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ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE

DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Influence of Construction Supply Chain Challenges on project progress, Case of 40/60 Housing program of Addis Ababa!

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Approval of Board of Examiners

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Declaration

I hereby declare that this study entitled "**Effect of Construction Supply Chain Challenges on project progress, Case of 40/60 Housing program of Addis Ababa''** is my own work. All information in this document has been obtained and presented in accordance with academic rules and ethical conduct.

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Letter of Certification

This is to certify that **Gelana Assefa** has carried out his research work on the topic entitled " **Effect of Construction Supply Chain Challenges on project progress, Case of 40/60 Housing program of Addis Ababa''** as a partial fulfillment of the requirement of Masters of Arts Degree in Logistics and Supply Chain Management. This study fulfils requirement to obtain academic degree from the university.

Advisor: Tariku Jebena (PhD)

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List of Acronyms

SCM	Supply chain management
GDP	Gross Domestic Product
IHDP	Integrated Housing Development Program
CSCM	Construction Supply Chain Management
MSEs	Micro and Small Enterprises
PPA	Public Procurement Agency
ASHE	Addis Ababa Saving Housing Enterprises
MUDH	Ministry of Urban Development and Housing

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Abstract

Construction projects of 40/60 housing program, located in different parts of Addis Ababa city, suffer from many problems. Consequently, the objective of this research is to identify and examine the construction supply chain challenges and to elicit their effect on the progress of construction projects. A comprehensive literature review was deployed to generate a set of CSC concepts, benefits, and factors believed to affect construction project progress. A total of 143 questionnaires were distributed to 4 key groups of CSC participants; namely owner (government), consultants, MSEs and contractors. The survey findings indicate that all 4 groups agree that actors involved in the construction of 40/60 housing projects have poor knowledge of Construction Supply Chain Management which is an indicative of poor Construction supply chain management practices within the chain. It also revealed that factors such as 'Poor integration among the stake holders', 'Shortage of construction material' and 'capacity problems of contractors' sequentially have the highest impact on the construction supply chain of 40/60 project. The actors in the CSC need to work towards more aligned and structured ways of working. Specially the government should work towards creating strong CSC by applying a system that increase integration and collaboration within and between project supply chains. Continuous coordination and relationship between project participants are required through project life cycle for solving problems and enhancing project progresses.

Keywords: *supply chain management, construction supply chain management, supply chain integration*

Chapter One

I. Introduction

1.1. Background of the Study

Supply chain management (SCM) is a concept that has originated in the manufacturing industry to control logistics (McCaffer and Root, 2000). It represents a management process by which enterprises administer and control the worldwide network of suppliers, factories, warehouses, distribution centers and retailers through which raw materials are acquired, transformed and delivered to customers (Ganeshan and Harrison, 1995). According to these authors construction, procurement and procurement related activities occur during all phases of a construction project. Because of inevitable complexity and fragmentation of the construction process, supplies of resources like equipment, labor, material and other services may not be always available on time, in right amounts and in the desired quality and price.

"Supply chain management (SCM) is a well-established concept within the manufacturing industry although the terminology has changed over the years" (McCaffer and Root, 2000 Delhi Business Review Vol. 3, No. 1, January - June 2002 page 1). They defined supply chain as 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 the customers. Supply chains exist in both service and manufacturing organizations, although the complexity of the chain may vary greatly from industry to industry and firm to firm.

Traditionally, marketing, distribution, planning, manufacturing, and the purchasing organizations along the supply chain operate independently. These organizations have their own objectives and that are often conflicting (Koskela, 1992). This traditional way of managing is essentially based on a conversion (or transformation) view on production, whereas SCM is based on a flow view of production. The conversion view suggests that each stage of production is controlled independently, whereas, the flow view focuses on the control of the total flow of production (Koskela, 1992). Supply chain management is a

strategy through which different parts of operations can be integrated (Cooper and Ellram, 1993.)

Construction is a one of greatest sectors in many countries that contribute significantly to the economic growth of the country. According to Fahlin 2008, construction industry is a vital economic sector of a country and largely contributes between 3 to 6 percents of overall Gross Domestic Product (GDP). At the same time, construction sector also contributes to the high employment in many countries. In this context, it is pointed out that the construction sector plays crucial roles in contributing to growth and employment of a country in globe. Nevertheless, construction has been subjected to the high level of failures, which is almost twice as much as other industry. One of crucial causes of failures specifically the performance-related problems is not uncommon in the construction industry. These poor performance failures lead to the criticisms about the construction suffered from various high-profile performance problems of high fragmentation, large waste, poor productivity, cost and time overruns, and conflicts and disputes for a long time.

In construction, supply chain refers to the end-to-end "chain" of stakeholders and partners that come together both on individual projects and during a firm's business life (Belmak, 1992). Construction managers and contractors do not typically consider the supply chain or SCM; they deal with the supply chain and make SCM decisions on a daily basis. According to Belmark, a supply chain includes the owner, planner, designer, architect, engineer, construction manager, general contractor, subcontractors, suppliers, distributors, and manufacturers.

McCaffer and Root 2000, described supply chain within the construction project, as the owner at the top followed by designer, contractor, specialist contractors/ subcontractors/ suppliers etc., forming various levels of supply chain. Demand can be seen as flowing down the chain in terms of information, e.g. project briefs, drawings, schedules, works orders etc, with a flow of goods and materials flowing in the opposite direction. According to the authors the management of this supply chain is often problematic due to the fragmentation in the construction industry; increasing complexity of the projects and the demand for greater performance at lower costs from the clients. These problems have led the stakeholders to become more actively involved in the project life cycle.

Construction supply chain management is subjected to different challenges and barriers. According to Fox et al. (1993) problems such as fragmentation, bank rates, political situation, material delivery, labor strikes, site accidents and design changes are the noticeable barriers to construction. In addition, lack of guidance for creating alliances with supply chain partners, lack of trust inside and outside a company and lack of integrated information systems etc., make the supply chain inefficient.

Construction is one of greatest sector that contributes to the current rapid economic growth of Ethiopia. According to the Ethiopian Construction Industry Development Policy published on December/ 2014 the construction sector is growing yearly at an average of 12.43% and contributes 5.3 percent of overall Gross Domestic Product (GDP). In the policy it is pointed out that the construction sector also plays crucial role in contributing to the employment of the country through the creation and Development of Small and Micro Enterprises.

Even though the construction sector is playing a crucial role in solving the country's economic and social problems, it is subjected to a variety of challenges and problems. It has been described that there exists an imbalance between construction services and inputs. The main role players such as contractors and consultants are limited in capacity, insufficient in number and luck business ethics to meet the needs of fast growing industry. As stated in the policy the industry is suffering from the absence of accountability and transparency issues leading to corruption and malpractices. The role players such as contractors, consultants and contract administrators want to create wealth in a non value adding ways manifested in low quality design, improper and biased bidding process, delayed project and complicated payment processes. According to the policy well integrated supply chain is not put in place to avail construction inputs produced by the local manufactures or the imported ones at the right time, at the right amount, at the right quality and with the reasonable price.

1.2. Statement of the problem

Ethiopia has been implementing ambitious government-led low- and middle-income housing programs, the Integrated Housing Development Program (IHDP) which is designed to meet the shortages of housing in urban areas especially in Addis Ababa city which has been implemented since 2005. The initial goal of the program was to construct 400,000

condominium units, create 200,000 jobs, promote the development of 10,000 micro - and small - enterprises, enhance the capacity of the construction sector, regenerate inner- city slum areas, and promote home ownership for low- income households.

The IHDP has been successful in many respects. Although the large-scale program has not met all of its original targets, at country level it has built more than 181,000 housing units to date. The program has also built the capacity of the construction sector, addressed the existing slums and has been a significant generator of employment opportunities.

Currently the government has designed additional housing programs namely 10/90, 20/80, 40/60 and public private partnerships by aiming to involve and benefit every class of the society. For the housing scheme 10/90 ten percent of the housing cost will be covered by the users through saving while the rest (90%) will be down paid in long period which at first covered by the government. The same concept holds true for 20/80 and 40/60 schemes with the only difference in their percentage. The implementation of the program has already begun in Addis Ababa city and will be expanded to other cities and towns of the country. In Addis Ababa city alone the number of dwellers registered and waiting for the lottery base housing distribution has reached more than 940,000 people out of which 153,309 have registered for the 40/60 housing scheme.

The objective of the 40/60 housing program is to solve housing problems for the middle income group through the initiation of saving culture and creation of job opportunities. This housing program is led by Addis Ababa city Saving Houses Enterprise and with other key stakeholders. According to the data obtained from the Ministry of Urban Development and Housing, the constructing of 38,790 houses of which 1,292 houses are 94% completed, 18,496 houses are 57% completed and 19,002 houses are 16% completed is already underway in 13 different project sites located in different parts of Addis Ababa city Administration (Ministry's report as of February 2016). There is also a plan to begin the construction of additional 15,000 units by 2016.

Many of the construction sites are moving behind the schedule as can be observed from project performance report of Addis Ababa Saving Houses Enterprise for the month December 2015. According to the report there are only 3 sites relatively moving nearer to

their targeted time schedule while the10 sites performance is far behind the schedule. In the report it has been indicated that the construction processes of the program is subjected to different barriers. Inefficient and delayed bidding process to supply construction inputs and services, the shortage of construction inputs, the lack of engagement of contractors and consultants with their full machinery and human capacity as per the contract agreement, the frequent design change and dalliance of design review implementation, shortage of water and power and the absence of strong monitoring and control mechanisms by the owners are among the barriers.

This research tried to thoroughly indentify and examine the CSC challenges (barriers) associated in the construction supply chain of 40/60 housing program and has indicated their effect on the construction progress of the housing projects.

1.3. Basic research Questions

This study analyzed the Construction Supply Chain Management Challenges and their effect on 40/60 Housing program and tried to answer the following basic research questions:

1. How are the actors in the construction supply chain of 40/60 working together?
2. How are, construction supply chain challenges affecting the progress of 40/60 housing program?
3. What level of influence these construction supply chain challenges put on projects cost and time?

1.4. Objectives of the study

1.4.1. General Objective of the Study

The general objective of this study is to analyze construction Supply Chain Management Challenges that are affecting the progress of 40/60 Housing program.

1.4.2. Specific Objectives of the Study

The specific objectives of this study are:

1. To articulate the nature of current construction supply chain management of the program;

2. To identify and analyze the effects of CSC challenges on the construction supply chain integration of the program;
3. To describe the effects of construction supply chain management challenges on projects progress with regard to time and cost

1.5. Significance of the study

This study benefits the Ministry of Urban Development and Housing and Ministry of Construction, in the process of formulating policies and strategies. To this effect it can help the sectoral policy and strategy implementers (Regional and City Administrations) by helping them to understand and establish the concept of Construction Supply Chain Management and its challenges. It can help in selecting and managing the key construction Supply chain partners involved in the Construction and Housing Development. Also, through the findings and suggestions of this research, a particular awareness has been generated about the Construction process of 40/60 Housing program for which problems have been identified and feasible solutions recommend. This research can also serve as an input for other researches and scholars such as: academicians, policy makers, consultants and some other bodies who conduct further researches on related fields.

1.6. Scope of the study

Supply chain management (SCM) aids the members of the supply chain (SC) to Consider themselves as an integrated whole and provoke synergy effect. Shortly an effective and efficient SCM has the importance of cost minimization, reducing lead time, waste minimization, operational flexibility, system integration, resource utilization and ultimately customer satisfaction.

As Construction Supply Chain Management (CSCM) has vast areas of managerial practices, it would be difficult and unmanageable for the researcher to study at the industry level. Therefore, the scope of this study is delimited to specific context that is on CSCM challenges of 40/60 Housing program at Addis Ababa city Administration and their influence on its progress in terms of cost and time.

1.7. Limitation of the study

This study lacks wholeness in addressing all the actors involved in the construction supply chain of 40/60 housing program. First, this paper has only addressed supply chain partners that are the main role players such as the owner (the government), contractors, consultants and sub-contracting MSEs. The other supply chain partners such as construction equipment and machine renters, construction material producers and importers and construction material manufacturers were not involved in the study due to the capacity limitation to access the partners. This can affect the effort to thoroughly investigate the real challenges and impacts that can exist in construction supply chain management of 40/60 housing program.

1.8. Organization of the Study

The study has been organized into five chapters. Chapter one is the introductory chapter that covers the background of the study, problem statement and objectives of the study, scope and limitation of the study. It introduces and focuses upon giving the reader an overview of the study's development.

The second chapter presents the review of related literature. It covers concepts and theoretical frameworks of Construction Supply Chain Management.

Chapter three presents in detail a discussion and explanation of the research methodology. it begin with a discussion of the research design, unit of analysis, population and sampling design, sampling techniques, data sources, instruments of data collection, procedures for data collection, method of data analysis, description of variables and ends with ethical considerations. Chapter four, deals with data presentation and analysis of the study. The research findings, conclusion and researchers recommendation are covered under the final chapter of this paper which is chapter five.

Chapter Two

II. Review of Related Literature

2.1. Introduction

This chapter reviews the theoretical and empirical literatures on the general concepts of supply chain management (SCM) and specifically on the concepts of construction supply chain management (CSCM). In the first case the evolution of supply chain management and its goals are discussed. In the second case which is most relevant to the study is the discussion of concepts of construction supply chain management with the details goes to challenges and benefits, characteristics, supply chain integration in construction, interdependencies in and across construction supply chain, construction industry in Ethiopia and the Conceptual framework of the study.

2.2. Concept of Supply Chain management

Chris- Topher,(1992) defined supply chain as the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer.

SCM views the entire supply chain rather than just the next part or level, and aims to increase transparency and alignment of the supply chain's co-ordination and configuration, regardless of functional or corporate boundaries

There are no sources in the current document.(Cooper and Ellram, 1993). The basic idea of SCM is to recognize the interdependency in the supply chain, and thereby improve its configuration and control based on such factors as integration of business processes. According to (Cooper and El- lram, 1993), the shift from traditional ways of managing the supply chain towards supply chain management (SCM) includes particular elements.

