

Supply Chain Maturity Assessment of Coca Cola Ghana Ltd

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<p>This study aims to assess the supply chain process management of Coca Cola Ghana Ltd; this research is of importance due to its potential to point out processes that can yield higher performance of the supply chain and those processes that can be enhanced for higher performance levels.</p> <p>The sample for this study was selected using purposive sampling; five supply chain management practitioners in the company were used for the data extraction. Questionnaires were sent to these five respondents and the response rate was 100 %.</p> <p>To extract the data needed a maturity test tool was developed based on the best practices of the Supply Chain Operations Reference model which provides the scope and focus for this study.</p> <p>Data was evaluated using a variety of analytical tools. Microsoft Excel and Google forms were used for the manipulation of the extracted data.</p> <p>The findings of this thesis have proven that all processes must be constantly reviewed to find better ways of doing same activities but with better management practices. This thesis also found the supply chain of the company to be using the best practices in managing most of the processes.</p> <p>In conclusion from the findings of this thesis, firms must carefully find and select the best practices that can enable them achieve higher performance and profitability. Processes can be the game changer in meeting customer expectations and achieving higher results in companies.</p>	
Keywords Supply chain management process, Supply chain maturity model, Best practice	

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1 Introduction

1.1 Background and Statement of problem

Today's supply chain management practices involve complex processes that keep innovating with the intent of adding value and superior performance. Vanathi and Swamynathan (2013, 1921) assert that, to be a leader in the ever growing competitive world, firms must enhance their process and capabilities to stay on top of their game. Juran and Dershin (2010) makes a point that supply chain does not function on a single process, but a collection of processes that makes up a system that functions to meet customer expectations. In order to be able to beat competitors or do well, firms must make sure their capabilities or processes are performing better than current practices in the industry or at least are able to do activities and processes at acceptable levels.

All supply chains have their capabilities, development or competency levels which shows how they can perform. Supply chain maturity as a concept can show how capable supply chains are at a point in time. (Kyratzoglou, 2013.) A different level of competence in supply chain management is achieved by implementing different management practices (Frederico& Martins 2012, 1). Companies that do not explore their capabilities would surely be left in the wilderness of convention. According to Chen, Defee, Gibson and Hanna (2014) most companies are at the beginning stages of their supply chain development, while only few have reached their craved level of supply chain maturity. For this reason, the need for assessment of maturity level of supply chains has become an important reason for process enhancement.

Coca Cola Ltd as a company holding the highest market share in the soft drink beverage industry in Ghana would need to have a very competent a capable supply chain that can deliver nothing less than customer satisfaction. How the firm controls its supply chain processes shows how they can perform. The aim of this research work is to find and gauge the competency level of the supply chain process management at Coca Cola Ghana Ltd.

1.2 Purpose and deliverables of the project

The main purpose of this research work is to rate the current level of supply chain maturity of the case company. The research aims to capture intelligence on how current activities in the supply chain of Coca Cola Ghana are being carried out, assign a level of maturity on how current supply chain processes are managed in the company and aid in mitigating

risks by pointing out activities that can be enhanced for better performance of the supply chain.

1.3 Research questions and investigative questions

According to Kothari (2004, 12) there are two types of research problems; those related to finding status and those relating to relationships between variables. The research problem under investigation in this study is the kind related to finding status. This study is only interested in establishing a status quo and does not encompass any issue in the area of relationship studies. Selected **SCOR** best practices were used as the criteria for testing the four investigative questions of the study.

The research question and investigative questions to be researched in this study are as follows:

Research Question

What is the maturity level of the supply chain of Coca Cola Ghana?

The following investigative questions would provide answers to fulfill the main research question under discussion:

IQ1. How matured is the planning process by standards of the SCOR best practice in the supply chain?

IQ2. How matured is the sourcing process done by standards of the SCOR best practice in the supply chain?

IQ3. How matured is the manufacturing process by standards of the SCOR best practice in the supply chain?

IQ4. How matured is the delivering process by standards of the SCOR best practice in the supply chain?

SCOR (Supply-chain operations reference-model) used as the bases of testing would be explained into details in the chapter two of this thesis.

1.4 Significance of the study

The study would be a significant model that can be used by other players to enhance performance through the exposure of processes that would need face-lift or better management. This study would make the firm have a crystal clear picture of how current processes and activities are carried out in the supply chain. According to Mourot (2014) managing a supply chain effectively can improve decision making proficiency as well as business performance; creative strategies and practices must be implemented to enhance efficiencies throughout the value chains.

This research would also shed light on the need for firms to enhance their decision making and supply chain process management. It might also become a reference point for future reference in the field of supply chain management.

As said earlier this study might have an impact in the designing of the management strategy for the supply chain of the firm. Since this research investigation is being done by an outsider, the results would be void of manipulation of facts.

1.5 Demarcation

The demarcated area for this thesis is best practice; the focus of this research work is to figure out how processes and activities are managed according to the SCOR best practice criteria in the areas of PLAN, SOURCE, MAKE, and DELIVER. Return activities in the supply chain would not be investigated because it is not of interest to the case company. This research is not after the value of performance but how processes are carried out to achieve performance. Level four of the SCOR model will not be used in any way in this study.

1.6 Definition of key terms

Performance measurement is the process of measuring efficiency and effectiveness of a supply chain (Roberto Antonio &Guilherme Francisco 2012, 3).

Supply chain management process is the process of making decisions and taking actions to direct activities of people within a supply chain towards common objectives; planning, organizing, staffing, leading and controlling. (McCormack, Johnson &Walker 2003, 49.)

A Supply chain maturity model is a frame of reference that describes a particular area of interest in a supply chain by indicating the levels of fitness at which activities in the supply chain can be carried out. (Vanathi&Swamynathan 2013, 1922.)

Best practice is a way of carrying out activities in the most efficient and effective way (Gattorna& Walters 1996, 228).

Weske (2010, 5) describes **business process management** as practices that include approaches, methods and capabilities used to support the design, management, configuration, enactment and analysis of business processes.

Business process reengineering is the process of reorganizing a company's processes for higher process performance or objectives (Gartner IT Glossary, 2013)

1.7 Description of case company (Coca Cola Ghana)

Coca-Cola Bottling Company of Ghana Limited (TCCBCGL) has been operating in Ghana since 1956 as a franchise but got nationalized in 1962. The company was fully acquired by a Spanish company named Equatorial Coca-Cola Bottling Company in 1995, with its headquarters in Barcelona, Spain. Its operational head in Ghana is based in Accra, with two bottling plants Accra and Kumasi serving the entire country with their refreshing drinks daily. Coca-Cola Bottling Company of Ghana Limited (TCCBCGL) is a non-alcoholic drink producer in Ghana that manufactures five categories of drinks which are; Drinks (Drinks (Coca-Cola, Fanta, and Sprite), Water (BonAqua), Energy (Burn), Juice (Minute Maid), and Dark Malt (Schweppes Malt). The firm commands the greatest market share in the beverage industry in Ghana. The firm has nine main departments that manage its affairs to satisfy customers and bring returns to shareholders of the company; these are (Finance, Operations, Human Resources, Internal Control & IT, Supply Chain Management, Marketing, Commercial & Sales, Technical and Public Affairs and Communication). (AmoahTwum, 2012.)

1.8 The Coca Cola Supply Chain

Principles governing the Coca Cola Supply Chain

- The supply chain must all times serve customers with tailored services where ever they are in any part of the world.
- The firm applies the philosophy of customer driven supply chain management.
- High customer care through segmentation, the company has different product types within its localized production structure globally.
- High collaboration with suppliers to ensure best practices accepted are used in the buying processes.
- The company has a policy of having very few Stock Keeping Units in its operations.
- To enable offer the firm its localized customer service globally the firm has the world's largest lean six sigma operations to enable it leverage best practices and programs the increase performance as well as excellence.
- Centralized management system allowing for visibility in all facilities and fast rerun of forecasting and production plans.
- With centralized management, the company has visibility throughout all its facilities because of that, the entire forecast and production plan can be rerun in less time.

(Jiménez-Lutter, 2014)

1.9 Thesis structure

Chapter one of this thesis would describe these main elements, background and statement of problem at hand to be investigated; purpose and deliverables of the study, Research question and investigative questions, significance of the study, limitations, definition of key terms and description of case the case company and its supply chain. Chapter two concerns the literature review where elements of best practice, supply chain maturity process maturity, Business processes orientation and SCOR are well discussed to give a good understating and foundation for the concepts used in the research. Chapter three would involve the research methods used for the data gathering and analysis to answer the questions to be researched and investigated in chapter one. Chapterfour would show pictorial views of the ratings from the results obtained. Chapter five would discuss the main findings of the research, referrals would be made to the investigative questions and research questions posed in the beginning of the study and provide the answers based on the data analyzed. Figure 1 below shows structure of the thesis described above.

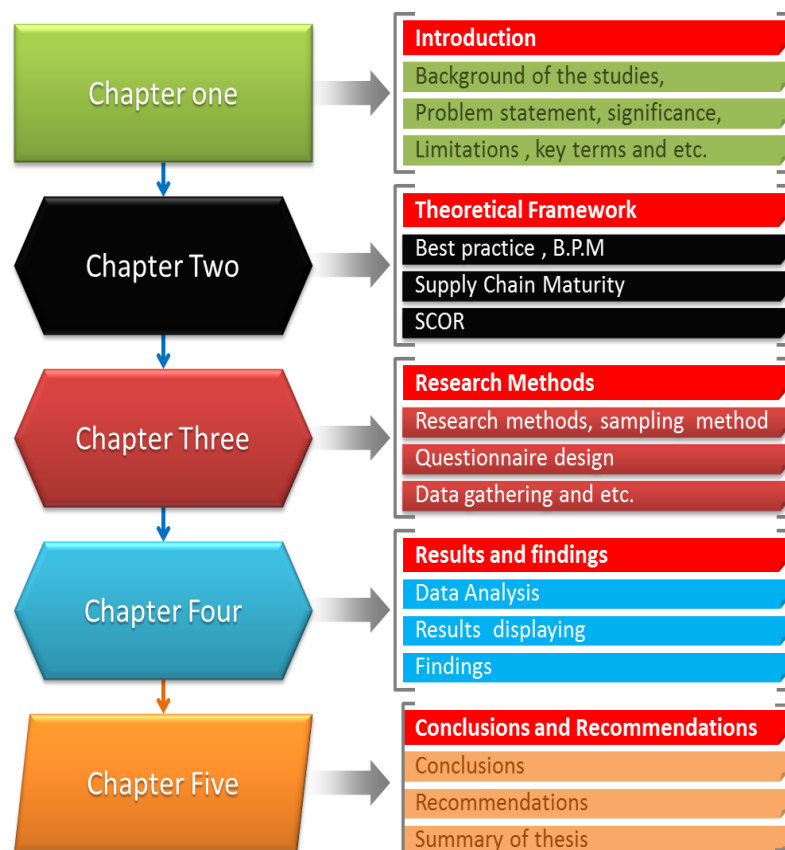


Figure1. Structure of the thesis

2 Conceptual framework

The conceptual framework of this study is to show the grounds on which this study would be done, the framework behind the basis of this thesis of the view that when the processes in the supply chain are well controlled and practiced through applying best practices in the industry would lead to a higher supply chain maturity thereby leading to a higher supply chain performance. The figure below gives a simple picture of the idea.

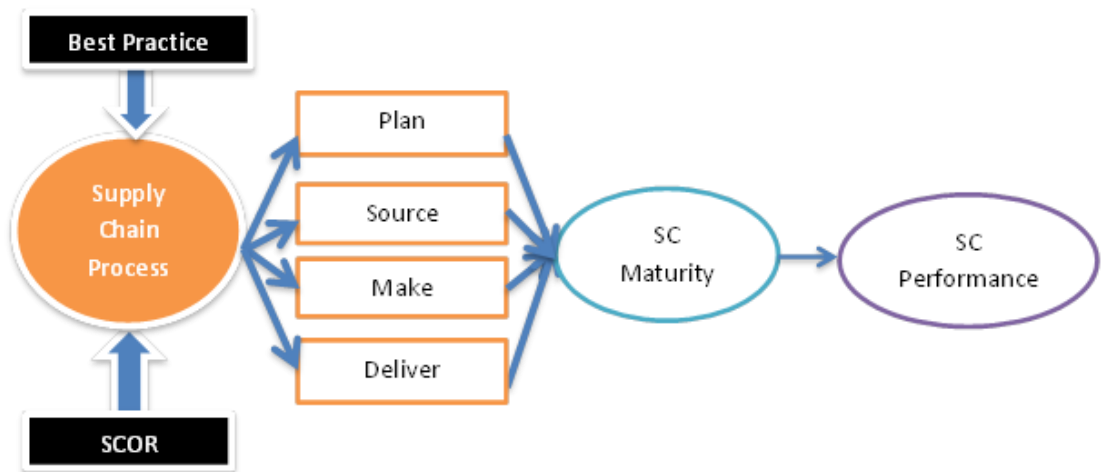


Figure2. Link between application of best practices and supply chain maturity

From the figure above controlling of all process in the supply chain by using best practices available in the industry would lead to a higher, would lead to a higher maturity level which would translate into higher supply chain performance and business profitability.

2.1 Best practices in supply chain process management

The use of best practices in an industry to improve performance has been area focused on by supply chain practitioners and researchers (Lockamy& McCormack 2004a, cited in Netland, Alfnes&Fauske 2007, 1). Blanchard (2012) also asserts that, the need for firms to follow and use best practices has heightened due to the fact that globalization and supply chains are getting shorter with more pressures always showing up. All management practices have standards and best practices that can lead to a superior performance. Due to the impact of supply chain management on business profitability and performance, activities and processes carried out in a supply chain have to be approached with the best management approaches.

Best practice is described by Gattorna and Walters (1996, 228) as using strategies in the most effective way with specific focus on a particular part of operations or process in an organization or industry. The Supply Chain Council defines best practice as a special way to organize a process. It also goes on to explain that this uniqueness can be related to a specific management practice in an organization or supply chain. Lawes (2006, 24) points out that the concept behind best practice is to generate a standard accepted by a group as the best approach for any specific circumstance. In simple terms best practice can be defined as the accepted way of carrying out processes and activities in an industry to produce high performance and the meeting of business aims. Lawes (2006, 24) also gave a sign that, the term best practice was made popular by Tom Peters in his books on business management. Netland, Alfnes&Fauske (2007) also points out that the idea of best practice has been an issue discussed in decades by both industry and academic players and those continuous efforts are being dedicated to defining and providing best practices for the achievement of superior performances.

Applying best practices can separate best performing supply chains from poorly performing ones. Indeed in our current ever growing competitive business environment, businesses find themselves in now; there is no other alternative to survive without applying best practices. Poirier, Swink and Quinn (2010) believes that best in class companies manage and control activities in their supply chains in a different way that places them in a superior advantage over less successful competitors. McCormack and Johnson (2002, 13) also points out that firms gain competitive advantage by performing strategic activities cheaper and better than competitors. Applying tried and tested best practices can make processes more efficient, effective and make firms capable of staying on top to meet the ever-growing demand for higher productivity, streamlining processes and eliminating bottlenecks. Poirier, Swink and Quinn (2010) have the belief that, best in class companies` embrace certain practices that distinguish them from other competitors making them run effectively and efficiently in areas of practices, processes and principles that guide their activities.

Though the concept of applying best practice can offer leverage in competition there has been some disparages in the understanding of the term and its application. Davies and Kochhar (2002) emphasizes that best practices do not will work in all organizations and that best practices are just based on contexts, it implies that though there can be a whole list of best practices that can be applied to manage processes not all of them would work, so firms must be creative in applying these best practices to deliver the expected business outputs. Kaczmarek (2013, 52) also argues that best practices fade in time, as time goes on best practices become a normal practice that holds the foundations on which all busi-

ness and processes stand, so they cannot be termed as best practice. Schrage (2003) also makes a claim that best practice should never be a goal but a way of getting it right on the way to the desired levels. It does imply that application of best practices would not automatically lead to higher performance if not well used within the contexts that fit that particular practice.

