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DEPARTMENT OF LOGISTICS & SUPPLY CHAIN MANAGEMENT

Assessment on the Effects of Transportation on the Logistics performance
of Construction Projects: The case of Koysha Hydroelectric Power Project, SNNP

BY: Abel Esayas

A THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE IN
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DECLARATION

I, the undersigned, declare that this paper is my original work and has not been presented for a degree in any other university and that all sources of materials used for this study have been duly acknowledged.

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STATEMENT OF CERTIFICATION

This is to certify that the thesis prepared by Abel Esayas Beyene entitled “Assessment on the Effects of Transportation on Logistics Performance: The case of Koysha Hydroelectric Power Project, SNNP”, which is submitted in partial fulfillment of the requirement for the degree of master’s in Logistics and Supply Chain Management (LSCM), complies with the regulations of the university and meets the accepted standards with respect to standards to originality and quality.

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Common abbreviations used in this Study

BRE	Building Research Establishment
CCC	Construction Consolidation Centers
CIWM	Chartered Institute of Waste Management
CLM	Council of Logistics Management
EEP	Ethiopian Electric Power
GERD	Grand Ethiopian Renaissance Dam
GTP	Growth and Transformation Plan
HPP	Hydropower Project
IMO	Inventory Management Optimization
JIT	Just In Time
MDG	Millennium Development Goal
LTL	less than truckload
SCM	Supply Chain Management
MoWIE	Water, Irrigation and Energy Minister

Abstract

An effective logistics sector is now recognized almost everywhere as one of the core enablers of development and it is a key element for reducing costs and delays in construction projects. The purpose of this study was to examine the effect of transportation on the logistics performance of construction projects. In the case of larger projects involving a number of contractors, incompatibility of logistics concepts and lack of coordination results in serious disturbances in material and information flows. Logistics performance is about how efficiently supply chains connect firms to domestic and international opportunities. Without well-developed transportation systems, logistics could not bring its advantages into full play. Besides, a good transport system in logistics activities could provide better logistics efficiency, reduce operation cost, and promote service quality.

By considering this fact and central role of transportation at every construction project, the researcher performed the study by identifying roles of transportation in logistics performance dimensions (logistics differentiation, effectiveness and efficiency) and to understand the relationship between the effect of transportation and logistics performance. The study covers the Koysha hydroelectric power projects that is located at Omo River in southern Ethiopia's Koysha. The study used deductive approach and both descriptive and explanatory research design to assess, describe and examine the effect of transportation in logistics performance on the construction's projects. In the study both primary and observational data were used. The primary data were collected using questionnaire as a tool. A total of 113 questionnaires were distributed to respondents and a response of 103 were analyzed using regression methods on SPSS version 20.0. Accordingly, the findings of the analysis confirmed the positive relation between the independent variables (Reliability, Delivery time, Travel cost, capability, Accessibility and Network & infrastructure) and the performance (dependent variable) of the study. On the other hand, the logistic regression result identifies that Fuel management practices and transportation service to give quick response to special requests as a determinant of overall logistic performance at 5% level of significance and Transportation service flexibility of the projects and demand smoothing was also identified as determinants of overall logistic performance at 10% level of significance. Based on the findings of the study, the researcher recommends adequate training should be prepared to all employees working on transport and logistics implementation, Fuel management practices, Transportation service flexibility of the projects and demand smoothing should be improved to increase the overall logistic performance

Key Words: Logistics, Transportation, performance

CHAPTER ONE

INTRODUCTION

Chapter one deals with background of the study, Background of the organizations, statement of the problem, objectives of the study, significance of the study, Limitation of the study, definition of key terms and organization of the study.

1.1 Background

1.1.1 Back ground of the study

The term logistics in a construction industry can be defined as getting construction materials, equipment and labor to site before they are required. Logistics functions in a construction firm can be divided into supply logistics and site logistics (Silva and Cardoso, 1999). Logistics plan is the implementation and control of efficient, effective flow and storage of goods, service and related information from the point of origin to the point of consumption (Ala-Risku and Karkkainen, 2006).

Construction logistics deals with many technical, organizational and environmental issues affecting the cost of a project, time and quality of execution. Traditionally, each contractor uses and manages his own supply chains. In the case of larger projects involving a number of contractors, incompatibility of logistics concepts and lack of coordination results in serious disturbances in material and information flows. According to modern ideas of management, centralization of logistic functions and management allow many actors of a construction project

to reach the synergetic effect of their efforts. Implementation of integrated logistics systems such as those offered by logistic centers may be particularly effective in larger construction projects located in city centers (confined space, limited transport possibilities), where massive flows of material have to be managed (e.g., extensive earthworks requiring transport of excavated material). The main task of an integrated logistic system is to provide just-in-time deliveries, eliminating most of material handling and storage on site, to shorten the time of project completion by eliminating reasons of work stoppage, to minimize disturbances in local traffic and air pollution due to exhaust gases emission. Shifting most of the logistic processes on logistic professionals allows construction companies to reduce their fixed costs and to concentrate on the development of their core competencies.

According to Briscoe and Dainty (2005) and O'Brian et al. (2009), cited in Ahmed (2017) logistics management is important to increase the performance of construction projects. Logistics has proved to be an essential management strategy when managing projects that involve a large number of participating companies, supply components, and materials (Dainty et al., 2007). Therefore, effective logistics is a key element for reducing costs and delays in construction projects.

Janne, Fredriksson, Berden, and Amstel (2018) described that each construction project has difficulties of materials and resources that need to be delivered on time, to the correct location on site. Therefore, construction logistics concerns all supply and disposal shipments of materials, equipment from the construction site, in addition to the efficient and effective planning and control of these resources at the construction site (Janne et al., 2018).

In the construction industry, particularly with large industrial projects, uncertainty and risk can lead to cost increases and scheduling delays, and may ultimately result in a project that is not of

the scope or quality that the public and other stakeholders need (Flyvbjerg et al., 2012 cited in Ahmed, 2017). The major construction problems are related to logistic implementation and operational level logistics is considered as the control mechanism of materials and information flow via successive stages of supply chains (Tah, 2005). Similarly, construction logistics management aims to improve construction performance through efficient materials handling and delivery scheduling (Veiseth, Rostad, & Andersen, 2003). Some scholars identified the main cause of poor logistics that delays in material delivery is problems associated with material transportation (Hoe, 2006).

The processes of managing transport services make a transport and logistics system. The effectiveness of management of these processes is meaningfully influenced by the forecast and planning of correspondence of shipment flows, distribution of resources. In the conditions of formation of the market of transport services, the transport and logistics system are affected by many of its subjects and objects, the uncertainty of demand for transport services, the lack of accountability of the external space factors and subjective perception of the internal environment. All this leads to imbalance in the pace of transport services provision and as a result affects their effectiveness. Quality process management requires optimization. Achieving a positive result of optimization is possible by forming transport and logistics management methods of transport services. The work investigates transport and logistic methods of transport services management. Principles of setting goals of strategic functions of the main transport and logistic process should be considered, its invested periods have to be presented.

The typology of criteria of efficiency of optimum management of correspondence flows in the segment of freight traffic and the main stages of optimization of this process has to be developed.

In addition, Stank and Goldsby (2000) stated that transportation in a construction is significant to deliver the full benefits from adoption to completion of efficient construction. Furthermore, Shakantu, Tookey & Bowen (2003) stated that transportation is the major determinant of logistics environmental performance along the project required for the transportation of construction materials (Ibid) and storage of construction material on-site (Said and El-Rayes, 2011). Generally, better transport services can improve logistics performance (Sreenivas & Srinivas, 2011).

1.1.2 Background of the organizations

SaliniImpregilo S.P.A., Ethiopian Branch is listed on the Italian Stock Exchange, is an international company based in Italy that has just been renamed as: Webuild S.P.A, Ethiopian Branch is currently constructing the two Ethiopian Government highest priority projects; i.e.: The Grand Ethiopian Renaissance Dam (GERD) and the Koysa Hydroelectric Power Project.

Webuild S.P.A is an Italian industrial group specialized in the construction and civil engineering business headquartered in Milan. The company was formally founded in 2014 as the result of the merger by incorporation of Salini into Impregilo.

Webuild S.P.A./SaliniImpregilo is a leading global player in the construction of major infrastructures. It specializes in the water sector, where it has been recognized by the Engineering News-Record as the global leader for the third consecutive year, as well as in railways and metro systems, bridges, roads and motorways, large civil and industrial buildings, dams and airports. The Group has 110 years of experience on five continents, with design, engineering and construction operations in 50 countries and about 35,000 employees of over 100 different nationalities.

Through their projects, they support their clients in pursuing numerous SDGs, including energy, water, the fight against climate change, sustainable cities, and resilient infrastructures. As much as 70% of their construction backlog relates to projects that contribute directly to the fight against climate change, with initiatives for renewable energy (hydroelectric) and sustainable transport (railways and metro systems).

Water projects have always been a distinctive characteristic of the Group's excellence, recognized as a world leader in implementing infrastructure projects in the water sector. Over the last 110 years, Webuild S.P.A has worked on over 257 dams and hydroelectric plants on 5 continents, for a total installed capacity of over 37,500 MW of low-cost clean energy, contributing to the sustainable development of entire nations. The Group is a leader in the construction of complex hydraulic engineering projects, which include the expansion of the Panama Canal, considered the most important engineering work of the 21st century, the Grand Ethiopian Renaissance Dam in Ethiopia, which, when completed, will be the largest dam in Africa, and the Lake Mead hydraulic tunnel, a complex system for collecting and transporting water from one of the largest artificial lakes in the United States.

1.2 Statement of the problem

Construction companies can secure the advantage in market over the competitors if they can develop a sustainable logistic administration system (Drucker, 1962 cited in Islam & Siddiqui, 2019) which mainly focus on decreasing material costs, better delivery times and quantities (Osterman, 2017). In addition, efficient logistics can enhance overall construction project outcomes including cut down on time, material wastages and reduce construction cost (Regassa, 2015 and Koskela&Vrijhoef, 2000).

On the other hand, poor logistics activities on construction including errors in ordering materials and difficulties in ordering materials (Bossink and Brouwers, 1995 cited in Patience 2017); delays material and equipment delivery regarding transportation (Aibinu and Odeyinka, 2006). Handling and storage (Glass, Osmani and Price, 2008), production of defective materials (Formoso et al., 2002) and improper planning (Zewdu, 2016) are also causing delays in construction projects. Generally, poor logistics associated with the construction firms' results in the delay of construction projects (Lange and Schilling, 2015).

Most construction materials used on construction sites are not manufactured on site. Therefore, transportation is a key factor that affects construction logistics performance as well as transportation cost covers a huge percentage of logistics cost. (Y.Y. Tseng, Yue and Taylor 2005) stated that transportation occupies one-third of the amount in the logistics costs and transportation systems influence the performance of the logistics system hugely. Without well-developed transportation systems, logistics could not bring its advantages into full play. A good transport system in logistics activities could provide better logistics efficiency, reduce operation cost, and promote service quality. Logistics inefficiencies harm the competitiveness of private firms through their effects on both cost and time in highly competitive international markets demanding just-in-time delivery. Thus, poor performance of transportation can lead to decreased completion on the schedule and eventually impacts negatively on project outcome (Bowersox, Closs& Cooper, 2000).

