ADDIS ABABA UNIVERSITY
SCHOOL OF COMMERCE

SUPPLY CHAIN AGILITY OF COMBAT RATION IN RESPONSE TO URGENT MILITARY MISSION:
THE CASE OF ETHIOPIAN DEFENSE LOGISTICS

A THESIS SUBMITED TO THE DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF ARTS IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT, ADDIS ABABA UNIVERSITY, SCHOOL OF COMMERCE

BY

YOHANNES HABTE DIKO

ADVISOR: TARIKU JABANA (Ph.D.)

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Statement of Declaration

I, Yohannes Habte Diko, declare that the thesis entitled "Supply Chain Agility of Combat Ration in Response to Urgent Military Mission" is my original work. I have carried out the present study independently with the guidance and support of my research advisor Tariku Jabana (PhD). Moreover, this study has not been presented for any other program or university and that all sources of materials used have been acknowledged accordingly.

Declared by: Yohannes Habte Diko

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Date & Signature

This is to certify that Yohannes Habte Diko has carried out his research work on the topic "Supply Chain Agility of Combat Ration in Response to Urgent Military Mission". The work is original and is suitable for submission for the award of Master of Arts in Logistics and Supply Chain Management.

Advisor: Tariku Jabana (PhD)

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Date & Signature

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BY

YOHANNES HABTE DIKO

APPROVED BY BOARD OF EXAMINERS

Tariku Jabana (PhD)
Advisor

Date and Signature

Busha Temesgen(PhD)
Examiner

Date and Signature

Biniam Berhe(PhD)
Examiner

Date and Signature

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List of Abbreviations and Acronyms

CFD-US combat feeding directorate
CODA -observe, orient, decide, act
CPI - continuous product improvement
CRP- continuous replenishment planning
DLA- Defense Logistics Agency
DOD- US Department of Defense
EDI-Electronic data Exchange
ERP- enterprise resource planning
FDRE-federal democratic republic of Ethiopia
FSR -first strike ration
HTML - Hyper-Text Markup language
MRE-Meal ready to eat
MCW-meal cold weather
SCM- supply chain management
SCIS- supply chain infrastructures
TOTM -tailored operational training meal
USA-United States of America
XML-Extensible Markup language

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ABSTRACT

Supply chain agility is very essential to supply combat ration for any army unit. As it is known combat ration is required when there is a field mission including war. Nowadays it is difficult to obtain combat ration from the supply market when it is needed urgently. Because of this the study aimed to investigate the gap of combat ration supply chain agility in response to urgent military mission the case of Ethiopian defense logistics. Combat ration is a fundamental thing for successful accomplishment of military mission on war front. The study employed descriptive research design. The reason the researcher used descriptive research design was to identify and describe the gap of supply chain responsiveness for uncertain demand of combat ration for urgent military mission. The researcher also used descriptive research strategy to determine the relationship between agile combat ration supply for urgent military mission and the five supply chain agility dimensions stated in the study as dependent and independent variables. Qualitative and quantitative data has been collected and analyzed using frequency and percentage. The population of the study was selected by non-random data sampling method/purposive data sampling from the supply chain members of combat ration. The sample size was 106. From this sample size 5 top managers gave interview additionally. All respondents returned their questionnaire. The study is conducted on the following specific conceptual frame work of supply chain agility dimensions alertness, accessibility, decisiveness, swiftness and flexibility. The research found that combat ration supply chain is not alert enough to respond urgent demand, combat ration supply chain information is partially accessible, and combat ration supply chain is not flexibility to respond the demand as per the military mission requires. The supply chain is not agile enough to respond urgent requirement of combat ration during urgent military mission. The proposed recommendation for the gap identified in the study is: to establish an agile supply chain of combat ration by multiple sourcing, making a strong relationship with existing supply chain members, advancement of supply chain information communication technology and flexibility of using variety of combat ration through advanced manufacturing technology.

Keywords: supply chain**, **Agility**, **combat ration**, **Urgent military mission.

Chapter One

1. Introduction

This chapter illustrates about back ground of the study, objective of the study, significance of the study, scope of the study and the study gap identified. The study is conducted by answering the research questions stated in this chapter.

1.1 Back ground of the study

The success of military operations depends on the physical and mental status of the individual involved. An individual's physiological and nutritional status can markedly affect one's ability to maximize performance or effectiveness in short term, high stress, high intensity assault missions in a continuous challenge due to diminished appetites of individuals under stress (Medicine, 2005). To overcome the challenges in assault mission combat ration has a great role. Next to courage and weapon combat ration is very essential to defeat enemy in the battle field. Supply chain is conceptualized as a network of companies from suppliers to end users (Gundlach, 2006). Most of the time, the end user of combat ration is the war fighter army. To address the war fighter army demand there should be a consistent supply of combat ration in response to urgent military mission. Consistency in supply chain can be realized by integrating supply and demand through coordinated efforts by linking supply chain partners from the upstream to the downstream for the flow of materials and information (Monczka, 2005).

Agility in a supply chain is the ability of the supply chain as a whole and its members to rapidly align the network and its operations to dynamic and turbulent requirements of the customers (AMB, 2010). Army mission always needs alertness and rapid response. Due to this the supply chain responsiveness is measured by its responsiveness to the urgent mission requirement in the army. The principle of supply chain states that leanness and agility are the two features of strategically managed chains. Briefly, while agility focuses on effectiveness and speed, leanness focuses on efficiency and cost saving (Cozzolino, 2012). When we come to an army mission effectiveness and speed are critical things.

According to (Peltz, 2014) the core mission of the National Defense Logistics is to efficiently support the armed services requirements. To successfully perform the armed mission inventories of items must be maintained for which their demand is highly variable even when relatively stable, could increase or decrease dramatically on short notice, or may never even materialize. While commercial firms might consider stocking such items is unprofitable and would be unlikely to do so without a purchase guarantee. Defense Logistics does not have this option if it is to effectively support the warfighter. When we bring it in to Ethiopian context the Defense Logistics is considered as a back bone of the army. To be the real and functional backbone of the army the Ethiopian Defense Logistics would have an insight to improve supply chain agility. The combat units available in Ethiopian context are ground force, air force, special force and recently established Navy. Nowadays the operating location of the army is uncertain. This uncertainty implies for the supply chain to be agile for the supply of combat ration.Combat ration is one of the major tools to win every military mission on war front. Among the food supplies which have a key role in urgent military mission in the case of Ethiopian army are canned foods, biscuit and sugar. Currently Ethiopian army is deployed all over the country to control domestic conflict which is happening now and then repeatedly; because of this the mobility of the army is too high. To manage this high mobility of the armed force there should be a dependable combat ration supply to fulfill the mission requirement of the army. The need for urgent food supply is different from the normal/usual food supply. Most of the time commercial firms do not stock in required amount unless they get order from buyers. To be truly agile, a supply chain must possess a number of distinguishing characteristics which include: market sensitivity, virtuality, process integration and networking (Danuta Kisperska-Moron, March 2009). The agility of food supply chain specifically for combat ration is very critical in response to urgent military missions. Therefore the supply chain should be responsive based on supply chain agility dimensions alertness, accessibility, decisiveness, swiftness and flexibility.

1.2 Statement of the Problem

The military wants to be prepared at all times in case of war, a large supply of combat ration would have stocked for close to three years before they are shipped out for consumption; thus creating a three year supply of combat ration at the warehouse level (Lai, 2003). In other hand to reduce material stock outs and inventory excess that leads to disposal it is very essential to make the supply chain agile (Peltz, 2014). In Ethiopian defense logistics department case it is difficult to get dependable reserve stock and supply of combat ration for urgent military missions. Based on the preliminary interview made with the logistics department of Ethiopian Defense force there is a challenge for the logistics department as well as the army in obtaining combat ration as per the mission requires. This is inappropriate for field mission which may create problem on the success of the military mission. To address the root cause of this problem; this study played a great role in examining the gap of supply chain agility in combat ration supply for urgent military missions. The Ethiopian Defense Logistics Department supplies common military items to the armed forces. Among the supplies food supply is the major one. Combat ration is one of the food items supplied for the army during field missions. Currently Ethiopian army is deployed in the country almost in all directions of the country with great mobility. This frequent mobility of the army requires combat ration. To effectively make agile the supply of combat ration for urgent military missions this study tried to fill the identified gaps on supply chain agility dimensions like: alertness, accessibility, decisiveness, swiftness and flexibility.

Even if there are limited researches made on different areas in Ethiopian defense force joint logistics main department, there is no other research conducted before in the area of combat ration supply chain agility. Hence, this research is the first that focuses on “The supply chain agility of combat ration in response to urgent military mission”. The study incorporated areas where the supply chain agility problems were not assessed by other researchers specifically focusing on alertness, accessibility, decisiveness, swiftness & flexibility. Ethiopian defense

force is the only organization that provides military services in the country Ethiopia (Leul, 2019). To perform its military operation the defense force needs combat ration. Therefore, knowing the gap in combat ration supply chain agility is one of the major solutions for the institution to improve its success in field mission accomplishment.

1.3 Objective of the study

1.3.1 General objective

General objective of the study is to assess the agility of combat ration supply chain in response to urgent military mission requirement with practical reference to the Federal Democratic Republic of Ethiopian Defense Force.

1.3.2 Specific objectives

1. To evaluate the alertness of combat ration supply chain in response to urgent military mission
2. To assess the accessibility of combat ration supply chain in response to urgent military mission
3. To examine decisiveness of combat ration supply chain in response to urgent military mission
4. To analyze the swiftness of combat ration supply chain in response to urgent military mission
5. To investigate the flexibility of combat ration supply chain in response to urgent military mission

1.4 Research Question

In light of the problem discussed above, the research aimed to answer the following questions:

1. To what extent combat ration supply chain is alert enough to respond for urgent military mission requirement?
2. How is the accessibility of information with in the combat ration supply chain in response to early detected uncertain or urgent demand?

3. How far the combat ration supply chain members are decisive on accessed demand information at hand?
4. How is the swiftness of combat ration supply chain in response to accessed demand information at hand?
5. How is the flexibility of combat ration supply chain to source, manufacture and distribute combat ration for urgent military mission requirement?

1.5 Significance of the study

The study would benefit the FDRE Defense Force Logistics Department leadership to know the possible challenges they might face during urgent military mission to supply combat ration which is life blood for military mission accomplishment. The study would also give input for the management to think over other options to supply combat ration for urgent military mission consistently without any supply chain interruption. Furthermore the study would give insight for the management on overall management of military food supply chain for the army and his family too. The study would also give an insight for the FDRE defense logistics department management to see the supplier's attitude towards supporting military mission beyond their business scope. However the study would carry out for academic purpose and it is limited to Ethiopian ministry of national defense logistics department, the findings of this study would contribute by directing towards making the supply chain of combat ration agile for Ethiopian army during urgent military missions. Furthermore it leads the defense logistics department of Ethiopia to think other options to fill the gap of supply chain flexibility.

1.6 Scope of the study

The study covered only the supply chain agility of combat ration in response to urgent military mission in Ethiopian context. The study area is limited on Ethiopian National Defense logistics department, suppliers and end users of combat ration. The time scope of the study is limited on current situation of combat ration supply chain agility in response to urgent military mission accomplishment. The geographic scope of the study would range from Addis

Ababa to and surrounding areas. The conceptual scope of the study would be on dimensions of supply chain agility like alertness, accessibility, decisiveness, swiftness and flexibility.

1.7 Limitation of the study

The study will be conducted based on primary data which is collected through self-administered and interview questionnaire which is costly in time and other resources. The current scenario COVID-19 pandemic made the data collection very difficult and tiresome. Due to this corona virus people were not free to meet you to give an interview and even to fill a questionnaire. However it is difficult to get people for the data collection through continuous request/begging the data was collected.

1.8 Definition of terms and concepts

A supply chain is a network of organizations and business processes to select raw materials to transform them into intermediate and finished products and distribute the finished products to customers (Reis, 2014).

Agility the ability of an organization to adapt and react to unexpected or unforeseen changes is critical to achieving and maintaining a competitive advantage (Aziz, 2013).