Despite the few criticisms of the application of best practices, they cannot be ignored because of their importance and effect on management practices, so supply chain process managers must use the best available supply chain management process to manage and control their business activities. Though there are different standards and process used in managing supply chains, SCOR practices seems to be the widely accepted standard hundreds of companies try to follow. For instance, Stadtler and Kilger (2010, 41) makes a claim that the SCOR model is the most widely accepted model used in the modelling of supply chains, with this in mind the SCOR process model would be used as the best practice model to assess maturity of the supply chain at the end. The SCOR concept would be well discussed later in this literature review.

2.2 SCOR best practice

SCOR (2012) describes best practice as a special way of configuring a process or set of processes. According to Georgise, Thoben and Seifert (2013, 14) the best practices in SCOR have been drawn from supplier chain practitioners in various industries. They also point out that the best practices have been compiled to give firm methods that execution of supply chain processes can be managed. The SCOR version 10.0 has 422 best practices, 98 green best practices and 11 best practices in Risk management.

The model categorizes practices in any organization into four groups which are:

- Leading or emerging practices
- Best practices
- Common practices
- Poor practices

Leading practices are those practices that present new technologies, knowledge and a different way of carrying out activities. These leading practices can reset the common grounds on which activities are carried out in supply chains. These leading activities are most at times not easy to adopt because of the special knowledge and skills required to control, but has a very high risk potential but high potential of getting good results.

Best practices are recent, designed and repeatable practices that have a track record of yielding high supply chain performance. The results obtained are moderate and risk attached to these of best practices is moderate.

Common practices are the ways most companies or industries use to manage their activities. Since it is how most firm's practices or carries out processes it does not offer any competitive advantage among companies. There is a low risk and results attached to this kind of practice.

Poor practices are ways of doing business that have proved to produce very bad results as showed by key performance indicators in the supply chain. The risk here is very high and results from this form of practice are very poor or negative.

2.3 Business process management

Hammer (1990) as cited in McCormack and Johnson (2002, 16) define the concept of BPO as a group of input actions that creates an output that is of worth to a customer. Business process orientation is an idea based on providing better business performance by strategically targeting processes that would deliver the value and satisfaction required by customers. It can also be described, as a way of strategically monitoring and controlling processes present and used in managing organizations. Richardson (2007) points out that, organizations processes are mechanisms that direct resources and activities towards the delivery of strategies in achieving, commercial aims, exciting existing customers and winning new ones. Processes are tools used by organizations to create and hold positions in the current competitive global market for instance, being fast in delivery can create the difference between a poor and better functioning entity that customers would like to align themselves with. Vanathi and Swamynathan(2013, 1921) asserts that process are viewed as assets and are very critical in every organization so firms must constantly check their business processes and find ways to enhance them . According to Kim and Suh (2010) the competitiveness of a business depends on how business processes are executed with dexterity and efficiency, business processes strategic are weapons that can be used to defeat competitors.

Lockamy III and McCormack (n.d.,4-5) points out that BPO links components like process measurement and management, process documentation, process jobs, process structure, process value and beliefs and IT support ; Where process measurements and management systems are practices that reward processes improvement initiatives, measurement

systems for processes and rewards for customer driven initiatives. Process documentation involves the documentation of the rules and steps used in managing supply chain both in visuals and written forms. Process jobs involves the delegation and ownership of processes in managing supply chains, roles like Global supply chain manager become very clear in the supply chain. Process structure deals with the systems putted in place in the management of the supply chain. Process values and beliefs are fundamental guiding principles that are used to invigorate an entity, examples are honesty and trust that other partners in the supply chain adopt ethical and quality management systems and etc. and IT support deals with clear need and use of IT in the process management of the supply chains.

In a research by McCormack & Johnson (2001) a conclusion was drawn that businesses that apply the concepts of BPO performed better, minimized fracas and a more enhanced corporate climate. According to Kumar, Miri-Lavassani, Movahedi& Kumar (2011) a process oriented entity is one that in its philosophy places an emphasis on processes instead of chains of command, and also accentuates process outcomes and customer satisfaction. Process oriented entities have people in all functioning units with good orientation of customer needs and alignment of strategies to satisfy those needs. Using the BPM orientation approach improves operational performance by focusing delivered results, carefully controlling and monitoring the processes used in an organization. It also provides a firm foundation for continuous process improvement and having a standard code of practices and processes in an organization for easy communication and effectiveness. Human errors in process management can thus be reduced and efficiency enhanced.

2.4 SCOR Model

SCOR has become the widely accepted standard most firms are using in the design and process management of their supply chains. SCOR stands for supply chain operation reference model and the current model is version 10.0. Kilger and Stadtler (2010, 41) describes SCOR as a model that can be used to describe, dissect and design supply chains. Lee, William and Katzorke (2010, 28) also describes SCOR as a process reference model that incorporates best known concepts of business processes re-engineering, benchmarking and business process measurement. Huan, Sheoran and Wang (2004) as cited in (Hudson, 2004)also describes SCOR as a management instrument that can be used to discuss, improve and communicate decisions of supply chains internally and with suppliers and customers of a company. Mehta (2012) indicates that the SCOR model was first developed in 1996 by members of the council all over the world.

The model has three major pillars which are, process modeling, performance measurements and best practice. The SCOR model was designed by the supply chain council with about one thousand members. Member chapters are in Asia, Australia, Latin America, China, Japan and South Africa. Membership to this organization is opened to firms that have interest in applying and improving the principles of supply chain management. (Boltorff& Rosenbaum 2011, 10.)

Though SCOR has been widely accepted, it is not free from criticisms, Yilmaz and Bititci (2006) pointed out a claim that the SCOR model has its entire focus on the supply chain but not essentially on the value chain. Moberg, Pienaar, Stank and Vitasek(2008) also argues that, the model does not include all aspects of business process or activities including areas such as sales, marketing, research, innovation, quality, administration etc. They also point out a fact that the SCOR model is more complex than other models and requires more training to understand and customize processes due to limitations of the model.

2.4.1 Levels of the SCOR model

The SCOR model has four levels but the last level is out of scope of the model, these levels are:

Level 1(Model): this is the preeminent level of the SCOR model which describes the scope, ambiance, segments and products. This level of the Model describes the basic functions in supply chains which are grouped under plan, source, make, deliver and return. Stadtler and Kilger (2010, 42) points out that, this level of the model describes both working and strategic activities in supply chains.

Level 2(Strategies) describes the main strategies in supply chains by decomposing the five process types in the first level into twenty-six process categories (Stadtler&Kilger 2010, 43). According to Camerinelli (2009, 120) this level of the model describes the primary strategies in the supply chain, these are:

- **Make-to-Stock:** Production for the warehouse.
- **Make-to-order:** Production for an incoming customer order.
- **Engineer-to-order:** Customer order specific engineering.

This level in the model allows for supply chain configuration.

Level 3 :(process, Metrics and best practices) describes the key processes within any given supply chain setting. At this level performance metrics and best practices are given emphasis as well as focus on other key transactions in a company. According to The Supply Chain Management Council, the level 3 describes capabilities of a firm to successfully compete in selected markets. This level drills into the various work flow situations and information flows within the organization. This level allows for conclusions to be drawn about process elements, available best practices and benchmarks.

(Level 4): defines specific management practices that can be used to meet competitive advantage and adaptation to changing business situations (IrfanXu, Deng & He 2008, 291). At this level, implementation of activities is the main focus but this level falls outside the scope of the Model since every implementation strategies are different in every organization, industry and etc.

The figure below summarizes the features of the levels in the SCOR model


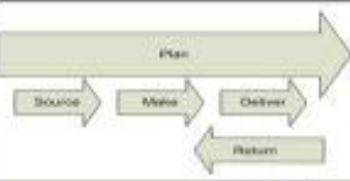



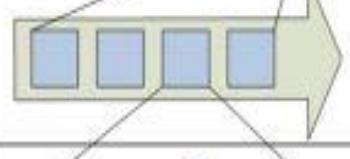

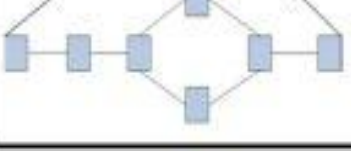
Level	Description	Diagram	Dimension	Application	Classes
1 	Process		Entire Supply Chain	Determination of the coverage	•Planning •Execution
2 	Process category		Entire Supply Chain	Configuration	•Planning •Execution •Infrastructure
3 	Process element		One diagram per process category	Process design	•Planning •Execution •Infrastructure
4 	Implementation		One diagram per process category	Detailed Process design	•Planning •Execution •Infrastructure

Figure3. Levels in SCOR (LotharSchulze,n.d)

2.4.2 Process types in SCOR level one

The Supply Chain Council (2010) describes a process as peculiar activity carried out to meet a specific outcome. These processes are very necessary to meet customer demands in supply chains. The process types in SCOR as said earlier are five as follows plan, source, make, deliver and return. These process types in this model would be described in the paragraphs below:

Plan: Plan refers to all activities that are involved in planning of operations of the supply chain. It encompasses all activities involved in executing the goal of meeting customer demands and achievement business aims. It includes activities like information gathering on available inventory and requirements, adjusting requirements with available inventory, defining targets and identification of activities that can deliver the desired targets and etc. It involves planning of the other components.

Source: Activities in the source process type involve activities in obtaining materials required for production, receiving of goods and services, storage of inventories and etc. It also includes management of the supplier networks and contracts in the chain, scheduling of deliveries, processing of payment for goods received and so on. This process also embodies processes issuing of purchasing orders to the stage of accepting invoice from customers.

Make: Make involves activities that add value to sourced inventories or creation of services for customer consumption. According to Stadtler and Kilger (2010, 42) make canvasses production scheduling processes, production, testing, packaging as well as product deliveries. It also includes the control of equipment's and work in progress inventories. The make term covers all value addition activities involved in transforming raw materials or unfinished products into ones desired by customers.

Deliver: The deliver scope encompasses activities that are involved in the supply chain after products and services have been produced to be delivered to the customer. It covers activities such as authentication and making of customer orders, delivery scheduling and on transferring to the customer in the in the delivery manner preferred by the customer.

Return: This scope covers activities involved in the pulling back of goods delivered back into the supply chain in a reverse form. It includes classification of goods that need to be returned; shipment plans as receiving procedure, but does not include processing of the returned goods.

2.4.3 Justification for using SCOR process criteria

Since there are several different models that are applied and used to meet specific goals, to create a strong base the results and analysis of this research, the SCOR process model would be used because of the following reasons:

The SCOR model was developed to give a better picture of applying best practice for management of processes and practices with the intent of increasing performance (Dumke, 2010). The model has well-developed supply chain processes that can be used in various firms and industries. The best practices prescribed are well laid down for good supply chain performance enhancement.

Lee and Katzorke(2010, 28) claims that the model helps to understand and communicate activities in management of supply chains and that many firms are adopting the SCOR model. Moberg et al. (2008) asserts that the model is process focused, and that it can be extended to other stakeholders in the supply chain. Irfan et al. (2008,298) also points out that the model gives firms the opportunity to benchmark with competitors and permits for admirable supply chain management systems and practices to be implemented in organizations.

The use of the SCOR model has benefited firms through its usage by showing problems in supply chains, creation of road maps for supply chain and alignment of business functions (Scott, 2004).Processes in supply chains can be compared to that of others and a quick diagnosis of processes that need face lifts can be identified and enhanced.

Scott (2004) also emphasis that the SCOR model prescribes business processes that can be used to meet and satisfy the needs of customers. Irfan et al. (2008, 292) also makes a point that the SCOR model can be used to configure ideal supply chain states using the processes prescribed. The overall goal of supply chains are to satisfy customer needs and increase business performance, with this in mind processes must be managed with models widely accepted and the SCOR model helps to meet this goal.

Vanathi and Swamynathan (2013, 1924) also point out that the SCOR model used in addition with maturity models provide a firm means for measurement of supply chain systems and processes. The SCOR model provides KPIs (key performance indicators) that can be used to measure performance of attributes in a supply chain for strategic planning.

2.5 Supply chain maturity model

Maturity level is defined by McCormack, Johnson and Walker (2003, 47) as a limit that if reached would firmly set up processes and activities that would enable a firm meet a defined set of process goals. Vanathi and Swamynathan(2013, 1922) also describe it as a model that indicates the predictability, ability, effectiveness and control of efficiency that are remarkable for achieving organizational goals. These definitions point out the fact that maturity has a focus on process to deliver expected outputs in an organization, linking it to supply chain; it can also be described as a level that indicates the ability level of a supply chain. The supply chain maturity model is a tool for sketching an organizations stature on the way to achieving excellence in supply chain excellence.

Lockamy III and McCormack (2004), points out that though the concept of maturity models has been around for some time there are few publications that link the concept to supply chain management, Frederico and Martins (2012,1) makes a case that the application of maturity models are not new in the field of management. De Oliveira, Ladeira and Mccormack (2011) also makes a claim that for some few years now researchers are increasingly dedicating their efforts towards investigating ways in which the right information can be provided to the right people to design competitive supply chains to transfer products and services to the market. Gunasekaran, Patel and Tirtiroglu (2001) also points out that for some few years now researchers are gradually focusing on the main areas of supply chain maturity in developing performance measures for tactical management of supply chain processes. These points out the importance of supply chain maturity as a fast developing concept that managers of supply chains would like to apply for supply chain excellence. These positions also gives an indication that practitioners of supply chain management are continuously finding ways to enhance the effectiveness of supply chain processes and activities by using supply chain maturity models. Indeed many distinguished consulting firms like IBM, Booz Allen and Gartner are applying this concept in analysing and finding the status of processes in supply chains of their customers and making recommendations for enhancement of their processes.

Heriberto and Giachetti (2010,415) asserts that many process improvements programs like six sigma, total quality management (Six Sigma: Is a management philosophy and initiative designed to produce processes, manufacturing, services that ensures a high rate of sustained reduction in defect rates and cycle times (Gitlow, 2004).Rouse (2005) also describes total quality management as a comprehensive and structured management approach that aims to enhance quality of products and services through continuous process improvement initiatives) are accessible to companies to enhance their activities but

none is able to have a direct focus on supply chain management. Activities and processes lead to performance of supply chain management and without the right activities and processes, supply chains will not yield their aims and targets.

Supply Chain Maturity Models is an idea that is increasingly being used to design and model better superior performance in supply chain operations. Vanathi and Swamynathan (2013, 1924) assert that maturity models are very important skeletons for organizational leadership. Maturity models guides organizations to test distinct areas and highlight areas that would not lead to better performance and develop strategies to enhance them. Ian (2005) also points out that if extended, it can be used to calibrate a firm's position for future planning and target setting.

Maturity models are not free from criticisms for instance, Hunter (2013) points out that maturity is not a product and not a value but an outcome of practices. Robert (2012) also points out that maturity assessments have the edge of being plain, it also has the potential of being too simple for use. The foundation on which the maturity model is built must be strong enough to make sure the results can be used for strategic future planning. Though maturity models and their outputs have had significant impacts on decision-making, the idea is not immune to criticisms.

2.5.1 Link between Supply chain maturity and performance

Tracey, Lim and Vonderembse (2005,187) emphasis that organizations that do not strive to meet and keep up higher levels of supply chain management competencies would definitely find themselves in a competitive disadvantage. Having a higher maturity than competitors can be a differentiator due to the fact that, processes and the bottlenecks that occur in managing supply chains affect operation of firms. The higher the maturity level translates to a better performance than competitors.

Vanathi and Swamynathan (2013, 1922) asserts that, when maturity models are adopted and used in firms standardization occurs through the placing of firmly laid policies and organizational structures, the model also gives an indication that predictability, ability, effectiveness and efficiency control of supply chains are important for firms.

Dubeil (2014,6) makes a claim that , when there is a high level of maturity in a supply chain, it is a missile that leads to efficiency by do more with less, responding fast and meeting customer demands. Vanathi and Swamynathan (2013, 1924) points out that hav-

ing a higher supply chain maturity will enhance capacity of managing supply chain pressures.

Application of diverse practices in managing supply chains leads to different levels of maturity (Frederico& Martins 2012). Söderberg and Bengtsson (2010) assert that a higher level of maturity in the managing business processes would result in advanced authority over operational results. It does imply that there is a direct link between practices applied to the management of supply chains, ability level of the supply chain and performance. The more reliable practices applied in managing the supply chain, the better the ability of the supply chain to meet needed outcomes.