Element	Traditional management	Supply chain management
Inventory management approach	Independent efforts	Joint reduction of channel Inventories
Total cost approach	Minimize firm cost	Channel-wide cost efficiencies
Time horizon	Short term	Long term
Amount of information sharing and monitoring	Limited to needs of current transaction	As required for planning and monitoring processes
Amount of co-ordination of multiple levels in the channel	Single contact for transaction between channel pairs	multiple contacts between levels in firms and levels of channel
Joint planning	Transaction based	Ongoing
Compatibility of corporate philosophies	Not relevant	Compatibility at least for key relationships
Breadth of supplier base	Large to increase competition and spread risks	Small to increase co-ordination
Channel leadership	Not needed	Need for coordination focus
Amount of sharing risks and rewards	Each treated separately	Risks and rewards shared over the long term
Speed of operations, information and inventory levels	Warehouse orientation (storage, safety stock) interrupted by barriers to flows; localized to channel pairs	Distribution centre orientation (inventory velocity) interconnecting flows; JIT, quick response across the channel

Table 1 Characteristic difference between traditional ways of managing the supply chain and SCM

Source European Journal of Purchasing & Supply Management (v.6, 2000)

SCM represents one of the most significant paradigm shifts of modern business management by recognizing that individual businesses no longer compete as solely autonomous entities, but rather as supply chains (Lambert and Cooper, 2000). The term SCM was originally introduced by consultants in the early 1980s (Oliver and Webber,1992) and has subsequently gained wide attention (La Londe, 1998). It has been used to explain the planning and control of materials and information flows as well as the logistics activities internally within and between companies (Cooper et al., 1997a). Christopher's (1992) definition goes beyond the idea of a dyadic, merely transactional relationship between buyers and sellers throughout the supply chain with a unidirectional flow of information and a reverse flow of materials. Supporters of this approach Wijnstra, (1998) argued that buyer-seller relationships are influenced by the characteristics of the product and organizations involved, and the relationships between these organizations and other

organizations which are part of the supplier network. According to the Supply Chain Council (2003), the supply chain encompassed every effort involved in producing and delivering a final product or service, from the supplier's supplier to the customer's customer. In other words, SCM includes managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, and delivery to the customer.

SCM focuses on how firms utilize their suppliers' processes, technology and capability to enhance competitive advantage (Simchi-Levi et al., 2004). It is a management philosophy that extends traditional intra-enterprise activities by bringing trading partners together with the common goal of optimization and efficiency (Schechter and Sander, 2002). Baatz (1995) further expanded SCM to include recycling or re-use. Baatz's (1995) definition of SCM is useful in applying the concept to construction waste minimization. In short, SCM can be best described as the linking up of activities through better relationships with suppliers and customers with the aim of minimizing waste and achieving certain advantages.

Supply chain management is a concept that originated and flourished in the manufacturing industry. The first visible signs of SCM were in the JIT delivery system, as part of the Toyota Production System (Shingo, 1988). This system aimed to regulate supplies to the Toyota motor factory just in the right small amount, just in the right time. The main goal of this system was to drastically decrease inventories, and to effectively regulate the suppliers' interaction with the production line. Another stimulus for SCM originated in the field of quality control. As early as 1950, in an address to Japanese industrial leaders, Deming suggested that working with the supplier as a partner in a long-term relationship of loyalty and trust would improve the quality and decrease the costs of production (Deming, 1982).

After its emergence in the Japanese automotive industry as part of a production system, the conceptual evolution of SCM has resulted in an autonomous status of the concept in industrial management theory, and a distinct subject of scientific research, as discussed in literature on SCM (e.g. Bechtel and Yayaram, 1997; Cooper et al.,1997). In addition to the Japanese influence, Western scholars like Burbridge and Forrester provided early contributions to the understanding of supply chains (Towill, 1992). Along with original SCM approaches, other

management concepts (e.g. value chain, extended enterprise) have influenced its conceptual evolution, which has led to the present understanding of SCM. SCM has recently concentrated on closer relationships between parties involved in the flow of goods from the supplier to the end user. The supply chain concept indicates that value must be added to the process greater than costs (Male, 2002).

SCM does not imply ownership of upstream suppliers and downstream customers, which is different from vertical integration (Mohanty and Deshmukh, 2000). It aims at building trust, exchanging information on market needs, developing new products, and reducing the supplier base to a particular original equipment manufacturer so as to release management resources for developing meaningful, long term relationship (Berry et al., 1994).The focus of SCM is the management of relationships in order to achieve a more profitable outcome for all parties in the chain (Serpell and Heredia, 2004).

2.3. Construction supply chain management

The application of SCM to the construction industry requires huge effort. SCM is increasingly being seen as a progression on internal program aimed at improving effectiveness. The focus is now not only limited to increasing internal efficiency of organizations but has been broadened to include methods of reducing waste and adding value across the entire SC. The holistic approach associated with SCM is essentially motivated by the benefits to derive from a more effective management of interfaces between all organizations involved (Saad and Jones, 1998). Construction businesses are beginning to realize that their success is increasingly dependent on the organizations they supply to and buy from, and that for continued success they need to cooperate and collaborate across customer/supplier interfaces (Egan, 1998).

SCM has been observed as an emerging field of research and potential source of improved performance for the construction industry (O'Brien et al., 2002), but less attention has been devoted to investigating the management of the construction supply chains. Construction research involving the supply chain concept is a relatively new field, having explicitly emerged in the mid 1990s. Similar to the mainstream management

literature, it is evolving with corresponding influences from the theory of production, distribution and strategic procurement (Male, 2003).

Construction supply chains have been associated with make-to-order supply chains (Vrijhoef and Koskela, 2000). Typically, a make-to-order delivery process begins at the customer, through the entire supply chain from initiation to hand over, back to the customer. Thus a construction make-to-order supply chain converges on the construction site where the one-off final product is assembled (Vrijhoef and Voordijk, 2004).

The Construction Best Practice Program (CBPP) (2002) suggests that the supply chain encompasses all activities associated with processing raw materials to completion of the end product for the client or customer. This includes procurement, production scheduling, order processing, inventory management, transport, storage and customer service and all necessary supporting information systems.

London and Kenley (1999) defined supply chain procurement as the strategic identification, creation and management of critical project supply chains and key resources, within the contextual fabric of the construction supply and demand system, to achieve value for clients. Each company is a link in a chain of activities adding value at each stage, designed to satisfy end-customer demand in a win-win scenario. The process embraces all the activities and information systems necessary to support and monitor these activities.

2.3.1. Characteristics of construction supply chain

While construction has changed in complexity over time, the primary objective of the industry is basically the same as it was 100 years ago: to build infrastructure, roads, schools, homes, hospitals, factories, and other businesses (Briscoe and Dainty 2005). Unlike the widgets produced in manufacturing, the finished product in construction is customized and cannot be mass-produced. The operations function that shows improvement in the manufacturing sector has quite a different profile in the construction industry. The probability of failure remains constant for traditional construction organizations (Soemardi et.al. 2007).

3.

According to the literature on construction supply Chain management by Briscoe and Dainty (2005), the characteristics of construction industry has been summarized as follows;

> *The Construction industry is fragmented and distinguished by a collection of large and small firms, related bulk material suppliers, and many other support professionals. The typical supply chain for any given construction project could include architects and engineers, prime contractors, specialty subcontractors, and material suppliers that come together one time to build a single project for a specific owner. This complex supply chain is characterized by adversarial short term relationships driven by the competitive bidding process. The project owner selects a prime contractor who is the low bidder. In turn, the prime contractor uses price as the basis for selecting subcontractors and suppliers. This approach continues even if a subcontractor hires his or her own subcontractor; again, the low bid wins.*

The labor-intensive construction operation is characterized by decentralization, (Winch, 2003; Green and May, 2003; Green et al., 2005). A prime contractor may self-perform a portion of the work as other specialty subcontractors move in and out of the project as their sections of work are ready. Over time, the jobsite is transformed from a temporary production facility with materials and heavy equipment to the actual completed project, a school or a hospital. Projects are typically located near the project owner who is either hands-on or represented by an architect or construction manager. There is little or no coordination and collaboration between the design professionals, prime contractors, subcontractors, and suppliers involved during the life-cycle aspects of the project (Hassan 2006).

According to Jakran (2007) information in construction industry generated by various sources, at many levels of abstraction and detail, contributes to fragmentation. Project information exchanged between architects/engineers and a prime contractor is compliant and has been mainly based on paper documents. These documents come in the form of architectural and engineering drawings, specifications, bills of quantities and materials, and change orders. This lack of communication and implementation leads to significant negative impact low productivity, cost and time overruns, change orders, inadequate design

specifications, liability claims, and, generally, conflicts and disputes which directly impact the customer by increasing project completion time and cost.

2.3.2. Supply Chain Integration in Construction

According to Pagell (2004, p. 460), SCM and integration are intertwined to the extent that "the entire concept of supply chain management is really predicated on integration". "Integrate", defined as "to form, coordinate, or blend into a functioning or unified whole" involves inter-organizational integration of flows, processes, systems and actors (Power, 2005; Fabbe-Costes and Jahre, 2006). In the construction literature there is also a focus on integration of processes across companies, and on building close relationships among the actors involved. However, as Fearne and Fowler (2006) remark, construction is arguably the least integrated of all major industrial sectors, characterized by adversarial and disjointed relationships. Lack of coordination and communication between the involved parties is seen as a key reason for the perceived poor supply chain performance in the construction industry (Humphreys et al., 2003; Love et al., 2004).

Numerous studies have been directed towards overcoming these problems by identifying key factors necessary for successful integration of the construction supply chain. First, it is argued that information exchange and communication throughout the supply chain is essential, specifically through early involvement of the actors, e.g. contractors, subcontractors and engineers (Love et al., 2004). The development of effective ICT systems for dissemination of information is also considered vital (Vordijk, 1999; Titus and Bro¨chner, 2005; Xue et al., 2007). Second, the use of standards for alignment of systems, quality assurance and innovation as well as risk reduction, is claimed to be essential (Elliman and Orange, 2000; Gibb, 2001; Sa`nchez-Rodriguez et al., 2006). Third, it is argued that developing solutions based on more pre-assembly would increase efficiency (Gann, 1996; Gibb and Isack, 2003; Vordijk and Mejboom, 2006). Fourth, co-ordinated working and development of close relationships, although not necessarily based on formal contracts, is put forward as a necessity (Nicolini et al., 2001; Saad et al., 2002; Love et al., 2004). In particular, trust and mutual understanding are emphasised as necessary preconditions when close relationships are built (Akintoye et al., 2000). Accordingly, and in line with the general

SCM literature, the focus is on integration of processes and flows as well as systems and actors. Still, it has proven difficult to obtain supply chain integration in construction, and several reasons have been given. It is concluded that the current state of construction relationships, being arm's length and adversarial, is a major impediment for close cooperation and integration of activities (Briscoe and Dainty, 2005), and resulting from the clients' traditional procurement practices (Briscoe et al., 2004).

2.3.3. Interdependencies in and Across Construction Supply Chain

It is argued that construction is a highly complex industry, owing to all the interdependencies between tasks, parts and units involved in the process and which need to be coordinated (Winch, 1989; Gidado, 1996). The literature suggests different approaches to dealing with this complexity problem. One is to consider the construction industry as consisting of different types of chains that need to be managed and organized differently depending on their respective contexts and conditions. For example, Cox and Ireland (2002) discuss the difference between material, labor, and equipment supply chains, while Vrijhoef et al. (2000) instead suggest that chains will differ depending on whether they are dominated by suppliers, contractors or architects. Other related researchers emphasize solutions to integrating processes for specific actor categories, such as builder's merchants (Agapiou, Clausen, Flanagan and Norman, 1998; Agapiou, Flanagan, Norman and Notman, 1998) and subcontractors (Dainty et al., 2001a, b).

The most common approach to SCM and integration of supply chains in the construction industry, however, is to examine each separate project and to consider what is needed for that particular project as one supply chain, i.e. as "the extended enterprise", suggesting the integration of all "tiers" and the activities and actors involved in these (see Vrijhoef and Koskela, 2000; Cooper et al., 2003). Love et al. (2004) argue for creating a seamless construction supply chain by integrating the interfaces between different phases of a construction project, particularly the design and the production processes. They suggest a definition of what they term "project SCM" in this setting: the network of facilities and activities that provides customer and economic value to the functions of design development,

contract management, service and material procurement, materials manufacture and delivery, and facilities management (Love et al., 2004).

This approach implies a somewhat simplified model of the construction supply chain, focusing on integration of activities between one supply chain and one construction site in a one to- one relationship, assuming that better performance is obtained by making the integration more efficient. Vrijhoef and Koskela (2000, p. 171) suggest four major roles of SCM in construction for improving the interface between site and chain, which in turn will lead to reductions of buffers and lead times. The roles differ depending on whether the focus is on the supply chain, the site, or both. The first role focuses on the interface between the supply chain and the construction site. The second role focuses on the supply chain. The third role focuses on transferring activities from the construction site to the supply chain. Finally, the fourth role focuses on the integrated management of the supply chain and the construction site.

The control of the "total flow of production" is emphasized in their model (Vrijhoef and Koskela, 2000, p. 171). Standardization of tasks as well as parts (Stinchcombe, 1959) is required in all four roles, whereas moving activities from site to supply chain specifically means more preassembly. The goal of integrating the supply chain with the site production is to replace the usual temporary chains in construction with more permanent (traditional) supply chains (Vrijhoef and Koskela, 2000, p. 172). The latter point is suggested as a major challenge (Gann and Salter, 2000) and addressed by Dubois and Gadde (2000, p. 213) in terms of the link between temporary (project) and permanent (the actors in the industry) networks: "The project network activates resources in the permanent network to perform the activities required for completion of the building" (p. 213). It is also suggested that difficulties of supply chain integration might relate to how the temporary supply chains (for specific projects) meet with the permanent supply chains in production of raw materials and components (Ballard and Howell, 2003, p. 120).

A way to understand these challenges is through the different types of interdependencies that seem to exist. Accordingly, economies of scale in (permanent) production facilities wherein

construction materials are produced, resulting from pooled interdependence, and economies with a basis in the construction site related to coordination of reciprocal interdependencies, adds to the sequential interdependencies traditionally addressed in the supply chain management literature (Ha°kansson and Persson, 2004). The three types of interdependencies were defined by Thompson (1967) as follows:

1. In pooled interdependencies “each part renders a discrete contribution to the whole and each is supported by the whole” (Thompson, 1967, p. 54). An example in construction is the way two specialists share a crane or other major piece of equipment (Shirazi et al., 1996). There is not necessarily a direct operational dependence between the parts, but the failure of one part can threaten the whole and the other parts involved. For example, even if the failure of one party in a project does not necessarily mean the failure of the other parties, it may impact upon their reputation (Walker, 2007).
2. Sequential interdependencies refer to situations where direct interdependence exists between activities in terms of output from one activity being the input to the next (Thompson, 1967). Indirect interdependence and pooled aspects are also present as the parts contribute to and are sustained by a whole. Sequential interdependence in construction is typical in the traditional production process of material and components (Winch, 1989). Shirazi et al. (1996) provide examples of the steel bender who bends bars that are then fixed into a form provided by the carpenter and the bricklayer who makes the brick wall (output), which serves as the input for the plasterer.
3. Reciprocal interdependencies refer to the “situation in which the outputs of each become inputs for the others”, (Thompson, 1967, p. 54), meaning that each unit poses contingency for the other, but there is also pooled and sequential aspects to it. Each unit involved affects the other. Shirazi et al. (1996) exemplify reciprocal interdependence in construction as the way heating, ventilation and electricity all depend on, and have to be adjusted to, each other. Walker (2007) argues that even if all three types of interdependencies are highly involved, reciprocal interdependencies dominate the construction process.