Supply chain agility can be defined as the capability of the supply chain and its members as a whole to rapidly align the network and its operations to dynamic and turbulent customer requirements (Ismail & Sharifi, 2006).

Combat rations are specially designed to supply adequate energy and nutrients for particular types of missions (Kemmer, 2015).

Alertness is defined as the ability to quickly detect changes, opportunities, and threats.

Accessibility emerged as the second dimension of firm supply chain agility. It is defined in the study as the ability to access relevant data.

Decisiveness It is defined as the ability to make decisions resolutely.

Swiftness: The ability to implement decisions quickly is defined as swiftness .This element emerged as the fourth dimension of firm supply chain agility.

Flexibility is defined ability to modify the range of tactics and operations to the extent needed.

Chapter Two

2. Literature Review

2.1 Introduction

The literature review part of the study covers key areas that are essential in the study. This chapter presents the theoretical literature, empirical study and conceptual frame work of the study. Based on the objectives and theoretical thresholds of this study; this chapter reviewed related and up-to-date literature on the concept of supply chain agility in response to urgent military mission.

2.2 Supply Chain Definition

A supply chain is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers (Sebastian, 2013). A supply chain (SC) is a network of organizations, flows and processes wherein a number of various enterprises (suppliers, manufacturers, distributors and retailers) collaborate (cooperate and coordinate) along the entire value chain to acquire raw materials, to convert these raw materials into specified final products, and to deliver these final products to customers (R.Hughes, 2008).

2.3 Supply Chain Management Definition

Supply Chain Management is the management of upstream and downstream relationships with suppliers and customers in order to deliver superior customer value at less cost to the supply chain as a whole. The goal of supply chain management might be to reduce or eliminate the buffers of inventory that exist

between organizations in a chain through the sharing of information on demand and current stock levels. Thus the focus of supply chain management is upon the management of relationships in order to achieve a more profitable outcome for all parties in the chain. This brings with it some significant challenges since there may be occasions when the narrow self-interest of one party has to be subsumed for the benefit of the chain as a whole (Behrenbeck & Merschmann, 2007).

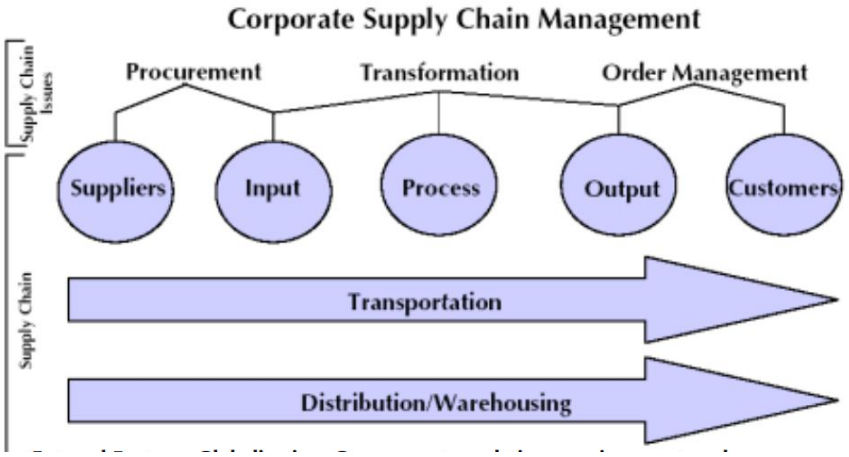


Figure 1 Corporate SCM

External Factors: Globalization, Government regulations, environment, and competition.

2.3.1 Military Version of Supply Chain Management

SCM for the Army is slightly different from SCM for corporate organizations because the Army's focus is on mission requirements rather than on quarterly earnings. The seven components of SCM for the Army are the same as for business: Suppliers, Procurement, manufacturing, Order management, Transportation, warehousing & Customers (soldiers). The SCM conceptual models for both business and the Army are remarkably similar; however, there are some significant differences. Most notable are the dual directional arrows on the chart for transportation and for distribution and warehousing in the Army SCM model. These illustrate that the Army may retrograde equipment and components for maintenance or retrograde personnel for medical care. Other differences are in the

external factors that affect the supply chain. These factors include: Joint interoperability among the services' command, control, communications, computer, and intelligence (C4I) systems, deployment of forces, Soldier and mission requirements. The supply chain reflects the Army's focus on mission accomplishment as opposed to business' focus on profitability (M.Lenzini, et al., 2002).

2.3.1.1 Military Supply Chain Principles

We cannot separate military logistics from combat moving forces to conflicting areas around the world by providing materials deployment, and bringing them home as conflict subside are all part of the complex process of military logistics. Meeting the challenges of coming decades will require substantial logistics capability, and the nature of that capability will differ from what it has been in the past (Muckstadt, 2012). According to Muckstadt, 2012 there are five fundamental principles of military supply chain. He clearly discussed it with practical applications with in the armed force. The first is Know the Customer: This means it is not possible to construct military supply chain effectively without a clear understanding and definition of combat unit requirements. Constant research and collaboration, the construction of an information infrastructure to capture unit transaction data, and the storage and analysis of these data from a strategic, tactical and operational perspective can help to understand the combat unit requirement. Supply chain requirements vary greatly by type of combat unit, commodity and operating location. Further, the needs of the operating unit must be understood within the context of the missions it is asked to perform, which vary considerably over time. All of these requirements must be thoroughly understood to establish the foundation for constructing responsive, efficient and effective supply chains. Supply chains supporting ships at sea differ from supply chains supporting Air Force units at a fixed location. Supply chains designed for low cost, high demand material (e.g. rations) differ from those designed for high cost; low demand items (e.g. complex equipment repair items). Supply chains that exist for repairable items must include planning for and allocating repair capacity and providing adequate transportation links to and from repair locations. Weapon system repair parts are related to one another by their common application and the unique configuration of the equipment being supported. This

interconnectedness must be considered when designing supply chains. Failure to take these differences, and many others, into account when planning inventory and capacity requirements will significantly degrade performance. The second military supply chain principle is to adopt lean philosophies this philosophy makes internal lead times have been shortened and made more predictable. It is also help full set up times and work-in-process inventories have been reduced. But for maximum supply chain efficiency, all partners must engineer, align, and execute their jointly designed and operated processes so that the entire chain has the desired attributes: response times must be short, predictable and repeatable. Thus lean supply chains must be designed as a system that responds quickly and predictably to fluctuations in military need. Therefore, lean philosophies must be extended beyond the boundaries of individual internal organization or Service logistics organizations to include all supply chain partners. No combination of software systems can compensate for a poor physical operating environment. Many defense contractor and manufacturing and repair facilities have been able to reduce their flow times and make them more predictable. If set up times have made improved, planners have found they can respond better to changing demand, even with less inventory. Furthermore, lean supply chains cannot exist if procurement. The third military supply chain principle is to create a supply chain information infrastructure. Although actual performance frequently falls short of the desired level of performance, it is possible now for all partners in military supply chains to share demand information, inventory status, and logistics requirements. But true collaboration requires more than just data exchange between successive supply chain partners. Rather, it requires joint planning of inventory, production and repair strategies, and executing the resulting plans quickly and reliably on a continuing basis. How various capacities (inventory, transportation, production, repair) are used daily must be considered from a systems perspective and not just a local viewpoint. The Defense supply chain information infrastructure must be capable of responding effectively to frequent changes in combat and logistics requirements. Re-planning the use of capacities may need to be done daily and in some cases even more frequently. Knowledge of inventory levels and unit demands will not be sufficient to maximize equipment availability. Part repair

requires careful planning and allocation. Transportation to and from units and repair locations is critical to effective support. The ability to re-plan transportation routes as combat units deploy and relocate is essential. Component stocks must exist at the repair sites for repairs to be accomplished. Positioning of these stocks to meet changing requirements is essential to executing combat operations. The fourth military supply chain principle is to integrate business Processes. Business processes must be established both intra and inter organizationally. These processes, coupled with the information infrastructure, support the efficient flow of material through the supply chain. While much attention has been placed on understanding business processes within Defense organizations, it is essential to understand what processes must be built inter organizationally to leverage and enhance partner capabilities. Business processes are the negotiated rules that govern how organizations inside and outside of the Defense organization deal with one another. Effective business processes allow events to trigger actions automatically throughout the entire supply chain by all partners. Business processes control the sharing of information, accountability and movement of material, and financial compensation. The writer concluded in his study that too often, in US Department of Defense supply chains, business processes do not effectively tie partners together. Events that should automatically trigger follow-on actions do not and therefore responsiveness and effectiveness become seriously degraded. The fifth principle of military supply chain is unify decision support systems.

According to Muckstadt, 2012 researchers have designed supply chain Decision Support System environments for the military for decades. Much of the capability currently offered by commercial software providers began with research done for the US Department of Defense. Yet within the DoD there is little understanding of this capability. These environments are based on different philosophical models. Also, they differ in how they forecast demand, and how they drive production, repair and allocation decisions. Their goal is to generate plans that consider some of the elements of the supply chain. No matter which approach is taken, these

systems and their embedded rules drive many daily supply chain activities. Therefore, they have a substantial impact on the operating behavior, and consequently on overall supply chain performance and operational effectiveness. How much they enhance military supply chain performance depends on both the accuracy of their input data and the modeling approaches employed. We believe that these decision support systems need to address uncertainty in an explicit manner most do not. Defense managers must calculate and defend the need for budgetary resources annually. The data and underlying modeling approaches used for developing these estimates should be consistent with the methods used to allocate resources once they become available. Muckstadt also suggested that defense managers face daily challenges of how best to utilized available capacity for repair, manufacturing, and transportation. A consistent modeling environment is essential. Defense managers must be prepared to re-plan on short notice, since international tensions may require combat units to deploy to new parts of the world. Consequently, demand for resources moves to new locations, transportation links must be established and others eliminated, the location of intermediate repair activity may have to change, and inventory may need to be repositioned. These changes may have to happen very quickly; the impact of the existence of these resources affects a significant portion of all combat units. Defense managers facing these challenges require unified decision support systems.

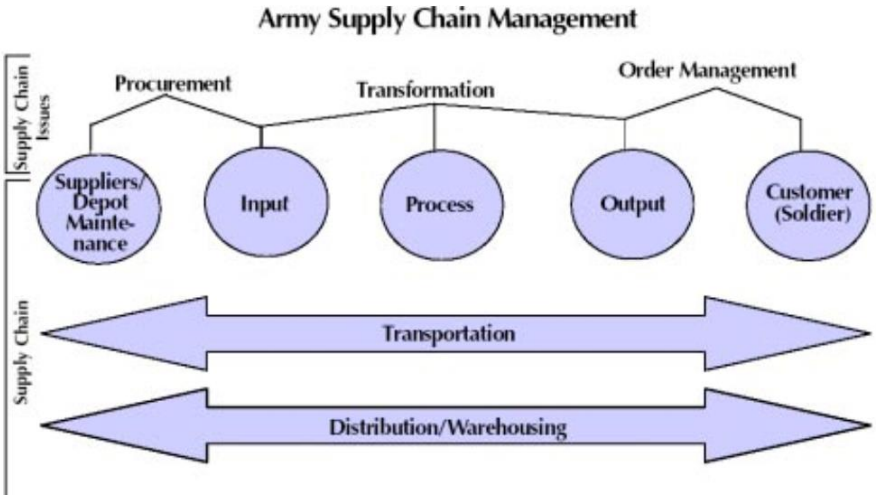


Figure 2. Army SCM

External Factors: End-user need, DOD regulations, environment, joint interoperability, deployment within and outside the continental United States, mission requirements

2.4 Supply chain strategy

supply chain strategies requires a total system view of the linkages in the chain that work together efficiently to create customer satisfaction at the end point of delivery to the consumer as a consequence costs must be lowered throughout the chain by driving out unnecessary costs and focusing attention on adding value. Throughput efficiency must be increased, bottlenecks removed and performance measurement must focus on total systems efficiency and equitable reward distribution to those in the supply chain adding value. The supply chain system must be responsive to customer requirements (Hines, 2012).