In today's competitive global business environment companies are under pressure to deliver nothing less than what customers want (Burnson, 2013). Firms are under pressure to manage their activities efficiently and effectively to meet desired business results. Vanathi and Swamynathan (2013,1924) also asserts that the success of a firm depends on performance of a supply network and as such, developing a mature processes structure is vital for clear visibility of supply and demand coherence in the chain. Hofmann (2004) also points out that a maturity model also facilitates the applications of strategic decisions and solutions in managing supply chains.

2.5.2 Levels of supply chain maturity

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Level I(Reactive supply chain management):There is low attention on sources of supply chain risk, poor inventory planning causing poor customer service delivery, little coordination between supply and product design functions, poor coordination between members supply chain partners.

Level II (Internal supply chain integration with planned buffers): Risk management process is integrated, performance targets and information is aligned across internal departments in the organization, and changes in the demand pattern have a repercussion on product design and a bit of discerners on external developing factors.

Level III (Collaboration across extended supply network): There is high visibility due to comprehensive information sharing, external visibility is used to predict changes and variability, product design and inventory management are well integrated as well as monitoring of the resilience in the supply chain.

Level IV (Dynamic Supply Chain adaptation and flexibility): At this level, there is alignment of KPIs across the entire supply chain, constant monitoring and analysis of data; risk policy is a combination of market attributes and supplier profiles. There is an adjustability and acceptance of additional supply chain value creators and a satisfactory customer service.

McCormack, Johnson and Walker (2003, 49) also prescribes five levels of supply chain maturity.

Level one (Ad-hoc): Processes are disorganized and process measures are not used. This level also exhibits high cost with unpredictable performance levels. Low customer satisfaction and horizontal processes structures are not used only conventional supply chain practices are utilized. Set goals are usually not met, with lots of pressure on the supply chain causing disappointments. Another attribute associated with this level of maturity is high cost of operating and maintaining the supply chain.

Level two (Defined): Traditional processes in the supply chain are cataloged and construed. Jobs and system structures have process aspects but still show basic process qualities. Meetings are held between representatives of functions in the supply chain to deliberate issues on process activities. Achievements are a bit predictable, there is low-level of customer satisfaction as compared to other levels on the maturity scale and there

is high cost in managing the supply chain. Pressure and low customer satisfaction can also be seen at this level of the maturity level.

Level three (Linked): This is the stage of development; managers intentionally adopt the idea of process management as a strategic aim. Continuous process improvement is adopted to limit early occurrence of problems and lead to higher performance. Processes jobs are employed and systems are adopted that are different from traditional supply chains practices. Basic processes and rules used in supply chain management disappear and introduction of advanced practices begins to appear in the management practices. There is collaboration within the company structures and vendors, teams are formed to share accepted process measures and goals. Objectives are often met and performance becomes more predictable. Cost reduction in the supply chain shows up and customer satisfaction sees an improvement.

Level four (Integrated): There is process collaboration among stakeholders in the supply chain. The application of some well-known best practices start to show up the system and processes are based on supply chain processes and are documented. Performance measurement systems are well used and regular meetings are held with teams to improve measured targets. Costs reduction and customer satisfaction are achieved at this level.

Level five (Extended): Competition is based on multi-enterprise networks, trusts and collective dependencies are the binding qualities that hold the extended network as a unit. Collaboration in the supply chain is firmly adhered to, customer focused policies are also well adhered to and well-practiced. Best and advanced practices are well used in the management of the activities in the supply chain; stakeholders take shared ownership of the supply chain and apply advanced practices to the management practices. Process performance and tenability measurement systems are adopted and targets are often achieved in certainty. Costs and benefits attributed to the supply chain are shared; customer satisfaction is always on a high pedestal.

A pictorial image of the levels in the supply maturity is shown the next figure

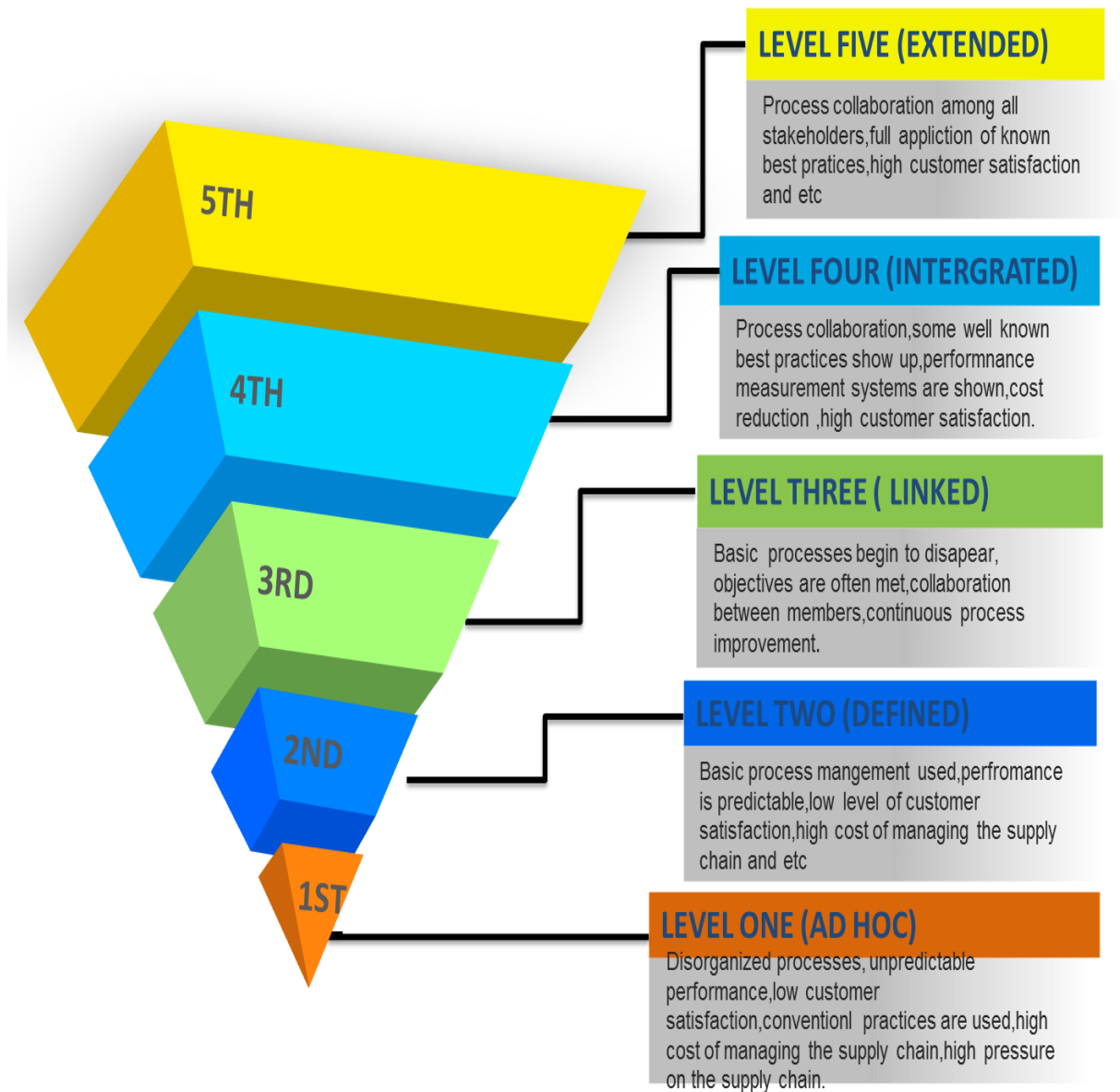


Figure4 Levels in supply chain maturity

Table1. Maturity models designed by different authors

	Nedland et al (2007)	MIT forum (2013)	Kevin McCormack, Marcelo BronzoLadeira and Marcos Paulo Valadares de Oliveira (2011)
Levels	Five levels	Four levels	Five levels
Focus areas	50 best practices focused on, Strategy, control, processes, resources, materials Information and organization.	Enablers of supply chain maturity and risk management, the focus areas are: flexibility and redundancy, alignment between stakeholders, supply chain integration, alignment of internal and external business functions, complexity in management and data usage.	Focus areas are on the SCOR areas, Plan, Source, Make and Deliver.
Similarities	Five levels just as Kevin McCormack, Marcelo BronzoLadeira& Marcos Paulo Valadares de Oliveira Easy to apply and make assessment. Have elements of SCOR and best practice.	Easy to apply and make assessment.	Five levels just as Nedland et al. Easy to apply and make assessment. Has elements of SCOR, Have best practice elements.
Differences	Takes Operations management into account. Seven object classifications	Grounded on Risk management, has seven object classifications	Grounded on business process management. Has fourteen objective groups

2.5.3 Maturity assessment and its importance

Supply chain maturity assessment is a process of identifying gaps in current supply chain process in comparison to recognized best practices and identification of opportunities for enhancement in efficiency and effectiveness. Assessment of supply chains can be done in different aspects, like general performance measurement, integration and application of other specific management practices. Maturity assessment with respect to supply chain process management can enhance the process by identifying which processes are not being carried out in the best way. Kugel (2012) asserts that using maturity scales provides a simple way of knowing the status quo of current management practices and provides a means of knowing what practices are not been carried out as required. This model would enable supply chain stay excellent if constantly applied and assessed for identification of gaps.

Netland, Alfnes and Fauske (2007) also points out that assessment of supply chain maturity is vital for advancement of consistent operational strategies aligned to overall business strategies which covers stakeholders in the supply chain. Achieving lasting gains in performance comes as a result of approaches used in the management of activities, assessing the competency level of the management practices can offer a platform for sustainable progress in management for better performance.

2.6 Summary of theoretical framework

From the review of literature best practices have been found to be of high importance in executing business processes to gain higher performance and maturity levels. Processes are weapons that can be unleashed to gain better advantages when in competition. Without applying processes that can increase productivity and performances firms are bound to fail. SCOR has a good framework that can be used for engineering processes for better outputs.

3 Research Methodology

Yu and Khushalani (2013) claims that in measuring supply chain excellence the supply chain of most organizations are at different levels of sophistication and advancement. All supply chains are not at advanced levels, some are ahead while others are lagging. Hus-sain (2012) points out that a firm must know the maturity of its supply chain to be able to set targets and fish out areas needing improvements. The only way to know the levels of advancement can be known is by measuring it and maturity assessments can help achieving that goal.

According to Kothari (2004, 8) research methodology is a systematic way of solving a re-search problem. Krishnaswami and Satyaprasad (2010, 40) also point out that a research design is a rational and standardized plan for moderating a research work. From these explanations, it thus means that a research methodology is a deliberate plan used to manage and organize a research project. It is the blueprint used to direct and control ac-tivities is a research work to get data, measure it and make analysis to fulfil a particular research problem or research work.

This chapter of the thesis presents the design of the research, data collection plan, analy-sis and ways that would be used to tackle the research and investigative questions of this research work.

3.1 Research methods

Jha (2008, 54) and Kothari (2004, 5) points out that researches can be identified by quan-titative or qualitative based on the questions being investigated or researched and data to be collected. Since this is about rating the levels in the supply chain maturity, a quantita-tive research method approach would be used. Quantitative data collected through the questionnaires would be used to assign levels of maturity the supply chain. Jha (2008, 54) also points out that if quantification of data cannot be done, then the research is a qualita-tive one. Thus the main difference between quantitative and qualitative research lies in the data collection and analysis procedure used in the research.

The main aim of this research work is to check process in the supply chain, for this reason a descriptive research methods would be applied. Sachdeva (2009, 22) points out the goal of descriptive research is to describe things, data and characteristics about a popula-tion or activity being investigated. Descriptive research also involves the usage of fre-quencies, averages and other forms of statistical analysis and manipulations. Since the

facts to be extracted can be quantified and statistical manipulations can be applied to it we term it as descriptive.

3.2 Tools

Bell (2010, 122) defines a research instrument as a tool used to collate data. According to Boulton (2012) it is important to use a good tool to run a survey to help in collection of data and analysis. Kelly, Clark, Brown and Sitzia (2003) also points out that, the areas of interest in any research work should be well demarcated and related to research question under investigation. As the tool used to gather the data would be an important factor that can affect the reliability and validity of the results generated, the tool generated would be given serious attention in the development stage to make sure it satisfies the intended goals of the study.

In order to design a good tool that can be able to extract the needed information for analysis, the latest version of the SCOR (2012) was comprehensively looked at with focus on best practices that fit the areas of interest of the thesis. Since the target is to measure how activities are being carried out, the defined best practices in the SCOR (2012) model would be the criteria used in the assessment. The questionnaire would tackle some selected processes used in managing activities in the supply chain from the planning to final delivery to the customer. The maturity test tool (see Appendix A) consists of 32 Likert-scale questions.

Processes of interest in this study

After a careful study of the best practices in the SCOR model the processes that fall within the areas of interests were selected for testing. Each of these areas has two best practices from the SCOR model measured in the test tool. These processes would be described below

Plan

Lean planning is the planning of practices with the intent of reducing inefficiencies and wastage during the in the execution of activities. In this study awareness of employees and teams of the roles expected of them to play would be assessed. How ready the supply chain is to for unforeseen occurrences would also be measured.

Demand Planning and forecasting concerns how demand and forecasting issues are managed. Matching of demand and resources available for easy and faultless execution of

customer requirements would also be assessed. Usage of (CPRF) would also be assessed. Collaborative Planning, Forecasting and Replenishment is a concept for enhancing supply chain integration by supporting and assisting joint practices.

Supply and inventory planning is the planning of inbound supplies and inventories for better execution of supply chain goals.

Master Data Management

This concerns how information flows are managed and used in the supply chain for better planning.

Source

Strategic sourcing and supplier relationship management: This area concerns gaining value from sourcing strategies, VMI and collaboration in the sourcing activities. VMI is a concept for planning and controlling inventory, where the supplier has access to the customer's inventory data and is in control and maintaining the inventory level required by the customer. Joint service agreements are agreement between partners on terms for a transaction to be executed.

Green sourcing

These are activities aimed activities that use activities that have less negative impact on the environment.

Lean Sourcing

This concerns how the firm manages its activities to cut wastage in the sourcing.

E-sourcing

These are practices that use internet in sourcing activities.

Make

Information management

Practices used to ensure availability of information during the manufacturing stages of products for efficient execution. Availability of information to employees and systems to guarantee accurate information would be assessed.

Lean Manufacturing

Practices used to cut wastage in the manufacturing activities of the supply chain.

Quality management

Practices used in to ensure quality is guaranteed. Usage of quality management techniques and awareness of employees on quality issues would be assessed.

Environmental management

Practices used to manage environmental issues and ensure minimal impact of manufacturing activities in the environment. HAZMAT pharmacy system would be assessed.

HAZMAT pharmacy is a system based on ensuring that poisonous substances used in manufacturing activities do not end up polluting the environment and causing damages.

Deliver

Information management

Practices used to ensure visibility, availability for decision-making and how customers have access to information about their orders. Information management system and availability of information help desk for customer enquiries.

Inventory management

Practices for managing inventories to ensure no stock outs and better information on inventory levels in the supply chain are achieved. Calculation of safety stocks and availability to monitor inventories would be assessed.

Environmental management

Practices aimed at ensuring that delivery activities inflict fewer damages on the environment. Ability to use carriers with environmental management systems and management of spill control for finished goods in warehousing.

Warehousing and transportation

Activities aimed at ensuring high efficiency and effectiveness in transportation activities as well as order processing. Cross docking and order consolidation would be assessed.

Cross docking is a distribution practice used to increase inventory velocities while maintaining efficiency in shipping.

3.2.1 Maturity levels of this test

This test has five levels of maturity that would show the level of development of the supply chain these levels are described below from lowest to highest.

Level 1

Practices used are basic management process, no current best practices are used, and processes are carried out with a short term view. Poor customer satisfaction would be achieved at this level and most business targets would be missed. Nothing in the supply chain is predictable and there is a high cost of managing the supply chain.

Level 2

Functions are still carried out at the basic level; customers would be dissatisfied a few business targets would not be met. High cost of managing the supply chain, the Focus is to match demand and supply. Information is not well communicated among execution teams.