The challenge of potentially conflicting economies in the chain versus the project owing to the different interdependencies relates to an argument by Arbulu et al. (2003) that in spite of the benefits gained from reducing individual supply chain lead times, it is the combination of supply chains that defines a project's delivery process. Too much focus on the individual chain can be negative for the total project (Fearne and Fowler, 2006). For example, Koskela's (1992) and Ballard and Howell's (2003) conception of "lean thinking" as a model of the supply chain interfacing with the construction project has been criticised. It is argued that one can lose sight of the fact that efficiencies in operational matters within logistics (as part of the permanent supply chain) do not necessarily improve the effectiveness of the construction process (to which the temporary supply chains belong) (Fearne and Fowler, 2006). Hence, it is not sufficient to secure integration of activities in individual supply chains, nor is it sufficient to coordinate activities only at the construction site. Instead, attention need to be paid to the whole set of supply chains that feed into the construction site - chains that are also subject to other interdependences apart from "meeting" at the site. Cox and Ireland (2002, p. 410) raise attention to this complexity. It is difficult to quantify the exact number of constituent supply chains that have to be integrated into a typical project". We refer to this type of interdependence as synchronic (Malone and Crowston, 1990), pointing to the need for synchronizing deliveries to the construction site, and thus introducing a fourth type in addition to those put forward by Thompson (1967).

While sequential interdependence operates within individual supply chains, pooled interdependence works across supply chains in that activities utilize common resources at the production facilities. Individual supply chains are thus linked in that they share resources (see Dubois et al., 2004). As pooled interdependence between activities relates different supply chains to each other, it also relates different construction projects to each other. Moreover, different supply chains feeding into the same construction project are subject to interdependence, as the output of each chain must be synchronized with other chains in order to coordinate the chains with sequential and reciprocal interdependencies at the site. At the construction site, uncertainties and continuous adaptations result in reciprocal interdependencies among the activities undertaken. The identified interdependencies have important implications for how to approach activity coordination in construction, as they

imply that the actors must adjust and direct their activities and resources in and between numerous supply chains and numerous construction sites.

2.3.4. Challenges of Construction Supply Chain Management

Trkman and Groznik (2010) present the current issues and problems facing by the industry while adoption of supply chain management. Their study reveals the common issues and problems like risks, business process renovations, trust buildings, lack of leadership and so on. They also highlight the SCM standard that provides guidelines to face these kinds of challenges. A typical construction project life-cycle consists of the stages; Project conceptualization, Engineering and Design, Procurement of materials and services (Contractor, Sub-contractors, consultants etc.), Construction and Project Implementation and Project Utilization. The construction supply chain encounters serious problems (Cox et al., 2006) during each phases of this life cycle.

According to Cox. the construction supply chain face, incomplete definition of the scope due to poor understanding of project requirement by the client, misunderstanding of technical and financial viability of the project, inappropriate funding strategy, budgeting and/or cost benefit analysis are change of Client's requirements even before finalization of the project are problems that happen during project conceptualization phase. Problems during Engineering and Design are also indicated as**;** incomplete and / or inappropriate design information and documentation, failure to undertake adequate geotechnical and site exploration, inappropriate contract strategy and tender procedures, failure to select competent consultants and contractors.

Similarly Cox. identified problems that are a challenge to CSCM during Procurement of materials and services (Contractor, Sub-contractors, consultants etc) which include; lack of robust supplier/vendor selection methodology, failure in appropriate project planning leading to the delay in procurement, the procurement methods focusing lowest cost resulting in more disputes and claims and selection of suppliers and subcontractors not linked to performance criteria. Problems that are challenges to CSCM During Construction and Project Implementation are also identified as poor site preparation and problems with approvals, unrealistic time scale for construction and project execution, inappropriate time buffers built

into the construction activities, inappropriate and poor site supervision, coordination and management of works, unsystematic feedback updating of contract information, incompatible or inappropriate selection of equipment and machineries for execution of the work, poor communication between the various stake-holder at the project site and poor quality of construction and workmanship.

There are also problems which are challenge to CSCM during project utilization which include poor level of profitability for the construction firm, unexpected delays and over budget during the construction, problems with (late) payments and cash-flows, subsequent disputes leading to arbitration, legal action and settlement of claims.

According to Rouse (2005) the client is the most important value driver in construction supply chain management. In the context of construction supply chains, the client is the final recipient of the completed project. If the client values completion of the project on time or ahead of the schedule, all of the projects supply chain activities should be geared towards achieving this goal. He identified construction supply chain value drivers as: Customer/User/Client, Project Budgeted Cost/Estimate, Flexibility / Change Order, Time / Construction Duration and Construction Quality and Safety.

Even-though, SCM offers promise for the construction industry, however, intense implementation challenges, prevents effective implementation of supply chain benefits and proves detrimental to any planned operational efficiency advantages (Benton and McHenry, 2010). The barriers of construction supply chain which hinders not only the development of integrated supply chain but also makes the execution of the projects extremely difficult such as failure to share project information, fear of loss of control, lack of awareness, lack of understanding the project requirements, lack of understanding the supply chain, myopic thinking and strategies etc.

2.3.5. Influence of CSC challenges on project progress

Throughout the world, the business environment within which construction organizations operate continues to change rapidly. Organizations failing to adapt and respond to the

complexity of the new environment tend to experience survival problems (Lee et al. 2001). With increasing higher users' requirements, environmental awareness and limited resources on one side, and high competition for construction business marketplace on the other side, contractors have to be capable of continuously improving their performance (Samson and Lema 2009).

Some authors have conducted studies to examine factors impacting on project progress in developing countries. Faridi and El-Sayegh (2006) reported that shortage of skills of manpower, poor supervision and poor site management, unsuitable leadership; shortage and breakdown of equipment among others contribute to construction delays in the United Arab Emirates. Hanson et al. (2003) examined causes of client dissatisfaction in the South African building industry and found that conflict, poor workmanship and incompetence of contractors to be among the factors which would negatively impact on project progress. Mbachu and Nkando (2007) established that quality and attitude to service is one of the key factors constraining successful project delivery in South Africa.

The construction industry is complex in its nature because it comprises large numbers of parties as owners (clients), contractors, consultants, stakeholders, and regulators. Despite this complexity, the industry plays a major role in the development and achievement of society’s goals. It is one of the largest industries and contributes to about 10% of the gross national product (GNP) in industrialized countries (Navon, 2005). Ethiopia is no exception; the construction industry is one of the main economic engine sectors, supporting the national economy. However, many construction projects report poor performance due to many causes such as: unavailability of materials; excessive amendments of design and drawings; poor coordination among participants, ineffective monitoring and feedback, and lack of project leadership skills (Ethiopian Construction Industry Development Policy, 2014).

Project progress can be measured and evaluated using a large number of performance indicators that could be related to various dimensions (groups) such as time cost, quality, client satisfaction, client changes, business performance, health and safety (Cheung et al. 2004; DETR 2000). Time, cost and quality are, however, the 3 predominant progress evaluation dimensions.

Generally, progress evaluation dimensions may have one or more indicators, and could be influenced by various project characteristics. Dissanayaka and Kumaraswamy (1999) found that project time and cost performances get influenced by project characteristics, procurement system, project team performance, client representation's characteristics, contractor characteristics, design team characteristics, and external conditions. Similarly, Iyer and Jha (2005) identified many factors as having influence on project cost performance, these include: project manager's competence, top management support, project manager's coordinating and leadership skills, monitoring and feedback by the participants, decision-making, coordination among project participants, owners' competence, social condition, economic condition, and climatic condition. Coordination among project participants, however, was identified as the most significant of all the factors, having maximum influence on cost performance.

2.3.6. Benefits of Construction Supply Chain

In spite of having the above barriers, the construction supply chain has immense benefits to the construction organizations in developing vertical integration in the design, construction processes, operations and maintenance focusing on maximizing opportunities to add value while minimizing total cost of project. This application requires significant shift of the mindset of stakeholders towards collaboration, team work and mutual benefits.

Many authors agree that effective CSC can help to decrease inventory cost by more accurate estimation and scheduling construction execution to match it, reduce the overall construction cost by streamlining the flow of supplies to the execution process and by improving information flow between the agencies. It also improves client’s satisfaction by offering better qualities, timely completion of projects and by minimizing the costs. The implementation of effective CSCM can also help in accurate forecasting of change orders and making available actual estimation information to all levels, in standardizing of construction processes by implementing quality assurance plan and con help in reducing site administration and execution time and cost.

2.4. Construction Industry in Ethiopia

Construction is one of greatest sector that contributes to the current rapid economic growth of Ethiopia. According to the Ethiopian Construction Industry Development Policy published on December/ 2014 the construction sector is growing yearly at an average of 12.43% and contributes 5.3 percents of overall Gross Domestic Product (GDP). In the policy it is pointed out that the construction sector also plays crucial role in contributing to the employment of the country through the creation and Development of Small and Micro Enterprises.

It has been mentioned that Construction Industry in Ethiopia Involves the Government, Private Companies, Consultants, Contractors, Financial Institutions, Construction Input Suppliers, the Owners and Users Of Construction End Products, Construction Infrastructure Providing Companies, Construction Licensing And Monitoring Bodies and other relevant bodies acting in the industry.

Even though the construction sector is playing a crucial role in solving the country's economic and social problems, it is subjected to a variety of challenges and problems. It has been described that there exists an imbalance between construction services and inputs. The main role players such as contractors and consultants are limited in capacity, insufficient in number and luck business ethics to meet the needs of fast growing industry. As stated in the policy the industry is suffering from the absence of accountability and transparency issues leading to corruption and malpractices. The role players such as contractors, consultants and contract administrators want to create wealth in a non value adding ways manifested in low quality design, improper and biased bidding process, delayed project and complicated payment processes which leads to the compromise of quality, project dalliance and unnecessary cost increase.

The construction industry is also lacking efficient and responsive supply chain management which is taken as the main reason for the industry to be unproductive. A well integrated supply chain is not put in place to avail construction inputs produced by the local manufactures or the imported ones at the right time, at the right amount, at the right quality and with the reasonable price. Neither locally manufactured construction inputs nor imported material are available at the right condition demanded by the industry. There is shortage of

both manufactured and locally available construction inputs such as stone, sand and selected soil materials when compared to the demanded amount, resulting in rigorous price increase.

The other main problem mentioned in the policy document is the lack of integration and coordination among the key role players in the industry. As a result of this some government projects face poor feasibility and incomplete design. Procedures are not put in place to test and approve the reasonability of project price, quality of design and the control of project schedule. Even though objectives are set and strategies are designed to tackle the problems so far identified in the policy, there are significant challenges prevailing in the industry especially in the housing development programs.

2.5. Critical evaluation of the Literature Review

In the review, a wide range of subject matters related to the research objectives has been discussed. The concept of supply chain management in general and specifically the concept of construction supply chain management have been well defined. In addition the nature of supply chain management in the manufacturing industries has been comparably discussed with that of CSCM. Furthermore the nature of construction industry has been analyzed and Construction supply chain challenges, benefits, influences and integration ways are pointed out. Most of the authors agree that the construction industry is the most fragmented, disjoint and have difficulty of integrating the role players in the supply chain.

In spite of the massive focus on SCM, little attention has been paid to relationships upstream from the construction site, i.e. between contractors and their sub-contractors and material suppliers. This may suggest a lack of clear understanding of the type of relationships associated with SCM. In order to improve the efficiency and effectiveness of construction supply chains, a fundamental change in the management of relationships between clients, contractors and sub-contractors is required.

Although various partnering arrangements among the construction supply chain actors have been sought, practical ways to achieve integration among processes and firms was not well discussed. Taking a holistic and systemic view of the construction supply chain requires a

strategic approach which may, in fact, requires more extensive implementation effort. This is not easy within a single organization, let alone across a diverse and disperse group of trading partners of the kind so typical of the construction industry. The construction literatures seem to agree upon “supply chain integration” being the core task of SCM in construction. Furthermore, integration is seen as the key means to improve construction performance although definite and practical ways of achieved in an industry characterized by fragmented and adversarial relationships hasn’t been well indicated.

In conclusion construction industry is considered to be an engine in a nation’s economy and it has many important links to the rest of the economy. Construction is arguably the least integrated of all major industrial sectors, characterized by adversarial and disjointed relationships. Lack of coordination and communication between the involved parties is seen as a key reason for the perceived poor supply chain performance in the construction industry.

The complex and fragmented nature of construction supply chain have significant negative impacts on the construction process of projects. Impacts such as low productivity, cost and time overrun, conflicts and disputes, quality deviations, luck of trust and others frequently happen in the construction industry.

The application of CSCM to the construction industry has immense benefits to the construction organizations in developing the real sense of integration and collaboration. It can help in maximizing opportunities to add value while minimizing total cost of project through the integration of processes, organizations and information follows. This application requires significant shift of the mindset of stakeholders towards collaboration, team work and mutual benefits.

2.6. Conceptual Framework of the Study

According to Botha (1999), conceptual frameworks (theoretical frameworks) are defined as “a type of intermediate theory that attempt to connect to all aspects of inquiry (e.g., problem definition, purpose, literature review, methodology, data collection and analysis)”. Conceptual frameworks can act like maps that give coherence to empirical inquiry.

Based on the concepts and practices discussed in the literature review above and the information gathered from the Ministry of Urban Development and Housing, the construction supply chain process of 40/60 program can be depicted through narrative and figurative ways as follows.

The government, who owns the projects of 40/60 housing program hires Contractors, Consultants and also participates MSEs in the construction of the projects. The government provides more than 525 main items of construction material by performing procurement in two different ways. One is through a direct deal with the manufactures while the other is through local or overseas suppliers. The Ministry of Urban Development and Housing facilitates the bulk purchase of material from local and overseas supplier. The materials purchased are then distributed to constructions sites and provided to contractors and MSEs for the purpose of construction. Besides, Addis Ababa Savings Housing Enterprise procures some materials by itself under certain conditions. Contractors and MSEs also provide themselves with other construction inputs like sand and gravel. The design of the houses is also prepared by the government, the Ministry of Urban Development and Housing.

