading one with the highest mean value of 3.08; followed by the dairy industry with a 3.05 mean value, and finally cement industry with the lowest mean value of 2.88. Also, there was a statistically significant difference among the industries in their SCPs from the F-statistics and p-value given in Table 2. To sum up, the relatively better SCPs observed in the beer and dairy industry might be due to their better ISPs and IMPs.

Table 3. Factor analysis results and respective Cronbach α values for (a) information sharing practice, (b) Inventory management practices, and (c) firm's performance

Items	IQ	II	JIT	EOQ	MRP	ABC	VMI	Cronbach α
(a) Information Sharing Practices								
ISP/IQ1	0.78							0.74
ISP/IQ2	0.38							
ISP/IQ3	0.84							
ISP/IQ4	0.33							
ISP/IQ5	0.86							
ISP/II1		0.67						0.71
ISP/II2		0.76						
ISP/II3		0.78						
ISP/II4		0.24						
(b) Inventory Management Practices								
IMP/JIT1			0.78					0.73
IMP/JIT2			0.36					
IMP/JIT3			0.67					
IMP/JIT4			0.72					
IMP/EOQ1				0.31				0.76
IMP/EOQ2				0.55				
IMP/EOQ3				0.82				
IMP/EOQ4				0.79				
IMP/MRP1					0.82			0.78
IMP/MRP2					0.76			
IMP/MRP3					0.74			
IMP/MRP4					0.39			
IMP/MRP5					0.27			
IMP/ABC1						0.33		0.71
IMP/ABC2						0.64		
IMP/ABC3						0.76		
IMP/ABC4						0.83		
IMP/ABC5						0.26		
IMP/VMI1							0.38	0.72
IMP/VMI2							0.66	
IMP/VMI3							0.71	
IMP/VMI4							0.74	
IMP/VMI5							0.76	
Items	CR		DT		CS	Q	C	Cronbach α
(a) Firms Performance								0.73
FP/CR1	0.73							
FP/CR2	0.68							
FP/CR3	0.37							
FP/CR4	0.76							

FP/CR5	0.64							
FP/DT1			0.78					
FP/DT2			0.86					0.77
FP/DT3			0.81					
FP/DT4			0.24					
FP/DT5			0.28					
FP/CS1					0.87			
FP/CS2					0.83			
FP/CS3					0.32			0.81
FP/CS4					0.85			
FP/CS5					0.81			
FP/Q1						0.72		
FP/Q2						0.78		
FP/Q3						0.36		0.75
FP/Q4						0.36		
FP/Q5						0.87		
FP/C1							0.71	
FP/C2							0.77	
FP/C3							0.84	0.82
FP/C4							0.83	
FP/C5							0.26	

The SEM is a pool of numerical models that show the relationship among numerous variables. The objective of using the SEM is to confirm the degree to which the data can support the theoretical model, and if the data supported the theoretical model, a further progressive model can be predicted, otherwise, the researcher needs to revise and test the model. The primary reason to use SEM is its capacity to test the direct and indirect associations between variables to be investigated by a single model (Meydan & Sen, 2011).

Here, the researcher used SEM as a tool of analysis because of its unique ability to measure associations between constructs with several dimensions of items (Hair et. al, 2006). Furthermore, it allowed for dealing with advanced and rigorous numerical processes to handle difficult models (Tabachnick & Fidell, 2009). In this study, for the evaluation of the measurement model the maximum likelihood was used, and the results summarized for the predicted model's goodness of fit test (GFI) are given in Table 4.

Table 4 illustrates the GFIs of the SEM model that generated a satisfactory good fit in all four measured indexes. The model fits were measured by chi-square, root mean squared error of approximation, Tucker-Lewis Index/non-normed fit index, and comparative fit index. The four models included one overall model (M1), represented in Figure 1, and three other alternative models developed from the first model by dropping one of the links between the constructs one at a time as model 2, model 3 and model 4 to determine

whether the model in Figure 1 (M1) had the best fit. Therefore, first, model 1 represented the overall effects of information-sharing practices and inventory management on firm performance; second, model 2 was developed by dropping the direct link from information-sharing practice to organizational performance; thirdly model 3 was developed by leaving the intermediary effects of inventory management practices, and considering both information-sharing practice and inventory management practices as independent constructs; and finally model 4 was developed by removing the link between inventory management practices and firm performance.