Ethiopian Electric Power (EEP) has been planning to provide electric services to all parts of the country within the 2016-2020 five-year plan, known as the Growth and Transformation Plan II (GTP II). Italian construction and civil engineering firm Salini Impregilo has been awarded

the Grand Ethiopian Renaissance Dam (GERD), and Koyssha Hydroelectric Power project's in 2011 and 2016, respectively.

The Water, Irrigation and Energy Minister (MoWIE) is planning to complete the construction of the Koyssha Hydroelectric Power project in three years. However, the project didn't complete in the scheduled time and is only now 35% even after the end of the fifth year according to the report found from the project site office.

Many construction projects currently face complex and different situations that slow or hinder the process of achieving project success. (Abdul Mohsen .A & Janaka .R, 2013)

According to Salini Impregilo's report of 2018, the main reasons for the unintended delay are related to some operational risks including effective supply chain, logistics and inventory management, management of IT systems, personnel and planning and reporting which are directly linked to the level of complexity of the project or unforeseeable events. In addition, the transportation and logistics which are thoroughly related business units that share a common objective and goal where the transportation management is a subdivision of logistics will have a direct influence on the logistics performance too. That means the transported service has an essential impact on the logistics.

Ethiopian logistics system is characterized by poor logistics management system and lack of coordination of goods transport, low level of development of logistics infrastructure and inadequate fleets of freight vehicles in number and age, damage and quality deterioration of goods while handling, transporting and in storage. (Debela, F, 2013)

The researcher strongly believes that the aforementioned drawbacks which contributed the most to the negative cost and over delay for this project can somehow be improved and over cost and delays reduced by implementing efficient transportation service. The fundamental factors that

determine transportation are cost and time. There must be a trade-off between cost and time because selecting a low-cost carrier that takes longer time to deliver materials to site will cause delay of work. If materials run out on site before delivery, this will definitely increase the cost of construction (Frazzle, 2002).

Therefore, the study will try to assess the effect of transportation service on logistics performance on Koyssha Hydroelectric Power project using transportation performance measurement variables like cost, time, capacity, safety, location and physical condition and evaluate the current practice of logistic operations in order to improve a project logistics activity. It also tries to measure and analyze the effect of these measurement variables on logistics performance of construction industry using key performance indicators and identify the performance and come up with the finding and recommendation on the best practices and methods.

1.3 Research Questions

Based on the above statement of problem, the study will try to answer the following questions:

- i. What are the current logistics processes and a strategic practice in Webuild S.P.A at Koyssha Hydroelectric Power project?
- ii. What transportation practices at Koyssha project affect the effectiveness of transportation operation?
- iii. How transportation service on Koyssha Hydroelectric Power project affects logistics performance?
- iv. What effect do transport providers and vehicles have on logistics performance at Koyssha project?

- v. What methods and means can be employed or implemented to improve the current logistics performance?

1.4 Research objectives

1.4.1 General objective

The main objective of this study will be to assess the effects of transportation service on Koysha Hydroelectric Power project logistics performance.

1.4.2 Specific Objective

The specific objectives of the study will be:

- i. To assess, explore and evaluate the current logistics processes, status and strategic practices in Webuild S.P.A at Koysha Hydroelectric Power project
- ii. To evaluate, examine and assess the challenges of transportation practices on the logistics performance of Webuild S.P.A at Koysha Hydroelectric Power project;
- iii. To identify factors that affect the effectiveness of transportation operation, at Koysha Hydroelectric Power project.
- iv. To assess the current trend of the transportation activities and come up with possible solutions or means that can be employed to improve the logistics performance.

1.5 significance of the study

The study findings will provide important information for different stakeholders like EEP, academicians, and company managers who are participants directly or indirectly in logistics

activities about the present status of logistic process in Webuild S.P.A at Koysha Hydroelectric Power project.

The study will contribute as a guide line for the company's future, good and integrated transport and logistics service. Therefore, the above participants make decisions based on the findings of the study and the recommendations. This has an impact on decisions related to the issue of the transport system. Furthermore, the study can serve as a reference material for students and researchers who want to undertake further research on the same or related topics in future.

1.6 Scope of the study

There are two different Hydroelectric power projects that are under construction by Webuild SpA that was awarded by Ethiopian Electric Power (EEP). The projects are **the Grand Ethiopian Renaissance Dam** (GERD) and Koysha that are the two faces of Ethiopia's energy future, two large projects that will see the light of day in the coming years to take advantage of the country's hydraulic potential.

This study is delimited to **the Koysha Hydroelectric Project, that is the fourth to be built or** ongoing construction along the Omo River in southern Ethiopia's Koysha region and, along with the early inaugurated Gibe I, II and III and the future GERD.

Koysha has started operation in 2016 (Harris, M. (2016). The Project site is selected for the research because it is ongoing construction and involves the transport service at large.

Conceptually, the study was delimited to analyze the effect of transportation in the project site.

Furthermore, the respondents of the study were also delimited to only department staffs of the project in the logistics and transportation department because they are the one who do have direct relation with the movement of the shipment to the project site.

1.7 Limitation of the study

The study is limited to the eight departments only. The conclusion that is drawn at the end of the study is limited to the information obtained by the specific department of each concerned personnel. Another limitation is that the logistics performance of construction projects might be affected not only by transports services, but also by various other variables not considered in this study.

The research also does not comprehensively capture all the actors in the transportation service as applicable to transportation management. Rather, it made emphasis in measuring logistics performance of the project of the company from employees in the management point of view.

In addition to the aforementioned limitation since it is going to be carried out in only one Construction Company, the ability of the research may be limited as to generalize the findings for other organizations in different kinds of firm structure. It also needs to have more similar construction projects perspective in order to consider it as representative.

1.8 Definition of Terms

Logistics is the process of planning, implementing, and controlling the efficient, effective flow and storage of goods, services, and related information from point-of-origin to point-of-consumption for the purpose of conforming to customer requirements. It comprises the management of raw materials flow to finished goods through an organization. (The Council of Logistics Management (CLM) (1992)) and as per Margaret James (2020) logistics refers to the overall process of managing how resources are acquired, stored, and transported to their final destination. Logistics management involves identifying prospective distributors and suppliers and determining their effectiveness and accessibility.

Logistics efficiencythe degree to which resources have been used economically and doing the things right(Wai Peng Wong, Keng Lin Soh, Chu Le Chong and Noorliza Karia., 2015)

Logistics effectivenessdoing the right thing(Wai Peng Wong, Keng Lin Soh, Chu Le Chong and Noorliza Karia., 2015)

Logistics DifferentiationComparing results of logistics activities to competitors (Langley and Holcomb, 1992). Superiority when compared to competitors (Fugate et. al. 2010)

Logistic Performancelogistics performance is a subset of a larger organizational performance. According to Fugate et al. (2010) the concept by highlighting that logistics performance positively impacts organizational performance. According to Green et al. (2008) logistics performance as the “ability to deliver goods and services in the precise quantity and at the precise times as required by the customers”. (Chowet al. (1994))

Accessibility is the measure of the capacity of a location to be reached from, or to be reached by, different locations. Therefore, the capacity and the arrangement of transport infrastructure are key elements in the determination of accessibility. (P.Rodrigue.,2020)

Reliability is essential in implementing an operative supply chain management strategy since it enhances productivity and cuts costs. It also warrants inventory to be delivered to customers’ on-time. On-time, consistent performance is frequently attributed to shipper/carrier collaboration.

NetworkA logistics network is the system a business uses to move goods from their raw state through production and to customers. To create the most efficient and effective logistics networks, businesses must use logistics network modeling. (M.Murray.,2020)

Transport performancemeasures predict, evaluate, and monitor the degree to which the transportation system accomplishes adopted project objectives. They can be applied at all stages of transportation decision-making (ICF International,2011)

CapabilityThe term “capabilities” reflects the major role of strategic management in adapting, integrating and reconfiguring resources, organizational skills and functional competencies to respond to the challenges of the external environment. Morash et al. (1996) refer to capabilities as “those attributes, abilities, organizational processes, knowledge, and skills that allow a firm to achieve superior performance and sustained competitive advantage over competitors” (p. 1)

Infrastructure is the general term for the basic physical systems of a business, region, or nation. Examples of infrastructure include transportation systems, communication networks, sewage, water, and electric systems. These systems tend to be capital intensive and high-cost investments, and are vital to a country's economic development and prosperity. (J.Boyle 2020)

Travel costTravel expenses are costs associated with traveling for the purpose of conducting business-related activities. Reasonable travel expenses can generally be deducted by the business when employees incur costs while traveling away from home specifically for business purposes. (B. Jonson., 2020)

1.9 Organization of the study

The researcher has organized the entire study into five chapters. Chapter one introduction to the study. This provides a background to the study, statement of the problem, research questions, objectives, significance of the study, scope and limitations. Chapter two is literature Review. Which discusses theories relevant to the study and provides literature previously done by other authors on inclusive education perception and practice. Chapter three is research design and methodology. This chapter discusses the research design, sampling procedures, data collection methods and analyses that would have been used in the research. The fourth part will analyze the

problem, lastly, the fifth part consists of the conclusion and recommendation will be made based on the recommendations.

CHAPTER TWO

LITERATURE REVIEW

This chapter deals with theoretical and empirical review of the related literature on Logistics Techniques in construction, Logistics Performance, Transportation, Types of Transportation in Logistics, Role of transport to logistic process, Transport performance measurement, Conceptual framework. Finally, a conceptual framework is presented.

2.1 Theoretical Review

Logistics in a of construction

In construction terms (Silva and Cardoso, 1999) logistics can be understood as a multidisciplinary process that seeks to guarantee at right time, cost and quality: material supply, storage, processing and handling; manpower supply; schedule control; site infrastructure and equipment location; site physical flow management; management of information related to all physical and services flow. Furthermore, Construction logistics can be defined as all activities dealing with supplying the right materials and resources to the correct customer and construction site to meet the customer's requirements (Thunberg and Persson, 2014).

The tendencies towards efficiency improvement and risk control in project management indicate the significance of logistics, i.e., a branch of knowledge applying new concepts to control material, service, information and finance flows between suppliers and customers. In the field of construction, procurement planning and execution (ordering, reception, transport and storage) dominates the logistic processes (Jaśkowski, P., Sobotka, A. and Czarnigowska, A, 2018)

Logistics functions in construction are divided into two separate approaches: supply logistics and site logistics. Supply logistics include specification of supply resources i.e. materials, equipment

and manpower, supply planning, acquisition of resources and storage control. Supply logistics considers the multiple levels in the supply chain in order to improve the interactions between suppliers and clients (Vidalakis, Tookey, & Sommerville, 2011). Site logistics include management of handling systems, safety equipment, site layout, defining activity sequence and resolution of conflicts among site personnel. Site logistics considers logistics within the construction environment and aims to improve construction performance through efficient materials handling and delivery scheduling (Ala-Risku & Karkkainen, 2006).

Effective logistic management systems will also facilitate the integration and degree of coordination among contactors, sub-contractors, and suppliers and will ultimately increase construction workers' productivity (Caron, Marchet, and Perego 1998 cited in Almohsen, & Ruwanpura, 2013).

Logistics' role is to provide time and place utilities in order to facilitate the creation of global scale and scope economies while enhancing a firm's ability to provide high levels of seamless customer satisfaction (McGrath and Hoole, 1992 cited in Yirga, 2018). Lambert & Stock (2001) cited in Anna and Konrad, 2008 argues that good logistics practices can create a competitive advantage. More specifically they claim that best logistics practice plays an important role in three critical elements of the marketing concept. These elements are customer satisfaction; integrated effort and company profit (Ibid).