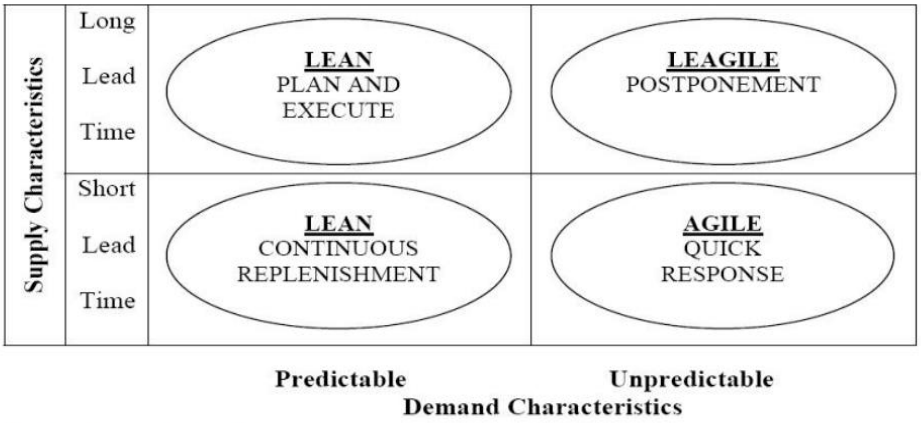
Strategy can be defined as a set of dynamic, integrated decision that one must make in order to position one's business in the complex environment. Thus, strategy represents the overall action or approach to be taken to achieve the firm's goal and business objective (Gattorna, 1998). The supply chain strategy cannot truly be aligned to overall business strategy (unless all the function of the

enterprise are integrated and unless strategic relationships have been established with supply chain partners) based on trust and information sharing. So that it can quickly respond to customer's demand with unique and tailored offerings. Effective integration is the key because if one of those links fails, the organization performance may suffer and may not meet the expectations of its customers or the service level of its competitor. The primary benefit of integration is that all business units and supply chain partners share the same data, synchronize action and minimize distortions in demand management (Kalambi.N, 2000). There are supply chain strategies that are applicable to all types of products and markets. Instead, the supply chain strategy needs to be tailored to match the specific demand characteristics of a product, product family or market. Classification model consists the following three parameters; type of products (standard or special), type of demand (stable or volatile), and replenishment lead-times (short or long) (Christopher, et al., 2006).

Learn supply chain identifies seven different types of waste (Spragu, 2015); (1) defects in production (2) overproduction , 3) inventories, 4) unnecessary processing, (5) unnecessary movement of people (6) unnecessary transport of goods and (7) waiting by employs . Therefore, a lean supply chain aims to operate smoothly with few disturbances. It is not even designed to adapt easily to market shocks. A lean supply chain builds a separate production line for each product and avoids product exchanges. As a result, the capacity utilization rates are usually high. Long lead-time is not that big a problem for a lean supply chain as long as it is shown to be a cost efficient solution (Sillanpää, 2014).

An agile supply chain focuses on responding to unpredictable market changes and capitalizing on them through fast delivery and lead-time flexibility. It utilizes information system and technologies as well as electronic data interchange capabilities to move information faster and to make better decision. As opposed to a lean supply chain, an agile supply chain wants to be making better decisions. As opposed to a lean supply chain, an agile supply chain wants to be demand- rather

than forecast-driven. An agile supply chain strives for as short a lead-time as possible. An agile supply chain invests heavily in reduction of setup times and disfavors inventory (Stavrulaki, 2010).



(Christopher and Towill, 2002:9)

Figure 3 Supply Chain Strategies

2.4.1 Lean Supply Chain Strategy

Lean supply chain is based on cost reduction initiatives and founded on the basis of waste elimination with emphasis on improved. The lean concept examines each process

individually and gradually inefficiencies and waste are identified. Alternatives are then developed in order to improve each of the individual processes. The lean concept also focused on standardization, as organizations mass-produced their goods, whilst ignoring the customer service elements. In order to achieve the above mentioned, strong relationships within the supply chain are required. Collaborative relationships are thus a key characteristic of lean supply chain up-stream and down-stream of the supply chain which is also found to be the case in agile supply chains. The result of close collaboration has allowed organizations to reduce lead-times and so become more flexible and responsive. Mention that there are five different processes which enable the lean concept, these are namely: (1) specify value, (2) identify the value stream, (3) flow, (4) pull and (5) perfection.

These lean practices improved the performances of organizations, however unstable customer demand makes the concept of lean unattractive as the need for customization increased Lean organizations carry fewer inventories in order to improve financial results, thus also contributing towards the inability of responding to uncertainties within the external environment. A stable environment accommodates standardized processes, reduced ambiguity and improved efficiency, however as the uncertainty increases these benefits of the lean concept diminish. These environmental changes have led to developments and it is argued that agility within supply chains has developed as a post-lean concept which incorporates a selection of the principles and practices found in the antecedent. The agility concept includes more elements for protection against changes in the environment which is contrary to the lean concept (Meyer, et al., 2013).

2.4.2 Agile Supply Chain Strategy

Agility can be something which organizations might attain without comprehending it. The nature of the competencies required to develop agility should be considered as intangibles, similar to intellectual property which consists of internally created synergies. Supply chain agility is constructed on the foundation of the well-known lean concept. Firm's supply chain agility is as "a firm's ability to quickly adjust tactics and operations within its supply chain to respond or adapt to changes, opportunities, or threats in its environment". However, agility should not be mistaken as leanness. Although, 'leanness' may be a component of agility in specific situations; it will not completely support an organization to satisfy customer requirements more effectively. Agility embraces different concepts that include: (1) flexibility, (2) alertness, (3) swiftness, (4) decisiveness and (5) accessibility. Flexibility and alertness has, however, been the most influential concepts associated with agility as it plays the most critical part in the success therein. Flexibility is often used interchangeably with agility while some characteristics of agility have been identified. The need for alertness in the supply chain developed as organizations had to anticipate possible variations in the environment in which they operate (Meyer, et al., 2013).

2.4.3 Leagile Supply Chain Strategy

Agile and leanness are two strategies that are complementary but could also be conflicting towards each other. There will be instances when an untainted lean or agile supply chain strategy would be appropriate. However, this situation is mostly unlikely to develop and that a hybrid strategy may be more appropriate, as some products might experience stable demand, while other products experience a more volatile demand. A supply chain may develop the need to be lean to a certain extent and agile towards the other. The term legality has been developed in order to accommodate both of these supply chain strategies, in which these two concepts to not co-exist but complement each other in that an enterprise uses both to their advantage. This hybrid strategy can be created by the creation of a decoupling point. The decoupling point plays an important role and is seen as the facilitator of employment in a hybrid strategy and is a strategic point in the supply chain where strategic inventory is positioned. The idea is to store inventory only in a generic form and complete the final assembly only when true customer requirements are known. The further downstream in the supply chain the decoupling point is positioned, the less stress is experienced in the physical supply chain, resulting in less safety stock and overtime requirements as well as manufacturing costs, planning, material coordination and improved information transparency. This strategy is known as postponement and has increasingly been utilized by organizations. Postponement leads to improved information flows and allows for the creation of a demand-driven supply chain, which is necessity for an agile supply chain. Supply chains which stretch across multiple geographic area should be split into multiple lean and agile systems, implying that multiple decoupling points should exist. The supply chain would become sustainable and responsive. Leaglity is the combination of the lean and agile paradigm, within the supply chain and utilizing the decoupling point to provide the needed flexibility to a volatile demand downstream, but similarly providing stable scheduling upstream from the market . Improved supply chain performance implies that a supply chain should possess the ability to quickly respond to customer needs. The

lean concept focuses on cost efficiency and the agile conception customer service, thus enabling a supply chain to explore two different supply chain strategies at once (Meyer, et al., 2013).

2.5 The Agility concept

Agility can be defined as the ability of an organization to adapt and react to unexpected or unforeseen changes (Ganguly, 2009). For a market -driven supply chain, the best definition of agility is the design of the supply chain to have the same cost, quality and customer service given the level of demand and supply volatility (Cecere, 2012). According to (Kirstin, 2010) agility is the organizational ability to quickly respond and react to demand changes. Agility is a business-wide capability that embraces organizational structures. Information systems, logistics processes and in particular (Gligor, 2012). The idea of agility in the context of supply chain management focuses around 'responsiveness'. A number of researchers have addressed the notion of agile supply chains' (Alessandro Brun, 2008) like quick response, describe shorter, more flexible, demand driven supply chains, as compared with traditional supply chain concepts which are characterized by high levels of inventory and are forecast driven.

2.6 Supply Chain Agility

The Agility Forum has defined ‘‘agility’’ as the ability of an organization to thrive in a continuously changing, unpredictable business environment. Simply put, an agile firm has designed its organization, processes and products such that it can respond to changes in a useful timeframe. Despite the obvious benefits of agility, firms that operate in complex environments such as international markets, face challenges in implementing the measures necessary to increase their agility. These challenges stem from the expense associated with the complex operations and management structures necessary to support the desired attributes. For example, it may be difficult for an intercontinentally operating firm that ships components or products by sea to serve niche markets with individualized goods. Moreover, it may be difficult for this firm to promptly react to changes in

demand. Hence, unless the firm is willing to significantly increase its administrative and logistics costs (e.g. for coordinating all parts of its value and supply chains), it may be forced to take counter-agile actions in order to remain competitive, and limit its vulnerability in the marketplace. In an international environment, the supply chain often is the part of a firm that is most severely affected by changes. The firm's international supply chain frequently limits performance along many traits usually associated with agility. For example, it may be hard to adjust the structure or geographical set-up of a supply chain to react to changes in the manufacturing or political environment if the firm has plants in more than one continent. In such cases, supply chain agility may quickly become the limiting factor of a firm's overall agility. To define the term supply chain agility we first discuss the terms agility and supply chain (Prater, et al., 2001). Two concepts inherent to the definition of agility are: Speed; and flexibility. In the context of this topic, speed is a measure of the time it takes to ship or receive a good. Flexibility is the degree to which the firm is able to adjust the time in which it can ship or receive goods (Prater, et al., 2001). Tw. Flexibility may be broken down into two capabilities: (1) The promptness with; and (2) the degree to which a firm can adjust its supply chain speed, destinations, and volumes. The supply chain may be broken down into three basic segments: (1) sourcing; (2) manufacturing; and (3) delivery. The combination of these supply chain segments on the one hand and speed and delivery on the other hand leads to the definition of supply chain agility. In particular, the degree to which a firm's supply chain is agile is determined by how its physical components (i.e. sourcing, manufacturing and delivery) are configured to incorporate speed and flexibility. As the levels of speed and, more importantly, flexibility increase, the level of supply chain agility increases. The firm can, to a certain degree, make up deficiencies in the speed or flexibility of one of the supply chain parts by excelling in the other two. For example, the delivery part of the supply chain may be inherently inflexible, such as is found in sea transportation (i.e. the speed is low). Supply chain agility may be increased if the firm is able to compensate for

this shortcoming by setting up its inbound logistics (i.e. sourcing) or manufacturing operations to be fast or flexible. As the speed in outbound logistics is inflexible, speed and flexibility in manufacturing and sourcing could help compensate for the slow outbound transportation (Prater, et al., 2001). If a deficiency is serious enough to limit supply chain agility, the firm becomes vulnerable to competitors and customers (Prater, et al., 2001).Two types of vulnerability exist: (1) internal vulnerability; and (2) external vulnerability.

Internal vulnerability is a result of a lack of internal supply chain agility. That is, the manufacturing segment of the supply chain. In this paper we focus on external vulnerability, i.e. the inbound and outbound logistics part of the supply chain, as it is a major factor determining the degree of agility of firms operating in international environments (Prater, et al., 2001). The degree of external vulnerability is influenced by two related factors: complexity of sourcing and delivery and uncertainty in demand or forecasting (Prater, et al., 2001).