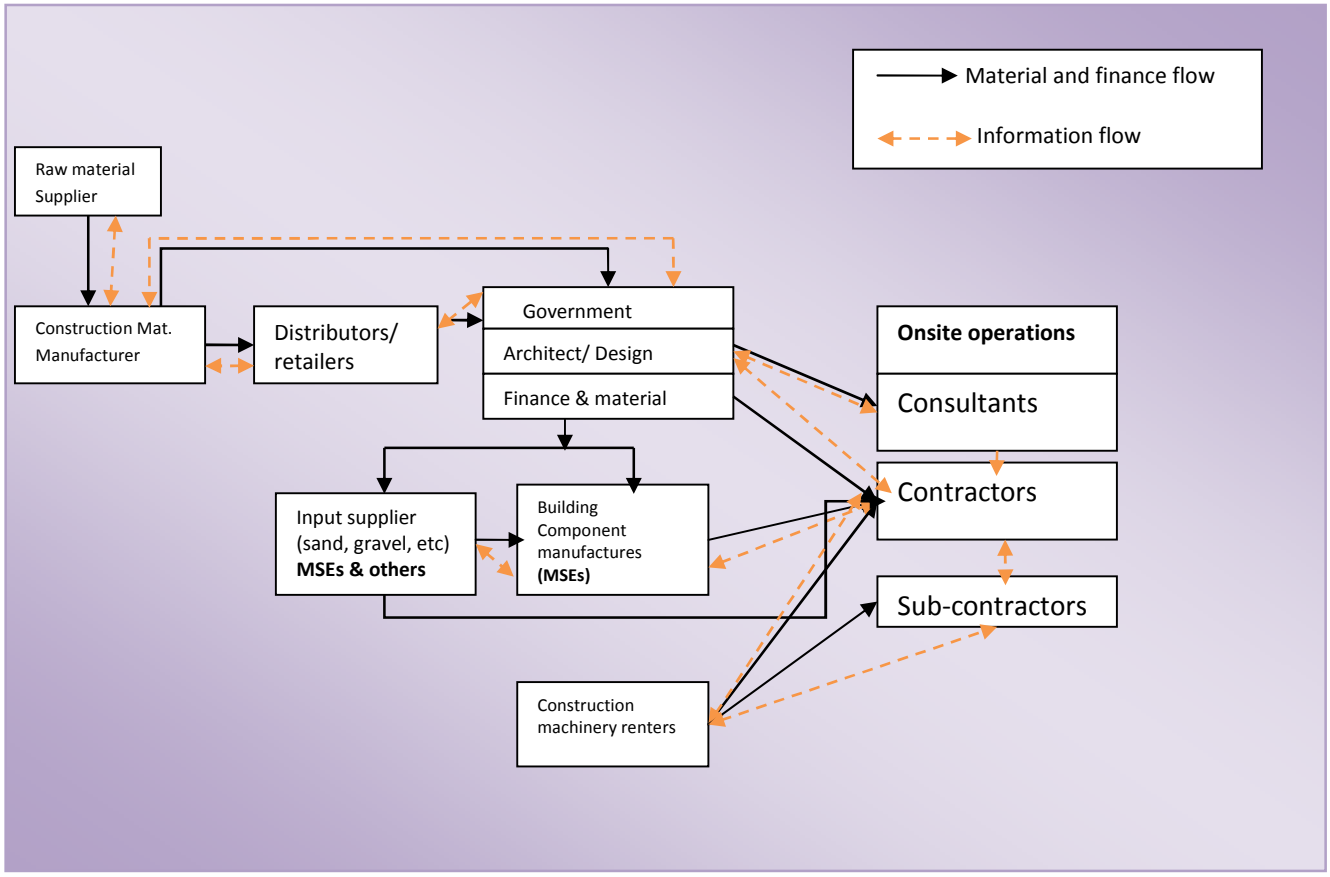


Figure 1 supply chain frame work for 40/60 housing projects

Source:- Own study

Chapter Three

III. Research Methodology

3.1. Introduction

This chapter deals with the methods that have been used in the research to come up with the findings of the study. The chapter includes research design, population of the study, sampling technique and sample size, methods of data collection, instruments of data collection, data analysis and presentation and ethical considerations.

3.2. Research design

A descriptive research was employed to obtain a comprehensive understanding of the current CSCM challenges and its influence on the construction progress of 40/60 Housing program. A mixed Concurrent Embedded Strategy with big emphasis given to quantitative method (Creswell & Plano Clark, 2007) was employed to collect data of both qualitative and quantitative types. This method has been chosen because the researcher wanted to support the quantitative data by the information obtained through qualitative data. The approach of the research in terms of design is therefore mixed (both quantitative and qualitative) methods. Quantitative method was used for ‘data’s collected through close ended questionnaire. Qualitative method was employed to collect datum that can describe and support the information obtained through quantitative methods.

3.3. Study Area

3.3.1. Unit of Analysis

The unit of analysis for this study is the Construction Supply Chain of 40/60 Housing program and units of observation is the construction supply chain actors indentified in the target population of the study.

3.3.2. Population of the Study

According to Hair et al. (2002, p.334) population can be defined as an identifiable total group of aggregation of elements (e.g. people, products, organizations, physical entities) that are of interest to the researcher and pertinent to the specified information problem.

The target population of this study was the main construction supply chain actors/stakeholders who are involved in the construction process of 40/60 housing program. Because of various factors (time money and capacity) it is very difficult for the researcher to wholly identify and address the construction supply chain members who directly or indirectly participate in the construction process of 40/60 Housing program. Therefore the researcher chosen to focus on the accessible population or major stake holders acting in the chain, such as; Contractors, Consultants, MSEs acting as sub-contractors and the concerned government organizations.

On the construction process of 40/60 housing program, 158 Contractors, 13 consultants and 250 MSEs sub-contractors (On Sanitary, precast beam, Block and Electrics works) are participating. Addis Ababa City Saving Houses Enterprise along with its two branches and Ministry of Urban Development and Housing are among the governmental bodies that have key role in the construction supply chain of 40/60 housing program. The respondents from these organizations were taken from the departments that are directly concerned with construction of 40/60 housing program. The appropriate departments are indentified in the table below and a single respondent was considered from the identified departments. Over all the sampling frame of the study contains 430 elements.

No	Organization/ firm	Roles	Relevant departments
1.	Ministry of Urban Development, and Housing; Housing Development and Government Buildings Construction Bureau	Design over all policy and strategy, prepare building designs for the housing schemes, provide capacity building and finance and regulates the program.	Housing building development Supply and capacity building
			Housing development finance and transfer
			Housing building projects monitoring and follow up
2.	Addis Ababa City Saving Houses Enterprise (SHE)	Manages the Construction of 40/60 housing scheme	Contract Administration, infrastructure building , follow up and houses transfer
			Construction material input and distribution
			Two branch offices
			Design, Construction and Monitoring
			MSEs Development and Support

Table 2 Concerned departments of government organizations

3.4. Sampling Technique and Sample Size

3.4.1. Sampling Technique

Both stratified random sampling and purposive sampling techniques were used to select respondents from the target population. Because of the population from which a sample was drawn did not constitute a homogeneous group, the target population was classified to the stratum of Contractors, consultants MESs, and Government offices. A complete listing of contractors, consultants and MSEs along with their specific address was found from the AASHE. For the random sampling techniques a lottery method without replacing the selected sample was employed to randomize the selection process.

The rationale to use purposive sampling technique is related to the level of information richness and the degree of response needed from the respondents. In this case heads of departments so far identified in table 2 were obviously information rich than others because they have more experience, exposure and responsibility. In addition 4 consultants that are consulting on much of the housing construction projects were selected purposefully.

3.4.2. Sample Size

Because the researcher has lacks on various resources including time and money to gather information from every actor in the chain, it becomes necessary to select a representative sample from the population. Sample size was calculated by using survey software which is used for random sampling methods. Since there are some differences among the target population of the study, it was divided in to four different strata, which are; contractors, MSEs, Consultants and the government. The sample size for contractors and MSEs stratum was calculated separately and together instituted the total sample. Accordingly the sample size for contractors and MSEs stratum was calculated by using the software with a 5 confidence interval and confidence level of 95% which are most used by similar business researches. As a result the sample size for contractors strata is 60, for MSEs 70, all the 9 department heads and 4 consultants were purposively selected and overall, 143 respondents were considered.

3.5. Data Sources

The data for the study was obtained from both primary and secondary sources. Primary data was collected from respondents (government officials and staffs from MUDH, ASHE, consultants, sub-contracting MSES,) through questionnaires and interviews: Secondary data was obtained from policies, strategies and reports that are relevant to the program.

3.6. Instruments of Data Collection

For this study standard questionnaire that was designed and used for two studies carried out by Akintoye et al. (2000) ‘A survey of supply chain collaboration and management in the UK construction industry’ and Pyke et al. (2000) ‘Manufacturing and supply chain management in China’, US contractors’ approach to the concept of supply chain management in construction industry’ is adopted. A structured interview was also used to gather qualitative data. The data collected by the questionnaire has been substantiated by the data obtained through interview conducted. Continuous scales (strongly agree to strongly disagree and very weak to very strong) were used to measure the items.

To check for the appropriateness of the questionnaire the draft was pilot tested. Accordingly 12 draft questionnaires were first administered to each of the category of the responds; two for contractors, two for Consultants, two for government respondents, and 4 for MSEs. As a result of the field test the content of the questionnaire, its format, questions and scales have been improved. These pilot respondents were not included in the main study. To this effect, the study was carried out after checking the appropriateness of the instruments by including the feedback from the pilot test. The Cronbach alpha statistics was used to check the reliability for the internal consistency of the scales.

3.7. Procedures for Data Collection

A listing of target respondents (contractors, MSEs and Consultants) with their detail address (phone number and location) was obtained from Addis Ababa Savings Housing Enterprise. After the respondents willingness to participate in the research was confirmed the student researcher and a hired assistant then clarified the objectives of the study at the time the questionnaire was administered to all sample respondents. In order to avoid confusion and to make the administration ease, a close follow up was maintained during filling up of the questionnaire. During qualitative data collection a face to face interview was made with purposively selected respondents of consultants and department heads.

3.8. Method of Data Analysis

Two types of data analysis techniques namely qualitative and quantitative techniques have been used in this research. The data collected from field work through questionnaires has been organized by computer software called Statistical Packages for Social Science (SPSS) version 19 and analyzed quantitatively. The data from open ended questionnaires and from interviews has been analyzed qualitatively. Both descriptive and inferential statistics have been employed to summarize and draw conclusions about the population from the sample data.

For ease of analysis the response distribution on the 5 point likert items was redefined in to numbers from 1 to 5. Hence, the statistical tool frequency distribution and mean have been employed to see the response distributions on the 5 point likert items. To check whether there

is a significance difference among the distribution of preferences in terms of given items, the Crobanche's Alpha test has been applied.

3.9. Description of variables

The dependent and independent variables for the study has been identified. The Dependent variables are construction supply chain management practices and influence of Construction Supply Chain barriers. The independent variables include, unavailability of construction material, bidding process, MSEs capacity, payment process, frequent design change, poor integration among stake-holders, quality of construction workmanship, lack of information, inappropriate contract strategy, contractors capacity, poor site supervisions and late payments

3.10. Ethical Considerations

The procedure of involving the participants in the research has considered the basic principles of research ethics, so that the researcher committed himself and sought the consent of participants, respected the confidentiality and anonymity of the research respondents. The researcher also ensured voluntarily of the participating and independency and impartiality of the research.

Chapter Four

IV. Data Analysis, Interpretation and Discussion

4.1. Introduction

This study aimed to present the CSCM practice , challenges and their influence on project progress of 40/60 housing projects with the involvement of selected contracting companies, government, MSEs and consultants with a view to come up with certain implications. Survey results were analyzed using SPSS version 19. Data were sorted and ranked according to the mean values to be dealt with. Each set of questions was analyzed with its contribution to clarify the contractors', MSEs, Consultants and clients opinions about CSCM concept and influence of construction CSC challenges on project progress. Detailed analyses and explanation of each set of questions are shown in the section "Analysis of Responses."

4.2. Response Rate

A self-administered questionnaire survey and structured interview were used to elicit the attitude of owner (the government), consultants, contractors and MSEs towards the concept of CSC practice, CSC challenges/barriers and their influence on the construction progress of 40/60 housing projects in Addis Ababa. Questionnaires were distributed to randomly selected contractors and MSE's and to purposively selected consultants and government bodies from Addis Ababa Saving Housing Enterprise (AASHE) and Ministry of Urban Development & Housing (MUDH). Interview was also conducted with respondents selected from these government organizations. Consultants, Contractors and MSEs were identified from the listings of Addis Ababa Savings Housing Enterprise with their detail address. The selection of respondents from the two government Organizations were based on their level of information richness.

The target populations of contractors and Consultants were companies hired by AASHE, with their number 158 and 13 consecutively. All the MSE's organized and awarded to work on the construction of 40/60 projects, as subcontractors on different construction works were also the target population; their number is 250. To the target population a total of 143

questionnaires were distributed as follows: 4 to consultants; 60 to contractors; 70 to MSES and 9 to government bodies. 115 were received (response rate of 80%) as follows: 4 (100%) from Consultants; 48 (80%) from contractors; 54(77%) from MSEs and all the selected government respondents were participated.

4.3. Respondents Profile

There have been four categories of respondents for this study; the government, contractors, MSEs and consultants. Most of the respondents from government side are department heads with only two of them from senior expert position. Majority of respondents of contractor category are owners and managers of the construction company; some project managers also participated in the study. All the respondents from the MSE categories are managers of the enterprise and that of consultants are all experienced resident engineers working for the consulting companies. The detail information of each respondent category is presented in table 3 below.

Respondents category	**Respondents Position**			**Level of education**			**Respondents Years of service**			
	Position	frequency	Percent	Level	Frequency	Percent	<2	2-5yrs	6-10yrs	>10
Governments	Departments heads	7	77.78	Degree	5	71.42	-	5		2
				Masters	2	28.57				
	Senior expert	2	22.22	Degree	2	100.0	-	1	1	-
				Masters	-	-				
Contractors	Owners and manager	39	81.25	Diploma	6	15.00	-	10	23	6
				Degree	30	77.00				
				Masters	3	12.00				
	Project manager	9	18.75	Degree	8	89.00	-	2	4	3
				Masters	1	11.00				
MSEs	Manager	54	100.00	Diploma	9	17.00	-	46	8	-
				Degree	45	83.00				
				Masters	-	-				
Consultants	Resident engineers	4	100.00	Degree	2	50.00	-	-	1	3
				Masters	2	50.00				

Table 3 Respondents job position, level of education and years of service

As can be seen from the table above the majorities of the respondent, from all categories are degree holders and have experience of 2-5 years and above. Therefore most of the respondents are experienced construction project managers, resident engineers and organizations' managers (with average experience of more than 6 years in the construction industry).

4.4. Scale Reliability Analysis

Cronbach's Alpha statistics using SPSS version 19 was applied to check the reliability of a set of questions designed to test 5-point Likert scale. "Since summated scales are an assembly of interrelated items designed to measure underlying constructs, it is very important to know whether the same set of items would elicit the same responses if the same questions are recast and re-administered to the same respondents" (Reynaldo and Santos, 1999). Cronbach's alpha is one of the most frequently used, which is the degree of inter-correlations among the items that constitute a scale. Considering '0.7' as an acceptable reliability coefficient for Cronbach's Alpha approachy, the higher the score, the more reliable the generated scale will be. The overall Cronbach's 'α' for the survey designed for the study is 0.795, which is well over the accepted limit of 0.70, which is reliable (Alpha=0.795>0.70 standard). Therefore, the result shows that the results extracted from the questionnaire are reliable.

Table 4 over all Crobanch's Alpha value

Reliability Statistics

Cronbach's Alpha	N of Items
.795	28

4.5. Analysis of Responses

The respondents were asked to indicate the practice of CSCM in the construction process of 40/60 projects based on their respective roles. They were asked to select the way they describe and label the nature of CSCM practices in the construction process of 40/60 housing projects. They were also asked to indicate the extent to which some potential factors are barrier to CSC and their influence on the progress of the projects with regard to project time

and cost. Here they were given lists of some common CSC challenges and asked to indicate the degree to which these barriers hinder the CSC of 40/60 projects on five points Likert scale as: strongly agree, agree, neutral, disagree and strongly disagree. They also indicated the level of influence the challenges/berries are imposing on the project progress in terms of time and cost, on five point Likert scale as: very weak, weak, Normal, strong and very strong.