2.1.1 Logistics Techniques in construction

Logistics is about the drive of materials and equipment from where they invent to where the workforce needs them. This material and equipment need to arrive on time and unspoiled. A simple illustration of logistics for construction sites is moving precast concrete from the plant it is made into the site. Also, when delivered, a crane will be needed to winch the precast panels

into position. So, a material is the precast panels, equipment is a hoisting crane, and there is the crew that will use them. Getting all three components to the same place, at the same time, is what logistics does.

Logistics has an important impact on profitability too. If the crane isn't on site when it is supposed to be, installation crews for the precast panels are idle. They are getting their hourly salaries even though the lack of a crane prohibits them from working. This kind of delay is unsuccessful.

Moreover, when it comes to construction, a delay in one aspect of the job can have comprehensive effects on job completion. If panels are late for installation, the crews that follow – electricians, plumbers, drywall erectors and other trades may also be delayed.

If logistics are considered at all for a construction site, it is usually as an afterthought. The absence of a logistical plan for a construction site can lead to the creation of blocks that place a stranglehold on the project.

According to Chartered Institute of Waste Management (CIWM) (2007) states that logistics is comprised of six interdependent activities; these are Just-In-Time Delivery, Demand Smoothing, Construction Consolidation Centers, On-site Marketplaces, Inventory Management Optimization, and Pre-assembled and offsite fabrication.

Just-In-Time Delivery (JIT): The Just-in-Time technique is an effective management technique that can determine the success or failure of any construction project. This technique manages the flow of materials, components, tools and associated information regarding ongoing project. JIT endeavors to accomplish smooth generation by giving, the right materials, in the right amounts and quality, just in time for production, and by assuring that the materials are delivered to the site on the actual day of use. Successful implementation of Just-in-time technique could be capable

of lessen numerous elements such as inventory level, storage space, manufacturing unit overhead, manufacturing costs, rectification works so that it will lead to improvement in quality.

(Patil, Ms.P.A. and Dhawale, Dr.A.W. (2018)

JIT delivery is a service of frequent deliveries in work packs or task loads, 'pulled' just in time for the trade to perform the next task without incurring any delays. This can be done either through a Construction Consolidation Centers or individually by suppliers.

The concept of just in time in construction is derived from the Toyota company's revolutionary system of lean manufacturing; where production input is determined on the basis of actual demand. As with many factory-based lean manufacturing principles, JIT delivery is becoming increasingly assimilated into lean construction methodologies. (NEHP on Oct 11, 2018)

JIT deliveries reduce or even eliminate the need for on-site storage of materials otherwise estimating material needs and "pushing" them through a project is incompetent and lead to error, often resulting in wasted effort, time, money, and supplies. Not only does this improve the site logistics but it reduces the risk of damage or loss of materials stored on-site as well as reducing congestion and the associated risks such as safety incidents.

Demand Smoothing:It is a means of looking at the program of project activities in the entire value chain and identifying how the activities can be balanced or 'smoothed' to reduce the amount of transport resources, materials and labor needed to carry out the task or activity.

Demand smoothing can be done at any level in the supply chain by clients and / or contractors.

Construction Consolidation Centers (CCC):can be used as a part of logistics management.

These are locations near to but not necessarily on site, to which deliveries are made and stored.

They are then brought to the site on a 'just in time' basis as and when required. This has the advantage of keeping the site clear of obstacles, cutting down on required storage space, and

ensures that the logistics manager is aware that the materials are available close-at-hand.(
Designingbuildings.co.uk. (2016))

Or it is a distribution center used to supply materials in the required quantities to one or more construction projects. They are an effective supply chain management solution enabling the safe and efficient flow of construction materials and equipment from supplier to project.It can be used in the process of managing project logistics, channeling material deliveries to a large, single construction site or a number of different sites. It facilitates the efficient flow of materials through the supply chain, reducing waste and other issues such as congestion.

On-site Marketplaces: It is a temporary storage area for consumable materials, fixings and small tools that are widely used and shared between a number of trade contractors working on-site. Typically, this will include metal channel, threaded rod, anchor fixings, nuts, bolts, screws, raw plugs, small drill bits and similar. Each trade contractor will deliver their supplies to the marketplace for common storage and distribution by a store-man when required, or they can agree to make a common contribution to the store for these materials to be provided by the store-man.

Pre-assembled and off-site fabrication: With pre-fabrication and pre-assembly, an integrated design-build firm and its construction team will set up a particular commercial space to pre-fabricate processes. These include examples like pre-poured slabs, pre-assembled modular wall and frame pieces, as well as other products. After these pieces are created off-site, the integrated design-build firm will truck the assorted products to its build sites. There are several compelling reasons why pre-fabricated and pre-assembled modular pieces are created early in the building process. This type of preparation in materials is becoming more common in commercial,

residential, and mixed-use construction projects as opposed to the materials being assembled on the job site.

Many of these factors have to do with conserving resources and maximizing efficiency. This has led to construction that is more agile. For example, a study from the National Institute of Standards and Technology (NIST) found that pre-fabrication could save 5% or more on industrial waste, improve site safety, reduce budgets by 6% or more, and reduce project schedules by four weeks or more. (VIP. (2018))

It is generally considered good practice that, where possible, materials should be obtained and configured as far as possible to their final use. For example, this might include electrical components made into partial wiring looms, or plasterboard pre-cut to the size needed. The next step might be for component materials which could be prepared in packages appropriate to a room, a floor or other designated area.

Inventory Management Optimization (IMO):

Construction site usually short of man oeuvre space and storage area. Most materials require proper storage and cover up again weather to avoid damages and deterioration. Therefore, ordered at the right time, delivered on the right time for use will minimized the holding stock and wastage. The process will gain economy in purchasing, maximizing storing capacity at site, reduce wastage, and shorten the procurement lead time. Failure in managing site inventory will result in cost overrun, delays in project completion and reduce overall project performance. (Bp Chua,2019)

IMO software systems are proactive planning tools to optimize inventory levels and the utilization of site/warehouse space and transport facilities. The software is designed to distribute

materials to the right place at the right time, with supply measured against actual and forecast demand for each individual supply center.

2.1.2 Logistics Performance

Logistics is multi-dimensional and is defined as the degree of efficiency, effectiveness, and differentiation associated with the accomplishment of logistics activities (Bobbitt 2004; Cameron 1986)

Logistics efficiency
Logistics effectiveness
Logistics Differentiation

Fig 2.1 logistics performance

Source: Fugate 2010

Efficiency refers to the internal functioning of logistics and generally is considered best represented through some ratio of the normal level of inputs to the real level of outputs (Chamberlain 1968; Van der Meulen and Spijkerman 1985)

In a broader sense, it is the ability of the logistics function to manage resources wisely. Thus, we adopt the definition of efficiency as the measure of how well the resources expended are Utilized

(John T. Mentzer Ph.D., Theodore P. Stank Ph.D.2011 ,logistics performance: efficiency, effectiveness, and Differentiation)

Different scholars like Christopher, (1999), Chow (1994) Kayakutlu and Buyukozkan (2011), Braz, Scavarda, and Martins (2011), Mentzer&Konrad, (1991) forward the logistic performance measurement regarding with Planning, implementing, controlling, satisfying the customers, cost effective flow of administrative process.

Logistics in construction is the management process of planning, implementing and controlling supply chain resources, generally from the point of origin, such as raw material accumulation, to the point of destination, i.e., delivering goods to the correct location on the construction site.

Typically, the projects related to construction are similar to the organizations which are also known as contractors; therefore, it is easy to study and understand the construction projects by focusing on organizations emphasizing on logistics performance. New measures are recognizing new opportunities for advancement and improvement in logistics performance, whereas old measures don't segregate the cost which don't add any value to the customer or to the organization (Lehtonen, 2001). In calculating the performance of logistics in the field of pipeline construction process for efficient supply of material of pipeline projects has been discussed in several studies such as (Lehtonen, 2001). Lehtonen has measured the logistics performance in the form of cost as well as lead time in the field of construction projects and claims that logistics performance is the name of fulfilment of the expectation of valuable customers while attaining the strategic objective of organization.

Lehtonen suggested that the project administration must focus on total cost of delivery not only on the cost of purchasing (Lehtonen, 2001). Cost of the projects referred to usage of cost and how cost has been influenced during the project's starting time to project's completion time.

Secondly, the lead time refers to the time when a particular project is being retired or completed (Lehtonen, 2001).

Fugate (2010) focuses on creating differentiation in logistics processes along with other traditional measures of logistics performance which are the efficiency and effectiveness (Fugate, 2010). Whereas, Lopez (2011) describes the knowledge of management and competencies of information technology used in the logistics process (Lopez, 2011).

2.1.3 Definitions of Transportation

Transportation refers to the movement of products and raw materials from one destination to another. This process begins with the supply chain to the shipping of the finished product to the consumer. It is an inseparable component of logistics. (Phạm, L,2019)

In the world of trade, the company with the ability to transport freight in the most cost and time efficient manner reigns supreme in their industry. Therefore; an essential part of transportation management lies in building an efficient supply chain from the six main modes of transportation: **road, maritime, air, rail, intermodal, and pipeline**. Understanding the strengths and weaknesses of each mode is paramount to building an effective supply chain. (Associates, M. & ,2018)

Transportation is a key element in the logistic chain. It joins together those components that are considered to be separated. Transportation systems connect supply chain components and must be properly managed and controlled for transportation and logistics to work together successfully. This means complete visibility and strong communication between all members of the chain. The success of any supply chain can be judged by its transportation management and it is of great importance in the success of a logistics plan. The operation of transportation determines the efficiency of delivering products.

In the construction industry, the material is often purchased from different suppliers who deliver on separate vehicles, without mutual coordination and timekeeping which lead to congestion at the construction sites (Lundesjo, 2015). The transportation industry is a global industry that meets the need for moving cargo, passengers, and information as efficiently as possible. Ground, sea, air, and space are all used by the transportation industry to get things where they need to go. Numerous multinational companies play some role in this industry, whether they maintain infrastructure, build equipment, or supply personnel. This industry is usually in a steady state of growth except in very poor economic conditions. (<https://www.wise-geek.com/what-is-the-transportation-industry.htm>)

In addition, many deliveries are also in small quantities, containing a few packages, resulting in an additional number of transportations. In terms of cargo, the transportation industry handles a variety of goods and supplies numerous services to consumers and customers. Cargo can be carried by ship, plane, pipeline, or truck, and in the case of small orders may be split for carrying by car and other smaller conveyances. Concerns with cargo transportation include the ability to secure supplies, deliver loads accurately, and cut down on transport time. Fees for cargo transport, storage, and delivery can vary. Some products need more protection and careful handling and are thus more expensive. (Tasker.M ,1991)

As a way of ensuring precise deliveries and addressing the described challenges, CCC may play a large role in the construction industry (Hamzeh, Tommelein, Ballard, &Kaminsky, 2007; Lundesjo, 2015).

The CCC is a buffer storage that is supposed to store material for a limited time period before transportation to the construction site (Sullivan et al., 2010). When striving for on-time and precise deliveries in order to avoid congestion on site, it is less risky and more easily controllable

to use a CCC instead of having each delivery done by the sub-contractors or suppliers themselves (Lange & Schilling, 2015).