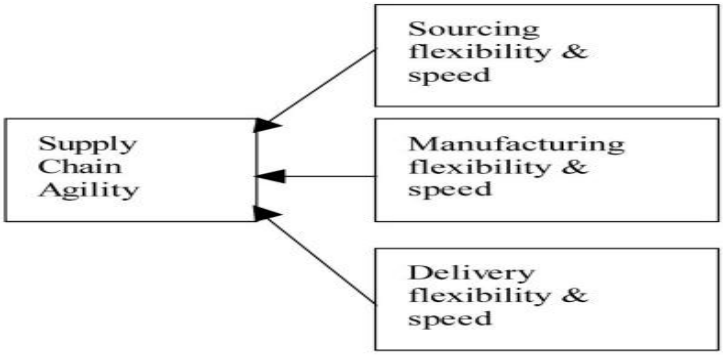


Figure 4. Supply Chain Agility

2.7 Military supply chain agility

Military supply chain require five interconnected systems; engineering, manufacturing, repair logistics, and manage opportunities for improved supply chain efficiency tend to be at the boundaries of these systems, the greatest advantages will come from focusing on (1) integrating the five systems intra-organizationally and (2) integrating the supply chain processes with collaborating supply chain partners, but integration alone will not achieve successful combat support (Muckstadt, 2016). To bring the supply chain operational excellence it is crucial to know the customer going to be served. Without a clear understanding and definition of combat unit requirements no military supply chain can be effectively constructed (Muckstadt, 2016). Supply chain requirements vary greatly by type of combat unit, within the context of the missions it is asked to perform, which vary considerably over time, all of these requirements must be thoroughly understood to establish the foundation for constructing responsive, efficient and effective supply chains (Muckstadt, 2016).

According to (Peltz, 2015) military supply chain agility is being able to better keep supply aligned with demand, in order to serve customers as well as or better than before, but at lower cost to potentially include having less inventory on hand or on order, more generally, we define improving supply chain agility as improving the responsiveness and efficiency with which customers with changing needs are served by increasing supply chain alertness and the rapidity of supply chain response to changes in demand and supply. This can include changes specific to individual items and those from broader changes in the environment that affect item segments or all or much of the item population. Research has shown that "the more dynamic the customer needs and expectation, the greater the necessity for higher levels of supply chain agility,

2.8 Determinants Supply chain Agility

As (Aziz, 2013) clearly illustrated the determinants of supply chain agility in his study, there are four determinants of supply chain agility namely information flow, organizational linkage. Resource sharing and supply chain infrastructure. Each determinant is elaborated in detail as follows:

2.8.1 Information flow

Aziz, (2013) written in his study about academics and practitioners opinion that, for firms to become flexible, adaptable and efficient, they must focus their resources on managing the information throughout the supply chain channel. On other hand, the competitive global marketplace requires firms to be flexible, for example, they are to be able to quickly respond to the spike in volume or respond change in demand; also they are required to deliver new products in a rapid development cycle, or drive towards operational excellence. Aziz cited in his paper the work of (Rajagopal, 2009) the definition of information flow in which it is the extent to which the supplier openly shares information that may be useful to the customer and supplier relationship.

Aziz also elaborated in his study when suppliers openly share their information, thus the firm will gain insights about the acquisition and use of the supplier's products, the supplier thus provides the basis for cooperating in ways to lower the customer's costs, Aziz emphasized (Andersen, 2001) opinion about open communication which can also foster functional conflict and can also be the basis for identifying and solving problems related to lowering costs, in this new competitive environment, understanding and optimizing information flows within and between organizations is the only viable alternative to costly stock holdings, further to this most companies face similar global market and competitive pressure- ever- shortening product life cycles and a need to lower costs.

The study by (Lee, 2000) mentioned in Aziz study by revealing that a program that has been particularly potent at leveraging information to increase supply chain effectiveness is continuous replenishment planning (CRP) a partnership

between manufactures and retailer wholesalers whose mutual goal is to minimize inventory holding. Besides these factors Aziz illustrated in his work emphasis given by (Lee, 2001) about how suppliers and customers have to be ready to handle web-based information flow thus enabling them which real time inventory visibility. Aziz emphasized that another key message that has to be noted on information flow in the interface between various types of enterprise system these system should be able to talk to each other or the players should have similar system. As it is cited in Aziz's work the bullwhip effect in a simple supply chain is investigated by (Chen, 2000). As the study shown that providing each stage of supply chain which complete access to the customer demand information significantly reduce the increase in variability. This again concludes that information flow is important and when it operates to all stages of the supply chain, the materials management becomes easier.

2.8.2 Organizational linkage

Aziz used the concept of organizational linkage from (Hussein Zolait, 2010) which the establishment of the formal linkage between external supply chain integration and internal linkage within supply chain integration, organizations are able to concerning the positive impact of supply chain linkage on performance.

Firms can be seen active players in developing business process in a win-win situations and jointly developing incentives, which are aligned against their task. Next, joint capacity planning with open communication across the channel internally and externally can also be developed. Firms can share the demand forecast in a timely manner via the information flow between them, which acts as an intervening factor in meeting the increasing uncertainty in demand (Kamil Aziz and Zailani, 2013).

2.8.3 Resource sharing

According to (Rajagopal, 2009) resource sharing in relation to supply chain agility has been concerned with the individual functions of operations management, order processing, inventory control, traffic management and the

like. Through resource sharing efforts, firms can restructure activities and realignment of resources within and across firms. While knowledge and technology are shared across these channels without much dispute (Ali Hussein Zolait, 2010). Additionally, it's relevant to note that customer relations management teams are formed to focus on long-term business gains. They make mutual adjustments mutually on their business operating procedures. Rajagopal et al., (2009) suggested that customer/ vendor scorecard forms are introduced to monitor the relationships and these are again used to measure their performance. The next phenomenon in managing the suppliers is the "supplier base" Which suggests that having a certain number of suppliers will facilitate better understanding and flexibility to firms which will eventually benefit in driving the cost and cycle time to its optimum.

2.8.4 Supply chain infrastructure

The supply chain infrastructure is associated with the logically and physically connected support among the various business processes, including the systems. An enrichment of product codes through semantics would provide the infrastructure that enables organizations to build an effective online business while product profiling, transaction processing, targeted marketing, and merchandising can integrate to create a comprehensive, customized system (Dimitri, 2001). (Mount, 2001) discussed the supply chain infrastructure set-up which will facilitate the inventory management. They noted that the internet-based supply chain system will provide early warning of an imminent slowdown in demand.

According to (Zhao, 2003), there are two classes of infrastructure systems, enterprise resource planning (ERP) systems and supply chain management (SCM) systems that are widely used to support the coordination of activities across major organizational and supply chain partners. They collectively referred to such systems as supply chain infrastructures (SCIS) and identified three categories of SCIS: (i) connectivity-based infrastructure, (ii) Database infrastructure, and (iii)

Middleware-based infrastructure. The connectivity-based infrastructure binds various ERP and SCM system together within and between organizations to perform an electronic data exchange. The data in the infrastructure may flow through EDI (Electronic data Exchange), HTML (Hyper-Text Markup language), and XML (Extensible Markup language (Sokol.P, 1996). The database infrastructure is the management of the various systems to realize the promise of XML as an enabler for exchanging business data (Sanjiv, 2002). The middle ware-based infrastructure provides inter-optional services such as transaction, directory, persistence, event handling messaging and process execution based on an architectural standard (Zhao, 2003).

2.9 Dimensions of supply chain agility

David Marius, 2013 illustrated in his study that there are five firm supply chain agility dimension alertness, accessibility, decisiveness, swiftness and flexibility. According to the study identification and clarification of the dimension of agility enables the development of a comprehensive definition of the supply chain agility. The following subsections present the literature review that lead to the emergence of the supply chain agility dimensions.

2.9.1 Alertness

According to (Gligor, 2013) alertness is defined as the ability to quickly detect changes, opportunities, and threats. The alertness theme emerged across a variety domains .within manufacturing research made by (Zhang, 1999) cited in the research paper of (Gligor,2013) recognize that agile organization need a basic ability that consists of sensing , perceiving , and anticipating changes in the business environment. The alertness in achieving the desired level of agility is also emphasized within information system and information development research. Within a supply chain management context (Christopher, 2000) was the first to acknowledge that, to be truly agile a supply chain must be capable of reading and responding to real demand. He refers to this capability as market sensitivity. Military science researchers have extensively investigated the concept

of agility (Dekker, 1999) sees agility as the ability to perceive an upcoming threat and respond to it quickly. While the US Army defines it more simply as the ability of friendly forces to act faster than the enemy (Army, 1997). The alertness dimension of agility is captured within the observe and orient stages of the loop and is a perquisite to an agile response. The speed of recognition of environmental elements is considered critical (Alberts, 2007) in combat, military forces require early awareness of upcoming threats. The quicker changes are detected the sooner the response can be deployed.

2.9.1.1 Identify Change

(Lin, et al., 2006) suggest several enabling attributes of supply chain agility including capturing demand information quickly, making information accessible in the whole of the supply chain and actively share knowledge with partners. These are connected to having access to updated information throughout the whole supply chain to reach a high level of supply chain agility.

2.9.1.2 React to change

(Swafford, et al., 2008) suggest a couple of time- related measurement of supply chain agility that emphasize the importance of making change happen in a speedy manner for the company to be agile. Speed in reducing manufacturing led time, speed in increasing frequency of new product introductions, speed in adjusting delivery capability and speed in improving responsiveness to changing markets needs are including among these.

2.9.1.3 Recover from change

The measurements connected to this sub- capability in literature are all in SCOR (APICS, 2017). Some are connected to the reestablishment of cycle times after an increase or decrease in product volumes. Other are connected to the amount of inventory that can be phased in or out without cost penalty given 30 days.

2.9.2 Accessibility

Accessibility emerged as the second dimension of firm supply chain agility. It is defined in the study as the ability to access relevant data **(**David Marius, 2013).

Research suggests that once a change is detected through the alertness capability. Firms must also be able to access relevant data to decide how to provide an agile response (David Marius, 2013). Supply chain-wide information access is recognized as a key requirement for supply chain agility. In his seminal article, Christopher (2000) agile supply chains must possess a number of distinguishing characteristics. Agile supply chains must be virtual, that is, they must be information based rather than inventory-based. Supply chain members must share real-time demand, inventory, and production information (Ahn, 2012). The creation of virtual supply chains allows all supply chain members to access relevant data and make informed decisions about how to respond to changes detected in the environment .Lin et al. (Lin, 2006) refer to the capacity to access information as information integration, and describe it as the ability to use information technology to share data between buyers and supplies. Information integration can be considered the infrastructure needed to create a virtual supply chain (Chrstophor, 2004 and 2008).

2.9.3 Decisiveness

It is defined as the ability to make decisions resolutely. Decisiveness was identified as the third dimension of firm supply chain agility (David Marius, 2013). Sports science and military science research suggest that agility is dependent upon the ability to make resolute decision using the available information (David Marius, 2013). Motor learning researchers have recognized the role of decision making in agility tasks. They managed to isolate the decision-making time of players in order to evaluate its contribution to agility performance (Sheppard, 2006). Researchers control the alertness and accessibility aspects of agility by presenting the stimulus to the player (limited need for detection) and by offering the information on how to respond to the stimulus (limited need for information accessibility). In their definition of agility, (Young, 2002) recognizes that the two main components of agility are change of direction speed and decision- making factors.

In a supply chain context Christopher (2000) makes a clear distinction between speed (meeting customer demand through shortened delivery lead times) and agility (responding quickly to changes in demand in terms of both volume and variety). Military science research also recognizes the importance of decisiveness. The decide phase is one of the components of the CODA (observe, orient, decide, act) loop (Fewell, 2005).

2.9.4 Swiftness

The ability to implement decisions quickly is defined as swiftness .This element emerged as the fourth dimension of firm supply chain agility. In the (Merriam-Webster, 2012) dictionary definition of agility, swiftness is recognized as a core characteristic of the concept. Christopher (2000) suggests that one of the required capabilities of agile supply chains is quickness, and defines it as the ability to complete an activity as quickly as possible. This ability is consistently recognized as a key enabler of agility across supply chain management research (Sharp et al.1999, Lin et al.2006, Jain et al 2008). Swiftness is also captured within Li et al.'s (2008; 2009) response capability dimension of firm supply chain agility. (Kumar & Motwani, 1995) refer to the swiftness dimension of agility as the accelerate activities on a critical path.