Level 3

Some best begin to show up and some basic practices begin to disappear. Customer satisfaction would be higher at this stage though not, better performance is achieved and can be predictable; information is made available to all functional teams. Continuous process improvement initiatives are given consideration. Cost of managing the supply chain is moderate.

Level four

Best practices implemented in most activities, all functional teams have the needed information that would allow them execute their duties. Higher customer satisfaction is attained. Business performances is high, most targets are met and are predictable. Continuous process improvement becomes fully accepted. All stakeholders are given attention during the making of decisions. Low cost of managing the supply chain.

Level five

Best practices are fully implemented in all activities. All business targets are met and performance levels are at the highest levels. Cost of managing the supply chain is low. Customers and suppliers become an important part of the supply chain. Costs are reduced drastically. Information sharing and management is given a serious attention.

3.2.2 How the tool was developed

The tool was developed after a careful study of the SCOR best practice list, it would have been good and more comprehensive to test all the SCOR best practices listed which is over 400 in number, but would have been a big challenge for the respondents to get the time to answer them and a challenge for the analysis as well. The areas of interest were chosen in agreement with the key person of contact for this thesis and the practices that fit were grouped under those headings.

The best practices were selected from all the different levels of the SCOR model, because every best appeared in another level of the model. The questions were developed by looking at the headings below and finding two best practices that can be used to manage such activities.

3.3 Sampling frame

Due to the reason that the needed feedback must be obtained from people who have complete knowledge and understanding of the supply chain management process in the firm, purposive sampling was found to be the right sampling method to satisfy the demand by targeting the right people in organization. Krishnaswami and Satyaprasad (2010, 77) describes purposive sampling as a method of a sampling within a group based on a particular need. Purposive sampling zeros in on the target group and extracts whatever information is needed. Since this research aims to assess supply chain maturity, the sample to be used would be supply chain management practitioners in the case company; five of the employees would be given the questionnaires for the data extraction. This criterion was used due to the reason that supply chain management members in the organization have the best understanding and control of the supply chain process.

Background of respondents

The respondents sampled are, members one member of the Inventory Control team, a member of the Production department, two Purchasing Management team members and a Logistics Services Salesperson. These were the people who had the time to take part in the study. All of them have good command over English language and have been working with the firm for over 4 years.

3.4 Validity and Reliability

According to Abbott and McKinney (2013, 223) every research design has its special issues with regards to reliability and validity. Validity and reliability affects all forms of studies adequate measures would be placed to ensure they are guaranteed in this study.

Validity

Greene, Baldwin, Dolor, Thompson and Neale (2011) describe validity as the extent to which data measures the intended purpose. Measuring what was originally planned and interpreting them to give correct answers to the mystery to be solved is what validity is concerned about. Conclusions drawn for studies can only be termed as valid based on the truthfulness of the generated results. To ignore validity in any research is to provide doubts on integrity of the study. Quinton and Smallbone (2006, 127) gave two generalized forms of validity in researches which are internal and external validity. These two forms would be described for clarifications and relevance to this study.

Internal validity: Shuttleworth (2009) describes internal validity as the type of validity that ensures a link between a researcher's experimental design and the principle of cause and effect. Internal validity concerns the extent to which the research study is good for the research questions or the hypothesis to be tested but

Sachdeva (2009,76) emphasis a fact that since it concerns only studies about cause and effect it is only relevant to studies that try to prove causal relationships. Since this study does not want to prove any form of relationship it would be right, it has no bearing on this research.

External validity: Quinton and Smallbone (2006, 127) describes external validity as the extent to which the results of a study can be applied to other contexts or situations. Not ensuring external validity in the research can pose a threat to the integrity of the findings.

To maximize external validity in this research purposeful sampling as described in the sampling method stage would be used. This would indeed ensure that the results and conclusions derived would be valid from the right sources. No other groups that are not related to the supply chain management team would be used in the study and data collection stages.

Reliability

Reliability is the level at which an assessment tool can produce the same result consistently (Mora, 2011). Different reasons can make the study and results generated from it unreliable. Errors associated with the study, to get the right answers during the data collection procedure, the tool to be used would be made in a simple way for easy understanding and answering. Respondents would also be given advice not to guess when providing the answers.

3.5 Ethical considerations

As the researcher of this study I hold a moral responsibility to present data and findings as correct as would be found due to the fact that it can influence decision-making in the firm. Results and conclusions derived would be presented in the most honest and objective manner. Any conclusion derived from this research would be backed by well-grounded facts.

A credible relationship would be established between all participants involved in this research. Confidentiality and anonymity of sensitive data of the firm used would be well protected to prevent any form of damage to the credibility of the firm and keep the image of the image intact through this study.

Participants of this research would not be exposed to any form of mental stress. Coercion would never be used at any stage of this project and deceptive strategies would also not be used at any stage in the conduct of this project.

All facts not generated by the researcher would be well referenced for further checking and avoidance of plagiarism.

3.6 Data Collection plan

To extract the needed data for easy analysis, an on-line questionnaire would be designed and the supply chain management team of the organization would then be given a time frame to respond to it for analysis. Five of these employees in the mid-level management that execute day to day activities would be used for this purpose. This data collection plan can cut the complexity and challenges that might arise due to the distance between the researcher, the respondents that are far away in Kumasi and Accra. The language to be used in this questionnaire is English because it is the official language of Ghana.

3.7 Response rates

Five respondents participated in this research and they all responded to the questions fully and no question was unattended to.

Data Collection process

The data obtained for this study were collected using self-administered online questionnaire using Google forms. The survey was administered between May 1st 2015 and May 10th 2015. Participants were expected to use at most 20 minutes to complete the questionnaire. Participants were notified of the survey dates via e-mail with a link to the questionnaire. The survey responses were then collected and manipulated with Microsoft Excel.

4 Results

This chapter focuses on analyzing data the extracted from the respondents. A brief description of the assumptions used to calculate the maturity levels.

4.1 Data Analysis technique

To analyze the data for a more meaningful presentation of the data obtained, this idea was used. First all the responses were given values which are as follows

- Does not exist score 1 point
- Sometimes or to some extent 2 points
- Frequently or partly exits 3 points
- Mostly or often 4 points
- Always or definitely exist scores 5 points

The responses are multiplied by the corresponding point of that responses and a total figure established after that the total is divided by the number of responses.

So for instance out of the 5 people the responses and calculations go this way

Does not exist or no	0
Sometimes or to some extent	1
Frequently or partly exit	0
Mostly or often	3
<u>Always or definitely exist</u>	<u>1</u>
Total Responses =	5

From the sample above

0 response for does not exist or no	(0x1) =0
1 response for Sometimes or to some extent	(1x2) =2
0 responses for frequently or partly exist	(0x3) =0
3 responses for Mostly or often	(3x4) =12
<u>1 response for Always or definitely exist</u>	<u>(1x5) = 5</u>
Total	=19

Since the total number of responses is 5 we divided the total by 5= $19/5=3.8$ rounded up to a **four (4)**.

To get the overall maturity level the average of all the 32 scores would be calculated for the rating. All figures would be rounded up to the nearest whole number.

4.2 Maturity test Results

4.2.1 Plan

The Plan focuses on activities used in the planning of supply chains

Lean planning

1. Do all functions and their undertakers understand the importance of their roles in the supply chain?

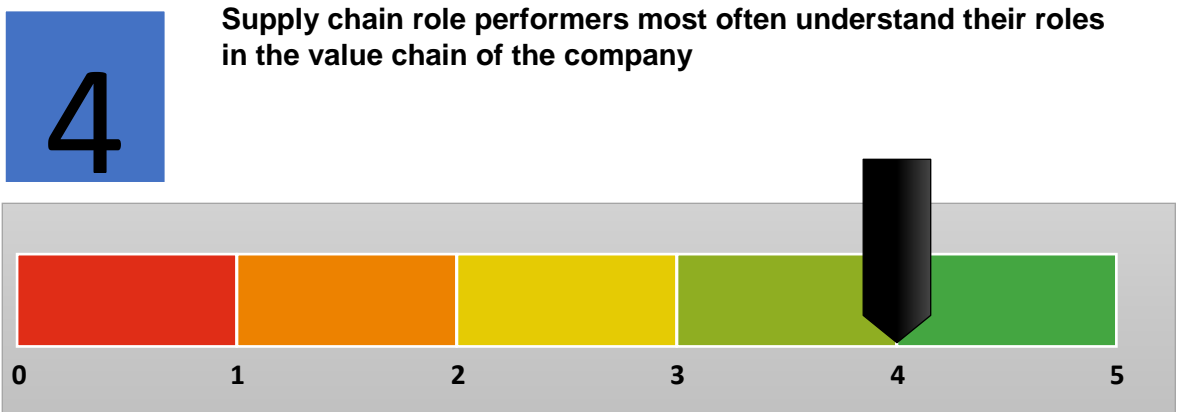


Figure5. Maturity level of understanding of roles to be played

2. Is “Simulated” Full-Stream Supply/Demand Balancing done for “What-If” Scenarios in your planning stages?

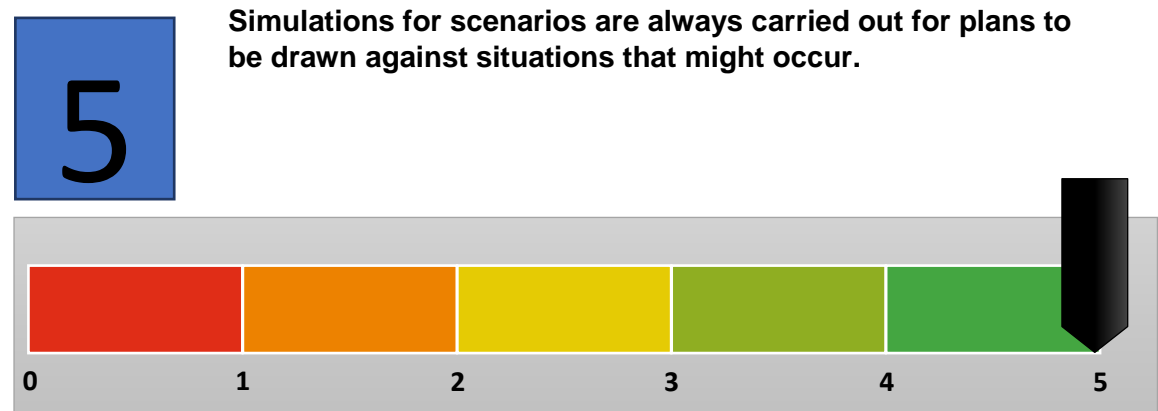


Figure6. Maturity level of Simulation exercises

Over all the maturity for the lean plan is a 5.

Demand Planning and Forecasting

3. Are capacity and supply constraints balanced against demand during the planning cycle?

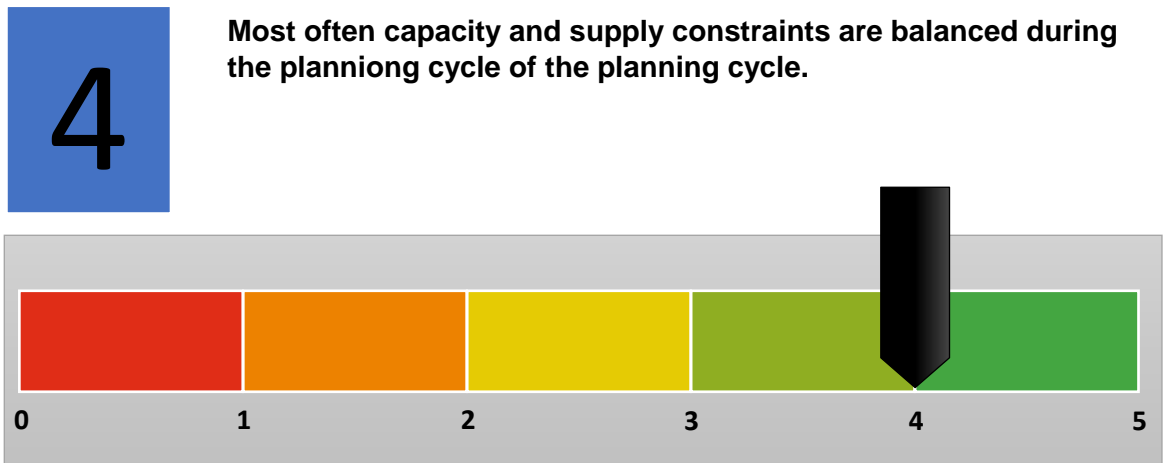


Figure7. Maturity level of balancing supply constraints and demand during planning stages

4. Do you use the idea of Collaborative Planning Forecasting, Replenishment (CPFR)?

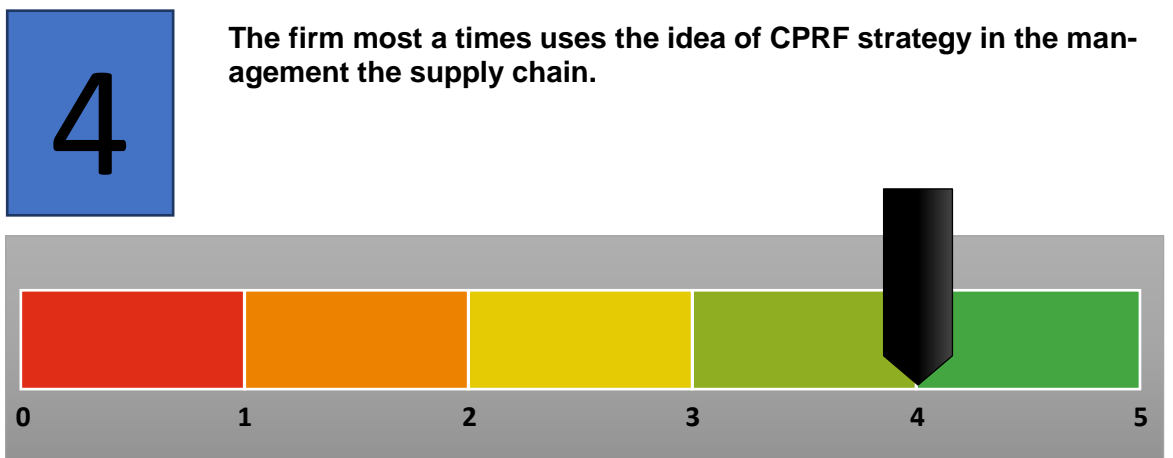


Figure8. Maturity level of the use of CPRF

The overall score for the demand planning is a **4**.

Supply Planning and Inventory Planning

5. Is there a system in place that allows for readjustment of supply and demand plans on daily basis with information from the “Customers’ Customer and Suppliers’ Supplier”?