Transportation is virtually inconceivable in today's economy for a firm to function without the aid of transportation (Kumar, 2014)

Without well-developed transportation systems, logistics could not bring its advantages into full play. Besides, a good transport system in logistics activities could provide better logistics efficiency, reduce operation cost, and promote service quality. The improvement of transportation systems needs the effort from both public and private sectors. A well-operated logistics system could increase both the competitiveness of the government and enterprises.

Transportation affects logistics in its that costs are influenced by a corporation's plants: Warehouses, vendors, retail locations, and customers or consumers, by the mode of transport that affects inventory requirements: High-speed or high-priced transportation systems may require smaller amounts of inventory, while slower, less-expensive transportation systems may require larger amounts of inventory, by the selection of a low or high-speed mode that can alter the delivery schedule or how freight is packaged and by Carrier classification rules and transport modes that can influence the packaging(Phạm, L,2019)

2.1.4 Relationship between Transportation and Logistics

Without well-developed transportation systems, logistics could not bring its advantages into full play. Besides, a good transport system in logistics activities could provide better logistics efficiency, reduce operation cost, and promote service quality. The improvement of transportation systems needs the effort from both public and private sectors. A well-operated logistics system could increase both the competitiveness of the government and enterprises (Tseng and Yue, 2005).

Integrated Transport Demand and Logistics- The more integrated the supply chain is, it becomes harder to differentiate between physical distribution and materials management. These days the responsibility for transport and warehousing is distributed between retailers, wholesalers and manufacturers. The distribution channels have extended from suppliers to customers. (Rodrigue et al, 2009)

Logistics requires planning, transportation is just the mode to execute the planning, when getting freight from point A to point B. Clearly, they are not the same thing, but transportation is just simply a part of logistics. When it comes to logistics, logistics executives must make further decisions beyond the mode of transportation to include packaging, containerization, documentation, Insurance, storage and etc. (GlobalTranz Enterprises, LLC,2013)

2.1.5 Types of Transportation in Logistics

The four primary modes of transportation in logistics are shipments by truck, ship, train and plane also known as road, maritime, rail and air shipments. While each of these modes of transportation has unique benefits, knowing which method is right for business requires careful consideration.

Type of Logistics in Transportation for the Company

In a world where fast shipping is not just a luxury, but an expectation, choosing the right type of logistics transportation for the company is crucial for the success of business, the safety of the product and the happiness of customers. Before choosing a logistics transportation method, the following should be considered and use the information to guide the decision making: (Purolator International (2020)

The Product

First, analyze the shipment that is being transported. Is the product hazardous, perishable or challenging to handle? What are the dimensions of the shipping container? This information is critical for choosing a shipping method that can accommodate the products within budget.

Location

where the shipment is leaving and its final destination:

- **Shipping origin:** Where is the shipping from? Where the products are located is important, as it's the starting point for the tracking. Does it have access to maritime ports, railroads or airports questions should be answered
- **Borders:** What natural borders will your shipment cross? While one method of transportation might be the most suitable option for the product, it may be more expensive and time-consuming than other means if it is not located within easy access to these options.
- **Shipping destination:** Where is the shipping to? The shipping destination is one of the most significant factors to consider. Calculate the total shipping distance, factoring in all stops and checkpoints.
- **The consumer:** Is the shipping to an individual or a business? This might indicate which speed or method is preferable.

Special Considerations:

consideration should be taken into account the cost and difficulty of any special considerations the shipment requires:

- **Time:** The time of moving the product during the holiday season, for instance might impact overall shipment times.
- **Urgency:** How urgent is the shipment? Can afford a delay both financially and in the eyes of the consumers?
- **Budget:** What is the transportation budget? Convenience is great, but staying within the budget is crucial for long term operations.
- **Existing relationships:** What shipping and logistics companies do you have a relationship with already? What services do they offer?

Comparing Logistics Transportation Methods

No matter how the ship is made, there are advantages and downsides to each method. The secret to finding the best transportation option for the business is understanding these differences. The below is a breakdown of each transportation method and its pros and cons:

Truck Freight -Road Transportation

A road is an identifiable route way or path between two or more places. This mode of transport helps to transfer the goods from one place to another place by road through various methods like auto, buses, trucks, cargos, and other suitable factors (Subject Query.com. 2019)

The top benefits of truck freight include:(Purolator International,2020)

- **Implements fewer restrictions:** Compared to other modes of transportation, especially air transport, there are far fewer restrictions for truck freight, including heavy or hazardous materials. Trucks are also easier to track than other modes of transportation, due to built-in navigational systems and real-time tracking abilities

- Costs less than air and ship transportation: Truck freight is very economical compared to air and ship transportation because associated expenses, such as fuel and truck maintenance, are far less costly.
- Allows for more accessibility: Road transportation is highly accessible. Most companies have easy access to a major highway system, while not every company has access to railroads, airports or ships for other forms of transportation.
- Offers more options: With truck freight, there are limitless options available to. There are many different specialized trucking companies that can accommodate perishable, hazardous or oversized goods. Depending on the shipping company, it can be chosen from things like parcel, full truck and less than truckload shipping. When you only need to ship a small number of packages, parcel shipments are an excellent option. Similarly, to parcel shipping is less than truckload (LTL) shipping. LTL freight services are ideal when your shipment is less than a truckload but too large or oddly shaped for parcel shipments. When compared to full truckload shipments, parcel and LTL provide an enticing level of flexibility that other transportation methods cannot.
- Allows for door-to-door shipment: Perhaps the most significant benefit associated with truck freight is the ability to ship a product directly to the consumer's front door. Although last-mile delivery is not always available due to the type and size of the product or final destination, the possibility of door-to-door shipment is why many companies opt for truck freight over other methods.

Despite these numerous benefits, there are a few important factors to consider before selecting truck freight, such as:

- Time: Truck freight can take longer and is more susceptible to shipment delays than other methods.
- Control Due to how truck freight works, there is control over how the products are handled. Road travel can be rough on some shipments, and some companies may mishandle the product

Ship — Marine Transportation

Ocean transport accounts for more than 90% of the world's trade economy. Whenever the business requires transport for heavy, cumbersome loads or country to country shipping, ship transportation is usually the way to go.

Compared to air transportation, ships are capable of carrying immensely heavier loads for a fraction of the cost. It is the preferred transportation for large items shipped in bulk, such as metals, agriculture products, building supplies and others that cannot be reasonably accommodated by plane.

The benefits of maritime transportation include:

- Accommodates more space and weight: Cargo ships range in length, and can carry thousands of tons of weight. For this reason, ships are often the best and only option for oversized products or bulk quantities that must move at the same time.

- Costs less than air transportation: Marine transportation is often a more economical choice than air transport due to the lower cost of fuel. Cargo ships operate on a set schedule, so there is also less opportunity for costly shipping delays.
- Enhances the safety of the shipment: Because ships operate on a set route and planned schedule, the shipment will go through minimal handling. Most of the time, it will be securely stored in a slow-moving vessel, which is preferable for easily damaged goods.

Sea transportation may not always be the most economical or accessible choice, depending on the location of the warehouse. However, the most significant factor to consider about maritime transit is how long it takes to move a shipment:

- Speed: Although ships are capable of carrying much bigger loads than other transportation methods, maritime shipping takes much longer. It is not usually the preferred shipping method for businesses that rely on speedy delivery

Train — Rail Transportation

Since the invention of the railway, trains have played an important part in trade and logistics around the world. Rail transport is ideal for companies who require fast, scheduled ground freight.

Some benefits of rail transport are:

- Offers more carrying capacity: Trains can transport heavy, bulk cargo such as coal over long distances. They can handle more weight than truck transportation.
- Reduces the chances of delays: Trains operate on a fixed schedule, making them a predictable and reliable form of transportation. Because railroads operate independently, train shipments are often less prone to delays that plague truck freight, like traffic jams or inclement weather.

- Minimizes its environmental impact: Although the environmental impact of a shipment depends on a combination of several different factors, trains tend to be less impactful than trucks, planes and ships because they require less fuel to operate.

The two main factors to consider with rail transport are:

- Transit time: Rail transport is slower than truck and air freight, and they often require multiple transfers throughout the shipment process.
- Accessibility: Not every area has access to railroad tracks, so rail transport almost always requires other forms of transportation to move products. Rail transportation is often combined with truck freight for efficient delivery.

Plane — Air Transportation

Air transport is the newest shipping method, but it is often the best choice if there is a desire for fast, uncompromising delivery. Air transport is accessible across most of the world and is ideal for shipments that need to be moved quickly across long distances, including overseas. Air transportation also has a vast scope compared to rail and ship freight, as it is an ever-expanding industry with several thousand airports and landing strips in operation across the globe.

The two most significant benefits of air transport are:

- Allows for speedy deliveries: Despite the possibility of occasional flight delays, air transport is significantly faster than ship, truck or plane delivery under most circumstances. Additionally, airplanes operate on a fixed schedule. This reliability is an asset when arranging shipment, particularly for perishable goods that require prompt, usually overnight delivery.

- Offers enhanced security: Planes offer this speed with little to no compromise to the quality of the product, providing optimal protection and safe handling due to rigorous flight checkpoints and little interference during flight.

However, a few disadvantages to consider about air transport are:

- Cost: Air transport is more expensive than truck transport due to the higher cost of fuel and additional expenses like tickets, maintenance, checkpoints, special handling fees for certain materials, shipping containers and more. When ground logistics are an option, and guaranteed quick delivery is not required, trucks are often the more economical decision.

For companies who can afford the cost and rely on fast shipments, air transport is ideal.

Limitations: Due to the nature of air transport, there are certain limitations in place that some companies may find difficult to navigate, including size, weight and product restrictions. Airplanes have a set weight capacity that they cannot exceed, and many materials are too hazardous to transport via flight.

The researcher will take into consideration for this study the Truck Freight (Road Transportation) since most inbound cargos are imported by the type of Transportation Methods

2.1.6 Role of transport to logistic process

Brewer et al. (2001) stated that, when the economy is growing, both production and consumption will grow, hence leading to an increase in the demand for transport, and vice versa. The development of a market economy depends upon the ability to move goods, that is, on the availability of transportation service (Fair & Williams, 1981).

The role that transportation plays in Logistics system is more complex than carrying goods for the proprietors. Its complexity can take effect only through highly quality management. By means of well-handled transport system, goods could be sent to the right place at the right time

in order to satisfy customers demands. It brings efficacy, and also it builds a bridge between producers and consumers. Therefore, transportation is the base of efficiency and economy in business logistics and expands other functions of logistics system. In addition, a good transport system performing in logistics activities brings benefits not only to service quality but also, to company competitiveness.

The key element in a logistics chain is transportation system, which joints the separated activities. Transportation occupies one-third of the amount in the logistics costs and transportation systems influence the performance of logistics system hugely. Transporting is required in the whole production procedures, from manufacturing to delivery to the final consumers and returns. Only a good coordination between each component would bring the benefits to a maximum. (Tseng and Yue, 2005)

Transportation is required by the whole logistics operation processes. It plays a significant role in connection between various processing stages. For example, the raw materials from the place of production are transported to the industries for manufacturing. It is operated in various patterns,

For any logistics activity transportation plays a vital role. Sloggett and Woods (1989) pointed out that transportation plays a significant role in making location decisions for new business or industry. In fact, the two determinants of any business location are primarily transportation objectives; low transportation cost and satisfactory transportation service.