2.9.5 Flexibility

Flexibility is defined as the ability to modify the range of tactics and operations to the extent needed. This element was identified as the fifth dimension of firm supply chain agility. Research suggests that a firm‘s response to changes depends on the flexibility of its supply chain tactics and operation. Supply chain agility literature recognizes the role of flexibility in providing an agile response. Empirical research found a direct positive relationship between procurement and manufacturing flexibility and supply chain agility (Swafford, et al., 2008).

In their frame work, Swafford et al. consider supply chain agility as an externally focused capability that is derived from flexibility (internally focused competency) in supply chain processes. Research also indicates that supply chain flexibility

directly and positively impact supply chain agility (Swafford et al. 2008). Flexibility has long been identified as a key agility dimension across manufacturing research (Nagel & Dove, 1991).

2.9.5.1 Mix flexibility

(Beamon, 1999) defines mix flexibility as the ability to change the variety of products produced. Swafford et al. (2008) suggest a flexibility measure of the ability to accommodate changes in the production mix. A similar measure is suggested that the number of different products that can be produced within a given time period is a measure of mix flexibility. Another dimension of mix flexibility found in literature is focused on the effort of changing between productions of different products. The effort is either connected to the time to change.

2.9.5.2 Volume Flexibility

(Beamon, 1999) defines volume flexibility as the ability to change the output level of products produced. Another consideration regarding this kind of flexibility influencing agility is it defines the range of volume over which the firm can run profitably (Tsourveloudis & Valavanis, 2002).

2.9.6 Quickness

The relevant areas for measuring quickness found in literature are grouped under the three sub-capabilities identified as namely operations lead time, delivery time and timeliness, and new product time to market.

2.9.6.1 Operations lead time

The measurements within this sub-capability are all related to the time it takes to source and produce products. (Sharifi & Zhang, 1999) and (Swafford, et al., 2006) suggest that the ability to reduce the manufacturing lead times is a way of measuring supply chain agility. Similar to this, (Swafford, et al., 2008) suggest that the ability to reduce manufacturing throughput times to satisfy customer delivery is contributing in achieving supply chain agility. The manufacturing

cycle time is also measured as part of the agility dimension in (APICS, 2017) which is also the case for procurement cycle time.

2.9.6.2 Delivery leads time and timeliness

The measurement found in literature that is connected to this sub- capability is focusing on the time it takes to deliver the products. (Goldman, et al., 1994) in (Swafford, et al., 2006)suggest that the ability to reduce the delivery lead times is a way of measuring supply chain agility.

2.9.6.3 New product time to market

The measurements found in literature that are connected to this sub- capability are focused on the time it takes to develop and introduce new products. Lin et al. (2006) argue that fast introduction of new products is part of one main enabling attribute in achieving supply chain agility. Similarly, Goldman et al. (1994) in Swafford et al. (2006) suggest that the ability to decrease ramp-up time for new products and the ability to reduce product development cycle time are ways of measuring supply chain agility.

2.9.7 Competency

(Zhang & Sharifi, 2007) and Lin et al. (2006) both suggest that good relationships with other supply chain actors are an important enabler of agility. Lin et al. (2006) put emphasis on the trust dimension of relationships while Zhang and sharifi (2007) suggest that the number of suppliers as well as their involvement in product development and planning activities influence agility. The study highlighted as a literature review that the level of partnership could be measured by the stage at which the supplier gets involved in the operations of the customer organization. Other authors suggest that partnership could be measured by the level of mutual improvement initiatives and problem-solving efforts between the supplier and customer. Another enabling attribute within the competency capability of agility is suggested to be vertical integration. This is connected to the operation efficiency and effectiveness dimension of competency. M any authors also emphasis the technology dimension of competency being important in

achieving agility. Swafford et al. (2008) also suggest several areas of use of IT to coordinate and integrate activities in the supply chain.

2.10 Rations

2.10.1 Introduction

According to army knowledge online, 2015 rations are divided in name by operational objective and are referred to as individual meals, group meals, or special meals.

2.10.2 Garrison Ration

It is a group rations, feed more than one soldier, group rations provide meals in either 18 or 50 person modules depending on the specific group of ration selected. The mandatory supplement, milk and other meal enhancements such as bread, salad, vegetables, and fruit are necessary to provide a fully balanced dining experience (USArmy, 2015).

2.10.3 Combat ration

According to (Wikipedia, 2010) a field ration (also known as combat ration, ration pack, or food packet) is a canned or pre-packaged meal, easily prepared and consumed by military troops. They are distinguished from regular military garrison rations by virtue of being designed for minimal preparation in the field, using canned, vacuum-sealed, pre-cooked or freeze-dried foods, powdered beverage mixes and concentrated food bars, as well as for long shelf. Most field rations typically contain meat as one of its main course. Such meals also prove invaluable for disaster relief operations, where large stocks of these can be ferried and distributed easily, and provide basic nutritional support to victims before kitchens can be setup to produce fresh food. Individual operational rations are used when mission conditions dictate group operational ratios cannot be issued or prepared. Special operational rations and commercial food sources are available to support unique situation such as training, survival, special religious requirements, and humanitarian assistance. Individual operational ration meals,

such as the MRE, are packaged, pre-cooked foods that will provide one soldier one complete individual meal.

According to army knowledge online, 2015 there are four types of combat/operational rations: these are the MRE, tailored operational training meal (TOTM), meal cold weather (MCW), food packet, long range patrol and first strike ration (FSR). The MRE is the primary and most familiar individual operational ration meal. It is continually reviewed and new menus are added annually to avoid menu boredom. MREs are packaged meals designed for consumption either as an individual meal or in multiples of three as a complete day's ration. This ration helps to sustain individuals during operations that prevent the use of organized food service facilities.

2.11 Combat ration supply chain agility

The following literature written by US Natick soldier center clearly showed how to work on the supply chain agility of combat ration. They exhaustively worked on it to make their army operate everywhere in this contemporary operating environment of the world. The contemporary environment of the world requires state-of-the art combat rations to provide for the nutritional needs of the warfighter in a wide variety of situations, from peacekeeping to high- intensity combat and contingency operations. Under auspices of the US DOD combat feeding directorate (CFD) and Defense Logistics Agency (DLA) troop support employ a total life cycle approach in developing, testing, evaluating, procuring, fielding and supporting all military rations. These rations are a vital contribution to the overall quality of life of the individual combatant. DOD CFD is responsible for the research, development, engineering, integration, and technical support for the entire family of combat rations. The program is driven by Warfighter timely manner and at an affordable price. The mission of the DOD combat feeding program is to ensure that America's warfighters are the best fed in the world. By investing in high risk/high payoff science and technology, and utilizing

continuous product improvement (CPI), CFD provides Warfighters with revolutionary combat feeding capabilities (NSRDEC, 2012).

2.12 Empirical study made on supply chain agility

The empirical study made by (peltz et al., 2014), gave conclusions and recommendations to USA department of logistics on supply chain agility of generalized items in order to minimize excess inventory. The study illustrated supply chain agility as the responsiveness and efficiency with which customers are served when they have changing needs. As an emphasis made by the study improvement in supply chain agility enable an organization to reduce material stock outs and inventory excess that leads to disposal. The study also proved that improving three processes enables supply chain agility to improve: increasing the speed and accuracy of the delivery of information about planned changes that will affect customer demands, shortening lead times, and reducing order quantities. The study find out that American Defense logistics Agency has strong incentives for improving its supply chain agility. Due to this it places a high priority on avoiding stock outs to meet customer needs. The study also found that American Defense Logistics agency had been generating excess inventory, resulting in an average of $1 billion in annual disposal. As a result the study find out that improving supply chain agility offers opportunities to increase customer service and inventory efficiency, thereby reducing the annual level of disposals and thus the annual level of purchases for inventory. Through analyses that spanned the entire USA Defense Logistics Agency supply chain agility based on the results of these analyses, the study identified a number of recommendations for process improvements that will lead to greater supply chain agility. According to the study USA DLA is already implementing some of these recommendations. The recommendations given by the study are the following: Increase the Emphasis on DLA supply chain Agility enterprise wide, continue and expand efforts to reduce lead times, right-size order quantities, continue efforts to increase the use of long term contracts and improve the flow of information about demand changes from

customers. This study is aimed to resolve the problem of combat ration supply for urgent military mission in the case of Ethiopian defense logistics department. When we compare the scenario of this study with the American army they are in fear of disposing surplus products which is excess from consumption. From the above literature what we can conclude is that Americans need supply chain agility to minimize inventory while in Ethiopian Defense logistics case it is to obtain combat ration with the minimum amount required for urgent military mission.

2.13 Conceptual frame work of the study

As many scholars of supply chain management agrees with supply chain agility is a concept which is about to respond/ react for urgent/uncertain demand of customer requirement, agility in supply chains is critical for competitive advantages as it helps to explore and exploit opportunities in fast changing markets. Firms are increasingly dependent on information in takes. As (Kumar, et al., 2015) cited in their study and defined agility as it is the ability of an organization to respond rapidly to changes in demand both in terms of volume and variety. They also cited and defined agility as a means of using market knowledge and a virtual corporation to exploit profitable opportunity in a volatile and unpredictable demand increases the need of agile supply chain for any firms. With respect to manufacturing or agile strategy mainly relies on strategic alliances / partnerships (virtual enterprise environment) to achieve speed and flexibility. But agile strategy is not so much concern about the issue of cost and the integration of suppliers and customers. Agility of a firms' supply chain depends on how well the components of the supply chain are configured to include speed and flexibility such that the level of supply chain agility increase as the levels of both speed and flexibility increase (Somuyiwa, et al., 2011)

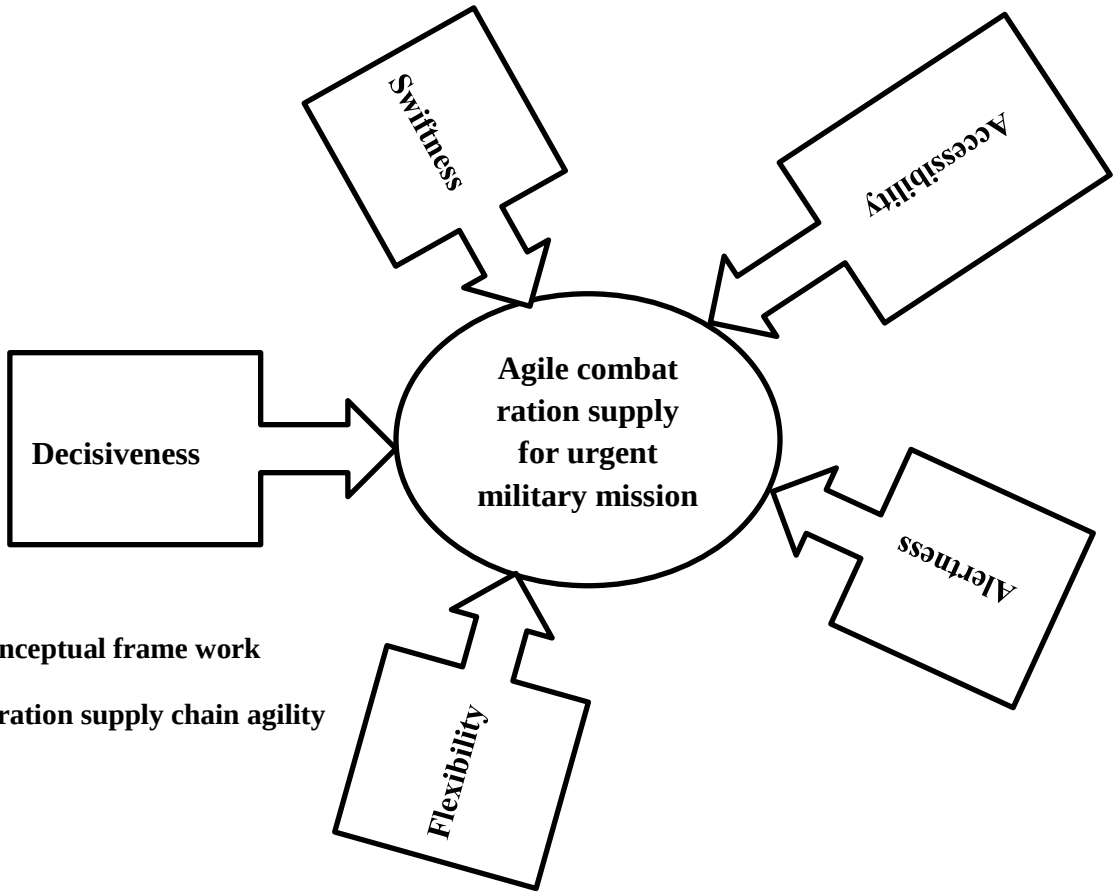


Figure 2 conceptual frame work

on combat ration supply chain agility

Chapter Three

3. Research Methodology

3.1 Introduction

This chapter provides a discussion of the research methodology which was used in this study. It discusses effective approaches equipped throughout the research process and structured into study area, research design, target population, method of data collection and research instruments, reliability test, data analysis techniques and ethical consideration. This is important in ensuring that the study to address the set objectives and in turn will answer the research questions on which it will found.