4.6. The way Actors practice Construction supply Chain Management within 40/60 housing projects

In this part all the four categories of respondents were asked to describe the concept of CSC management and the way they are discharging their respective roles in practicing the construction supply chain management within the construction process of 40/60 housing projects. Specific and common questions aimed to elucidate the roles of each target supply chain partners within the construction process were presented to the respondents.

All the categories of respondents were commonly asked to elicit their perception towards the concept of CSCM practice in the construction process of 40/60 housing projects as; well known, little or not known. The majority of all the respondents voted for little known.

Table 5 below summarizes the perception of the respondents towards concept of CSCM within the construction process of 40/60 housing projects.

	Respondent category							
	Government		**Contractors**		**Consultants**		**MSEs**	
Concept of CSC mgt	Frequency	percent	Frequency	Percent	Frequency	percent	Frequency	Percent
It is well known	3	33.33	11	23.00	-	-	13	24.50
It is little known	5	55.55	31	64.60	4	100.00	37	68.50
It is not known	1	11.11	6	12.50	-	-	4	7.40

Table 5 Summery of respondent's response regarding concept of CSC management

As can be seen from the table 5 above 55% of government respondents, 64% of contractors respondents, 68% of MSEs and all respondents of the consultants category agreed that the concept of construction supply chain is little known in the construction process of 40/60 housing projects. Therefore it is possible to say that the construction supply chain actors in the construction of 40/60 housing projects are not familiar with the concept of construction supply chain management practice.

4.6.1. Contractor's Construction Supply Chain Management Practice

Even though most of the construction inputs are provided by the government, the contractors are mandated to supply inputs such as sand, gravel, machineries and some others that are not provided by the government. Some of them sub-contracted parts of their construction project so that they have suppliers and sub-contractors in their downstream and the government in their upstream across the chain. Contactors were then asked to elicit the way they are connected to their downstream and upstream supply chain partners. Accordingly 66.67% of them responded that they have not established a program to manage their sub-contractors and suppliers and also responded (67.7%) that they have short term type of relationship with their sub-contractors and suppliers. Majority of them (87.5%) similarly responded that they have a short term relationship with the client (government). The way they share information with their sub-contractors and suppliers is found to be a limited way (71% of them). Also majority of them (81%) responded that they select their suppliers or sub-contractors through an open bidding process and their relationship with other contractors in the construction supply chain process is competitive. This shows that the contractor's construction supply chain management practices is poor and are traditionally managing their supply chain.

CSC practices	**Contractors Response**	
	Frequency	Percent
1. Relationship with sub-contractors/ suppliers		
Short term	32	66.67
Long term	9	18.75
Selective	7	14.58
2. Relationship with other contractors		
Cooperative and Collaborative (win-win)	12	25.00

Competitive (win-lose)	36	75.00
Counterproductive (lose-lose)	-	0.00
3. Supplier/ Sub-contractor relationship management program		
Yes	13	27.08
No	35	72.92
4. Base of Sub-contractor/ supplier selection		
Based on convenience	7	14.58
Family or Friends	2	4.16
Bidding process	39	81.25
5. Relationship with client (government)		
It short (transactional)	42	87.50
Long term (strategic)	4	8.33
Selective (preferred)	2	4.16
6. Ways to share information with sub-contractors/ suppliers		
Transparent way	14	29.16
Limited way	34	70.83
There is no way	-	-

Table 6 Summary of Contractor's response on SCS practice

4.6.2. MSE's Construction Supply Chain Management Practice

All the construction inputs to MSEs are also provided by the government except those involved in producing precast, blocks and terrazzo tiles. These MSEs have to provide inputs such as sand and gravel from other MSEs organized to provide these materials. The government is therefore a client, as well as a supplier for most of the MSEs. The MSEs were asked to elicit the way they are connected to their partners in the construction network. Accordingly 82% of them responded that they have no supplier relationship management program and also responded (70%) that they have long term type of relationship with their supplier. Majority of them responded that they have long term type of relationship (79%) with the government but have counterproductive type (67%) of relationship with the contractors. The way they share information with the government, contractor and suppliers is found to be a limited (69% of them). Also majority of them (71%) responded that their relationship with other MSEs in the construction supply chain process is competitive. This

shows that MSEs are also not practicing construction supply chain management and are traditionally connected to their chain member.

CSC practices	MSE's Response	
	Frequency	Percent
1. Relationship with supply chain actors		
Short term	38	70.37
Long term	11	20.37
Selective	5	9.25
2. Relationship with other MSEs		
Cooperative and Collaborative (win-win)	16	29.62
Competitive (win-lose)	38	70.37
Counterproductive (lose-lose)	-	0.00
3. **Relationship with contractors**		
Cooperative and Collaborative (win-win)	4	7.40
Competitive (win-lose)	14	26.92
Counterproductive (lose-lose)	36	66.67
4. Supplier relationship management program		
Yes	11	20.37
No	44	81.48
5. Relationship with client (government)		
It short (transactional)	16	29.63
Long term (strategic)	38	70.37
Selective (preferred)	-	-
6. Ways to share information with government, contractors and suppliers		
Transparent way	12	22.22
Limited way	37	68.51
There is no way	5	9.25

Table 7 Summary of MSE's response on CSC practice

4.6.3. Government Construction Supply Chain Practice

Nine respondents, seven department heads and two senior experts from the ministry of Urban Development and Housing and AASHE were asked to describe the nature of relationship between the government and the other main actors in the construction process of 40/60 housing projects. They were asked to elicit the relationship between government and contractors, consultants, MSEs and suppliers. Accordingly majority of them responded that there is a short term relationship with contractors, suppliers and consultants while most of

them voted for the existence of long term relationship with the MSEs. They were also asked whether a system to share information is in place or not. Majority of them (66%) responded that the system to share information is inefficient. The result of this analysis reveals that the government is traditionally managing the CSC actors without considering the establishment of long term relationship with chain members but has long term connection with MSEs.

4.6.4. Consultants Construction Supply Chain Practice

There are 13 consulting companies participating in the construction process of 40/60 housing projects. Four of them have been selected purposively depending on the number of projects they are consulting and years of involvement in consultation on the construction of housing projects. These consultants have been hired by AASHE and their main connection is with the government followed by the contractors and MSEs. They were asked to indicate the type of relationship they have with the government and all agreed they have short term relationship. They also indicated that there is limited ways of sharing information between them, the government and MSEs. Similar to other actors consultants are traditionally managing the CSC without considering the establishment of long term relationship with chain members.

4.7. Construction Supply Chain Management Challenges of 40/60 Housing Program

The researcher investigated the factors that hinder the proper implementation of construction supply chain and development of CSCM organizations in the construction process of 40/60 housing program. The lists of potential barriers that may exist during enhancement of the CSC among actors were asked to figure out the common problems of the constructors, Consultants and MSEs. . Factors which might be potential barriers were listed as; Bidding process, shortage of construction material, Late payments, Complex payment process, Frequent design change, Poor integration among stake-holders, MSEs capacity, Lack of information, Inappropriate contract strategy, Contractors capacity, Poor site supervisions and Quality of construction workmanship. The five point Likert scale, “1” refers to “very high”, “2” refers to “high”, “3” refers “neutral”, “4” refers to “low”, “5” refers “very low” was used to indicate the degree of challenges of these factors on the construction supply chain management of 40/60 housing projects.

Respondents from the government category were interviewed and provided with open ended questions to help them describe the reasons they perceive are contributing for the existence of CSC barriers in the construction process of 40/60 housing program.

4.7.1. Construction Supply Chain Challenges for Contractors

The contractors were asked to rate the degree of challenges of those potential factors on the CSC within the construction process of 40/60 housing projects. Table 8 shows the descriptive statistics of contractor's response regarding impact of the potential factors on the CSC of the project.

Descriptive Statistics

Factors	N	Minimum	Maximum	Mean	Std. Deviation
Bidding process	47	1	4	1.77	.813
shortage of Con. Materials	48	1	4	1.33	.781
Late payment	48	1	4	2.35	1.062
complex payment process	48	1	4	2.15	.743
frequent design change	48	1	4	2.44	1.183
Poor integration among stake holders	48	1	2	1.10	.309
Quality of Const. workmanship	48	1	4	2.40	1.005
lack of information	48	1	3	1.81	.571
inappropriate contract strategy	48	1	4	2.31	.879
contractors capacity	48	1	2	1.40	.494
poor site supervision	48	1	5	3.46	.967
MSEs capacity	48	1	5	3.00	1.111
Valid N (list wise)	47				

Table 8 Descriptive statistics of contractor's response on CSC challenges

As can be seen from table 8 above the factor with the lowest mean, for which 89.6% of constructors voted 'very high' is "poor integration among the stake holders" which implies that there is a high degree of fragmentation among the role players in the construction process of 40/60 housing projects followed by 'shortage of construction material' for which 79.2% of contractors voted 'very high' and 'contractors capacity' (60.4% 'very high') are the second and third important factors that are highly affecting the construction supply chain of 40/60 projects.

Poor integration among stake holders

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	43	89.6	89.6	89.6
	High	5	10.4	10.4	100.0
	Total	48	100.0	100.0	

shortage of Con. Materials

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	38	79.2	79.2	79.2
	High	7	14.6	14.6	93.8
	Low	3	6.3	6.3	100.0
	Total	48	100.0	100.0	

contractors capacity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	29	60.4	60.4	60.4
	High	19	39.6	39.6	100.0
	Total	48	100.0	100.0	

Table 9 contractor's response rate on first 3 factors

Next to these factors 'bidding processes, 'lack of information, 'complex payment process, 'inappropriate contract strategy' and 'late payment' are consequently impacting the supply chain in a nearly high level. Other factors such as 'quality of construction workmanship' and 'frequent design change' also have a significant impact on hindering the construction supply chain of the projects while 'MSEs capacity' and 'poor site supervision' have the lower impact.

4.7.2. Construction Supply Chain Challenges for MSEs

Respondents of the micro and small enterprises (MSEs) similar to contractors, were presented to rate the degree of challenges the potential barriers have on the CSC of 40/60 housing program. Table 10 shows the descriptive statistics of MSEs responses on the five point Likert scale explained before.

Descriptive Statistics

Factors	N	Minimum	Maximum	Mean	Std. Deviation
Bidding process	54	1	4	1.82	.9727
shortage of Con. Materials	54	1	4	1.54	.794
Late payment	54	1	4	1.78	.925
complex payment process	54	1	4	1.80	.810
frequent design change	54	1	5	2.33	1.332
Poor integration among stake holders	54	1	4	1.52	.693
Quality of Const. workmanship	53	1	5	2.06	1.099
lack of information	54	1	5	3.07	1.465
inappropriate contract strategy	53	1	4	1.55	.607
contractors capacity	54	1	2	1.22	.420
poor site supervision	54	1	5	4.43	6.987
MSEs capacity	54	1	5	3.70	1.283
Valid N (list wise)	52				

Table 10 contractor's response rate on second 3 factors

The MSEs responses regarding the factors that are barrier to the construction supply chain of 40/60 housing projects is nearly similar to that of contractors. Here ‘Contractor’s capacity’ is found to be the most significant factor to affect the supply chain of the projects followed by ‘poor integration among stake holders’ and ‘shortage of construction materials’ which are similarly ranked by contractors. Out of the 54 respondents of MSEs 77.8% voted the ‘contractors capacity’ as a factor having ‘very high’ impact on the construction supply chain while ‘poor integration among stake holders” is rated ‘very high’ by 55.6% and ‘unavailability of construction materials’ is voted ‘very high’ by 54.3% of the respondents. It is possible to observe that there is no significant difference between the factors perceived by the contractors and MSEs to be the most important, in affecting the CSC of the program.

contractors capacity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	42	77.8	77.8	77.8
	high	12	22.2	22.2	100.0
	Total	54	100.0	100.0	

Poor integration among stake holders

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	30	55.6	55.6	55.6
	high	22	40.7	40.7	96.3
	low	2	3.7	3.7	100.0
	Total	54	100.0	100.0	

Shortage of Con. Materials

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	32	59.3	54.3	59.3
	high	18	33.3	33.3	92.6
	neutral	1	1.9	1.9	94.4
	low	3	5.6	5.6	100.0
	Total	54	100.0	100.0	

Table 11 MSE's response rate regarding the first three factors

Other factors ‘late payments’, ‘complex payment process’ and ‘bidding process’ have a mean value of less than 2, indicating that their impact is between ‘very high’ and ‘high’.

‘Frequent design change’, ‘lack of information’, ‘poor site supervision’, ‘MSEs capacity’ and ‘Quality of Construction workmanship’ have a mean value of 2> which indicated that most of the respondents of MSEs agree on less impact of the factors.

4.7.3. Construction Supply Chain challenges for Consultants

Since the number of respondents that have participated in the study from the consultants group is small, it is expected that their mean responses coincide. The figure below shows the mean results of four contactors response on the potential factors they perceive have impact on the construction supply chain of the housing projects.

Descriptive Statistics

Factors	N	Minimum	Maximum	Mean	Std. Deviation
Bidding process	4	1	2.0	1.50	.5774
Unavailability of Con. Materials	4	1	2	1.50	.577
Late payment	4	1	2	1.25	.500
complex payment process	4	1	2	1.50	.577
frequent design change	4	1	4	2.75	1.500
Poor integration among stake holders	4	1	2	1.25	.500
Quality of Const. workmanship	4	2	4	2.75	.957
lack of information	4	1	2	1.50	.577
inappropriate contract strategy	4	1	2	1.25	.500
contractors capacity	4	1	2	1.25	.500
poor site supervision	4	1	4	2.75	1.500
MSEs capacity	4	1	4	2.50	1.291
Valid N (list wise)	4				

Table 12 Consultants response rate regarding the first three factors

As indicated in the table 12 above the construction supply chain barriers 'contractors capacity, inappropriate contract strategy, Poor integration among stake holders and late payment' are equally rated as the most important factors by the consultants. 'Bidding process, unavailability of construction materials, complex payment process and lack of information' are also equally perceived as the factors that have impact on the CSC next to the previous four factors. The remaining factors 'MSEs capacity, poor site supervision, Quality of Construction workmanship and frequent design change' have relatively low impact when compared to the other factors but still have impact when an individual consultants response is considered.

4.8. Qualitative Response Analysis

Respondents of the government category were asked to describe the problems that are currently exacerbating the CSC barriers of 40/60 housing projects. An interview was conducted with two of the department heads while five of them and two senior experts were provided with open ended questions to describe their perception for the persistence of construction supply chain barriers.