2.1.7Transport performance measurement

As discussed in statement of the problem, the overall parameters that determine the choice of transportation carrier stem from the cost-time principle, and they are described as follows (Coyle et al., 2003):

Transportation Cost: Transportation cost analysis is an important criterion in selecting the mode of conveying materials and equipment to the construction site and the analysis involves evaluating the basic modes of transportation. Transportation cost includes the rate, minimum weights, loading and unloading facilities, packaging and blocking, damage in transit and stopping in transit and the implication of selecting any of them. These are cost factors to be considered before selecting any materials carrier.

Transit Time: Transit time is the time required for the pick-up of delivery, and terminal handling of materials i.e. the time of movement between origin and destination terminals. Transit time affects the storage level on site. While shorter transit times result in lower storage cost, longer transit time can result in materials stock out (which can cause operation down time).

Reliability: This is the consistency of the transit time a carrier provides. More reliability on the service provided by any carrier will require lower storage level than an unreliable and inconsistent delivery service. This will definitely reduce storage cost

Capability: Capability is the ability of the vehicle to provide the facilities and equipment required for the movement of the materials. Examples of capability factors include equipment that can provide required temperature, humidity or special material handling facilities.

Accessibility: Accessibility is the ability of the vehicle to reach the point of delivery. The accessibility of a carrier is affected by the construction site location, geographic limits of the carrier's route network and constraints placed by regulatory authorities.

Network and infrastructure: refer to the physical condition and connectivity of a network of infrastructure that supports freight movement. Thus, it refers to facilities that support both line haul movements and interchanges at transfer facilities. The size and condition of the facility may restrict some movements (spring load restrictions do not allow all trucks to use all roads during

spring). It is also important to note that this category and related measures/indicators apply to all transportation and not just to freight transportation in most of the cases (e.g., interstate routes being used heavily by both cars and trucks) (Varma, 2008).

2.2 Empirical Review

The success of any supply chain can be judged by its transportation management. Transportation and logistics can account for as much as 7-14% of sales, depending on the industry. (Phạm, L,2019)Transportation decisions play a strategic role and acts as a long-term decision for the overall supply chain. It occupies one-third of the amount in the logistics costs and transportation systems influence the performance of logistics system hugely (Shree Kanungo, M. 2014)

A study on logistics performance and the influence it had to firm performance, done in USA by Fugate et al. (2010) revealed that increase in logistics efficiency, effectiveness, and differentiation decreased expenses, inventory, cash requirements and increased inventory availability, timely delivery, on-time and damage-free deliveries, line-item fill rates and sales which improved net margin and asset turnover, which improved return on assets and overall firm performance.

According to Fair and Williams (1981), transportation plays a connective role among the several steps that result in the conversion of resources into useful goods in the name of the ultimate consumer. It is the planning of all these functions and sub-functions into a system of goods movement in order to minimize cost and maximize service to the customers that constitutes the concept of business logistics. In addition, it plays a connective role between the several ladders that result in the exchange of possessions into useful goods in the name of the final consumer. It is the planning of all these roles and sub-functions into a system of goods movement in order to

decrease cost and maximize service to the clients that represents the model of business logistics. The structure, once put in place, must be successfully organized (Tseng and Yue, 2005).

Well-managed logistics system improves efficiency and benefits business while decreasing logistics costs increases profits of products. Transportation is one of the basic and important elements of operational activities in international logistics operation and it plays a significant role in the successful completion of the logistical chain process (Bhat, 2011 cited in Tagel, 2014). In order to reduce the cost of logistics, good management of transportation is the key issue due to the fact that it occupies a big part in the logistics activities.

The requirement for transportation of materials to construction sites is very significant because the construction process consumes enormous quantities of materials (Shakantu et al., 2008).

Failing to deliver on time leads to the delay of projects and hurts the final consumers from the project. It is a matter of fact that most projects in Ethiopia are not finalized on the intended day. The Ethiopian Grand Renaissance Dam project is one example where the project has been intended to be finalized in 5 years but still it is under construction (August 2021) due to several reasons. Apart from the need to convey large quantities of materials, transportation often accounts for a significant part, between one-third to two-third, of the cost of logistics in many industries (Ghiani, Laporte, & Musmanno 2004). According to Building Research Establishment (BRE) (2003), transportation of construction materials accounts for about 10-20 percent of construction costs. Furthermore, high fluctuations of demand can result in a sporadic delivery service that can defeat the entire effort to integrate transport capability into a logistical system (Bowersox, Closs, & Cooper, 2007). According to these empirical findings, the problems with transportation have not been addressed properly or their solution wasn't given. Therefore, this

paper is going to try to assess the problems and give some explanation on the challenges that hinder implementation of effective transportation in Webuild S.P.Aat Koysa Hydroelectric Power project along with the solutions that is recommended in order for the logistics performance improvement,

2.3 Conceptual framework

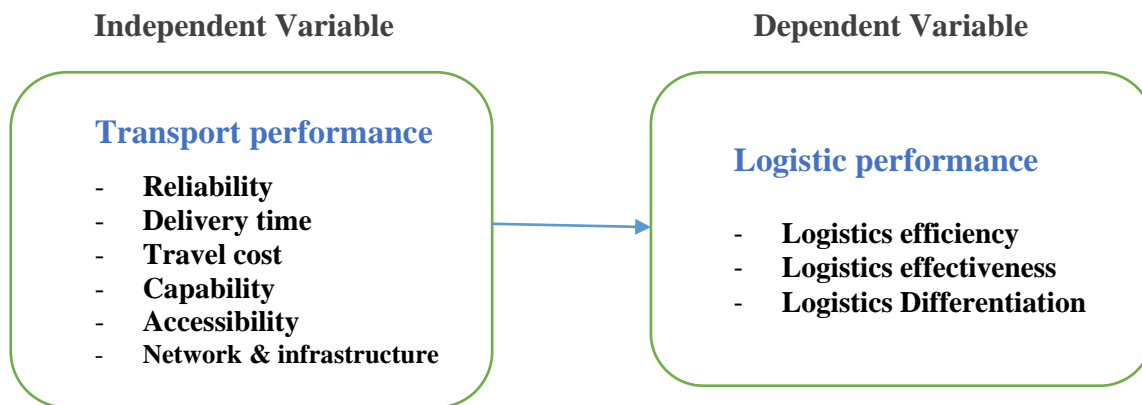


Fig 2.2 Conceptual framework

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

Research methodology is very crucial that helps the researchers how to address the research problems and provides the overall structure for the procedures that researchers should follow. It is also very important to get meaningful data to achieve the objectives of the study. This chapter deals with research design, the population of the study, sampling techniques, instruments of data collection, data analysis, pilot study, validity and reliability, and ethical consideration.

3.2 Research Approach

The research starts with theory that is developed from the academic literature, and designed to test the theory which implies the study employed deductive approach as a research approach. Deduction possesses several important characteristics. First, there is the search to explain relationships between concepts and variables. Second, in deduction concepts need to be operationalized in a way that enables facts to be measured, often quantitatively (Saunders et al., 2012)

3.3 Research design

Thus, the study adopts both descriptive and explanatory research design in order to assess, describe and examine the effect of transportation in logistics performance of Webuild S.P.A at Koysa Hydroelectric Power project. According to (Cooper and Schindler, 2006) descriptive research design enables the researcher to narrate how various behaviors and events occur. It

describes a phenomenon occurring in a population without influencing the subjects being studied. On the other hand, the explanatory research design also known as causal research design seeks to establish relationships between variables. This design is used to establish relationships between two or multiple variables of interest. (Creswell, 2014) asserts that explanatory research design can be used to predict an outcome such as the performance of construction firms. Consequently, explanatory research design can be used to investigate the influence of the challenges of the logistics operations on the performance of construction firms by estimating the relationships between various aspects of the challenges of logistics operations and the performance of construction firms. Similarly, (Kothari, 2004), those two research designs may facilitate research to be as efficient as possible yielding maximum information. Descriptive and explanatory research design provides the collection of relevant evidence with minimal expenditure of effort, time, and money; the purpose of the study happens to be an accurate description of the situation and analysis of the relationship between variables (Kothari, 2004).

3.4 Population of the study

The population considered for this are employees at the head office of Webuild SpA who have a direct relationship with the logistics department and management groups. Since the majority of the firm's logistics activities are procured and approved by the transit office and administration and finance department respectively in addition to 6 departments, these eight departments were selected. They are well-suited to the research as being able to provide sufficient and reliable information related to transportation services and logistics of the firm.

All logistics personnel and other departments in the head office which have a direct relation with transport are taken as the study population. From 250 employees of head office Webuild SpA,

113 are employed under the department of the eight departments. Therefore, this study focused only on these group, where the total population of this targeted department personnel are 113.

3.5 Sampling Size and Technique

Depending on the target population number explained above, i.e., 113, this study used a sampling technique to select the study sample size from the total population. The sample selection techniques used is a purposeful sampling of the most commonly focused departments and management bodies. The main reason for using this category of people is that their activities directly or indirectly have a bearing on logistics activities within applicable area which is the scope for the study and the researcher has collected data from every employee of the mentioned department. Then, purposeful sampling was applied to select the respondents from Management, Administration and Finance, Production, Commercial Office, Plant Office, Transit Office, Procurement Officer, and IT Office. They selected purposefully because the respondents were those who have a direct relationship with the logistics and management groups.

3.6 Tools of Data Collection

This study contained both primary and secondary data. The secondary data was collected from yearly reports of the organization, from written documents, and also from any available and recognized tools. Primary data was collected by using two data collection mechanisms called questionnaire and physical observation.

Questionnaire

A survey questionnaire was the main data-gathering tool of this study. In this particular study, questionnaires were utilized to assess freight transport performance and logistic performance in

the study area. The questionnaire was prepared in English as it is a widely used communication language in any international organization.

The questionnaire was piloted with some employees who were asked to indicate any vagueness in the questionnaire. The Likert scale questionnaire was prepared to collect data from the respondents. Then, any concerns faced here were clarified and incorporated in redrafting the final questionnaire.

Observation

An observation can give useful insight into problems, work conditions, bottlenecks, and Methods of work (Avison & Fitzgerald 2006).

Observation is the second method used to gather information regarding the effects of transport services on logistics performance. The observation was the potential factors and challenges on logistics performance. For the purpose of this research, the office staff in Addis Ababa was visited to observe the current system used and to know how they handle the transportation service.

3.7 Data Analysis

This section describes how each study variable was measured and explains the study objectives based on the data analysis techniques used.

The research approaches under this study are a combination of quantitative (performance measurement) and qualitative (customer satisfaction and integrated effort measurement), which has been practiced, as recommended by Creswell (2009:203-216).

The finding and conclusions of the study depend on the full utilization of statistical data collection and analysis.

In this study, the data analysis method was used to answer the research question. The quantitative data was analyzed with the help of SPSS version 20. The major descriptive statistics and inferential techniques used for the questionnaire.

On the other hand, Qualitative data from the observation part was analyzed using thematic analysis methods. According to Creswell (2014), thematic analysis which is based on the frequent theme of data can be used to make sense of qualitative data. It can be used to evaluate qualitative information and to systematically gain knowledge about a person, an interaction, a group, a situation, an organization, or a culture. This study also administers qualitative data in terms of content and where applicable and a quotation form analyzes the source of challenges on the project site.