3.2 Description of the study Area

The FDRE Defense Minister is one of the ministerial offices and located in Addis Ababa in front of Ambassador Theatre, under this ministerial office there are different commands and departments. Among the departments Defense Joint logistics main department is one of the key army departments. It is located in

front of armed force general hospital, its activities and mission is generally to support mission during war and peace. The study had focused on supply chain agility of combat ration in response to urgent military missions in the case of Ethiopian national defense logistics department. Ethiopian national defense logistics department is responsible for the supply of combat ration for the army during urgent missions and in normal situations any other supplies which are essential for the army too. The logistics department is the one which is always busy in mission support relatively with other departments. Specifically during casualties this department has a vital role in mission accomplishment. Therefore to support the army in urgent missions this department has a relationship with some manufacturers of combat ration, these manufacturers of combat ration are ELFORA Agro industry, Kality Food complex, Dire Dawa Food complex and Sugar Corporation. Manufacturers of combat ration, have a relationship with suppliers of raw material and packaging companies. The end users of combat ration are the war fighter army found in different army units. The above mentioned are the supply chain members of combat ration supply. The study obtained relevant data concerning raw material and packaging from manufacturers of combat ration.

3.3 Research Approach

The research approach is both qualitative and quantitative in which it involves describing the supply chain agility phenomena in quality, speed or efficiency to have insight into problems on supply chain responsiveness. The study asks the target' population questions about their opinions on combat ration supply chain responsiveness during emergency. The study merely describes what people say; they think and do about the supply chain agility of combat ration. The study also attempted to find relationships between the dimensions of supply chain agility with the respondents and their reported opinions.

3.4 Research Design

Research following a qualitative approach is exploratory and seeks to explain how and why a particular phenomenon, or program, operates as it does in a particular context (WEBB, 2009). In this proposed study descriptive study design is used. The study addressed the opinion and phenomenon of respondents based on the gap of supply chain agility of combat ration and then describes the observed phenomena and received opinion from the study population. The study is conducted on supply chain members involved in the supply and consumption of combat ration which are mentioned in this study.

3.5 population of the study

Total population of the study was 106. From food processor's 36, from defense logistics main department officials 20, from special force unit commanders and from the war fighter army 50 soldiers/ consumers of combat ration are selected from different special force units. From the population data 4 managers of combat ration producers and two Ethiopian defense logistics commanders additionally gave interview. The above number of population in supply chain member is determined by judgmental/purposive sampling design. This sampling design is selected because of the data supposed to be collected can be obtained from key informant groups of each supply chain members. In order to get data from concerned officials and experts this design is appropriate. The number of the fighter army is selected purposely from the special force to get up- to- date data about combat ration supply chain agility problem.

3.6 Sample design

The study will follow a purposive sampling procedure. Purposive/judgmental sampling is typically used in qualitative research to identify and select the information-rich cases for the most proper utilization of available resources. This involves identification and selection of individuals or groups of individuals that are proficient and well-informed with a phenomenon of interest. In addition to knowledge and experience, and note the importance of availability and

willingness to participate, and the ability to communicate experiences and opinions in an articulate, expressive, and reflective manner (Etikan, 2016). However purposive sampling is one of the most cost-effective and time-effective sampling methods available it has vulnerability to errors in judgment by researcher, low level of reliability and high levels of bias and inability to generalize research findings (Dudovsky, 2020). John, Dudovsky (2020) suggested that qualitative research is often criticized for lacking generalizability but he confirmed that being too reliant on the subjective interpretations of researchers, qualitative data is incapable of replication by subsequent researchers. This sampling design is selected because of the specificity of the supply chain partners of combat ration are heterogeneous in nature. In addition the combat ration usage is limited with soldiers who are engaged in frequent armed mission and the issue is the concern of specific official in the army unit and defense logistics department. Furthermore the supply chain partners of the combat ration are also very specific and few in number. The research type of this study is descriptive the variability of the population is heterogeneous because of this it is better to use purposive/ judgmental sampling method. Even if the sampling error happens it will reduce the sampling error by increasing my sample size and my confidence level will be as much as possible 95%. Aiming to obtain reliable source of data the research limited the study on concerned officials of the supply chain members and consumers of the combat ration. Mostly the combat ration consumers are the war fighter armies who engaged in frequent armed mission. Among the armed units the special force is mostly mobile in domestic and cross boarder emergency missions. Therefore the population number taken from the special force is enough to express the consumer's opinion because this force is the more mobile than other ground forces in the past and currently. The other supply chain members are specific and known to make them as a target population.

3.7 Data sources and types

The data source for this study is primary data source which is obtained through interview, questionnaire and semi structured questioner for interview. It is not easy to get secondary data in Ethiopia context on this research topic. It is unusual to write any literature about the military in our case. For this reason it is mandatory to access primary data through interview and questionnaires'.

3.8 Data collection procedure

The data collection procedure had been done through interview and questioner. The data is collected from each supply chain member through questionnaire and interview. For each member of the supply chain the same type of interview and questionnaire is forwarded. The opinion collected from each supply chain member is analyzed and concluded separately.

3.9 Data measurement and instrumentation

Measurement instrument refers to the various methods through which a researcher obtains data from respondents for his research work ((Japheth, 2011). Measurement tools are instruments used by researchers and practitioners to aid in the assessment or evaluation of subjects, clients or patients. The instruments are used to measure or collect data on a variety of variables ranging from physical functioning to psychosocial wellbeing. Types of measurement tools include scales, indexes, surveys, interviews, and informal observations (Washington, 2020). Based on this the study is conducted using both types of data collection methods interview and questionnaire. **Measurement of variables** for the interview questions, each supply chain partner asked and summarized individually. Generally the data collected will be summarized qualitatively and quantitatively analyzed.

3.10 validity and reliability of instruments

Leul Weldeyes (2019) cited in his paper that validity of an instrument is the degree to which an instrument measures what it is intended to measure. Validity can be categorized in to internal and external validity. Internal validity refers to the ability of the research design to accurately answer the research questions. External validity refers to the capacity to generalize findings and develop inferences from the sample to the study population. To achieve internal validity, questionnaires included a variety of questions on the knowledge of the key informant groups about combat ration supply chain agility in response to urgent military missions. The Questions was based on information gathered during the literature review to ensure that they were representative of what respondents should know. Internal validity was further ensured by consistency in administering the questionnaires. All questionnaires were distributed to 106 respondents by the researcher personally. The questions were formulated in simple language and translated to Amharic language for clarity and ease of understanding. Clear instructions were given to the subjects. The experts confirmed that most of the questions are standard and fit to be distributed but some of the modified questions needed to be reshaped in relation to the research objective and the researcher corrected them accordingly. In order to demonstrate the independent variable which was directly responsible for the effect on the dependent variable and ultimately for the results found in the study; I applied the whole processes of the research question , objective and theories that helps me to confirm the validity of the study . To ensure the reliability of the data to be collected I used data collection and instruments like interview and questionaries' with direct observation of what respondents forwarded on interview and questionnaire.

3.11 Ethical consideration

To have permission of the selected target group for data collection the researcher will have a letter from Addis Ababa university graduate school of commerce department of the selected target group will give assurance about the confidentiality of the information data to be collected through interview or questionnaires'.

3.12 Data analysis Technique

The data was prepared by edition and tabulation before it was analyzed. Editing has been done to ensure that the data was properly entered and tabulated. The data was arranged in columns and rows to clearly show the analysis. Descriptive data analysis was done using averages, frequency distribution, and percentage distribution. The reason for this type of approach was to identify and describe the gap on combat ration supply chain agility and describe its effects on urgent military mission performance. The data to be collected from questionnaire was analyzed by using averages, frequency distribution, and percentage distribution and they were interpreted according to their type. Finally the responses from interview and questionnaire were triangulated in order to make the study more valid. The study included both dependent and independent variables. The relationship between these variables was measured by describing their occurrence in frequency, average and percentage distribution.

Chapter Four
Results and Discussion

4.1 Introduction

This chapter includes presentation, analysis and interpretation of data collected through questionnaire and interview. The data were collected from Ethiopian Defense logistics department, special force units, ELFORA Agro industry, Sugar Corporation, kality food complex and Dire Dawa Food complex. The researcher distributed 106 questionnaires to the respondents and collected all the questionnaires. The researcher conducted interview with the chief of logistics

main department and with managers of food processing factories. Descriptive research design was used to conduct this study.

4.2 Sociodemographic Characteristics of the respondents

Participants were 20 officers working at different sub departments of the Ethiopian Defense logistics main department which are 18.6% of the participants , from special force 50 (47.16%) of the participants, 36 (33.96%) participants were selected from four different combat ration manufacturing areas, Sugar Corporation, ELFORA Agro industry, and Dire Dawa food complex and Kaliti food complex management. The assortment of the population in sex, age, education, rank, and service year is given in the table below.

Table 1: Characteristics of Respondents

Distribution of Respondents			
Indicators		F	%
	Male	80	75.8
	Female	26	24.2
	Total	106	100.0
	Less than 30	20	16.4
	30-39	41	33.6
	40-50	58	47.5
	51-60	3	2.5
Respondents Age	Total	106	100.0
	Certificate	18	19
	Diploma	33	31
	Degree	38	35
	Master's degree	16	14
	PhD	01	1
Respondents' Educational Status	Total	106	100.0
	Special force	50	47.16%)
	Defense Logistics staffs	20	18.6%
	Sugar Corporation	9	8.49%
	Dire Dawa Food Complex	9	8.49%
	Kaliti Food Complex	9	8.49%
	ELFORA	9	8.49%
2.2. Respondents'	Total	106	100.0

	6-10 Years	51	48.2
	11-15 Years	17	16.2
	16-20 Years	26	21.3
	More than 20 Years	12	24.5
Years of Service	Total	106	100.0

As indicated in the Table 1 above, (88%) of the respondents are male. Most of the respondents are in the middle age which contain (58.0%) is 40-50 and significant (20.0%) numbers of them are age 30. This range of age in supplementary to their educational back ground in which Certificate (19.0%) Diploma (31%) most (35%) are first-degree holder, Master's degree (14.0%) PhD degree (1.0%) it is helpful to make their response be free from irrationality. The military rank divided nearly equally (33.0%) of the respondents are higher officers, (31.0%) Line Officer and (36.0%) are from special force and logistics main department staffs and (33.96%) different food processing companies like ELFORA, Dire Dawa food complex, Kaliti food complex, and this is because the employed selection method was based on judgmental/purposive sampling based on knowledge on the area, academic background, year of service military rank and exposure to the topic of the research question. Service year is mostly (51.0%) under 6-10 year of serving in the military or in the other institution's department. In sum, the distribution of the characteristics of the respondents according to the requested item is gainful in using the diversified feelings to diversified responses. In the preceding part, the respondent's data is presented. The presentation follows the procedure of judgmental/purposive data collection method employed in the study. Thus the researcher discussed with higher level leaders in different company, military Officers and logistics main department staffs consecutively with respect to conceptual frame work taken from the literature review.