The result of the fit of the normal chi-square (X2/df) resulted in a value of 1.76, which was in the satisfactory range (Bollen, 1989). Similarly, the non-normed fit index (NNFI) or the Tucker-Lewis index in this model was 0.96; showing an acceptable model fit, as the value of NNFI fell between 0 and 1 with at least a limit of 0.95, which illustrated acceptability of the model fit (Bentler, 1990). Also, the 0.045 value of the root-mean-square error of approximation (RMSEA) showed the fitness of the model, since the estimated value of RMSEA ranged between 0 and 1, where less value shows a better and acceptable model fit (Brown & Timothy, 2015). Lastly, the comparative fit index (CFI) value of 0.97 for the model indicated the good fit of the model (Hu & Bentler, 1999).

Table 4. The goodness of fit test mode

			CFA	RMSEA	NNFI/TLI
Criteria	X^2	DF	>0.95	<0.06	0.95
Obtained Model 1	32.24	45	0.97	0.045	0.96
Model 2	41.35	46	0.98	0.036	0.88
Model 3	67.65	46	0.97	0.044	0.98
Model 4	54.27	46	0.95	0.048	0.97

Where,
X2 = chi square; DF = degree of freedom; CFI = comparative fit index;
RMSEA = root mean square error of approximation; NNFI = non-normed fit index

Table 5. Exploratory factor analysis

Construct	Dimensions	Factor 1	Factor 2	Factor 3
Information sharing	Information quality	0.71		
	Information intensity	0.58		
Inventory management practices	JIT		0.73	
	EOQ model		0.61	
	MRP		0.54	
	ABC Analysis		0.45	
	VMI		0.48	

Firm performance	Responsiveness			0.7
	Delivery time			0.71
	Customer service			0.65
	Quality			0.52
	Cost			0.81
Eigen value		3.15	1.13	1.07
Variance		33.21	14.39	6.93
Variance cumulative		33.21	47.60	54.53

The overall value of the Kaiser-Meyer-Olkin measure for adequacy of the sample was 0.73; and the total value of Cronbach's alpha was 0.76.

To check whether the model given in Figure 1 was the best fit, the researcher evaluated three alternative models by dropping one connection between the constructs at a time in successive steps.

The direct relationship between inventory management and organization performance was dropped to see the effects of information sharing on firm performance. Then, the path coefficient between firm performance and information sharing was estimated and the result revealed a slight relationship between the variables. Also, inventory management and information-sharing practices were considered independent constructs and resulted in significant outcomes for both constructs.

Lastly, the indirect effects of the information sharing practices of inventory management practices on firm performance were tested by removing the direct link between information sharing practices and firm performance. Then, the path coefficient for the path of information sharing and inventory management on firm performance was significant, suggesting a direct effect of information sharing on inventory management and firm performance. The fit statistics for the last model were slightly less than the fit statistics of the other three models.

Table 6. Results of Proposed hypotheses

	Relationship	Total effect	Direct effect	Indirect effect	Decision
H1	IS → OP	0.615	0.615	0	Accepted
	P-value	0.001	0.001	-	
H2	IS → IMP	0.764	0.525	0.239	Accepted
	P-value	0.001	0.002	0.011	
H3	I → MOP	0.642	0.642	0	Accepted
	P-value	0.010	0.010	-	

The hypotheses tested in this study by the SEM are given in Table 6 and Figure 1. The results of the hypothesis that links information sharing with organizational performance (H1) shows that firms with improved information sharing through sharing the right quality and quantity, right content and type of information have better organizational performance, in terms of reducing operation cost, enhancing the firms' responsiveness, improving customer service, minimizing delivery times and enhancing the quality of the firms' product. The standardized coefficient for the first hypothesis, which was 0.615, is statistically significant with a p-value of less than 0.01(0.001). The statistical significance of the hypothesis related to information sharing with organizational performance within the supply chain practices resulted in a positive and direct effect of information sharing with organizational performance.

Prior research also shows that in supply chain practices, information sharing can help the organization in diverse ways. Information sharing among supply chain partners has the potential to reduce cost and improve efficiency (Yeoh, 2017); and improve firm productivity and performance (Mourtzis, 2011); information sharing between the supply chain partners' enables firms to quickly respond to customers' orders and requests (Le et al., 2009) and improve customer satisfaction (Suhong et al., 2009). Specifically, the finding of this research confirms the result of a study made in Turkey by Sahin & Topal (2018) that recognized the presence of the direct and indirect effects of information sharing on firm performance. But, this study is in contrast to the findings of Baihaqi & Sohal (2013) who identified the lack of a direct link between information sharing and organizational performance.