3.8 Validity and Reliability

Creswell, (2014) stated that validity is a quality of data gathering instrument that enables it to measure what it is supposed to measure. In addition, Creswell describes validity as about whether one can draw meaning and useful inferences from a score on the instrument. To ensure content validity, the instrument was reviewed by the researcher's advisor and other experts. In addition to these, the study questionnaire found unsuitable for measuring the variables in the study were either rejected or adjusted to ensure that the right data was gathered for the study.

Reliability is a measure of the degree of questionnaire consistent result by coefficient Cronbach Alpha of 60% and above (Creswell, 2014). Thus, Cronbach Alpha was employed to test the reliability of the study instrument in the pretest and main data gathering process. It consists of an alpha 34 coefficient with a value between 0 and 1. Values of 0.7 or above indicate that the questions combined in the scale are measuring the same thing (Saunders et al., 2012). In the

study the questionnaires indicate consistency of internal existence among all the independent and dependent variables where the Reliability Statistics is .746 for 56 total number of items.

Validity refers to the accuracy of the measurement. Validity shows how a specific test is suitable for a particular situation. If the results are accurate according to the researcher's situation, explanation, and prediction, then the research is valid. If the method of measuring is accurate, then it'll produce accurate results. If a method is reliable, then it's valid. In contrast, if a method is not reliable, it's not valid. (Troy,2020)

Based on the above explanations, the researcher questionnaires are valid that were used by other researchers and supported by literature.

3.9 Ethical Consideration

The researcher clearly describes the purpose of the study to the participants before data gathering. The researcher also secured the informed consent of the participants before collecting the data and ensured that confidentiality concerns are considered following data collection. The Confidentiality was explicitly written as part of the instruction on the questionnaire and verbally indicated at the time of data collection that the data was only used for the intended purpose of this study. In addition to this, the researcher informed participants not to write their names on the questionnaires to keep their level of confidence and trust and also secure genuine data.

CHAPTER FOUR

RESULTS, INTERPRETATIONS AND DISCUSSIONS

This chapter deals with the presentation, analysis, and interpretation of data collected through questionnaire and document analysis.

4.1 Introduction

This chapter presents the analysis of data obtained from the respondents and discusses the findings on the relationship between effect of transport service and logistics performance at Kosyha hydraulic power project.

4.2 Response rate

The study intended to collect data from 113 employees working in webuild S.P.A Ethiopian office from eight departments that have a direct relation to Koysa Hydroelectric power project or for those who do have a link previously. The researcher managed to collect 103 questionnaires. That is the total usable data.

Table 4.1 Response rate

Distributed questioner	Collected	Percent
113	103	88.49%

4.3 Socio-Demographic characteristics

The background characteristics of the respondents are presented in Table 4.1. Among the total 103 respondents included in the study the majority 79 (76.7%) were male, 55 (53.4%) were in the age group 38 – 55 followed by 27 (26.2%) in the age group 18 – 37.

Table 4.2 shows that Position of the respondent for majority 72 (70%) were transit supervisor followed by 21 (20%) transit office. The majority 82 (79.6%) were currently working on Koyssha HPP project while the remaining 20.4% currently work on another project. About 74% of the respondents worked more than 9 years and 21.4% of the respondents worked between 3 - 8 years for Salini Impregilo. The majority 97.4% worked on Koyssha HPP for 3 – 5 years while the remaining 2.6% worked on Koyssha HPP for less than 2 years. The majority 54.4% of the respondent believe that Webuild SpA was fully successful in managing its logistics and transportation while 21.4% believe it was partially successful and the remaining 13.6% and 10.7% believe that Webuild SpA was less successful and not successful respectively.

Table 4.2 Socio-Demographic characteristics of the respondents

Variables	Categories	N	%
Sex of the respondent	Male	79	76.7%
	Female	24	23.3%
Age of the respondent	18-37	27	26.2%
	38-55	55	53.4%
	>55	21	20.4%
Positions of the respondent	Transit office	21	20.4%
	Transit supervisor	72	69.9%
	Head of transit	1	1.0%
	Transit accountant	1	1.0%
	Operation controller	3	2.9%
	Operation manager	5	4.9%
Department of the respondent	Transit department	27	26.2%
	Administration and finance department	7	6.8%
	Management	5	4.9%
	Production department	9	8.7%
	Commercial department	11	10.7%
	Plant department	15	14.6%
	Procurement department	17	16.5%
	It department	12	11.7%
Active at Koysha	Yes	82	79.6%
	No (GERD)	21	20.4%
Worked year at Salini	0-2 years	5	4.9%
	3-5 years	12	11.7%
	6-8 years	10	9.7%
	>9 years	76	73.8%
Worked year at Koysha	0-2 years	6	5.8%
	3-5 years	97	94.2%
What extent is Salini successful in managing its logistics and transportation	Fully successful	56	54.4%
	Partially successful	22	21.4%
	Less successful	14	13.6%
	Not successful	11	10.7%

4.4 Logistics and transportation role on Koysha HPP

Table 4.3(below) indicates the extent of transport management practices that was implemented in the organization. The extent of automated transportation system was testified to be moderate by the majority 78.6% of the respondent and 16.5% of the respondent testify the extent to be very small. The extent of fleet management practices was testified to be great and moderate by 80.6% and 18.4% of the respondents respectively. The extent of fuel management practices was testified to be great, small and very small by 61.2%, 11.7% and 16.5% of the respondents respectively. The extent of department organization was testified to be great, very great and moderate by 71.8%, 12.6% and 9.7% of the respondents respectively. The extent of Supplier coordination practices was testified to be great and moderate by 77.7% and 13.6% of the respondents respectively. The extent of Vehicle maintenance policy was testified to be great, moderate and very small by 65%, 15.5% and 15.5% of the respondents respectively. The overall transport management practices at Webuild SpA were believed to be fully satisfactory, partially satisfactory, less satisfactory and not satisfactory by 68.9%, 7.8%, 10.7% and 12.6% respectively.

Table 4.3 Transport Management on Koysha HPP

Variables	Categories	N	%
Automated transportation system	Very small extent	17	16.5%
	Moderate extent	81	78.6%
	Great extent	4	3.9%
	Very great extent	1	1.0%
Fleet management practices	Moderate extent	19	18.4%
	Great extent	83	80.6%
	Very great extent	1	1.0%
Fuel management practices	Very small extent	17	16.5%
	Small extent	12	11.7%
	Moderate extent	9	8.7%
	Great extent	63	61.2%
	Very great extent	2	1.9%
Departmental organization	Small extent	6	5.8%
	Moderate extent	10	9.7%
	Great extent	74	71.8%
	Very great extent	13	12.6%
Supplier coordination practices	Moderate extent	14	13.6%
	Great extent	80	77.7%
	Very great extent	9	8.7%
Vehicle maintenance policy	Very small extent	16	15.5%
	Moderate extent	16	15.5%
	Great extent	67	65.0%
	Very great extent	4	3.9%
Transport management practices that take place in the organization	Fully satisfactory	71	68.9%
	Partially satisfactory	8	7.8%
	Less satisfactory	11	10.7%
	Not satisfactory	13	12.6%

Table 4.4(below) shows the extent of the Transportation role with regard to time in the supply chain that was put in place in the department where the respondents work. The extent of adoption of better quality of information was believed to be very great, great, moderate and small by 11.7%, 67%, 8.7% and 12.6% of the respondents respectively. The extent of Information sharing with the supplier was believed to be very great, great and moderate by 10.7%, 67% and 9.7% of the respondents respectively.

The extent of organization investment on resources heavily on the infrastructure of the information system Webuild SpA was testified to be great and moderate by 67% and 14.6% and 17.5% small extent by the response of respondents.

The extent of Webuild SpA providing training for employees to utilize the info system effectively was testified to be great and moderate by 59.2% and 39.8% of the respondent respondents.

The extent of project site transpiration gives on time service for different requests was testified to be small, moderate and great by 1% ,50.5% and 48.5 % of the respondent respectively.

The extent of the project site transportation delivers training materials at the right time.by the organization was testified to be great and moderate by 73.8% and 26.2% of the respondents respectively. The extent of supply transportation reaches its goal for on time delivery of materials usedby the organization was testified to be great and moderate by 75.7% and 23.3% of the respondents respectively.

Table 1.4 Extent of Transportation role with regards to time

Variables	Categories	N	%
Better quality of information	Small extent	13	12.6%
	Moderate extent	9	8.7%
	Great extent	69	67.0%
	Very great extent	12	11.7%
Information sharing with the supplier	Very small extent	6	5.8%
	Small extent	7	6.8%
	Moderate extent	10	9.7%
	Great extent	69	67.0%
	Very great extent	11	10.7%
Org invest resources heavily on the infrastructure of information system	Small extent	18	17.5%
	Moderate extent	15	14.6%
	Great extent	69	67.0%
	Very great extent	1	1.0%
Org provides training for employees to utilize info system effectively	Very small extent	1	1.0%
	Moderate extent	41	39.8%
	Great extent	61	59.2%
The project site transportation gives on time service for different requests.	Small extent	1	1.0%
	Moderate extent	52	50.5%
	Great extent	50	48.5%
The project site transportation delivers training materials at the right time.	Moderate extent	27	26.2%
	Great extent	76	73.8%
transportation reaches its goal for on time delivery of materials.	Moderate extent	24	23.3%
	Great extent	78	75.7%
	Very great extent	1	1.0%

Table 4.5(below) shows the extent of Accessibility of transportation that has been implemented in the project site at Salini Impregilo. The extent of implementation of real time delivery of goods and services was believed to be great or very great by 70.9% and believed to be moderate by 29.1% of the respondents. The extent of implementation of avoidance of product reject/return was believed to be great by 75.7% of the respondents and believed to be moderate by 23.3%. The extent of implementation of time utility enhancement was believed to be great or very great by 79.6%, believed to be moderate by 9.7% and believed to be small by 10.7% of the respondents. The extent of flexibility of the transportation service in the project area was believed to be great or very great by 80.5% and believed to be moderate by 19.4% of the respondents.

The extent of the project site transportation service gives quick response to special requests was believed to be 89.3% and Moderate by 10.7% by respondents respectively.

The extent of the Project site community has high access in transportation service at regional distribution centers was believed to be great or very great by 70.9% and believed to be moderate by 29.1% of the respondent. The extent of the Project transportation can receive bulky load in a short period of time was believed to be great or very great by 71.9%, believed to be moderate by 22.3% and believed to be small by 5.8% of the respondents.