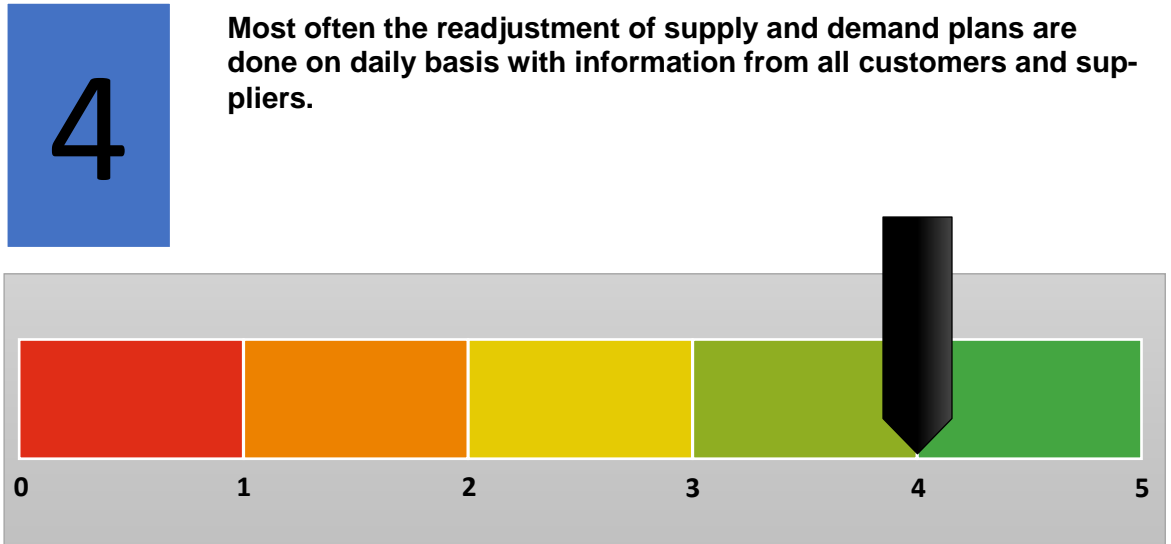


Figure9. Maturity level for the adjustment of demand and supply plans on daily bases

6. Is the demand plan frequently updated to reflect actual consumption?

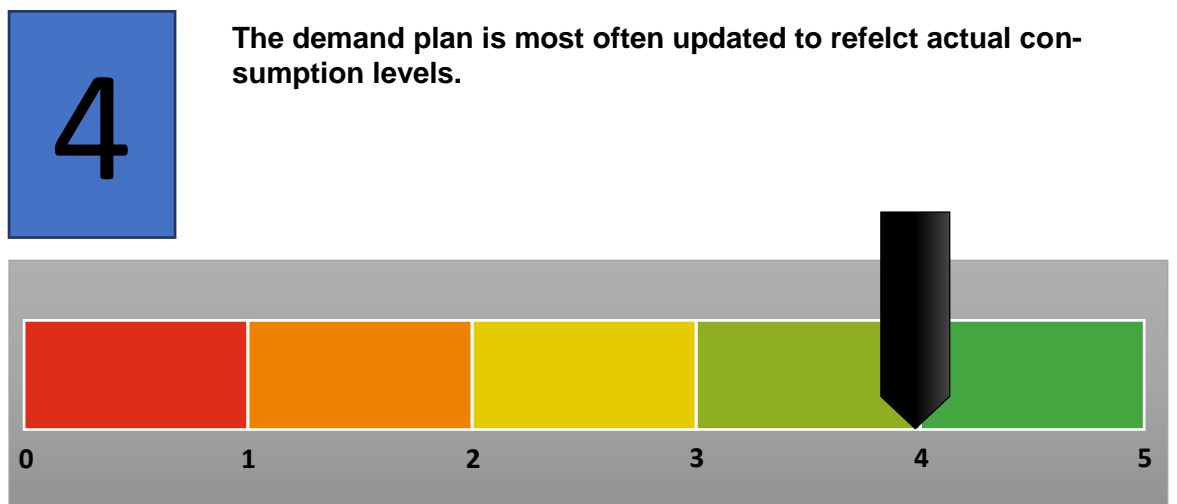


Figure10. Maturity level of how the demand plan is updated to reflect actual consumption levels

Overall score for the supply and inventory planning is 4

7. Do you apply principles of Business Intelligence (BI) to support your decision making?

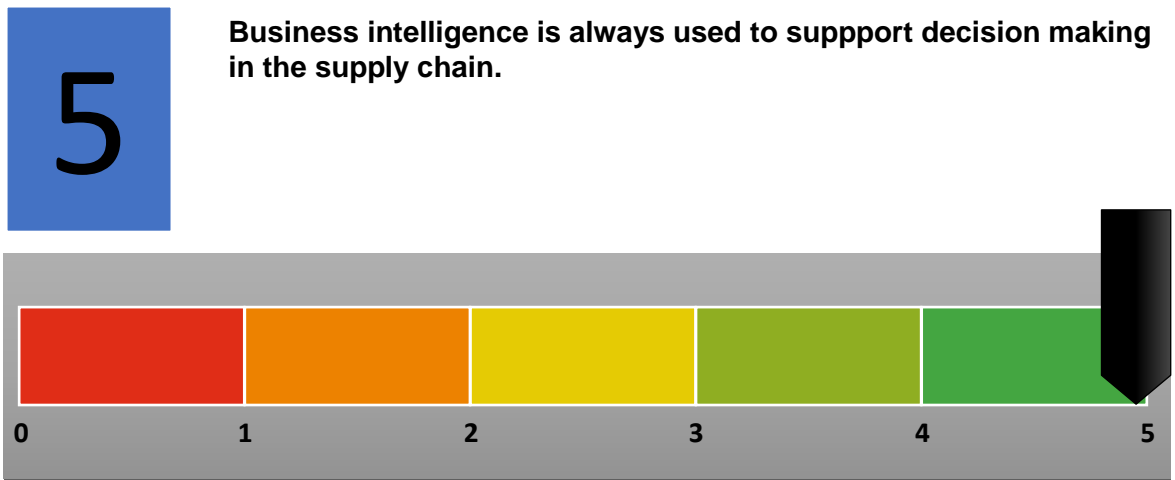


Figure11. Maturity level of how business intelligence used to support decision making

8. Are there Digital Links (XML Based, EDI, Etc.) among Supply Chain Members?

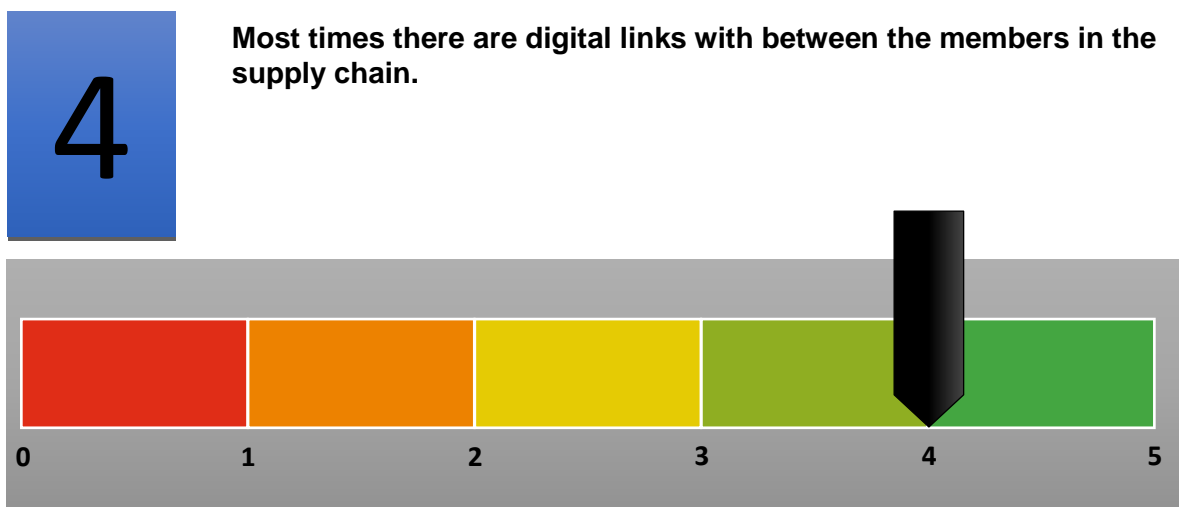


Figure12. Maturity level of the existence of digital links between members in the supply chain

The overall maturity level of master data management is **5**

4.2.2 Source

These are activities involved in getting the products and services needed to run operations and deliver to customers.

Strategic sourcing and supplier relationship management

9. Is VMI used to allow suppliers manage and replenish inventory?

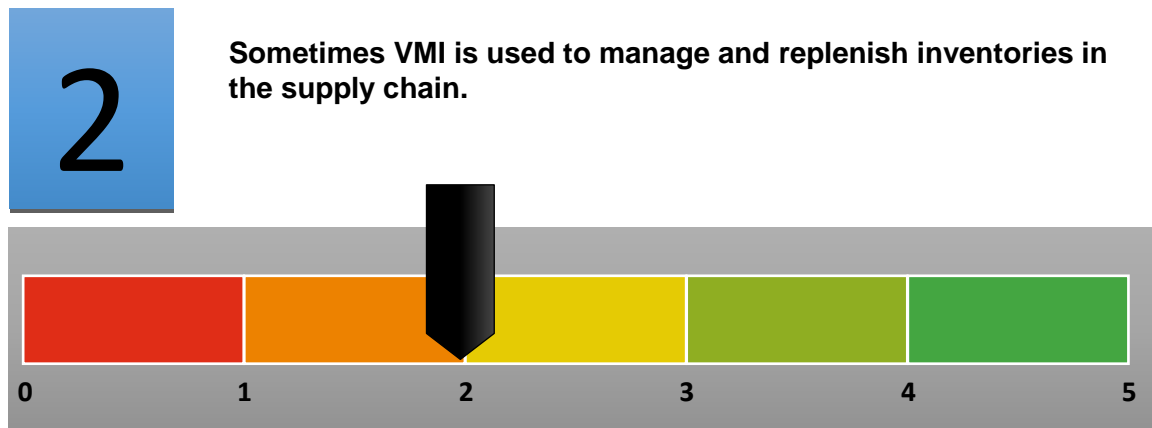


Figure13. Maturity level of the use of VMI

10. Do you have Joint Service Agreements with your suppliers?

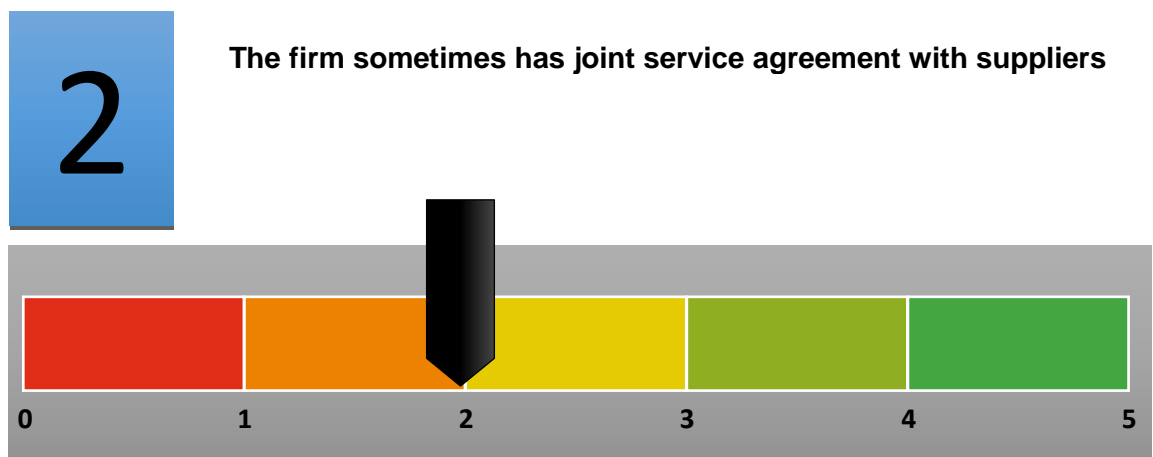


Figure14. Maturity level on the level of Joint service Agreements with suppliers

The over all maturity level is 2

Green sourcing

11. Do you have measures in place to monitor product compliance, quality and environmental requirements of your suppliers?

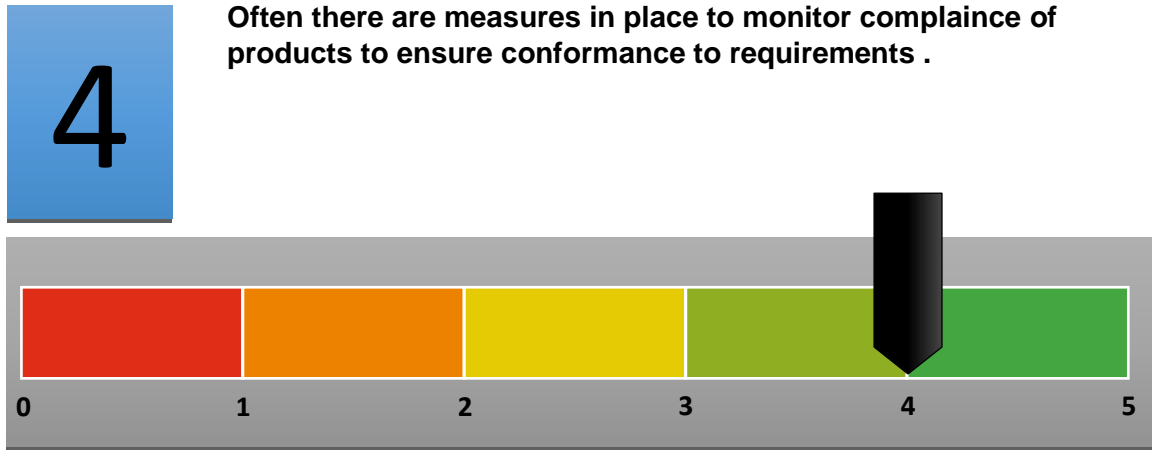


Figure15. Maturity level showing measures in place to monitor compliance to requirements.

12. Do you utilize green purchasing practices?

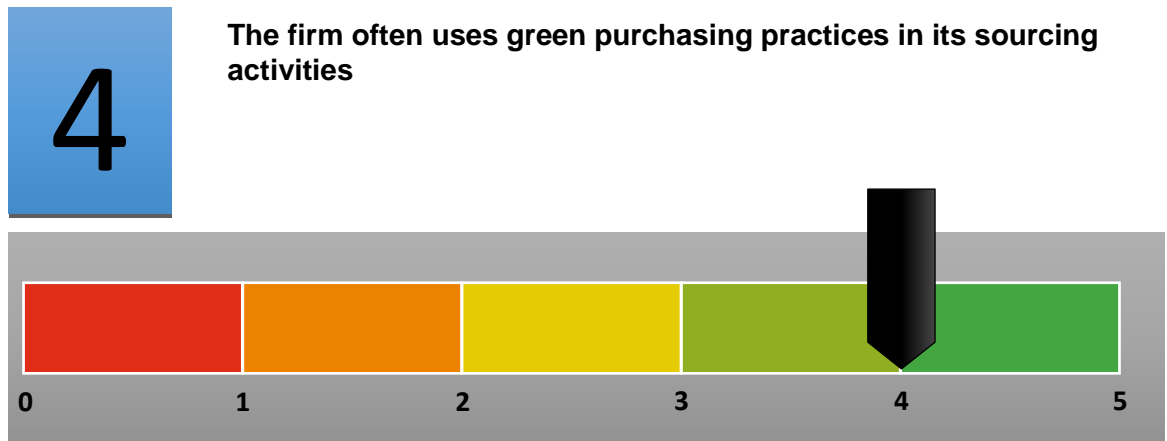


Figure16. Maturity level of how green purchasing practices are used

The overall maturity level of this is 4

Lean Sourcing

13. Are Supplier Certification Programs used to eliminate receiving inspection?

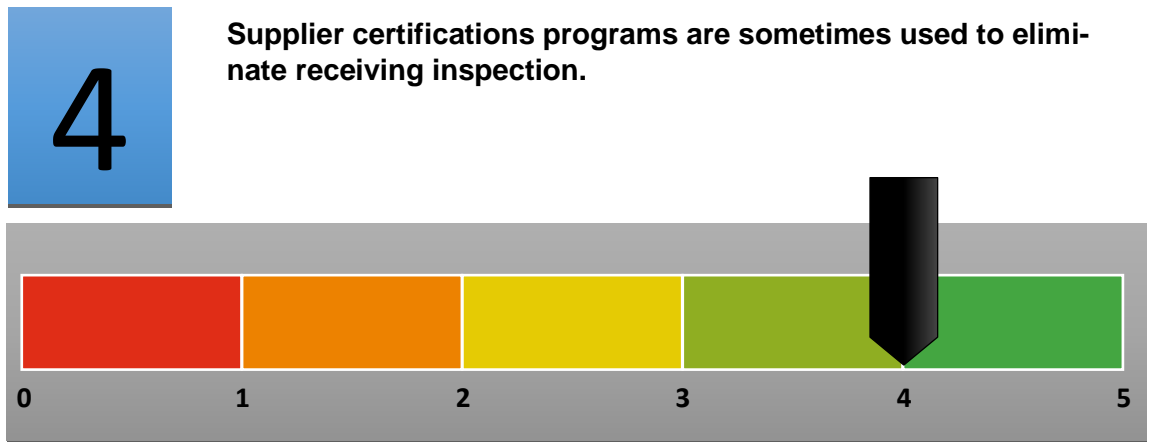


Figure17. Maturity level of the use of supplier certification programs

14. Is Bar Coding Used to reduce handling time and maximize data accuracy?

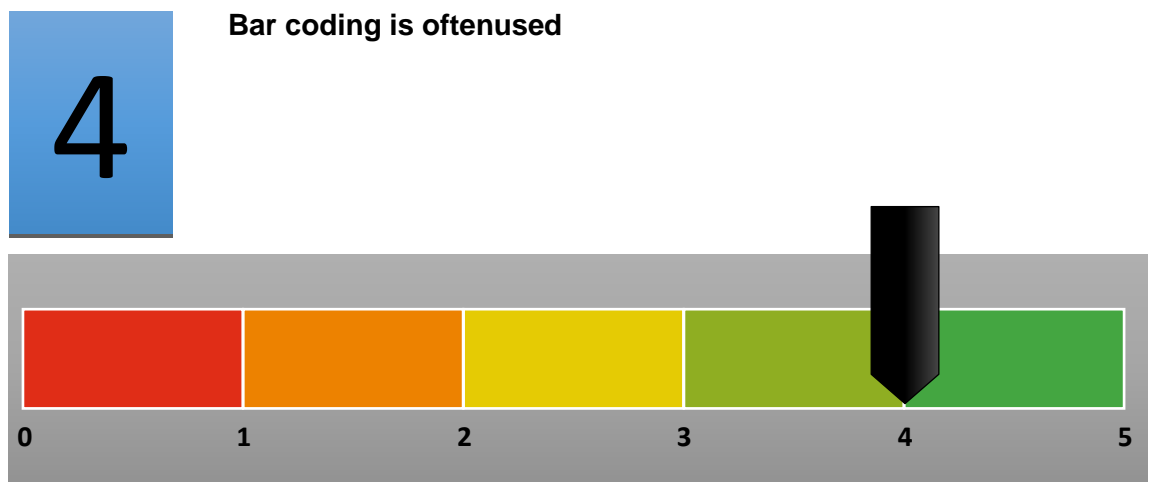


Figure18. Maturity level of the use of Bar coding

The overall maturity for the lean is a **4**

E-sourcing

15. Is electronic data interchange used to send technical information and requests for quotations to and from potential suppliers to assess their capabilities?