H2 tested the impacts of information sharing on inventory management practices in supply chain practices and the result given in Table 6 indicated a direct role of information sharing practices on inventory management practices, and thus on firm performance. The direct role in this context was the ability to share quality information of such intensity as to be able to affect inventory management practices directly, as shown by the firm performance standardized coefficient for the second hypothesis being 0.525, which was statistically significant at $p < 0.01(0.002)$. Improved information technology facilities and information-sharing practices in the supply chain practices were the precondition to implementing some of the inventory management techniques such as VMI, JIT and MRP.

The result of this study also revealed the presence of an indirect role of inventory management practices on firm performance. An indirect role, in this case, was the ability of information-sharing practices to affect inventory management practices, and the affected inventory management practices in turn affected firm performance. Here in this study, the indirect role of information sharing practices on firm performance via inventory management was 0.227 and significant at 5% of p-value. This showed a direct

and positive impact of information sharing on firm performance; and an indirect one via inventory management practices. The results also showed improved inventory management practices through inventory level reductions and its associated cost, and minimizing the bullwhip inventory level in the supply chain practices resulted in greater firm performance by reducing operational costs, enhancing firm responsiveness, improving customer service, minimizing delivery times and enhancing product quality, hence this confirmed the third hypothesis. Moreover, the standardized coefficient for the third hypothesis was 0.382, which was statistically significant at $p < 0.01(0.009)$. The result was in line with the outcome of Mentzer and Zacharia (2000); Mankazana et al., (2018); Prempeh (2016); and Mwangi, (2016), who all revealed the existence of the positive relationship between inventory management and firm performance. But, the outcome contradicted the results of Hornbrinck, (2013); Mensah (2015) and Sitienei & Memba, (2015) who all reported a negative relationship between inventory management and firm performance.

Generally, based on the standardized coefficients of the hypotheses tested, the information-sharing practices had a direct and large effect on inventory management practices with a 0.764 standardized coefficient relative to 0.525 for firm performance.

The result similarly showed that firm performance was less influenced by information sharing in the supply chain practices, where the standardized coefficient of information sharing was 0.615, relative to inventory management practices, with a coefficient of 0.764. This illustrated the significant relationship between inventory management practices and firm performance. Generally, the result showed that information-sharing practices had a more direct effect on inventory management than on firm performance. This might be because performance was influenced by several factors and inventory management was influenced by information-sharing practices in the supply chain practices.

Conclusion

The results of this study offer an empirical justification for a conceptual framework that tests the effect of information-sharing practices and inventory management on firm performance. Information sharing is measured from the scopes of quality and intensity; whereas inventory management is seen from the dimensions of the EOQ method, JIT technique, ABC analysis, VMI and MRP; firm performance is measured from five dimensions, namely cost, quality, responsiveness, customer services and delivery time.

The analysis made from the demographic section and background section of the organizations shows that the respondents have adequate supply chain experience and IT skills to carry out supply chain practices. Moreover, the IT infrastructure level within the companies is sufficient for them to carry out supply chain activities since the supply chain is IT-intensive activity.

The result of an EFA of an SEM shows that there is a direct and positive relationship between inventory management and information-sharing practices on firm performance. Similarly, there is an indirect and positive relationship between an organization's performance and information sharing, where inventory management practices act as an intermediary variable between firm performance and information sharing in supply chain activities. Generally, the outcomes show that higher information-sharing practices and inventory management practices increase firm performance by improving product quality, reducing operating costs, enhancing customer service and customer responsiveness, and minimizing delivery times, and increased information-sharing practices improve inventory management practices by reducing the level of inventory and its associated costs, and minimizing the bullwhip inventory level that in turn reduces operational cost, enhances firm responsiveness, improves customer service, minimizes delivery times and enhances the firms' product quality.

In this model, the effects of information sharing and inventory management in the supply chain practices on firm performance have been analyzed and the results were significant. However, if this model is practically applied in the industries under investigation, the real problems such as sudden price rises, poor customer services and inventory stock-out will be minimized. However, the real application of the model will demand a well-developed information technology infrastructure.

Limitation

The potential limitations of this study emanate from three facts. Primarily, the questionnaire used for data collection did not have standardized items; specifically, for the inventory management techniques of the ABC and VMI constructs, as the researcher did not get suitable standardized items. Therefore, it is recommended for potential future researchers to confirm the items used for the data collection in this research. Secondly, for this study, the data were collected only from six companies in three industries. Hence, this makes it difficult to generalize the whole of the supply chain practices at a country level. Finally, the constructs of performance measurement are open to being influenced by the subjective evaluation of the respondents, which might increase the measurement error. Thus, future researchers are required to minimize the potential measurement error by using secondary data in measuring the performance of an organization.

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