4.2 Supply Chain Agility of Combat ration in response to FDRE Defense Force Urgent Military Mission

The data collected through questionnaire and interview is presented in table for discussion for each supply chain agility dimension. The data was collected with two different strata on the alertness dimension all supply chain members participated and responded. On the other supply chain dimensions except the end user of combat ration (the special force) all members participated and responded. Therefore from the study population 106 were participated on supply chain agility dimension alertness. On other supply chain agility dimensions like accessibility, decisiveness, swiftness and flexibility 56 study populations were participated and responded to the questionnaire given.

4.2.1 Alertness to Supply Chain demand of Combat Ration for FDRE Defense Force

7 (7.05%) of the respondents responded that there is a very quick response to become alert to detect changes in demand of combat ration. 21 (20.3%) of the respondents responded that there is a quick response to become alert to detect changes in demand of combat ration. 51 (48.32%) of the respondents responded that there is a Slow response to become alert to detect changes in demand of combat ration. 13 (12.22 %) of the respondents responded that there is a very slow response to become alert to detect changes in demand of combat ration. 1(1.41 %) of the respondents responded that there is a moderate response to become alert to detect changes in demand of combat ration respectively. 11.4 (10.71 %) of the respondents responded that there is a steady response to become alert to detect changes in demand of combat ration respectively. 27.35% of the study population responded that the supply chain of combat ration alertness to detect demand earlier is very quick and quick. 1.41 % of the study population responded that the supply chain of combat ration alertness to detect demand earlier is moderate. From the above data presentation 71.25% of the study population responded that the supply chain of combat ration alertness to detect demand earlier is very slow,

slow and steady. The rest 28.75 % responded that quick and very quick to detect combat ration demand earlier. As per the interview taken from all manufacturing companies of combat ration they have the same response and they all said they only produce as per the order arrives their factory premise and then they try to share their demand of raw material to suppliers of raw materials. Ethiopian defense logistics department response is that it is difficult to obtain combat ration when we demand it urgently for urgent missions. Production capacity of producers is very less it cannot cover the demand of the army. The food processors machine is very old with less production capacity. This makes the supply chain of combat ration unreliable. Due to this it is difficult to have reserve stock of combat ration for future uncertain demand. The allocated budget for ration is under usage because of very less supply of combat ration for urgent military mission. Alertness as an element of supply chain agility is crucial as a proper response would not be possible if a supply chain is not alert to changes within the surrounding environment. This ability manifests itself in the ability to monitoring market trends, analyzing demand through point of sale information and truly understanding customer's needs (Li *et al.* 2009, 415). Generally the interview and the data analysis showed the combat ration supply chain is not alert enough to respond for urgent requirement of combat ration.

Table 2 Alertness to Supply Chain demand of Combat Ration for FDRE Defense Force

Parameters	Very quick		Quick		Slow		Very Slow		Moderate		Steady			
Alertness	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%
1.1 How do you detect changes, opportunities, and threats in the supply of combat ration?			27	25.50%	65	61.40%	14	13.10%					106	100%
1.2 How do you detect changes in demand of combat ration?			20	18.80%	65	61.40%	13	12.30%	8	7.50 %			106	100%
1.3 How do you sense when there is change in demand of combat ration?					78	73.60%	18	16.90%	7	6.60 %	3	2.60 %	106	100%
1.4 How do you respond to the detected change in demand?	11	10.30%	13	12.20%	67	63.20%	15	14.00%					106	100%
1.5 How do you anticipate the level of changes in demand of combat ration?			11	10.30%	68	64.10%	27	25.40%					106	100%
1.6 How do you perceive an upcoming threat and respond to it quickly?			17	16.30%	62	58.50%	27	25.40%					106	100%
1.7 How is your speed in reducing manufacturing lead time?			23	21.70%			7	6.60%			76	71.70%	106	100%
1.8 How is your speed in increasing frequency of new product introductions?	49	46.20%	23	21.70%	16	16.00%	9	8.49%			9	8.49 %	106	100%
1.9 How is your speed in adjusting delivery capability?			14	13.30%	77	72.70%					15	14.00%	106	100%
1.10 How is your speed in improving responsiveness to changing market's needs?	15	14.00%	67	63.20%	13	12.30%					11	10.30%	106	100%

KEY= NR -number of respondent ***Source: Compiled from own survey questionnaire (2020)***

4.3 Supply chain agility dimension on Accessibility of information with in the Supply Chain of Combat Ration

Table 3. Accessibility of information with in the Supply Chain of Combat Ration

S/N	Parameters	YES		NO		some how		Total	
2	**Accessibility**	No	%	No	%	No	%	No	%
	2.1 Are you able to access relevant data to decide how to provide an agile response?	45.5	81.25%	10.5	18.7%	----	----	56	100%
	2.2 Do you have a supply chain-wide information access?	11.2	20%	44.8	80%	----	----	56	100%
	2.3 Do you make information accessible in the whole of the supply chain and actively share knowledge with partners?	07	12.5%	49	87.5%	----	----	56	100%
	2.4 Is your institution information – based for agile supply chain?	33.6	60%	22.4	40%	----	----	56	100%
	2.5 Do you share with Supply chain members about real-time demand, inventory, and production information?	36.4	65%	19.6	35%	----	----	56	100%
	2.6 As an institution do you use information technology to share data between buyers and suppliers?	12.6	22.5%	35	62.5%	8.4	15%	56	100%
	2.7 Do you use IT to coordinate and integrate activities in the supply chain?	11.2	20%	25.2	45%	19.6	35%	56	100%
	2.8 Do you have good relationships with other supply chain actors?	37.8	67.5%	18.2	32.5%	----	----	56	100%

Source: Compiled from own survey questionnaire (2020)

24 (43.59%) of the respondents replied yes which implies that they are able to access relevant supply chain data for urgent mission requirement. 28 (50.16 %) of the respondents replied no which implies that they are not able to access relevant supply chain data for urgent mission requirement. 3(6.25%) of the respondents replied somehow which implies that they are not fully able to access relevant supply chain data for urgent mission requirement. As per the interview taken from combat ration supply chain members; they all have less activity in capturing demand information quickly and making information accessible in the whole of the supply chain and actively share knowledge with partners. Generally the data

analysis and interview analysis showed that the supply chain information is not fully accessible.

4.4 Decisiveness in response to Urgent demand of Combat Ration

Table 4. Decisiveness in response to Urgent demand of Combat Ration

Decisiveness					No	%
3.1 Do you make decisions resolutely using the available information?	51.1	91.30%	4.9	8.75%	56	100%
3.2 Do you capture demand information quickly?	53.2	95%	2.8	5%	56	100%
3.3 Are you really capable of reading and responding to real demand?	43.8	78.20%	**17.2**	**22.80%**	56	100%
3.4 Do you involve suppliers in product development and planning activities?	2.8	5%	53.2	95%	56	100%
3.5 Do supplier gets involved in the operations of the customer organization?	43.7	78%	12.3	22%	56	100%
3.6 Do you have a vertical integration with in a supply chain?	47.2	85.30%	8.8	14.70%	56	100%
Total sum	241.8	432.80%	99.2	168.25%		

Source: Compiled from own survey questionnaire (2020

40 (72.13 %) of the respondents replied yes which implies that they make decisions resolutely using the available information. 16 **(**28.04**)** of the respondents replied no which implies they do capture demand information quickly when the rest 02 (05 %) answered yes which implies they don't capture demand information quickly. Majority of the respondents replied that decisiveness in response to urgent demand of Combat ration is positively responded. Speed in reducing manufacturing lead time, speed in increasing frequency of new product introductions, speed in adjusting delivery capability and speed in improving responsiveness to changing markets needs are very crucial but they are not applicable by all food processors stated in this study. Kality food complex is now starting to expand manufacturing capacity. This shows that unless combat ration supply chain information is accessible enough and if there is no early detection of demand being decisiveness by itself is nothing. The supply chain agility dimensions are interconnected and one dimension is dependent on the other.

4.5 Swiftness of supply chain in response to urgent Combat Ration demand

Table 5. Swiftness of supply chain in response to urgent Combat Ration demand

S/N	Parameters	YES		NO		somehow		Total
4	**Swiftness**	No	%	No	%	No	%	No
	4.1 Do you decide quickly to change the variety of products to be produced?	44.1	78.8%	11.9	21.2%			56 100%
	4.2 Do you make an effort of changing productions design for production of different products?	53.2	95%	2.8	5%			56 100%
	4.3 Do you decide quickly to change the output level of products produced?	43.7	78%	12.3	22%			56 100%
	4.4 Do you take the change in demand of combat ration as an opportunity?	47.2	85.3%	8.8	14.7%			56 100%

Source: Compiled from own survey questionnaire (2020)

40 (72.13 %) of the respondents replied YES this implies that they decide quickly to change the variety of products to be produced 16 (28.04%) majority of the respondents replied NO this implies that they make an effort of changing production design for production of variety products. Manufacturers source their raw materials from farmers, association, manufacturers and Sugar Corporation from its own farm. They all are dependent of their raw materials source. To get these raw materials there is competition between companies the raw materials are highly demanded by other food processing industries. Due to this sometimes raw material shortage happens. Manufacturing lead time is very long because of raw material shortage, electric power interruption and capacity of old machines. In total sum this all things in addition with alertness and accessibility problems made the supply chain swiftness clumsy. Generally the data and interview analysis showed that without early detection of urgent combat ration demand and combat ration supply chain information there is no resolute decision making on combat ration supply chain agility issues.

4.6 Flexibility of Supply Chain in response to urgent Combat Ration demand

Table 6. Flexibility of Supply Chain in response to urgent Combat Ration demand

S/N	Parameters	YES		NO		somehow		Total	
5	**Flexibility**	No	%	No	%	No	%	No	%
	5.1 Do you have a variety of customized products to be produced on combat ration?	47.2	85.3 %	8.8	17.7%			56	100%
	5.2 Are you flexible enough in productions of different products of combat ration?	53.20	95%	2.8	5%			56	100%
	5.3 Are you flexible enough to change the output level of products produced?	41.1	73.3%	14.9	23.7%			56	100%
	5.4 Are you flexible enough to take the change in demand of combat ration as an opportunity?	51.1	91.25 %	4.9	8.75%			56	100%

Source: Compiled from own survey questionnaire (2020)

48 (86.21%) of the respondents replied no this implies that the supply chain of combat ration is not flexible to respond for urgent demand of Ethiopian defense force. 7 (13.78 %) of the respondents replied yes this implies that the supply chain of combat ration is flexible to respond for urgent demand of combat ration to Ethiopian defense force. The interview result regarding flexibility illustrates that all production facilities are not able to change the variety of products produced. ELFORA produces the usual vegetable and meat soup, Kality food complex produces the previously known biscuit, Dire Dawa food complex produces the previously known type of biscuit and Sugar Corporation produces sugar which is known by grain. Furthermore as per the response from Ethiopian Defense Logistics Department officials there is no flexible thinking in a variety of combat ration by assessing the opinion of the war fighter army with experts. Product Flexibility in mix and volume is very less because of the number of different products that can be produced within a given time period are very less due to machine capacity and oldness. Generally the data and interview analysis explicitly showed supply chain flexibility in response to urgent demand of combat ration is

much less flexible. That means the supply chain of combat ration is not flexible to respond the demand of EFDRE Defense Logistics.

Chapter Five

5. Summary of Findings, Conclusion and Recommendation

5.1 Introduction

This chapter summarizes and concludes the entire study. It presents recommendations and the direction for future research. The purpose of the research was to assess the supply chain agility of combat ration supply chain agility in response to urgent military mission.