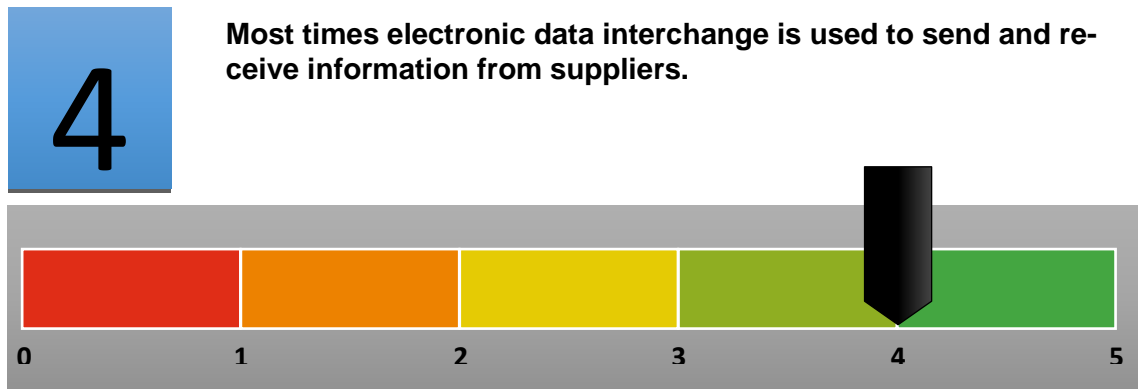


Figure19. Maturity level of the use of EDI

16. Do you have Electronic Kanban support that notifies Suppliers of the Need to Deliver Products?

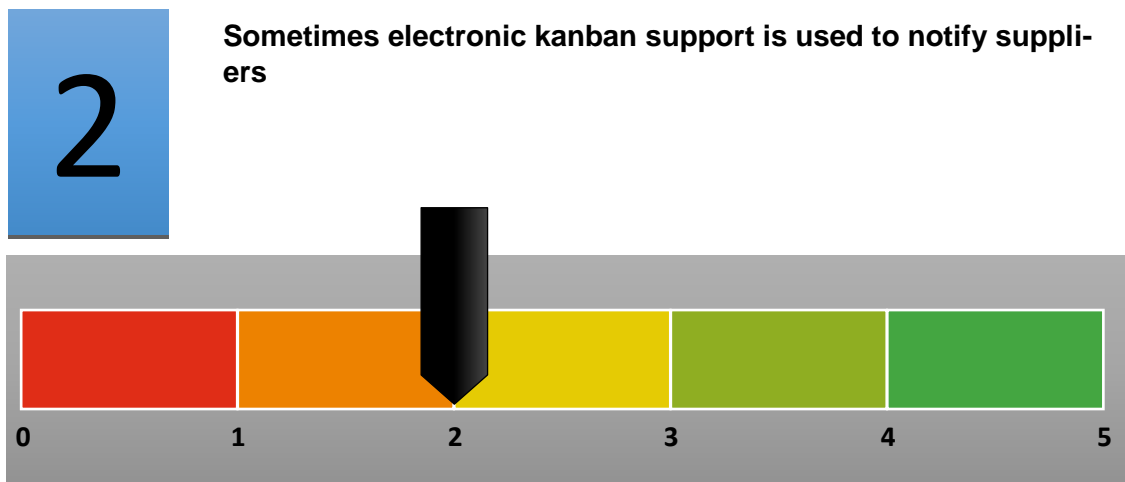


Figure20. Maturity level of the use of electronic Kanban support

The over all maturity is 3.

4.2.3 Make

Information management

17. Are performance results posted and made available to employees?

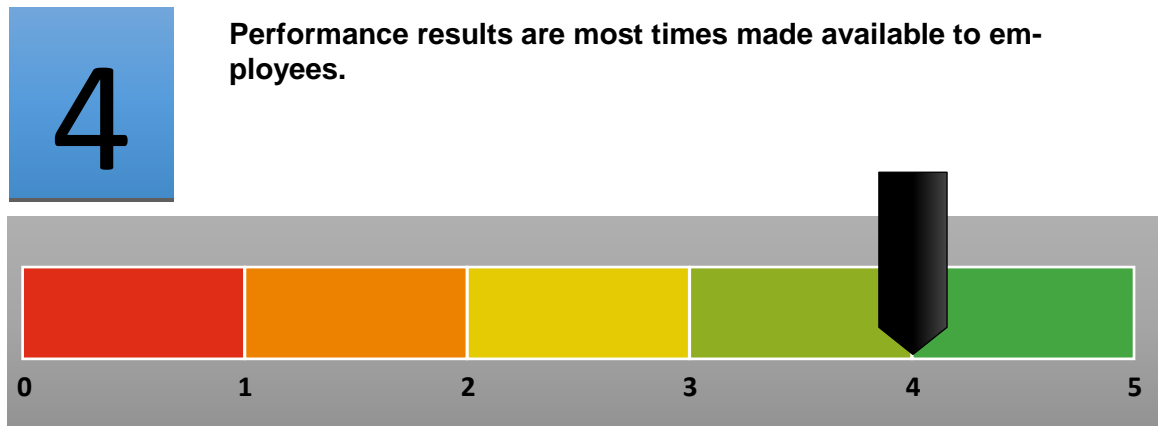


Figure21. Maturity level of Availability of performance results to employees

18. Do you have a system that ensures that production data, inventory levels and scheduling requirements are accurate?

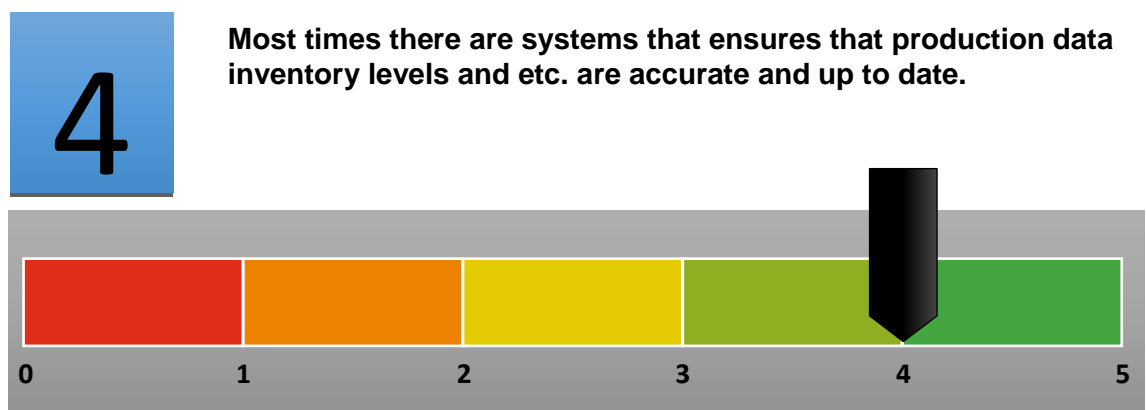


Figure22. Maturity level of systems available that ensures that production, inventory data and etc. are accurate

The over all maturity level of 4

Lean manufacturing

19. Is lean manufacturing practices used in your manufacturing activities?

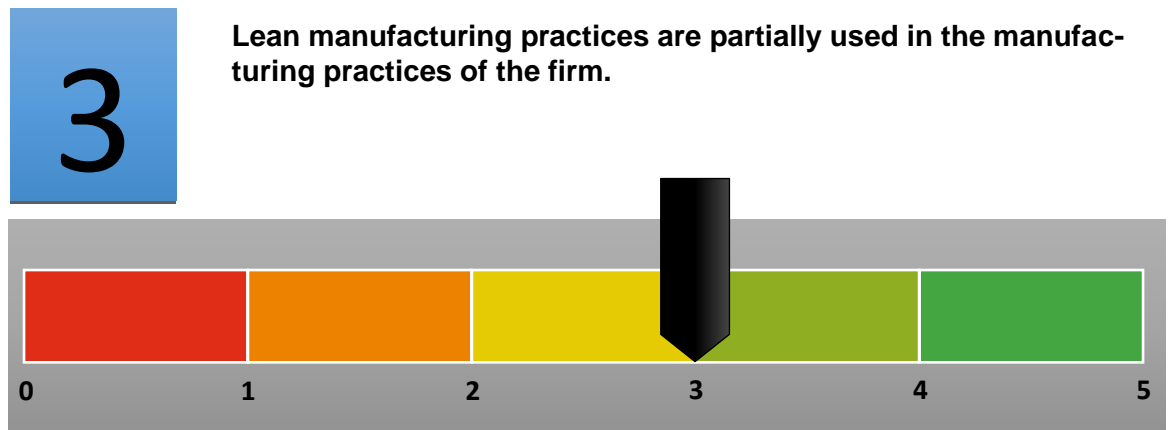


Figure23 Maturity level of the use of lean manufacturing practices

20. Are your manufacturing processes organized in a structure that enhances flexibility and efficiency?



Figure24 Maturity level of how processes are organised to enhance flexibility and efficiency

The over all maturity level is 4

Quality management

21. Do you have a real time quality control technique in place to monitor quality issues during manufacturing?

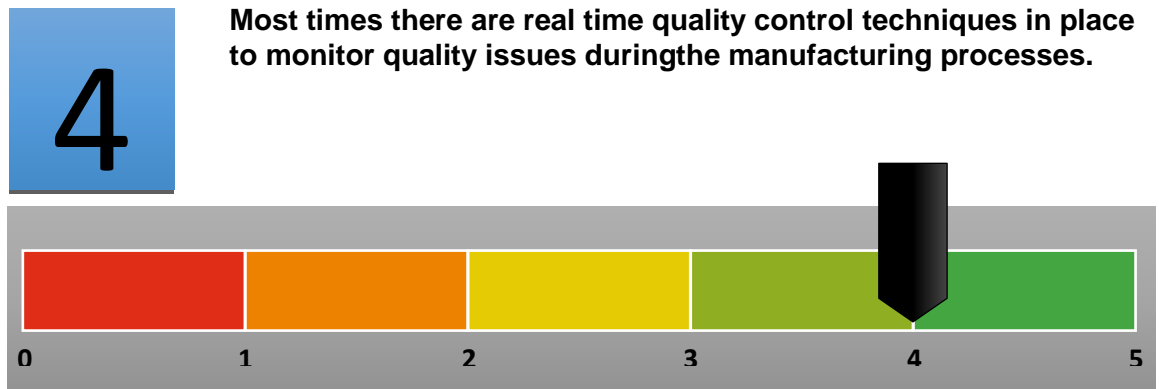


Figure25 Maturity level of quality issues during manufacturing

22. Is formal training given to employees on quality management tools like Total Quality Management, Six sigma and etc.?

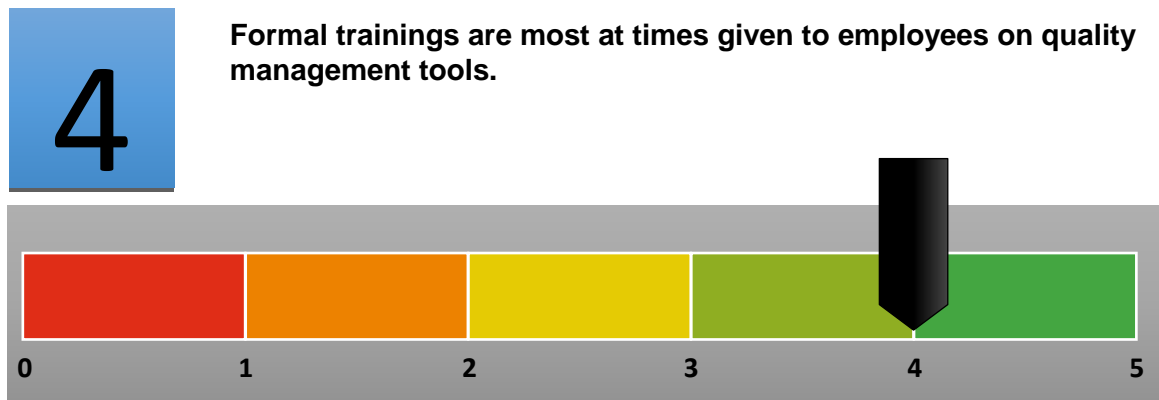


Figure26 Maturity level of how trainings are given to employees on quality management tools

The over all maturity level is 4

Environmental management

23. Is environmental management training given to all employees of the firm?

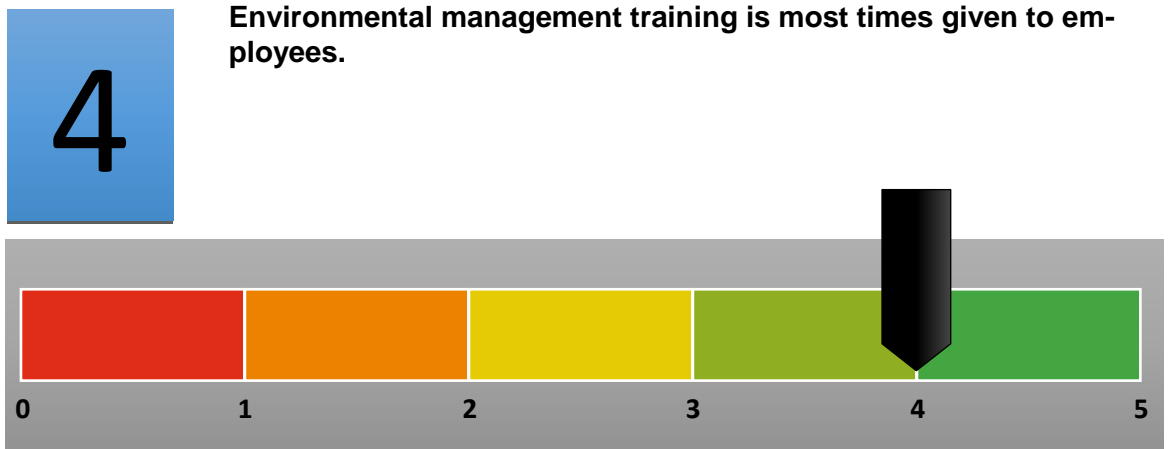


Figure27. Maturity level of training employees on environmental management

24. Do you have a HAZMAT “pharmacy” system established to ensure minimal damage to the environment?

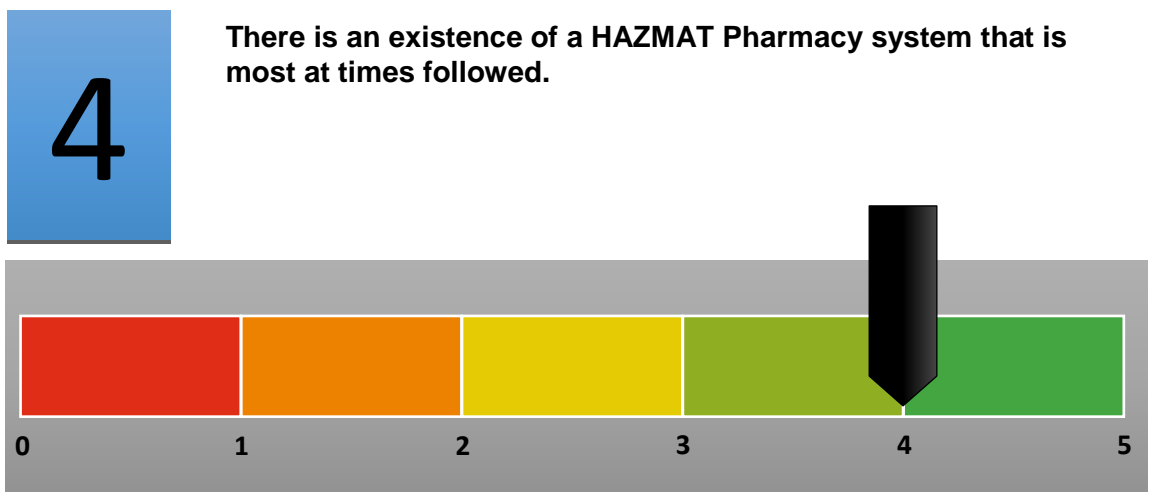


Figure28. Maturity level of the availability and usage of HAZMAT pharmacy system

Over all maturity level is four.