Table 4.5 The extent of Accessibility of transportation on the project site

Variables	Categories	N	%
Real time delivery of goods and services	Moderate extent	30	29.1%
	Great extent	70	68.0%
	Very great extent	3	2.9%
Avoidance of product reject/return	Very small extent	1	1.0%
	Moderate extent	24	23.3%
	Great extent	78	75.7%
Time utility enhancement	Small extent	11	10.7%
	Moderate extent	10	9.7%
	Great extent	79	76.7%
	Very great extent	3	2.9%
Transportation service of the projects is flexible.	Moderate extent	20	19.4%
	Great extent	81	78.6%
	Very great extent	2	1.9%
The project site transportation service gives quick response to special requests.	Moderate extent	11	10.7%
	Great extent	88	85.4%
	Very great extent	4	3.9%
The Project site community has high access in transportation service.	Moderate extent	30	29.1%
	Great extent	72	69.9%
	Very great extent	1	1.0%
The Project	Small extent	6	5.8%
	Moderate extent	23	22.3%
	Great extent	70	68.0%

transportation can receive bulky load in short period of time.	Very great extent	4	3.9%
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Table 4.6(below) shows the extent of logistics techniques included at Koysha HPP's logistics activities network. The extent of inclusion of just in time delivery logistics techniques at Koysha HPP was believed to be great or very great by 35% and believed to be moderate by 61.2% of the respondents. The extent of inclusion of demand smoothing logistics techniques at Koysha HPP was believed to be great or very great by 76.7%, believed to be moderate by 16.5% and believed to be small by 6.8% of the respondents. The extent of inclusion of construction consolidation centers logistics techniques at Koysha HPP was believed to be great by 87.4% and believed to be moderate by 12.6% of the respondents.

The extent of on-site market place at Koysha HPP was believed to very great by 25.2% and believed to be great extent by 74.8% of by the respondents.

The extent of pre-assembled and offsite manufacturing site at Koysha HPP was believed to moderate extent by 12.6% and believed to be great extent by 87.4% of by the respondents.

The extent of whole sale distribution at Koysha HPP was believed to small extent, moderate extent and great extent by 3.9%, 18.4% and 77.7% respectively by the respondents.

The extent of inclusion of inventory management software at Koysha HPP was believed to be great or very great by 90.3% and believed to be moderate by 9.7% of the respondents.

The extent of inclusion of inventory management logistics techniques at Koysha HPP was believed to be great or very great by 18.5% and believed to be small by 80.6% of the respondents.

Table 4.6 logistics activities network in each logistics techniques

Variables	Categories	N	%
Just in time delivery	Small extent	4	3.9%
	Moderate extent	63	61.2%
	Great extent	29	28.2%
	Very great extent	7	6.8%
Demand smoothing	Small extent	7	6.8%
	Moderate extent	17	16.5%
	Great extent	78	75.7%
	Very great extent	1	1.0%
Construction consolidation centers	Moderate extent	1	1.0%
	Great extent	89	86.4%
	Very great extent	13	12.6%
On site market place	Great extent	77	74.8%
	Very great extent	26	25.2%
Pre-assembled and offsite manufacturing site	Moderate extent	13	12.6%
	Great extent	90	87.4%
Wholesale distribution center	Small extent	4	3.9%
	Moderate extent	19	18.4%
	Great extent	80	77.7%
Inventory management software	Moderate extent	10	9.7%
	Great extent	86	83.5%
	Very great extent	7	6.8%
Inventory management	Small extent	83	80.6%
	Moderate extent	1	1.0%
	Great extent	18	17.5%

	Very great extent	1	1.0%
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4.7 Challenges in Implementing Logistics and Transportation Strategies at Koysha HPP

Table 4.7(below) shows the extent of transportation challenges that affect Koysha HPP's logistics activities. The extent of challenge from means of reliable transportation at Koysha HPP was believed to be great or very great by 9.7% and believed to be small by 83.5% of the respondent. The extent of challenge from delay in travel time at Koysha HPP was believed to be moderate by 11.7% and believed to be small by 88.3% of the respondents.

The extent of Variation in travel cost at Koysha HPP was believed to be moderate by 92.2% and believed to be small by 7.8% of the respondents.

The extent of challenge from availability of capable vehicles at Koysha HPP was believed to be very great by 11.7% and believed to be great by 88.3% of the respondents. The extent of challenge from road accessibility at Koysha HPP was believed to be great by 83.5% and believed to be moderate by 16.5% of the respondents. The extent of challenge from network of infrastructure for freight movement at Koysha HPP was believed to be great or very great by 7.8%, believed to be moderate by 84.5% and believed to be small by 7.8% of the respondents.

Table 4.7 Extent of transportation challenges that affect Koysha HPP's logistics activities

Variables	Categories	N	%
Reliable transportation means	Small extent	86	83.5%
	Moderate extent	7	6.8%
	Great extent	6	5.8%
	Very great extent	4	3.9%
Delay in travel time	Small extent	91	88.3%
	Moderate extent	12	11.7%
Variation in travel cost	Small extent	8	7.8%
	Moderate extent	95	92.2%
Availability of capable vehicles	Great extent	91	88.3%
	Very great extent	12	11.7%
Road accessibility	Moderate extent	17	16.5%
	Great extent	86	83.5%
Network of infrastructure for freight movement	Small extent	8	7.8%
	Moderate extent	87	84.5%
	Great extent	7	6.8%
	Very great extent	1	1.0%

Table 4.8(below) shows the challenges experienced in transport and logistics implementation at Koysha HPP. The extent of challenges from types of intermediaries in the logistics supply chain was believed to be great by 4.9%, believed to be moderate by 11.7% and believed to be small by 83.5% of the respondents. The extent of challenges from increased cost in the implementation

process was believed to be great or very great by 14.6% and believed to be moderate by 85.4% of the respondents.

The extent of management reluctant venturing into new logistics and transportation practice was believed to be moderate extent by 12.6% and to be great extent by 87.4 % of the respondents.

The extent of challenges from lack of adequate training of employees to coordinate new logistics practices was believed to be moderate by 93.2% and believed to be small by 6.8% of the respondents. The extent of challenges from lack of adequate funds to advance from the manual transport and logistics operations was believed to be moderate by 10.7% and believed to be small by 87.4% of the respondents.

The Level for logistics and transportation practice by the employees was believed to be very small extent or small extent by 82.6% and to be great extent or moderate extent by 17.4 % of the respondents.

Table 4.8 Challenges experienced in transport and logistics implementation at Koysha HPP

Variables	Categories	N	%
Types of intermediaries in the logistics supply chain	Small extent	86	83.5%
	Moderate extent	12	11.7%
	Great extent	5	4.9%
Increased cost in implementation process	Moderate extent	88	85.4%
	Great extent	3	2.9%
	Very great extent	12	11.7%
Management is reluctant venturing into new logistics and transportation practice	Moderate extent	13	12.6%
	Great extent	90	87.4%
Employees lack the adequate training to coordinate new logistics practices	Very small extent	7	6.8%
	Moderate extent	96	93.2%
Lack of adequate funds to advance from the manual transport and logistics operations	Very small extent	90	87.4%
	Small extent	2	1.9%
	Moderate extent	11	10.7%
Level for the logistics and transportation	Very small extent	1	1.0%

practices by the employees	Small extent	84	81.6%
	Moderate extent	16	15.5%
	Great extent	2	1.9%

4.6 Operational Performance at Koysha HPP

Table 4.9(below) shows measures of operational performance at Koysha HPP can be enhanced by the use of logistics and transportation. The extent of enhancement of operational performance efficiency from reduced production costs at Koysha HPP by the use of logistics and transportation was believed to be great or very great by 88.4% and believed to be moderate by 11.7% of the respondents. The extent of enhancement of operational performance efficiency from reduced distribution costs at Koysha HPP by the use of logistics and transportation was believed to be great by 86.4%, believed to be moderate by 9.7% and believed to be small by 3.9% of the respondents. The extent of enhancement of operational performance efficiency from reduced Transaction costs at Koysha HPP by the use of logistics and transportation was believed to be great or very great by 94.2% and believed to be moderate by 4.9% of the respondents.

The extent of enhancement of operational performance flexibility from customer satisfaction at Koysha HPP by the use of logistics and transportation was believed to be great or very great by 95% and believed to be moderate by 5% of the respondents. The extent of enhancement of operational performance flexibility from delivery satisfaction at Koysha HPP by the use of logistics and transportation was believed to be great or very great by 92% and believed to be moderate by 8% of the respondents.

The extent of enhancement of operational performance flexibility from exceptional orders at Koysha HPP by the use of logistics and transportation was believed to be great or very great by 93% and believed to be moderate by 7% of the respondents.

The extent of enhancement of operational performance flexibility from volume orders at Koysha HPP by the use of logistics and transportation was believed to be great, moderate and small by 87.4%, 6.8% and 5.8% of the respondents respectively.

The extent of enhancement of operational performance Differentiation from Percentage of on time delivery at Koysha HPP was believed to be great by 82.5%, believed to be moderate by 6.8% and believed to be small by 10.7% of the respondent. The extent of enhancement of operational performance Differentiation from Percentage of Damage free deliveries at Koysha HPP by the use of logistics and transportation was believed to be great by 67%, believed to be moderate by 14.6% and believed to be small or very small by 18.5% of the respondent. The extent of enhancement of operational performance Differentiation from Forecasting accuracy at Koysha HPP was believed to be Very great, Great by 11.7% and respectively 82.5% and believed to be moderate and small by 5.9% of the respondent.

The extent of enhancement of operational performance Differentiation from Lead time (time between order and delivery) at Koysha HPP was believed to be very great by only 2.9%, believed to be great by 82.5% and believed to be moderate small by 14.6% of the respondents.

The extent of enhancement of operational performance quality from product quality at Koysha HPP by the use of logistics and transportation was believed to be great or very great by 89.3% and believed to be moderate by 9.7% of the respondents. The extent of enhancement of operational performance quality from process quality at Koysha HPP by the use of logistics and

transportation was believed to be great by 86.4% and believed to be moderate by 12.6% of the respondents.

The opinion of the respondent about the effectiveness of logistics and transportation in enhancing operational performance at Koysha HPP was also shown in table 4.8. The extent of the effectiveness of logistics and transportation in enhancing operational performance was believed to be great or very great by 55.3% and believed to be small by 43.7% of the respondents.

Table 4.9 Measure of operational performance at Koysha HPP

Variables	Categories	N	%
Efficiency			
Efficiency reduced production costs	Moderate extent	12	11.7%
	Great extent	90	87.4%
	Very great extent	1	1.0%
Efficiency reduced distribution costs	Small extent	4	3.9%
	Moderate extent	10	9.7%
	Great extent	89	86.4%
Efficiency reduced transaction costs	Small extent	1	1.0%
	Moderate extent	5	4.9%
	Great extent	96	93.2%
	Very great extent	1	1.0%
Flexibility			
Flexibility customer satisfaction	Moderate extent	5	4.9%
	Great extent	95	92.2%
	Very great extent	3	2.9%
Flexibility delivery satisfaction	Small extent	8	7.8%
	Great extent	89	86.4%
	Very great extent	6	5.8%
Flexibility exceptional orders	Small extent	7	6.8%
	Great extent	91	88.3%
	Very great extent	5	4.9%
Flexibility volume orders	Small extent	6	5.8%

	Moderate extent	7	6.8%
	Great extent	90	87.4%
Logistics Differentiation			
Percentage of on time delivery	Small extent	11	10.7%
	Moderate extent	7	6.8%
	Great extent	85	82.5%
Percentage of Damage free deliveries	Very small extent	8	7.8%
	Small extent	11	10.7%
	Moderate extent	15	14.6%
	Great extent	69	67.0%
Forecasting accuracy	Small extent	5	4.9%
	Moderate extent	1	1.0%
	Great extent	85	82.5%
	Very great extent	12	11.7%
Lead time (time between order and delivery)	Moderate extent	15	14.6%
	Great extent	85	82.5%
	Very great extent	3	2.9%
Quality			
Product quality	Small extent	1	1.0%
	Moderate extent	10	9.7%
	Great extent	89	86.4%
	Very great extent	3	2.9%
Process quality	Very small extent	1	1.0%
	Moderate extent	13	12.6%
	Great extent	86	83.5%
	Very great extent	3	2.9%
Rate for the effectiveness of logistics and transportation in enhancing operational performance at Koysha	Small extent	45	43.7%
	Moderate extent	1	1.0%
	Great extent	54	52.4%
	Very great extent	3	2.9%

The overall logistic performance of Koysha HPP was measured by the average enhancement of operational performance of efficiency, flexibility, responsiveness and quality. Table 4.10(below) shows the overall logistic performance of Koysha HPP rated by the respondent has an average of 3.85, which is computed by scoring 1 to very small extent and 5 to very great extent, with minimum of 2.62 and maximum of 4.23. The average, minimum and maximum for the performance shows that there are no respondents who believe the extent of the overall logistic performance Koysha HPP to be small or very small. The performance rating by respondent was categorized as moderate if the average of the respondent rating is below the overall average (3.85) and great if the average of the respondent rating is above the overall average. The overall logistic performance was rated as moderate by 56.3% of the respondents while the remaining 43.7% rated as great.