5.1 Summary of Major Findings

The study confirmed that alertness of the supply chain to respond early the demand of Ethiopian army manufacturing companies of combat ration only produce as per the order arrives their factory premise and then they try to share their demand of raw material to suppliers of raw materials. In other side Ethiopian defense logistics department complains that it is difficult to obtain combat ration when it is demanded it urgently for military missions. Production capacity of producers is very less it cannot cover the demand of the army. The food processors machine is very old with less production capacity. This makes the supply chain of combat ration unreliable. Due to this it is difficult to have reserve stock of combat ration in Ethiopian Defense Logistics Ware house for future uncertain demand. The allocated budget for ration is under usage because of very less supply of combat ration for urgent military mission. According to the study finding the supply chain is slow in supply chain dimension **alertness**. This shows that the supply chain of combat ration is not alert enough to respond urgent demand through early detection. Generally the interview and the data analysis showed the combat ration supply chain is not alert enough to respond for urgent requirement of combat ration.

The study found that **Accessibility** of information with in Supply Chain of Combat Ration is very less. The activity in capturing demand information quickly and making information accessible in the whole of the supply chain is not fully accessible. The combat ration supply chain does not actively share knowledge with partners. Generally the combat ration supply chain information is not fully accessible with in that specific supply chain.

The study found that there is a problem in reducing manufacturing lead time, speed in increasing frequency of new product introductions, speed in adjusting delivery capability and speed in improving responsiveness to changing markets needs are very crucial but they are not applicable by all food processors stated in this study.

Combat ration supply chain decisiveness is applicable when combat ration supply chain information is accessible enough and when there is an early detection of combat ration demand. This shows that the supply chain agility dimensions are interconnected and one dimension is dependent on the other. For this reason **decisiveness** in response to urgent demand of Combat ration is negatively affected by supply chain agility dimensions alertness and accessibility.

The study confirmed that combat ration manufacturers source their raw materials from farmers, association, manufacturers and Sugar Corporation from its own farm. They all are dependent of their raw materials source. To get these raw materials there is competition between companies the raw materials are highly demanded by other food processing industries. Due to this sometimes raw material shortage happens. Manufacturing lead time is very long because of raw material shortage, electric power interruption and capacity of old machines. In total sum this all things in addition with alertness and accessibility problems made the supply chain swiftness clumsy. The study also found that without early detection of urgent combat ration demand and combat ration supply chain information decisiveness and swiftness are not functional.

The study found that supply chain **flexibility** in response to urgent demand of combat ration is highly inflexible. This result can show us the supply chain of combat ration is not flexible enough to respond for urgent demand of combat ration. To elaborate all combat ration production facilities are not able to change the variety of products produced. ELFORA produces the usual vegetable and meat soup, Kality food complex produces the previously known biscuit, Dire Dawa food complex produces the previously known type of biscuit and Sugar Corporation produces sugar which is known by grain. Furthermore as per the response from Ethiopian Defense Logistics Department officials there is no flexible thinking in a variety of combat ration by assessing the opinion of the war fighter army by experts. Product Flexibility in mix and volume is very less because of the number of different products that can be produced within a given time period are very less due to machine capacity and oldness. Generally the study explicitly found that supply chain flexibility in response to urgent demand of combat ration is highly negatively affected. That means the supply chain of combat ration is not flexible to respond the demand of EFDRE Defense Logistics.

5.3 Conclusion

Based on the supply chain agility dimensions the preceding findings were summarized and the following conclusions were also made based on supply chain agility dimensions in relation to the five research objectives.

- The combat ration supply chain is not alert to respond for urgent mission requirement. It is limited to detect uncertain changes in demand. It cannot also detect changes opportunities and threats with in the supply chain network. The supply chain is not capable in reading and responding to real demand. In the supply chain of combat ration there is also inability to perceive an upcoming threat and respond to it quickly.
- The combat ration supply chain information is not fully accessible by the supply chain partners. The Supply chain is not capable to share real time

demands, inventory and production information. All Supply chain members couldn't able to access fully relevant data and make informed decision about how to respond to changes detected in the environment. There is also less ability to use information technology for sharing data between buyers and suppliers.

- However, the population of the study responded that the combat ration supply chain is decisive enough to make resolute decision using the available information; the study identified that there is no decisiveness on combat ration supply chain agility until supply chain information is fully accessible and until there is an early detection of uncertain demand.
- However, the population of the study responded that the combat ration supply chain is swift enough to respond for urgent combat ration demand; the study identified that there is no swiftness on combat ration supply chain agility until supply chain is alert, accessible and decisive.
- The study found that the combat ration supply chain is not flexibility enough to respond for urgent military mission and variety of demand. Modification of tactic and operation is only performed on increasing working time and labor power increment. Fixed manufacturing capacity made manufacturers not to provide agile response. Generally the total sum of the study conclusion is that the combat ration supply chain is not agile enough to respond the demand of EFDRE Defense force Logistics department.

5.4 Recommendation

Based on the conclusion the following recommendation were forwarded by the researcher in relation to research objective

- Ethiopians defense logistics could see broad options of combat ration supply through multiple sourcing. By making frame work of agreement with multiple

suppliers in the country to have the combat ration in required amount during urgent missions.

- In the long run it is better to decide on make decision by EFDRE Defense Force to produce combat ration. It is cost effective with on time delivery and army mission confidentiality.
- Asper the study one of the manufacturing companies' bottle neck in delay of delivery lead time is lack of packaging materials. To overcome this problem it is better to have an industry which will produce different army demanded products including combat ration, packaging materials, military textile production and cover materials like canvas for military vehicles and weapons.
- There could be alertness in detecting future real demand of combat ration in response to urgent military mission by sharing information with supply chain partners. To be alert every supply chain member should adopt him/her self with information communication technology through long and short term training. Information communication technology infrastructure must be fulfilled.
- Ministry of national defense logistics department could hire or train nutritionist or food science professionals who can see different options of combat ration products based on domestically available raw materials.
- For short term plan helping combat ration producers/ manufacturers stated in the study in problems of electric power interruption, foreign exchange permit and other problems by contacting concerned government officials; giving directions to producers in how to expand their production capacity, participating in producers plan to expand production capacity, establishing a strong relationship with producers.
- Creating ownership sense of producers on helping their army by producing in deep concern beyond the business scope. It is about to make them feel national sense by motivating them always. This will continue for short period of time until the military complex industry established.

5.5 Direction for Further Research

According to US Army Natick Soldier Center publication in order to accomplish the mission of providing the highest quality rations to US Warfighters in the field, it is imperative that the development of new combat rations is fueled by the wants, needs, and ideas of Warfighters themselves. After feedback was received from troops that served in Operation Desert Storm/Shield, DoD CFD acknowledged the need to establish a CPI (Continuous Product Improvement) process that would ensure all operational rations meet the approval of Warfighters, first and fore most. Any new component that is approved in field tests by Warfighters must also obtain JSORF (Joint Services Operational Rations Forum) and U.S. Army OTSG (Office of the Surgeon General) approval before entering procurement for inclusion in rations. The CPI process is driven by the voice of the customer and meets military developmental and logistical constraints (NSRDEC, 2012). Having this in mind it's better to know Ethiopian army warfighters wants, needs, and ideas for the development of new combat rations. Now in Ethiopian Defense force case the combat ration under usage is not updated for 3-4 decades. It needs to be replaced with new combat rations. To do this it is necessary to conduct research on wants, needs, and ideas of the combatant.

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Appendix

SCHOOL OF COMMERCE
MASTERS IN LOGISTICS AND
SUPPLY CHAIN MANAGEMENT (LSCM) PROGRAM
RESEARCH QUESTIONNAIRE

Researcher: Yohannes Habte
Contact Address :(09-10 17 13 67),Email-habte.yohannes.diko@gmail.com

Research Topic: - Supply Chain Agility of Combat Ration in Response to Urgent Military Mission

Dear respondents:-

I would like to express my sincere gratitude for your good cooperation and genuine and timely information.

Objective:

This questionnaire is designed to collect information about supply chain agility of combat ration in response to urgent military mission. The information shall be used as a primary data in my research which I am conducted as a partial requirement of my study at Addis Ababa University College of business and economics school of commerce for completing my Master's degree.

General instruction

1. No need of writing your name
2. In all cases where answer options are available please tick (√) in the appropriate box.
3. For questions that demands your opinion, please try to honestly describe as per the questions on the space provided/

Confidentially

I want to assure you that this research is only for academic purpose authorized by the Addis Ababa University. No other person will have access to data collected. In any sort of report I might publish, I will not include any information that will make it possible to identify any respondent.

Participant information

1. Sex: Male ☐ female ☐

2. Which of the following age categories describes your age?

Under 25 ☐ 25-34 ☐ 35-44 ☐ 45-54 ☐ 55 and above ☐

3. Number of years you have worked for the organization (in years)/

0-4 ☐ 5-9 ☐ 10-19 ☐ 20-30 ☐ 30 years or more ☐

4. How long have you worked on your current job? (In years)/

0-7 ☐ 8-14 ☐ 15-20 ☐ 21-30 ☐ 5. 30 years or more ☐

5. Educational qualification/

High school graduate ☐

Technical school graduate ☐

College diploma ☐

BA/BSC Degree ☐

Master's degree ☐

PHD ☐

Other please state……

Questionnaire on combat ration supply chain agility

S/N	Parameters	Very quick	Quick	Slow	Very Slow	Moderate	Steady
1	Alertness						
	1.1 How do you detect changes, opportunities, and threats in the supply of combat ration?						
	1.2 How do you detect changes in demand of combat ration?						
	1.3 How do you sense when there is change in demand of combat ration?						
	1.4 How do you respond to the detected change in demand?						
	1.5 How do you anticipate the level of changes in demand of combat ration?						
	1.6 How do you perceive an upcoming threat and respond to it quickly?						
	1.7 How is your speed in reducing manufacturing lead time?						
	1.8 How is your speed in increasing frequency of new product introductions?						
	1.9 How is your speed in adjusting delivery capability?						
	1.10 How is your speed in improving responsiveness to changing market's needs?						

2	Accessibility	YES	NO	some how			
	2.1 Are you able to access relevant data to decide how to provide an agile response?						
	2.2 Do you have a supply chain-wide information access?						
	2.3 Do you make information accessible in the whole of the supply chain and actively share knowledge with partners?						
	2.4 Is your institution information –based for agile supply chain?						
	2.5 Do you share with Supply chain members about real-time demand, inventory, and production information?						
	2.6 As an institution do you use information technology to share data between buyers and suppliers?						
	2.7 Do you use IT to coordinate and integrate activities in the supply chain?						
	2.8 Do you have good relationships with other supply chain actors?						
3	Decisiveness	YES	NO	some how			
	3.1 Do you make decisions resolutely using the available information?						
	3.2 Do you capture demand information quickly?						
	3.3 Are you really capable of reading and responding to real demand?						
	3.4 Do you involve suppliers in product development and planning activities?						
	3.5 Do supplier gets involved in the operations of the customer organization?						
	3.6 Do you have a vertical integration with in a supply chain?						
4	Swiftness	YES	NO	some how			
	4.1 Do you decide quickly to change the variety of products to be produced?						
	4.2 Do you make an effort of changing between productions of different products?						
	4.3 Do you decide quickly to change						

	the output level of products produced?						
	4.4 Do you take the change in demand of combat ration as an opportunity?						
5	Flexibility	YES	NO	some how			
	5.1 Do you have a variety of customized products to be produced on combat ration?						
	5.2 Are you flexible enough in productions of different products of combat ration?						
	5.3 Are you flexible enough to change the output level of products produced?						
	5.4 Are you flexible enough to take the change in demand of combat ration as an opportunity?						

An interview questioner prepared for Mangers of Food processing Factories

1. **How do you identify change in the supply chain in order to be responsive for combat ration demand?**
2. **How do you react to change in demand of combat ration?**
3. **How do you recover from change in demand of combat ration?**
4. **How is your product Flexibility in mix and volume?**
5. **How is your quickness in operations lead time from sourcing up to producing your product?**
6. **How is your quickness in delivery lead time and timeliness?**
7. **How is your quickness in new product time to market?**
8. **How is your competency in combat ration supply chain?**