4.2.4 Deliver

Information management

25. Do you have a well-built information management system that allows for clear visibility of all customer data, warehouse transportation, and etc.?

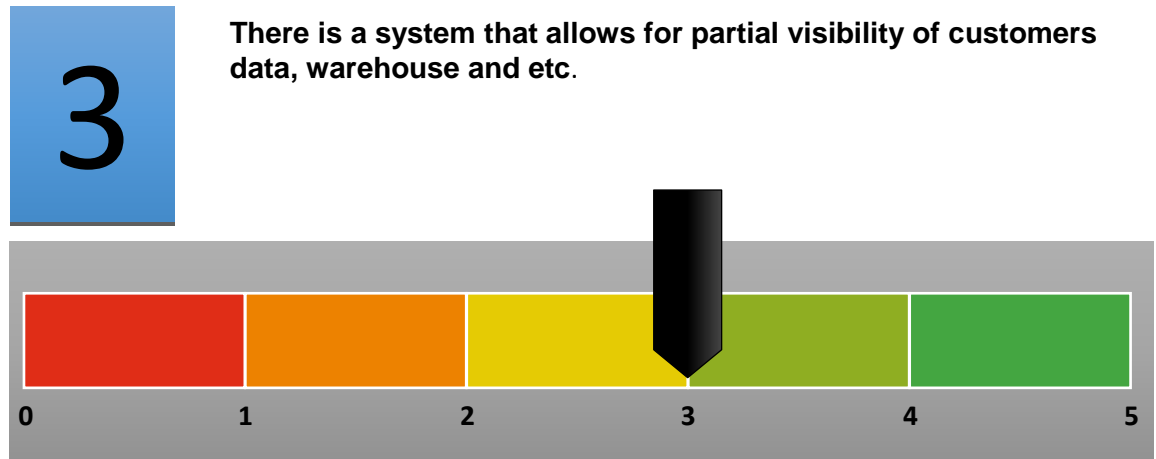


Figure29. Maturity level of the availability of a system that allows for clear visibility of all customer data, warehouse and etc.

26. Do you have Single Point of Contact for all Order Inquiries?

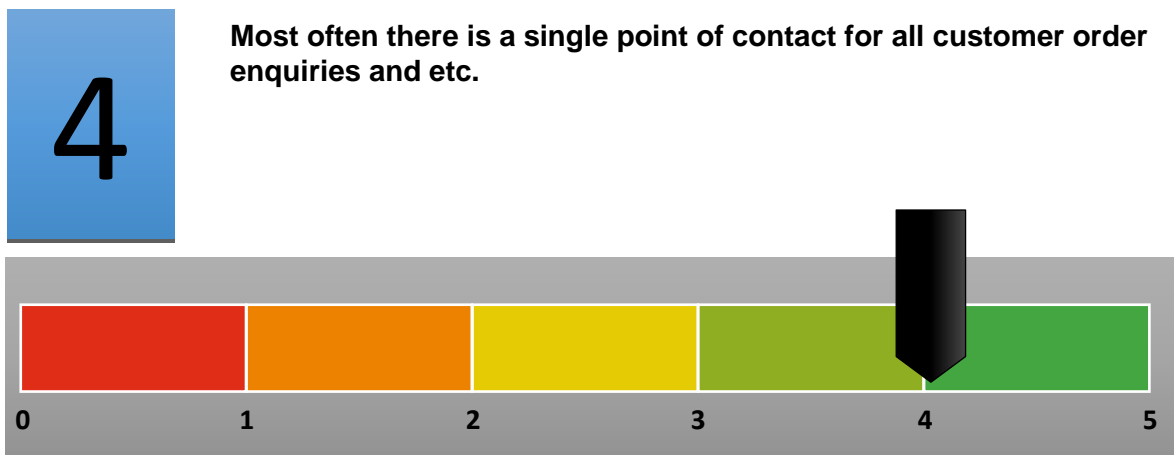


Figure30. Maturity level of availability of a single contact point for all customer enquiries and etc.

The over all maturity level is 4

Inventory management

27. Do you have a system to maintain real time inventory information and calculation of safety stocks?

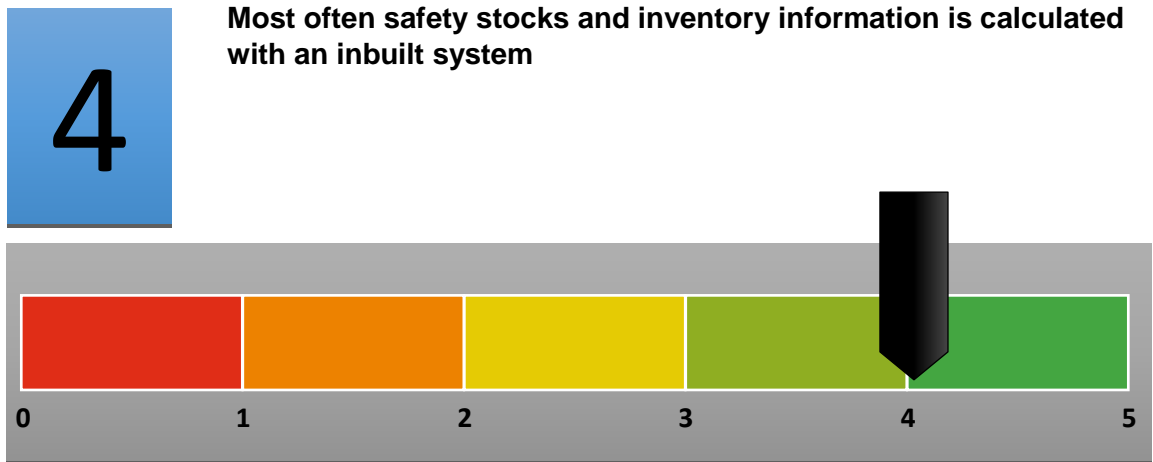


Figure31. Maturity level of ability to calculate safety stocks

28. Is there the availability of an integrated software system that allows for electronic matching between Point of sales data and store inventory?

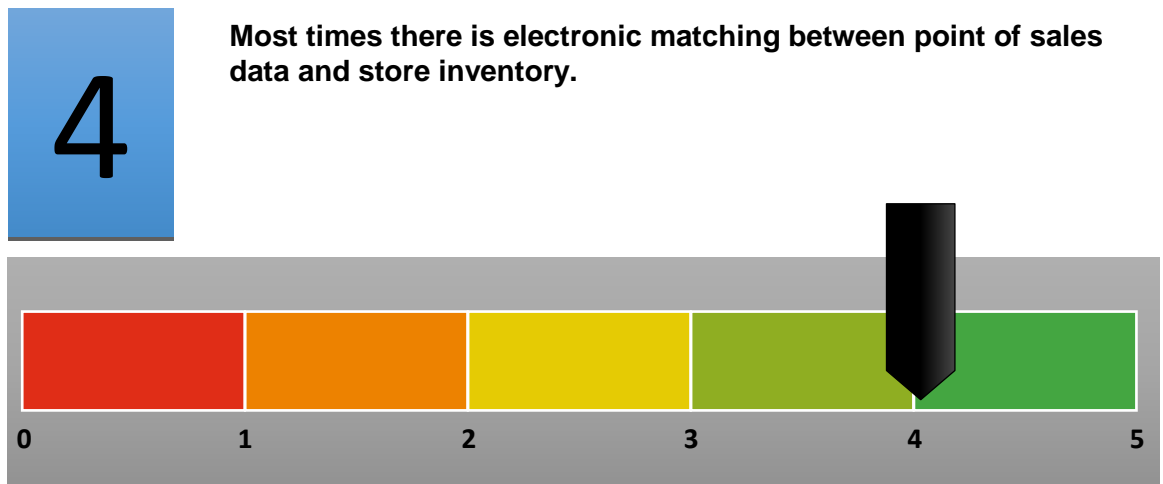


Figure32. Maturity level of the availability to match point of sales data and store inventory

Overall maturity level is four 4

Environmental management

29. Do you have established spill controls for finished goods inventory storage?

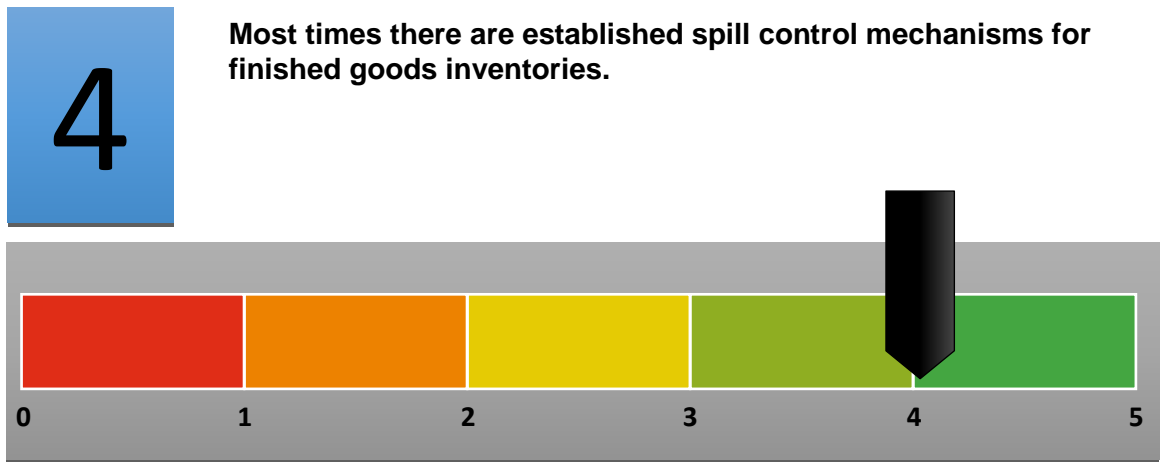


Figure33. Maturity level of established spill control measures for finished goods inventory

30. Do you Select carriers with an EMS or otherwise demonstrated environmental commitment?

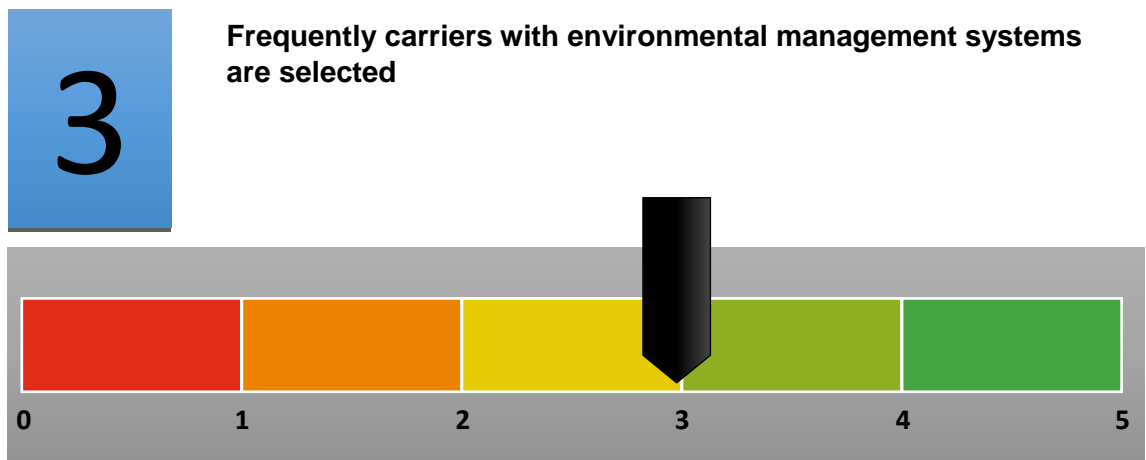


Figure34. Maturity level of how carriers with environmental management systems are selected

The overall maturity level is 4

Warehousing and transportation

31. Is Cross-Docking Used in the distribution centers to increase inventory velocity while maintaining shipping efficiency?

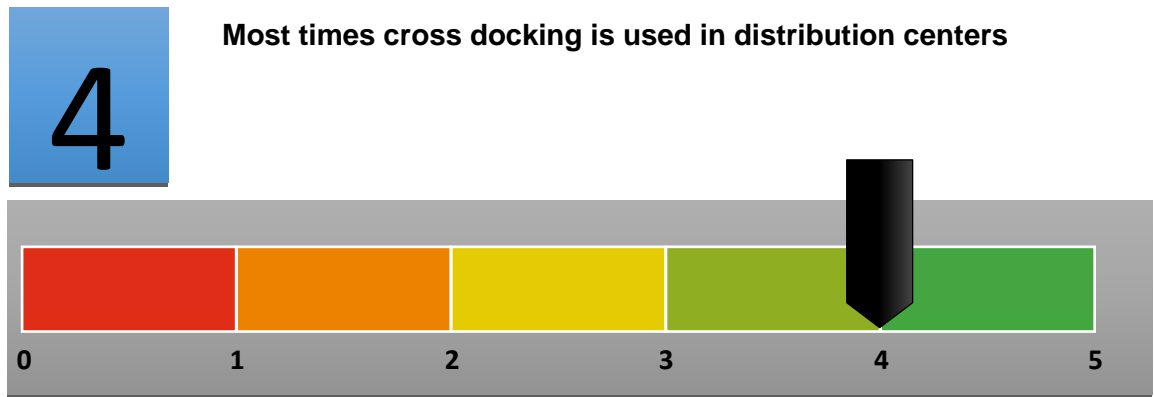


Figure35. Maturity level of the application of Cross Docking

32. Are Orders consolidated by Customer, Source, Traffic Lane, Carrier, Etc.?

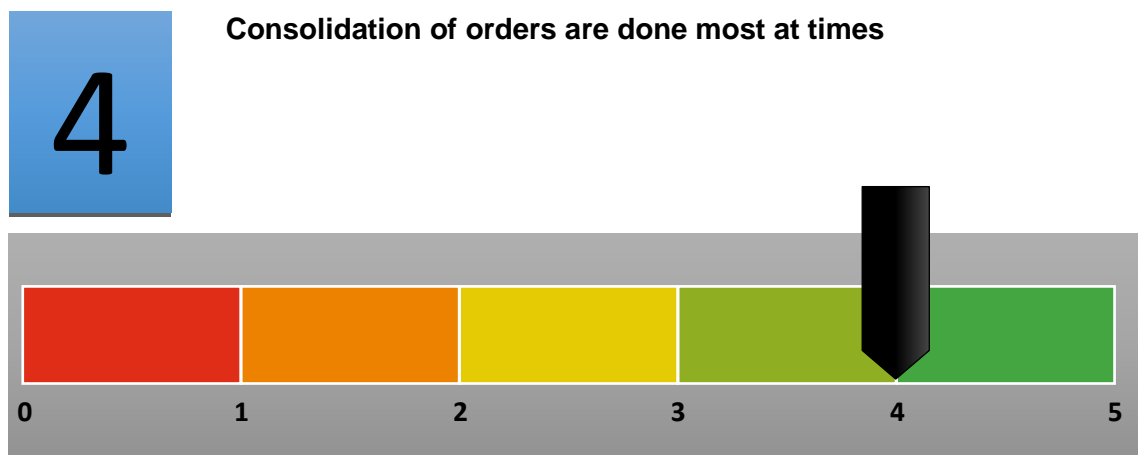


Figure36. Maturity level of how consolidation is applied to orders

The overall maturity level is 4

5 Discussions, findings and recommendations

Introduction

This research work from its inception had clear focus on seeking information about how current processes are being carried out in the supply chain by comparing them to some best practices in the SCOR model. The study also sought to find processes that are lagging behind that can be enhanced for better performance and assign a maturity level to how activities are being carried out in the supply chain.