Accordingly they were asked to indicate the reason why 'shortage of construction materials' exists and most of them responded that problems such as shortage of currency to purchase materials from oversee, complex bidding and purchasing process, lack of competent local manufacturers, shortage of construction materials on market, lack of efficient land transportation and lack of capacitated suppliers are the major problems exacerbating the shortage of construction materials for the construction of 40/60 housing projects. Similarly they were asked to indicate the cause of quality problems challenging the materials provided and majority of them agreed on problems such as; lack of 'well organized testing laboratories, absence of certified quality assessors, lack of standards and weak capacity of standards authority to set and sustain standards.

The respondents were also asked to indicate whether government payments are made on time or not, and all of them agreed that payments are not made on time. A follow up question was presented to them to explain reasons for the late payments and most of them responded that, lack of 'standard time and system, complex payment process, lack of finance, incomplete and delayed payment certification' are the causes for the late payment.

Similarly the respondents were asked to describe problems related to the process of selecting contractors and majority of them said 'corruption', 'lack of standard evaluation criteria', and 'lack of well experienced contractors' are the major challenges to the government. Problems related to design change; review and implementation have also some impact on the projects of 40/60 housing program. The respondents reasoned out 'increment of floors', 'intention to minimize cost', 'specific conditions of construction sites' and 'capacity problems of the consultants' are the major factors causing design change to the housing project.

4.9. Influence of Construction Supply Chain Barriers on Project Progress

So far the potential factors that are hindering the construction supply chain management of 40/60 housing projects were discussed. Now it is time to discuss the influence these factors have on the progress of the projects, with regard to project time (schedule) and cost. All the categories of the respondents were asked to rate the negative impact; those factors have on the progress of 40/60 housing projects. The five point Likert scale, "1" refers to "very weak", "2" refers to "weak", "3" refers "normal", "4" refers to "strong", "5" refers "very strong"

was used to indicate the degree of negative influence of these factors on the progress of project time and cost.

4.9.1. Influence of CSC Barriers on Project Time

The response of all the categories of respondents regarding the influence of factors on project time was analyzed together. With only some missing values, 115 respondents elicited their perception towards the negative influence of those factors on project progress with respect to time. Table 13 below shows the descriptive statistics of responses and the mean value indicates the average position the respondents voted for the five points of the Likert scale i.e. 'very weak', 'weak', 'normal', 'strong' or 'very strong'

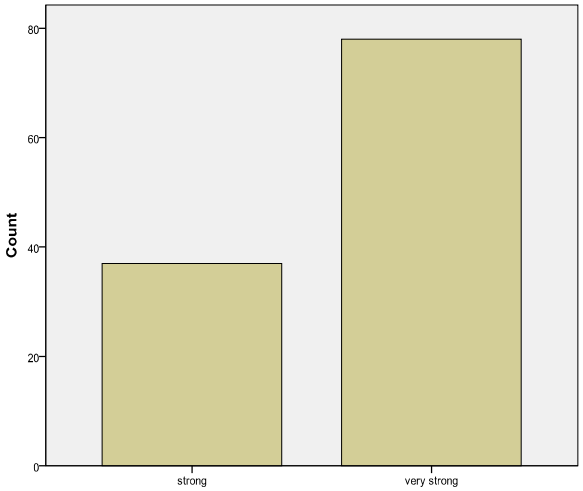
Descriptive Statistics

Factors influence	N	Minimum	Maximum	Mean	Std. Deviation
influence of late payment on time	114	1	5	3.96	1.185
influence of lack of info on time	115	1	5	3.05	1.241
influence of lack of integration among stakeholders	114	1	5	4.25	.750
influence of capacity of contractors on time	115	1	5	4.62	.629
influence of shortage of construction material on time	115	4	5	4.68	.469
influence of design change on time	115	1	5	3.09	1.288
influence of Bidding process on time	115	1	5	3.71	1.114
influence of Capacity of MSEs on time	115	1	5	2.64	1.141
Valid N (list wise)	113				

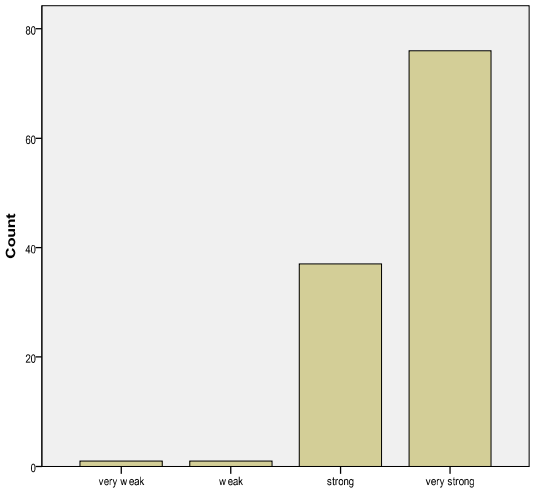
Table 13 Influence of CSC barriers on project time

As can be seen from the table 13 above factors such as; 'shortage of construction material', ' capacity of contractors' and 'lack of integration among stakeholders' have a mean value of >4 indicating that these factors have more strong impact on the project completion time of 40/60 housing projects. Figure 2 shows the level of influence of these factors on the project time based on each of the five point Likert scale.

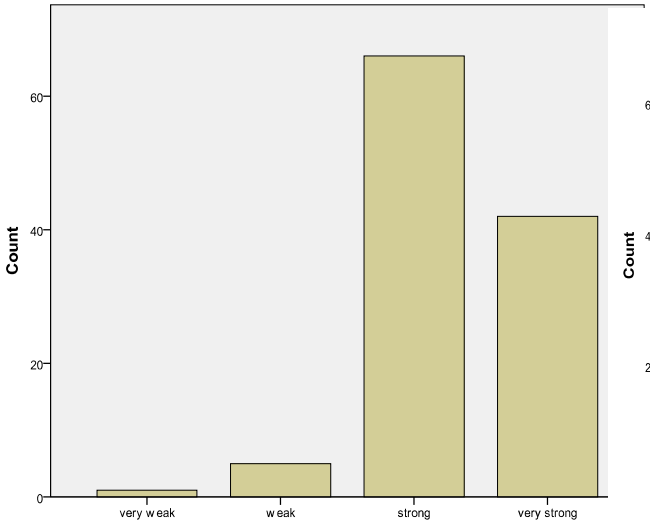
Figure 2: level of influence of CSC challenges on project time



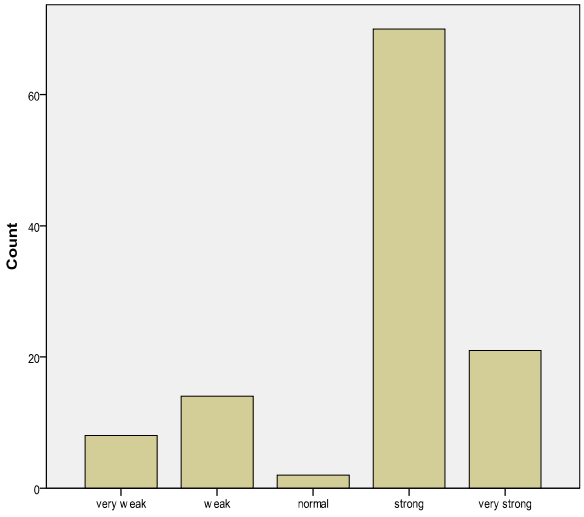
influence of shoratege of construciton material



influence of capacity of contractors on time



influence of lack of intergration among stakeholders



influence of Bidding process on time

4.9.2. Influence of CSC Barriers on Project Cost

Similar to the influence the factors have on project time, influence on cost, depending on the responses of 115 participants was analyzed. Figure 3 shows the value of mean responses which indicates the average position the respondents voted for the five points of the Likert scale i.e. ‘very weak’, ‘weak’, ‘normal’, ‘strong’ or ‘very strong’

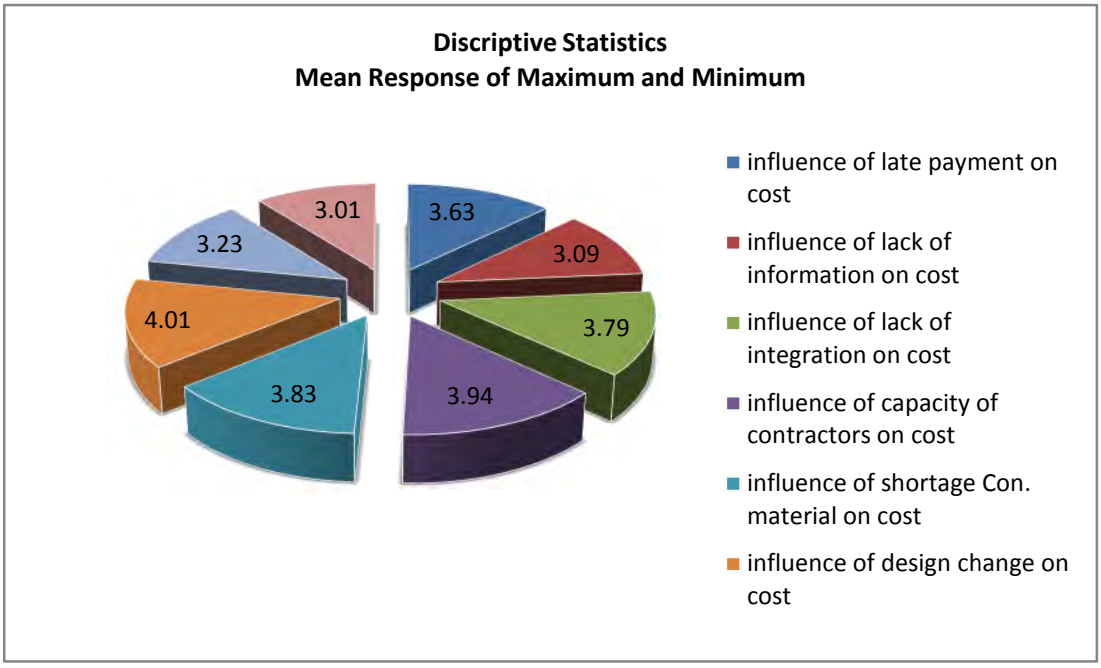


Figure 2 mean value of responses on the five scales regarding influence of CSC barriers on project cost

As can be seen from figure 3, the mean of ‘influence of design change’ on the project progress in terms of cost is 4.01 indicating design change is strongly influencing the progress of the projects. These means there are design changes affecting the progress of projects by increasing the cost. The other factor with a mean value of 3.94 is the influence of ‘capacity of contractors’. This indicates that contractors are not in a position to handle the costs of the projects due to capacity problem. Shortage of construction materials also have a mean value (3.83) that indicates relatively strong impact on projects cost.

If construction materials are not provided on time and by the right quantity inflation and other factors may result in project cost increase so that negatively affects the progress of the projects. The negative impact of ‘lack of integration among stake holders’ on project

progress is also a significant one, with a mean value of 3.79. When the actors involved in the construction of the projects are not working collaboratively towards a common goal, it's obvious that duplication of effort and unnecessary costs would incur.

This can directly affect the progress of projects by increasing the cost. The client's problem of performing payments on time can have a negative impact on cost. If payments are not effected on time for the firms involved in the construction of the projects, lack of finance can lead firms to idle time. This can lead to cost increase by the effect of inflation and the idle time the firms have experienced. The remaining factors have no significant impact when compared the previous major factors but still have impact on the cost.

Chapter Five

v. Summary, Conclusion and Recommendation

5.1. Summary of Findings

Based on the analysis and interpretation of the data obtained from all categories of the respondents the researcher has come up with the following summary of findings;

The respondents of all the categories agreed that, the concept of construction supply chain management within the construction process of 40/60 housing projects is little known which implies that actors in the CSC are not familiar with concept of CSCM.

The way the major actors in CSCM of 40/60 housing projects working together has also been investigated. Accordingly the way contractors are connected to their supply chain partners was found to be short term and driven by the sense of maximizing own profit. They have no programs to manage their sub-contractors and suppliers. Their relationship with client, sub-contractors and suppliers is temporary and there is poor information exchange between them. The relationship between government and other actors (contractors, consultants and suppliers) is also temporary, except with the MSEs. The long type of relationship is only found between governments and MSEs even thought poor information sharing is still a problem. The MSEs themselves are not working strategically for the common goal rather work to maximize own benefit and have far rough relationship with contractors. Over all, the relationship among the actors and with their respective downstream and upstream partners is temporary, competitive and a disintegrated one.

The factors that can hinder construction supply chain integration and the situations that help the factors to persist were also investigated. The level of challenge the factors impose on CSC integration from the viewpoint of contractors, MSEs and consultants has been analyzed. Majority of the contractors agreed that ‘Poor integration among the stake holders’ is the first to hinder CSC integration. ‘Shortage of construction material’ and capacity problems of contractors also have a high impact on the construction supply chain of 40/60 projects. The respondents from consultants and MSEs have also indicated

that there is high degree of disintegration, lack of contractor's capacity and shortage of construction materials in construction of the projects. The shortage of construction materials is related to problems such as shortage of currency to purchase materials from oversee, complex bidding and purchasing process, lack of competent local manufacturers, shortage of construction materials on market, lack of efficient land transportation and lack of capacitated suppliers. The quality problems related to provision of construction materials for the construction emanates from lack of 'well organized testing laboratories, absence of certified quality assessors, lack of standards and weak capacity of standards authority to set and sustain standards.

The analysis of all the categories of responses shows that the factors such as; 'bidding processes, 'lack of information, 'complex payment process, 'inappropriate contract strategy' and 'late payment' are also highly impacting the construction supply chain of the projects. Other factors such as 'quality of construction workmanship' and 'frequent design change' also have a significant impact on hindering the construction supply chain of the projects while 'MSEs capacity' and 'poor site supervision' have the lower impact when compared to the other factors.

The client (government) is not effecting payments on time because of lack of 'standard time and system, complex payment process, lack of finance, incomplete and delayed payment certification' prepared by the consultants. The problems of bidding process are caused by 'lack of standard evaluation criteria', 'corruption', and 'lack of well experienced contractors. The analysis shows that 'increment of floors', 'intention to minimize cost', 'specific conditions of construction sites' and 'capacity problems of the consultants' contribute for the design change that impacts the CSC of 40/60 housing program.

The impact of CSC barriers on project progress of 40/60 housing program in terms of time and cost was also analyzed. The result of the analysis reveals that 'shortage of construction material' is the number one factor delaying the projects of 40/60 housing program followed by 'capacity of contractors' and 'lack of integration among stake holders'. 'Bidding process and 'late payment' are the next factors having more strong influence on the project completion time of the projects. The remaining factors such as;

‘capacity of MSEs’, ‘lack of information’ and ‘design change’ are not significantly influencing the schedule of the projects.

On the other hand ‘design change’, ‘Shortage of construction materials’, ‘capacity of contractors’ and ‘lack of integration among stake holders’ are strongly influencing the progress of the projects in terms of cost. If construction materials are not provided on time and by the right quantity inflation and other factors may result in project cost increase so that negatively affects the progress. When the actors involved in the construction of the projects are not working collaboratively towards a common goal, it’s obvious that duplication of effort and unnecessary costs would incur. This can directly affect the progress of projects by increasing the cost. Payments to the firms involved in the construction of the projects are not made on time by the government. This can lead to cost increase by the effect of inflation and the idle time the firms’ experience. The remaining factors have no significant impact when compared the previous major factors but still have impact on the cost.