The study sought to answer these four investigative questions :

How matured is the planning process by the standards of the SCOR best practice in the supply chain?

How matured is the sourcing process done by the standards of the SCOR best practice in the supply chain?

How matured is the manufacturing process by the standards of the SCOR best practice in the supply chain?

How matured is the delivering process by the standards of the SCOR best practice in the supply chain?

5.1 Findings of the study and discussions

The results of the four sections of the research questions would be given attention in this sub chapter.

5.1.1 Plan

Lean planning

From this study it was found out that employees and people are given tasks to do most at times and they understand the importance of their roles in the value chain. Supervisors should enhance this by always providing detailed definition of roles and expectation of employees in the supply chain management team to make execution of activities clearer and enhance productivity. From this finding it implies that workers would waste less time

in executing duties as they would know what they are doing at most times and unnecessary activities would be avoided which would enhance productivity and efficiency. Simulation exercises were also done most times, this also means that managers of the supply chain carefully study activities and possible difficulties that can arise in their execution. This means the firm is most times ready for unprepared occurrences that might show up and there are strategies to limit any negative effect they can inflict on the supply chain.

Demand Planning and Forecasting

It was found out that most times demand and supply constraints are balanced during the planning stages in the supply chain. This means that the firm most times plan ahead and ensures that demand and supply is balanced to meet customers' expectations.

Better forecasting methods must be putted in place for higher performance. Collaborative Planning Forecasting, Replenishment (CPFR) was also used most times, this implies that there would be less costs of goods sold because of less disruptions and correct forecasts.

Supply and Inventory Planning

Readjustment of supply and demand plans are updated most times daily, this means plans can be reshaped based on accurate information and happenings in the environment for better performance. The demand plan is most often updated to show actual consumption levels. This means there is high sensing of what is being sold in the channel; this would inform managers about goods that are either becoming obsolete or going faster in sales.

Master Data Management

Business intelligence management tools were also found to be always used to support decision making in the company. This implies that there would be high operational efficiency, better contracts and negotiation with customers. Decisions would also be made based on information and there will be a possibility to find wasted resources and cut inventory costs and etc. There are digital links between members in the supply chain this means activities can be organized faster with less cost and etc.

5.1.2 Source

Strategic sourcing and supplier relationship management

From the information gathered the firm only uses VMI some times which would lead to partial benefits. This implies that, the planning and ordering cost would be high; there will also be high pressure on the firm to manage most inventories they can easily clear off their shoulders. The firm should encourage and find ways to have supplier partnerships that use VMI as it would enhance cost savings by reducing total investments on inventories and increase inventory turns. It would relieve the company of unnecessary costs attached to maintenance of inventories. The firm also sometimes has joint service agreement with suppliers; this is risky because when there are no joint service agreements ownership of responsibility would not be clear. Joint service agreements should be established for corrective actions to be taken when performance falls below expectations.

Green sourcing

Most times there are measures in place to check conformance to environmental requirements, this means the firm has putted in measures to make sure they cut the damages on the environment by making sure suppliers adhere to sustainable practices. Green purchasing strategies are also used most times, this means the firm is decreasing greenhouse gas emissions and the firm would be respected for acting responsible. Employees would have improved health as through cleaner air and water. There would also be less environmental costs.

Lean sourcing

Supplier certification programmes were also found to be used sometimes, with better supplier certification buying confidence from suppliers would be high and lead to lesser time used in checking and processing of supplies. Bar coding is also used most times to enhance data accuracy; this should also be encouraged and enhanced as it would always affect how time used and efficiency would be achieved.

E sourcing

Most times electronic data interchange techniques are used to send and receive information from and to suppliers. This should also be enhanced if possible for faster information and aid in better decision-making. Electronic Kanban support is sometimes

used this implies that there would be enormous steps in work process, higher lead times and higher inventory costs. The company should draw out strategies that would let the use of electronic kanban to improve efficiency and cut cost associated with management of the supply chain.

5.1.3 **Make**

Information management

Performance results are most at times posted for all employees to see, this means are given deep visibility of the health situations in the company and it would motivate them to work harder and improve in arrears they are not doing well in. There are systems in place to make sure synchronization of inventory, production are correct. This would also mean better decision and reduction of errors.

Lean manufacturing

The firm does not fully use the idea of lean management in the production activities; full benefits would not be obtained. There would be wastages in the system (occasional overproduction, higher inventory and etc.).The firm should critically look at its activities that can have the lean ideology applied to them to derive full benefits. Work activities are also organized efficiently for higher performance and benefits.

Quality management

Most times quality control techniques are used; this implies there are measures to ensure quality issues are well-managed in the production processes. There would be fewer mistakes and customers would be guaranteed of receiving quality products from the company. Formal trainings were also given to employees most times this would also imply that employees are aware of their ensuring they give quality inputs and produce quality output.

Environmental management

HAZMAT system is also most times used but not fully, HAZMAT should be fully used to prevent pollution and cut costs associated with pollution. Full compliance to all environmental management techniques would safe guard the company against costs that can occur through the damaging of the environment. Employees are also given adequate

training on environmental management; this also implies that employees would execute activities with the conscience of reducing damages on the environment.

5.1.4 Deliver

Information management

Most often there is a single point of contact for all customer order enquiries and etc., there will be higher information flow to customers and confusion would be minimized or eliminated. Customers will always have adequate information about their orders; time wasted in getting information can also be reduced immensely. There is a system that allows for partial visibility of data of customers, warehouse and etc. This means products can be tracked and traced throughout the entire supply chain.

Inventory management

Most times there is electronic matching between point of sales data and store inventory and most often safety stocks and inventory information is calculated with an inbuilt system. This means the managers of finished goods inventories have control over information which can help them check trends and adjust their plans.

Environmental management

There are established spill controls mechanisms used most at times, measures should be putted in place to ensure these control mechanisms never fall behind. The firm often selects carriers with environmental management systems; this implies that the carbon footprint of the firm would be less. Measures should be putted in place to carefully monitor environmental management systems of carriers since it can have an effect on the overall carbon footprint of the supply chain.

Warehousing and transportation

From the data it was also found out that cross docking was used at most times, this means there would be higher efficiency in transportation, higher flexibility to changes that can occur in the market. Order consolidation is also done most times this also implies that the total transaction cost of customers and that of the company would be less.

5.2 Summary of findings

To calculate the overall levels the average of all the 8 best practices in each of the four investigative questions are calculated and the ratings are below.

- **Plan has a maturity level of 5**
- **Source has a maturity level of 4**
- **Make has a maturity level of 4**
- **Deliver has a maturity level of 4**

The overall maturity level of the processes investigated gave the implication that the supply chain is at a stage of **four (4)**. Most best practices used to gauge the maturity level were used in the process management of the company. To achieve and gain better performance results the firm must find ways to ensure that most of the practices that were not always used be enhanced to obtain the benefits that comes with their usage. These findings are not surprising because of the stature of the company. The findings are not surprising too because hardly would there be a perfect system, the results has shown firms must constantly find gaps and areas that would might not be offering the best solutions that can be obtained in any situation.

The overall supply chain maturity of four was given to the supply chain by finding the mean scores of all the 32 best practices studied. Though some aspects had ratings of 2 and 3 their effect on the overall ratings was minimal.

The radar chart below shows the overall maturity level of the four focus areas.

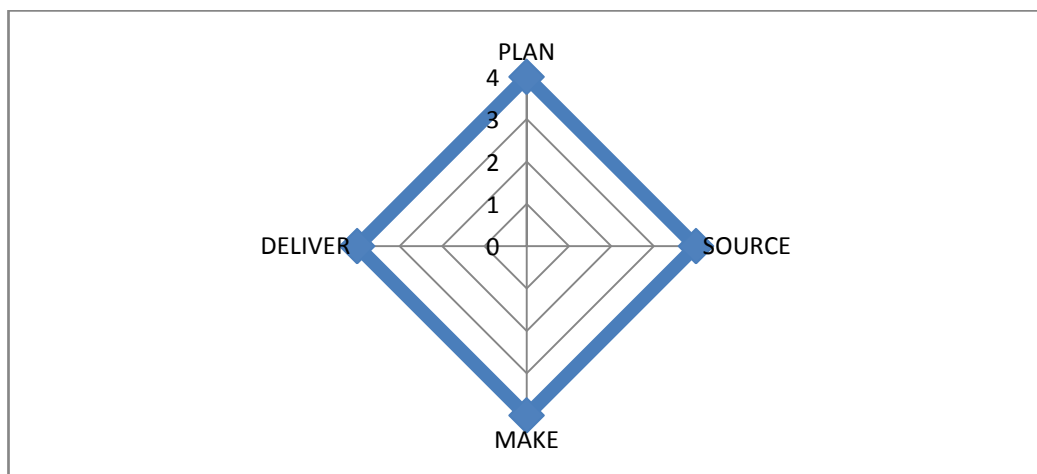


Figure37 Radar chart of maturity level of the four focus areas

5.3 Reflections

Through this study the following lessons were learnt, first giving critical attention to the SCOR model for full understanding of it has enriched my thinking and understanding of some processes and practices that can lead to higher performance of supply chains. This research work being the first independent academic writing with a large volume of work has also prepared me for the future as am preparing for a postgraduate studies. I have gained skills on how to write according to academic standards.

5.4 Recommendations for case company

The firm should carefully look at all the best practices tested in this study and find ways they can be enhanced and for better performance to be achieved.

The firm should also use the level attained in this study to set new targets.

The firm should also find to investigate reasons why some activities like VMI, Kanban support and ect are not used more often and address challenges they find to enhance performances.

Maturity test should also be done more often to gauge the status quo in other aspects of their business operations.

5.5 Recommendations for further studies

This thesis is not free from scrutiny there were some difficulties encountered during the study from literature review to the analysis.

The SCOR model has over 400 best practices selecting which of them to use for the study was challenge, the model does not list them in categories so made it difficult for use.

Further studies should be carried out to sort the best practices into categories that would make application easier.

Further studies should be carried out periodically to ascertain the maturity level of the processes used in the supply chain.

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Appendix A

QUESTIONNAIRE ON THE SUPPLY CHAIN MATURITY OF COCA COLA GHANA LTD

This is a questionnaire designed to assess how the processes in the supply chain of the company are being carried out.

Please choose an answer that best fits how current activities are carried out in the supply chain based on the following criteria

- 1 Does not exist or never applied**
- 2 Sometimes**
- 3 Frequently**
- 4 Mostly**
- 5 Always or definitely exists**

The assessment tool was developed based on the SCOR model

The levels at which these best practices were selected are attached to the question.

PLAN

Lean planning

- 1 Do all functions and their undertakers understand the importance of their roles in the supply chain? **(sP1) 2rd level**
- | | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
- 2 Is "Simulated" Full-Stream Supply/Demand Balancing for "What-If" Scenarios in your planning stages? **(sP1)2nd level**
- | | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

Demand Planning and Forecasting

- 3 Are Capacity and Supply Constraints Balanced Against Demand during the Planning Cycle? **(sP2.2 & sP2.1)3rd level**
- | | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
- 4 Do you use the idea of Collaborative Planning Forecasting, Replenishment (CPFR)? **(sP1)2nd level**
- | | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

Supply Planning and Inventory Planning

- 5 Is there a system in place that allows for readjustment of supply and demand plans on daily basis with information from the "Customers' Customer and Suppliers' Supplier"? **(sP1) 2nd level**
- | | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
- 6 Is the demand plan frequently updated to reflect actual consumption? **sP2.1 3rd level**
- | | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

Master Data Management

- 7 Do you apply principles of Business Intelligence (BI) to support your decision making? **sP1.3 3rd level**
- | | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
- 8 Are there Digital Links (XML Based, EDI. Etc.) among Supply Chain Members? **sP1.4 3rd level**
- | | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

SOURCE

Strategic sourcing and supplier relationship management

- 9 Is VMI used to allow suppliers manage and replenish inventory?
- | | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

10 Do you have Joint Service Agreements with your suppliers? **sS1.1sP1.1 3rd level**
1 2 3 4 5

Green sourcing

11 Do you have measures in place to monitor product compliance, quality and environmental requirements of your suppliers? **sS2.3 3rd level**
1 2 3 4 5

12 Do you utilize green purchasing practices? **sS1 2nd level**
1 2 3 4 5

Lean Sourcing

13 Are Supplier Certification Programs used to eliminate receiving inspection? **sS1.2 3rd level**
1 2 3 4 5

14 Is Bar Coding Used to reduce handling time and maximize data accuracy? **sS1.2 3rd level**
1 2 3 4 5

E-sourcing

15 Is electronic data interchange used to send technical information and requests for quotations to and from potential suppliers to assess their capabilities? **sS3.2 3rd level**
1 2 3 4 5

16 Do you have Electronic Kanban support that notifies Suppliers of the Need to Deliver Products? **sS3.3 3rd level**
1 2 3 4 5

MAKE

Information management

17 Are performance results posted and made available to employees? **sM1 2nd level**
1 2 3 4 5

18 Do you have a system that ensures that production data, inventory levels and scheduling requirements are accurate? **sM1 2nd level**
1 2 3 4 5

Lean manufacturing

19 Is lean manufacturing practices used in your manufacturing activities? **sM1 2nd level**

1 2 3 4 5

20 Are your manufacturing processes organized in a structure that enhances flexibility and efficiency? **sM1 2nd level**

1 2 3 4 5

Quality management

21 Do you have a real time quality control technique in place to monitor quality issues during manufacturing? **sM1.3 3rd level**

1 2 3 4 5

22 Is formal training given to employees on quality management tools like Total Quality Management, Six sigma and etc.? **sM1 sM1.3 3rd level**

1 2 3 4 5

Environmental management

23 Is environmental management training given to all employees of the firm? **sM1.3 3rd level**

1 2 3 4 5

24 Do you have a HAZMAT “pharmacy” system established to ensure minimal damage to the environment? **sM1.6 3rd level**

1 2 3 4 5

DELIVER

Information management

25 Do you have a well-built information management system that allows for clear visibility of all customer data, warehouse transportation, and etc.? **sD1.2 3rd level**

1 2 3 4 5

26 Do you have Single Point of Contact for all Order Inquiries? **sD1.1 3rd level**

1 2 3 4 5

Inventory management

27 Do you have a system to maintain real time inventory information and calculation of safety stocks? **sED.4**

1 2 3 4 5

28 Is there the availability of an integrated software system that allows for electronic matching between Point of sales data and store inventory? **sP4.1 3rd level**

1 2 3 4 5

Environmental management

29 Do you have established spill controls for finished goods inventory storage? **sD1.3 3rd level**

1 2 3 4 5

30 Do you Select carriers with an EMS or otherwise demonstrated environmental commitment? **sD1.5 3rd level**

1 2 3 4 5

Warehousing and transportation

31 Is Cross-Docking Used in the distribution centres to increase inventory velocity while maintaining shipping efficiency? **sD1.8 3rd level**

1 2 3 4 5

32 Do Consolidate Orders by Customer, Source, Traffic Lane, Carrier, Etc.? **sD1.4 sD1.5 3rd level**

1 2 3 4 5