5.2. Conclusion

Based on the analysis and interpretation of the data obtained from all categories of the respondents the researcher has come up with the following concluding remarks;

- In conclusion the actors involved in the construction of 40/60 housing projects have poor knowledge of Construction Supply Chain Management which is an indicative of poor Construction supply chain management practices within the chain.
- There is no long term relationship among actors in the CSC of 40/60 which is driven by the spirit of cooperation and collaboration to achieve a common goal.
- The government, contractors and consultants as one of the major actors are not properly playing their respective roles in establishing strategic relationship with their chain members. Most of the actors in the construction of projects have a temporary relationship with government which lasts only for a specific project life. The contractors also lack strategic relationship with their sub-contractors and suppliers. They have no programs to create a strategic relationship with their

downstream partners and they work in maximizing own benefit rather than working towards a common goal. There is also lack of capacity to effectively run the construction of projects as needed.

- The lack of integration among stake holders is the major factor impacting the CSC of 40/60 housing projects. Absence of integration among supply chain parties is hindering the effort to minimize overall project costs and the enhancement of information exchange and maintenance between parties, and ultimately impacting the progress of the projects.
- The necessary construction materials for the construction of the projects are not provided on time so that negatively influencing the progress of the projects in terms of time and const. The shortage of currency to purchase materials from oversee, complex bidding and purchasing process, lack of competent local manufacturers, shortage of construction materials on market, lack of efficient land transportation and lack of capacitated suppliers are contributing to this problem.
- Factors such as; 'capacity of MSEs', 'lack of information' and 'design change' are not significantly influencing the schedule of the projects.
- Payments to the contracting firms are not made on time by the government because of complex payments process, lack of standard time, system and finance. Preparation of payment certification by the consultants also delays the payment process.
- The government's bidding process to select contractors and suppliers is long and complex, which is causing problems of corruption that, opens illegal door for incapable contractors to participate in the construction of the projects.

5.3. Recommendations

- The actors in the CSC need to work towards more aligned and structured ways of working. Specially the government should work towards creating strong CSC by applying a system that increase integration and collaboration within and between project supply chains. In order to do so, virtually all firms and functions in the supply chain should be connected by the help of strong information system.

Information technology should be instituted to foster information communication within and among all supply chain members. Online information gathering and sharing should be designed based on mutual trust and purposes. Technologies also have to be compatible enough along the supply chain members to smoothen the flow and understandings along the networked lines.

- The government should take a lead to develop the concept of construction supply chain management in the construction of housing projects through proper and continuous training programs. This effort can update actor's knowledge and can assist them to be more familiar with construction supply chain practices and processes. Continuous coordination and relationship between project participants are required through project life cycle for solving problems and enhancing project progresses. The continuous participation of other stake holders like, higher academic institutions is also helpful in supporting the program by the transfer of knowledge.
- The government is encouraged to facilitate payment to the firms participating in the construction of the projects in order to overcome delay, disputes, and claims that have a direct impact on projects progress. A modern payment system that is supported by information technology can help to minimize delays resulting from ineffective payments system. In addition the government is urged to consider adequate contingency allowances in order to solve payment delays resulting from inadequate finance.
- To solve problems arising from shortage of construction materials the researcher recommends the government to develop the capacity of local manufactures. This can help not only by facilitating the provision of construction material inputs but also help to save foreign currency consumed by the importation of materials from oversees which in turn contributes to a reduced cost and on time completion of projects.
- The capacity of contractors should be enhanced to minimize problems that arise from underperformance of contractors.

- The long and complex system of selecting contractors and suppliers should be improved. A standard system that requires standard evaluation criteria should be designed to run the bidding processes to select contractors and suppliers.

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Appendix I: Questionnaires

Code _____

Addis Ababa University
School of Commerce
Master of Art in Logistics and Supply Chain Management

Questionnaire on "Influence of Construction Supply Chain Challenges on Project Progress, Case of 40/60 Housing Scheme of Addis Ababa".

Questionnaire for Contractors,

Dear Respondents,

This questionnaire has been designed to study the Influence of Construction Supply Chain Challenges on project progress of 40/60 Housing Scheme of Addis Ababa. The study is conducted in partial fulfillment of the requirements for the master's degree in Logistics and Supply Chain Management at Addis Ababa University.

Your response will form the major part of the data and the information you give will enable the researcher to critically analyze the influence of supply Chain barriers/ challenges on the progress of the projects.

Please answer all questions. Space is provided at the end for you to add further explanation or comments. I promise that all information you provide would be strictly confidential.

Please tick (✓), select or provide your own answers where applicable.

Thank you in advance for your indispensible cooperation to spare invaluable time and energy to complete these questionnaires. Name: GelanaAssefa MA Student at AAU, Telephone +251912165053, e-mail-assefagelana@gmial.com

Part I. General information

1.1.Level of education

- ☐ 10th complete
- ☐ Diploma
- ☐ First Degree
- ☐ Master
- ☐ PhD

1.2.Year of service in the industry

- ☐ Less than 2 years
- ☐ 2- 5 years
- ☐ 6- 10 years
- ☐ More than 11 years

1.3.Have you contracted out some of your construction works, to sub-contractor?

- ☐ Yes
- ☐ No

Part II: - Construction Supply Chain Management Practices

Construction supply Chain Management is the inter-organizational integration of flows (information, finance, etc), processes, systems and actors (Owner, designers, prime contractors, specialty subcontractors, material suppliers and other role players in the industry). It is the establishment of long term relationship among the actors driven by the spirit of cooperation and collaboration to achieve a common goal.

Please select your choice by putting (✓) mark in the box provided in front of each factors that you think describe the construction supply chain management practices of 40/60 housing program. Selection of more than one factor is possible where appropriate.

2.1. How do you describe Concept of Construction supply chain management in the construction process of 40/60 housing?

- ☐ It is well known
- ☐ It is little known
- ☐ It is not known

2.2.Does your company have Sub-contractor/Supplier relationship management programs in your business plans?

- ☐ No we have not
- ☐ Yes we have

2.3. What type of relationship your company has with sub-contractors / suppliers?

- ☐ It is short term (transactional)
- ☐ It is long term (strategic)
- ☐ It is selective (preferred)

2.4. What type of relationship your company has with other contractors in the construction process for 40/60?

- ☐ It is cooperative and collaborative (win-win),
- ☐ It is competitive (win-lose),
- ☐ It is counterproductive (lose lose),

2.5. What is the base of your company' Sub-contractor or Supplier selection?

- ☐ We select them based on convenience,
- ☐ We select them because they are friends/families
- ☐ We select them through bidding process(based on capability),

2.6. How does your company share information with sub-contractors and suppliers?

- ☐ We have a transparent way of information sharing
- ☐ We have a limited way of information sharing
- ☐ we have no ways to share information

2.7. What type of relationship your company has with the client (government)?

- ☐ It is short term (transactional)
- ☐ It is selective (preferred)
- ☐ It is long term (strategic)

Part III: - Factors which are Challenges/ Barriers to CSC integration for Contractors

Construction supply Chain challenges/barriers are the problems that the Construction industry is facing in managing its supply chains.

Please rate to what extent you believe the following factors are barrier to CSC for consultants in the construction of 40/60 housing program. The numbers in the table are defined as follows.

1= very high , 2= high , 3= neutral , 4= low , 5= very low

3	Factors which are barrier to CSC integration	1	2	3	4	5
3.1.	Bidding process					
3.2.	Unavailability of construction material					
3.3.	Late payments					
3.4.	Complex payment process					
3.5.	Frequent design change					
3.6.	Poor integration among stake-holders					
3.7.	Quality of construction workmanship,					
3.8.	Lack of information					
3.9.	Inappropriate contract strategy					
3.10.	Contractors capacity					
3.11.	Poor site supervisions,					
3.12	MSEs capacity					

Part IV: - Influence of Construction Supply Chain Challenges on project schedule, and cost.

Factors that may influence the progress of construction projects in terms of project schedule and cost are listed in the left side of the table. How do you rate the current negative influence of these factors on the construction progress of 40/60 housing projects with respect to time and cost? The numbers in the table are represented as follows.

1= very weak, 2 = weak, 3= normal, 4= strong, 5= very strong

4.1.	**Influence on**	Time					Cost				
		1	2	3	4	5	1	2	3	4	5
4.1.1.	Late payments										
4.1.3.	Lack of information sharing										
4.1.4.	Lack of integration among stakeholders										
4.1.5.	Capacity of contractors										
4.1.6	Shortage of Construction material										
4.1.7.	Design change										
4.1.8	Bidding process										

Any other please state

----------Thank You!

Code _____

Addis Ababa University
School of Commerce
Master of Art in Logistics and Supply Chain Management

Questionnaire on "Influence of Construction Supply Chain Challenges on Project Progress, Case of, 40/60 Housing Scheme of Addis Ababa".

Questionnaire for MSEs,

Dear Respondents,

This questionnaire has been designed to study the Influence of Construction Supply Chain Challenges on project progress of 40/60 Housing Scheme of Addis Ababa. The study is conducted in partial fulfillment of the requirements for the master's degree in Logistics and Supply Chain Management at Addis Ababa University.

Your response will form the major part of the data and the information you give will enable the researcher to critically analyze the influence of supply Chain barriers/ challenges on the progress of the projects.

Please answer all questions. Space is provided at the end for you to add further explanation or comments. I promise that all information you provide would be strictly confidential.

Please tick (✓), select or provide your own answers where applicable.

Thank you in advance for your indispensible cooperation to spare invaluable time and energy to complete these questionnaires. Name: GelanaAssefa MA Student at AAU, Telephone +251912165053, e-mail- assefagelana@gmial.com

Part I. General information;

1.4. Level of education

- ☐ 10th complete
- ☐ Diploma
- ☐ First Degree
- ☐ Master
- ☐ PhD

1.5.Year of experience in the industry

- ☐ Less than 2 years
- ☐ 2- 5 years
- ☐ 6- 10 years
- ☐ More than 11 years

1.6.Your position in the Enterprise

- ☐ General manager
- ☐ Deputy manager
- ☐ Expert
- ☐ Other specify……

1.7. Year of establishment of your Enterprise;

- ☐ ----------

Part II: - Construction Supply Chain Management Practices

Construction supply Chain Management is the inter-organizational integration of flows (information, finance, etc), processes, systems and actors (Owner, designers, prime contractors, subcontractors, material suppliers and other role players in the industry). It is the establishment of long term relationship among the actors driven by the spirit of cooperation and collaboration to achieve a common goal.

Please select your choice by putting (✓) mark in the box provided in front of each factors that describe the construction supply chain management practices of 40/60 housing projects. Selection of more than one factor is possible where appropriate.

2.1. How do you describe Concept of Construction supply chain management in the construction process of 40/60 housing?

- ☐ It is well known
- ☐ It is little known
- ☐ It is not known

2.8. Does your Enterprise have Supplier relationship management programs in business plans?

- ☐ No we have not
- ☐ Yes we have

2.9. What type of relationship does your company have with the project owner (the government)?

- ☐ It is short term (transactional)
- ☐ It is long term (strategic)
- ☐ It is selective (preferred)

2.10. What type of relationship your Enterprise has with suppliers?

- ☐ short term (transactional)
- ☐ long term (strategic)

2.11. What type of relationship your Enterprise has with other MSEs?

- ☐ counterproductive (lose lose),
- ☐ competitive (win-lose),
- ☐ cooperative and collaborative (win-win),

2.12. How does your Enterprise select Suppliers?

- ☐ Through bidding process(based on capability),
- ☐ Based on convenience,
- ☐ We select them because they are friends/families

Part III: - Factors which are Challenges/ Barriers to CSC integration for MSEs

Construction supply Chain challenges/barriers are the problems that the Construction industry is facing in managing its supply chains.

Please rate to what extent you believe the following factors are a barrier to CSC for consultants in the construction of 40/60 housing program. The numbers in the table are defined as follows.

1= very high , 2= high , 3= neutral , 4= low , 5= very low

3	Factors which are barrier to CSC integration	1	2	3	4	5
3.1.	Bidding process					
3.2.	Unavailability of construction material					
3.3.	Late payments					
3.4.	Complex payment process					
3.5.	Frequent design change					
3.6.	Poor integration among stake-holders					
3.7.	Quality of construction workmanship,					
3.8.	Lack of information					
3.9.	Inappropriate contract strategy					
3.10.	Contractors capacity					

Part IV: - Influence of Construction Supply Chain Challenges on project schedule, and cost.

Factors that may influence the progress of construction projects in terms of project schedule and cost are listed in the left side of the table. How do you rate the current negative influence of these factors on the construction progress of 40/60 housing projects with respect to time and cost? The numbers in the table are represented as follows.

1= very weak, 2 = weak, 3= normal, 4= strong, 5= very strong

4.1.	Influence on	Time					Cost				
		1	2	3	4	5	1	2	3	4	5
4.1.1.	Late payments										
4.1.3.	Lack of information sharing										
4.1.4.	Lack of integration among stakeholders										
4.1.5.	Capacity of contractors										
4.1.6	Shortage of Construction material										
4.1.7.	Design change										
4.1.8	Bidding process										
4.1.9	Capacity of MSEs										

Any other please state

----------Thank You!

Code _____

Addis Ababa University
School of Commerce
Master of Art in Logistics and Supply Chain Management

Questionnaire on "Influence of Construction Supply Chain Challenges on Project Progress, Case of 40/60 Housing Scheme of Addis Ababa".

Questionnaire for Consultants,

Dear Respondents,

This questionnaire has been designed to study the Influence of Construction Supply Chain Challenges on project progress of 40/60 Housing Scheme of Addis Ababa. The study is conducted in partial fulfillment of the requirements for the master's degree in Logistics and Supply Chain Management at Addis Ababa University.

Your response will form the major part of the data and the information you give will enable the researcher to critically analyze the influence of supply Chain barriers/ challenges on the progress of the projects.

Please answer all questions. Space is provided at the end for you to add further explanation or comments. I promise that all information you provide would be strictly confidential.

Please tick (✓), select or provide your own answers where applicable.

Thank you in advance for your indispensible cooperation to spare invaluable time and energy to complete these questionnaires. Name: GelanaAssefa MA Student at AAU, Telephone +251912165053, e-mail- assefagelana@gmial.com

Part I. General information

1.8. Level of education

- ☐ 10th complete
- ☐ Diploma
- ☐ First Degree
- ☐ Master
- ☐ PhD

1.9.Year of experience in the industry

- ☐ Less than 2 years
- ☐ 2- 5 years
- ☐ 6- 10 years
- ☐ More than 11 years

1.10. Your position in the Consultancy Company

- ☐ Owner of the Company
- ☐ Manager of the Company
- ☐ Expert
- ☐ Other specify……

1.11. Year of establishment of your company;

- ☐ ----------

Part II: - Construction Supply Chain Management Practices

Construction supply Chain Management is the inter-organizational integration of flows (information, finance, etc), processes, systems and actors (Owner, designers, prime contractors, specialty subcontractors, material suppliers and other role players in the industry). It is the establishment of long term relationship among the actors driven by the spirit of cooperation and collaboration to achieve a common goal.

Please select your choice by putting (✓) mark in the box provided in front of each factors that describe the construction supply chain management practices of 40/60 housing program. Selection of more than one factor is possible where appropriate.

2.1. How do you describe Concept of Construction supply chain management in the construction process of 40/60 housing?

- ☐ It is well known
- ☐ It is little known
- ☐ It is not known

2.13. What type of relationship does your company have with the project owner?

- ☐ It is short term (transactional)
- ☐ It is long term (strategic)
- ☐ It is selective (preferred)

2.14. How does your company share information with client?

- ☐ We have a transparent way of information sharing
- ☐ We have a limited way of information sharing
- ☐ we have no ways to share information

2.15. How does your company share information with contractors?

- ☐ We have a transparent way of information sharing
- ☐ We have a limited way of information sharing
- ☐ we have no ways to share information

Part III: - Factors which are Challenges/ Barriers to CSC integration for Consultants

Construction supply Chain challenges/barriers are the problems that the Construction industry is facing in managing its supply chains.

Please rate to what extent you believe the following factors are a barrier to CSC for consultants in the construction of 40/60 housing program. The numbers in the table are defined as follows.

1= very high, 2= high , 3= neutral , 4= low , 5= very low

3	**Factors which are barrier to CSC integration**	1	2	3	4	5
3.1.	Bidding process					
3.2.	Unavailability of construction material					
3.3.	Late payments					
3.4.	Complex payment process					
3.5.	Frequent design change					
3.6.	Poor integration among stake-holders					
3.7.	Quality of construction workmanship,					

3.8.	Lack of information					
3.9.	Inappropriate contract strategy					
3.10.	Contractors capacity					
3.11.	Poor site supervisions,					
3.12	MSEs capacity					

Part IV: - Influence of Construction Supply Chain Challenges on project schedule, and cost.

Factors that may influence the progress of construction projects in terms of project schedule and cost are listed in the left side of the table. How do you rate the current negative influence of these factors on the construction progress of 40/60 housing projects with respect to time and cost? The numbers in the table are represented as follows.

1= very weak, 2 = weak, 3= normal, 4= strong, 5= very strong

4.1.	**Influence on**	Time					Cost				
		1	2	3	4	5	1	2	3	4	5
4.1.1.	Late payments										
4.1.3.	Lack of information sharing										
4.1.4.	Lack of integration among stakeholders										
4.1.5.	Capacity of contractors										
4.1.6	Shortage of Construction material										
4.1.7.	Design change										
4.1.8	Bidding process										
4.1.9	Capacity of MSEs										

Any other please state

----------Thank You!

Code _____

Addis Ababa University
School of Commerce
Master of Art in Logistics and Supply Chain Management

Questionnaire on "Influence of Construction Supply Chain Challenges on Project Progress, Case of 40/60 Housing program of Addis Ababa".

Questionnaire for Government Sector,

Dear Respondents,

This questionnaire has been designed to study the Influence of Construction Supply Chain Challenges on project progress of 40/60 Housing Scheme of Addis Ababa. The study is conducted in partial fulfillment of the requirements for the master's degree in Logistics and Supply Chain Management at Addis Ababa University.

Your response will form the major part of the data and the information you give will enable the researcher to critically analyze the influence of supply Chain barriers/ challenges on the progress of the projects.

Please answer all questions. Space is provided at the end for you to add further explanation or comments. I promise that all information you provide would be strictly confidential.

Please tick (✓), select or provide your own answers where applicable.

Thank you in advance for your indispensible cooperation to spare invaluable time and energy to complete these questionnaires. Name: GelanaAssefa MA Student at AAU, Telephone +251912165053, e-mail- assefagelana@gmial.com

Part I. General information

1.12. Level of education

- ☐ 10th complete
- ☐ Diploma
- ☐ First Degree
- ☐ Master
- ☐ PhD

1.13. Your position in the organization,

- ☐ Department head
- ☐ Bauru head
- ☐ Expert
- ☐ Other specify……

1.14. Year of service in the organization,

- ☐ 1- 3 Years
- ☐ 4- 6 years
- ☐ 8-10 years
- ☐ 11 years and above

Part II: - Construction Supply Chain Management Practices

Construction supply Chain Management is the inter-organizational integration of flows (information, finance, etc), processes, systems and actors (Owner, designers, prime contractors, specialty subcontractors, material suppliers and other role players in the industry). It is the establishment of long term relationship among the actors driven by the spirit of cooperation and collaboration to achieve a common goal.

Please select your choice by putting (✓) mark in the box provided in front of each factors that describe the construction supply chain management practices of 40/60 housing program. Selection of more than one factor is possible where appropriate.

2.1. How do you describe Concept of Construction supply chain management in the construction process of 40/60 housing?

- ☐ It is well known
- ☐ It is little known
- ☐ It is not known

2.16. How do you describe the type of relationship between government contractors?

- ☐ It is a short term (transactional)
- ☐ It is long term (strategic)
- ☐ It is selective (preferred)

2.17. How do you describe the type of relationship between government consultants?

- ☐ It is a short term (transactional)

- ☐ It is long term (strategic)
- ☐ It is selective (preferred)

2.18. How do you describe the type of relationship between government suppliers,

- ☐ It is a short term (transactional)
- ☐ It is long term (strategic)
- ☐ It is selective (preferred)

2.19. How do you describe the type of relationship between government MSEs)

- ☐ It is a short term (transactional)
- ☐ It is long term (strategic)
- ☐ It is selective (preferred)

2.20. How do you describe the system of information sharing between the government and other actors (contractors, consultants, MSEs, Material Suppliers, Manufactures) in the construction process of 40/60 housing program?

- ☐ There is an established system of information sharing,
- ☐ There is an inefficient system of information sharing
- ☐ There is no system for information sharing

Part III: - Construction Supply Chain Challenges/ Barriers

Construction supply Chain challenges/barriers are the problems that the Construction industry is facing in managing its supply chain actors.

3.1.What are the main challenges the government faces in availing construction material inputs,

On time? ----------

by the right quantity ? ----------

by the right quality ?----------

3.2.Are payments to the contractors, consultants, suppliers and MSEs made on time?

- ☐ Yes
- ☐ No

If no, what are main reasons for the slow payments?----------
---

3.3.What are the main challenges the government is facing in selecting the right contractors and consultants?

3.4.Has any design change experienced in the construction process of 40/60 program?

- ☐ Yes
- ☐ No

If yes what are the main factors that arise for design change? ----------
---

Part IV: - Influence of Construction Supply Chain Challenges on project schedule, and cost.

Factors that may influence the progress of construction projects in terms of project schedule and cost are listed in the left side of the table. How do you rate the current negative influence of these factors on the construction progress of 40/60 housing projects with respect to time and cost? The numbers in the table are represented as follows.

1= very weak, 2 = weak, 3= normal, 4= strong, 5= very strong

4.1.	Influence on	Time					Cost				
		1	2	3	4	5	1	2	3	4	5

4.1.1.	Late payments										
4.1.3.	Lack of information sharing										
4.1.4.	Lack of integration among stakeholders										
4.1.5.	Capacity of contractors										
4.1.6	Shortage of Construction material										
4.1.7.	Design change										
4.1.8	Bidding process										
4.1.9	Capacity of MSEs										

Any other please state

----------Thank You!

Appendix II: - Frequency Tables

Bidding process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	51	44.3	44.3	44.3
	high	49	42.6	42.6	87.0
	neutral	5	4.3	4.3	91.3
	low	10	8.7	8.7	100.0
	Total	115	100.0	100.0	

Unavailability of Con. Materials

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	80	69.6	69.6	69.6
	high	28	24.3	24.3	93.9
	neutral	1	.9	.9	94.8
	low	6	5.2	5.2	100.0
	Total	115	100.0	100.0	

Late payment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	46	40.0	40.0	40.0
	high	44	38.3	38.3	78.3
	neutral	8	7.0	7.0	85.2
	low	17	14.8	14.8	100.0
	Total	115	100.0	100.0	

coplex payment process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	vey high	32	27.8	27.8	27.8
	high	67	58.3	58.3	86.1
	neutral	6	5.2	5.2	91.3
	low	10	8.7	8.7	100.0
	Total	115	100.0	100.0	

frequent design change

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	31	27.0	27.0	27.0
	high	34	29.6	29.6	56.5
	neutral	11	9.6	9.6	66.1
	low	33	28.7	28.7	94.8
	very low	6	5.2	5.2	100.0
	Total	115	100.0	100.0	

Poor integration among stake holders

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	80	69.6	69.6	69.6
	high	33	28.7	28.7	98.3
	low	2	1.7	1.7	100.0
	Total	115	100.0	100.0	

Quality of Const. workmanship

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	34	29.6	29.6	29.6
	high	53	46.1	46.1	75.7
	neutral	11	9.6	9.6	85.2
	low	14	12.2	12.2	97.4
	very low	3	2.6	2.6	100.0
	Total	115	100.0	100.0	

lack of information

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	28	24.3	24.3	24.3
	high	47	40.9	40.9	65.2
	neutral	7	6.1	6.1	71.3
	low	24	20.9	20.9	92.2
	very low	9	7.8	7.8	100.0
	Total	115	100.0	100.0	

inappropriate contract strategy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	43	37.4	37.4	37.4
	high	57	49.6	49.6	87.0
	neutral	4	3.5	3.5	90.4
	low	10	8.7	8.7	99.1
	21	1	.9	.9	100.0
	Total	115	100.0	100.0	

contractors capacity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	82	71.3	71.3	71.3
	high	33	28.7	28.7	100.0
	Total	115	100.0	100.0	

poor site supervision

	Frequency	Percent	Valid Percent	Cumulative Percent
very high	11	9.6	9.6	9.6
high	19	16.5	16.5	26.1
neutral	20	17.4	17.4	43.5
low	47	40.9	40.9	84.3
very low	17	14.8	14.8	99.1
54	1	.9	.9	100.0
Total	115	100.0	100.0	

MSEscapcity

	Frequency	Percent	Valid Percent	Cumulative Percent
very weak	12	10.4	10.4	10.4
weak	34	29.6	29.6	40.0
normal	5	4.3	4.3	44.3
strong	46	40.0	40.0	84.3
very strong	18	15.7	15.7	100.0
Total	115	100.0	100.0	

influence of late payment on time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very weak	11	9.6	9.6	9.6
	weak	5	4.3	4.4	14.0
	normal	1	.9	.9	14.9
	strong	58	50.4	50.9	65.8
	very strong	39	33.9	34.2	100.0
	Total	114	99.1	100.0	
Missing	System	1	.9		
Total		115	100.0		

influence of lack of info on time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very weak	14	12.2	12.2	12.2
	weak	34	29.6	29.6	41.7
	normal	8	7.0	7.0	48.7
	strong	50	43.5	43.5	92.2
	ver strong	9	7.8	7.8	100.0
	Total	115	100.0	100.0	

influence of lack of integration among stakeholders

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very weak	1	.9	.9	.9
	weak	5	4.3	4.4	5.3
	strong	66	57.4	57.9	63.2
	very strong	42	36.5	36.8	100.0
	Total	114	99.1	100.0	
Missing	System	1	.9		
Total		115	100.0		

influence of capacity of contractors on time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very weak	1	.9	.9	.9
	weak	1	.9	.9	1.7
	strong	37	32.2	32.2	33.9
	very strong	76	66.1	66.1	100.0
	Total	115	100.0	100.0	

influence of shortage of construction material

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strong	37	32.2	32.2	32.2
	very strong	78	67.8	67.8	100.0
	Total	115	100.0	100.0	

influence of design change on time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very weak	5	4.3	4.3	4.3
	weak	53	46.1	46.1	50.4
	normal	6	5.2	5.2	55.7
	strong	29	25.2	25.2	80.9
	very strong	22	19.1	19.1	100.0
	Total	115	100.0	100.0	

influence of Bidding process on time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very weak	8	7.0	7.0	7.0
	weak	14	12.2	12.2	19.1
	normal	2	1.7	1.7	20.9
	strong	70	60.9	60.9	81.7
	very strong	21	18.3	18.3	100.0
	Total	115	100.0	100.0	

influence of Capacity of MSEs on time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very weak	14	12.2	12.2	12.2
	weak	57	49.6	49.6	61.7
	normal	3	2.6	2.6	64.3
	strong	38	33.0	33.0	97.4
	very strong	3	2.6	2.6	100.0
	Total	115	100.0	100.0	

Frequency Table

influence of late payment on cost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very weak	6	5.2	5.2	5.2
	weak	21	18.3	18.3	23.5
	normal	4	3.5	3.5	27.0
	strong	62	53.9	53.9	80.9
	very strong	22	19.1	19.1	100.0
	Total	115	100.0	100.0	

influence of lack of integration on cost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very weak	8	7.0	7.0	7.0
	weak	15	13.0	13.0	20.0
	normal	2	1.7	1.7	21.7
	strong	58	50.4	50.4	72.2
	very stong	32	27.8	27.8	100.0
	Total	115	100.0	100.0	

influence of capacity of contractors on cost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very weak	4	3.5	3.5	3.5
	weak	17	14.8	14.8	18.3
	normal	4	3.5	3.5	21.7
	strong	47	40.9	40.9	62.6
	very strong	43	37.4	37.4	100.0
	Total	115	100.0	100.0	

influence of lack of info on cost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very weak	15	13.0	13.0	13.0
	weak	36	31.3	31.3	44.3
	normal	4	3.5	3.5	47.8
	strong	44	38.3	38.3	86.1
	very strong	16	13.9	13.9	100.0
	Total	115	100.0	100.0	

influence of shortage con.m on cost

	Frequency	Percent	Valid Percent	Cumulative Percent
very weak	9	7.8	7.8	7.8
weak	9	7.8	7.8	15.7
normal	11	9.6	9.6	25.2
strong	49	42.6	42.6	67.8
very stong	37	32.2	32.2	100.0
Total	115	100.0	100.0	

influence of design change on cost

	Frequency	Percent	Valid Percent	Cumulative Percent
very weak	3	2.6	2.6	2.6
weak	21	18.3	18.3	20.9
normal	4	3.5	3.5	24.3
strong	31	27.0	27.0	51.3
very strong	56	48.7	48.7	100.0
Total	115	100.0	100.0	

influence of bidding process on cost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very weak	7	6.1	6.1	6.1
	weak	40	34.8	34.8	40.9
	normal	4	3.5	3.5	44.3
	strong	47	40.9	40.9	85.2
	very strong	17	14.8	14.8	100.0
	Total	115	100.0	100.0	

Influence of MSEs capacity on cost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	vey weak	10	8.7	8.7	8.7
	weak	43	37.4	37.4	46.1
	normal	4	3.5	3.5	49.6
	strong	52	45.2	45.2	94.8
	very strong	6	5.2	5.2	100.0
	Total	115	100.0	100.0	