Table 4.10 Overall Logistic performance

Variable		N (%)
Logistic performance	Moderate extent	58 (56.3%)
	Great extent	45 (43.7%)
Performance	Mean	3.85
	Minimum	2.62
	Maximum	4.23

4.7 Determinants of overall Logistic performance

To identify the determinant of overall logistic performance we use binary logistic regression analysis since the dependent variable has two categories i.e., moderate and great. The insignificant p-value .057 for goodness of fit test for logistic regression shows that the model was a good fit to the data.

Table 4.11 Hosmer and Lemeshow Goodness of Fit Test

Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	15.088	8	.057

The classification table output shows that 77.7% of the overall logistic performance was correctly classified (predicted) by the model.

Table 4.12 Classification table

Classification Table^a				
Observed		Predicted		
		Logistic performance		Percentage Correct
		Moderate extent	Great extent	
Logistic performance	Moderate extent	49	9	84.5
	Great extent	14	31	68.9
Overall Percentage				77.7
a. The cut value is .500				

The logistic regression result identifies that Fuel management practices and transportation service to gives quick response to special requests as a determinant of overall logistic performance at 5% level of significance and Transportation service flexibility of the projects and

demand smoothing was also identified as determinants of overall logistic performance at 10% level of significance.

4.8 Regression Analysis

A logistic regression analysis has been made so as to determine the effect between the predictor variables on the logistics performance of construction projects. The researcher applied the statistical package for social sciences (SPSS) to code, enter and compute the measurements of the multiple regressions for the study.

Before proceeding further, the researcher has checked whether the basic assumptions on logistic regression such as outlier, multicollinearity, independent test, normally distributed test, and linearity test have met for the regression analysis and the assumptions has been met successful.

Table 4.13 Regression Result

Variables in the Equation		B	Sig.	Exp(B)	95% C.I.for EXP(B)	
					Lower	Upper
Positions of the respondent	Transit Office	1.468	.256	4.341	.346	54.537
	Transit Supervisor	-.376	.724	.687	.085	5.530
	Other Positions	Ref.				
Fuel management practices	Very Small Extent	-1.245	.128	.288	.058	1.432
	Small Extent	-4.324	.003	.013	.001	.236
	Moderate Extent	-.469	.701	.625	.057	6.846
	Great Extent	Ref.				
Supplier coordination practices	Moderate Extent	.211	.856	1.235	.125	12.159
	Great Extent	-1.254	.190	.285	.044	1.861
	Very Great Extent					
The project site transpiration gives on time service for different requests.	Moderate Extent	-1.008	.522	.365	.017	8.014
	Great Extent	Ref.				
Time utility	Small Extent	-1.913	.123	.148	.013	1.680

enhancement	Moderate Extent	-2.573	.173	.076	.002	3.094
	Great Extent	Ref.				
Project flexibility	Moderate Extent	1.417	.408	4.124	.143	118.556
	Great Extent	Ref.				
quick response to special requests.	Moderate Extent	-2.947	.067	.052	.002	1.235
	Great Extent	Ref.				
can receive bulky load in short period of time.	Small Extent	1.921	.022	6.828	1.322	35.259
	Moderate Extent	Ref.				
Departmental organization	Small Extent	-3.547	.163	.029	.000	4.210
	Moderate Extent	-3.293	.112	.037	.001	2.162
	Great Extent	-2.900	.096	.055	.002	1.666
	Very Great Extent	Ref.				
Better quality of information	Small Extent	2.015	.201	7.501	.341	164.969
	Moderate Extent	-1.358	.343	.257	.016	4.247
	Great Extent	-.419	.644	.658	.112	3.877
	Very Great Extent	Ref.				
Demand smoothing	Small Extent	-3.500	.021	.030	.002	.595
	Moderate Extent	.067	.945	1.069	.157	7.284
	Great Extent	Ref.				
Constant		3.452	4.459	.049	86.365	

Fuel management practice was one of the significant determinants of overall logistic performance (OR=0.013, 95% CI = [0.001, 0.236]). A respondent who believes the extent of fuel management practices was small was 98.7% less likely to rate the overall logistic performance to a great extent compared with a respondent who believes the extent of fuel management practices was great controlling all other variables in the model.

Receiving bulky load in short period of time at regional distribution centers was another significant of overall logistic performance (OR = 6.83, 95% CI = [1.3, 35.3]). A respondent who believes the extent of receiving bulky load in short period of time at regional distribution centers was small 6.8 times more likely to rate the overall logistic performance as great compared with a respondent who believes the extent of receiving bulky load in short period of time at regional distribution centers was moderate controlling all other variables in the model.

Quick response to special requests was another significant of overall logistic performance (OR = 0.052, 95% CI = [0.002, 1.235]). A respondent who believes the extent of quick response to special requests was moderate were 94.8% less likely to rate the overall logistic performance as great compared with a respondent who believes the extent of quick response to special requests was great controlling all other variables in the model.

Demand smoothing (identifying the entire value chain beforehand and smoothing activities to reduce the amount of transport resources, materials and labor needed) was another significant of overall logistic performance (OR = 0.03, 95% CI = [0.002, 0.595]). A respondent who believes the extent of demand smoothing was small was 97% less likely to rate the overall logistic performance as great compared with a respondent who believes the extent of demand smoothing was great controlling all other variables in the model.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The main objective of this study was to assess the effects of transportation service on Koysha Hydroelectric Power Project logistics performance. The overall transport management practices at Salini Impregilo were believed to be fully satisfactory by about 69% of the respondents while 23.3% of the respondents believed it was less satisfactory or not satisfactory. The effectiveness of logistics and transportation in enhancing operational performance at Koysha HPP was believed to be great or very great by 55.3% and believed to be small by 43.7% of the respondents.

Variation in travel cost, availability of capable vehicles, road accessibility and network of infrastructure for freight movement were transportation challenges that affected Koysha HPP's logistics activities. Management's reluctance in venturing into new logistics and transportation practice, increased cost in implementation process, and employees lack the adequate training to coordinate new logistics practices was challenges experienced in transport and logistics implementation at Koysha HPP.

The overall logistic performance was rated as moderate by 56.3% of the respondents while the remaining 43.7% rated as great. The determinants of overall logistic performance at Koysha HPP identified by logistic regression were fuel management practices, receiving bulky load in short period of time at regional distribution centers, quick response to special requests and demand smoothing.

5.2 Recommendation

Based on this study the following recommendations are forwarded

- Employees lacking adequate training to coordinate new logistic practices was believed to be a challenge experienced in transport and logistics implementation at Koysha HPP. Therefore, adequate training should be prepared to all employees working on transport and logistics implementation.
- Fuel management practices, Transportation service flexibility of the projects and demand smoothing should be improved to increase the overall logistic performance.

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Annex 1: WORK PLAN AND BUDGET

Annex 1.1 Work plan

SN	Activity	Time duration in G.C
1	Literature review	Up to March 30, 2021
2	Preparation of questioner, checklists and other materials	January 01-March 30, 2021
3	Selection of sample and data collection	April 01-April 15,2021
4	Data coding, editing, entry and analysis	April 16-April 30,2021
5	Literature Review and progress report	May 1-May 20, 2021
6	Interpretation of results and research writing	May 21-June 10, 2021
7	Research Submission	June 11-June 30, 2021

Annex 1.2 Budget

SN	Items	Unit	Quantity	Unit Cost	Total Cost	Remark
1	Two data collectors for a total of 15 days	person	2	1500	3000	
2	For secretarial service during the whole thesis preparation	Person	1	2000	2000	
3	Printing paper	Packet	1	220	220	
4	Note Book	No	1*5	20.00	100	
5	Printer toner	No	1	800	800	
6	Flash Disk	No	1	240	240	

Annex 2: Research Questioner

This study aims to gather information regarding the effect of transport service on logistics performance: The case of Webuild S.P.A (SaliniImpregilo), On Koysha Hydroelectric Power Project, SNNP. Kindly provide information as honestly as possible. The collected information will be kept as confidential and it will be used only for academic research and the individual data will not be shared with anybody under any circumstances.

Remarks: For the open-ended questions Please write your responses on the spaces provided and for the close ended one please circle your answer. Thank you very much for your due attentions and collaborations!

A. BASIC PERSONAL AND DEMOGRAPHIC INFORMATION

1. Sex
 - a) Male
 - b) Female
2. Age
 - a) 18-35
 - b) 36-55
 - c) >55
3. What is your position at SaliniImpregilo?
4. Which Department of SaliniImpregilo do you work?
5. Are you currently working on Koysha HPP?
 - a) Yes
 - b) NoIf your answer is no please specify on what project you are assigned to work? -----

6. How long you have worked for SaliniImpregilo? If your answer was no for question number 4 please leave this question.
 - a) 0 - 2 years
 - b) 3-5 years
 - c) 6-8 years
 - d) >9 years
7. How long have you worked on Koysha HPP?
 - a) 0 - 2 years
 - b) 3-5 years
 - c) 6-8 years
 - d) >9 years
8. To what extent is SaliniImpregilo successful in managing its logistics and transportation in general?
 - a) Fullysuccessful
 - b) Partially successful
 - c) less successful
 - d) Not successful

9. LOGISTICS AND TRANSPORTATION ROLE AT ON KOYSHA HPP

Please indicate to what extent the following transport management practices have been implemented in your organization.

Transport management	Very small extent	small extent	moderate extent	great extent	Very great extent
Automated Transportation System					
Well-coordinated Fleet Management Practices					
Fuel Management Practices					
Departmental Organization					
Proper Supplier Coordination Practices					
Vehicle maintenance policy					

10. What is your overall opinion on the transport management practices that have been put in place in your organization?

a) Fully satisfactory b) partially satisfactory c) less satisfactory d) Not satisfactory

11. To what extent Transportation role with regards to Time in the supply chain have been Practiced in your department?

Logistics Information System	Very small extent	small extent	moderate extent	great extent	Very great extent
Better quality of information					
Information sharing with the supplier					
Organization invests resources heavily on the infrastructure of an information system					
Organization provides training for employees to utilize information system effectively					
The project site transpiration gives on time service for different requests.					
The project site transportation delivers training materials at the right time.					
transportation reaches its goal for on time delivery of materials.					

12. Compared with the manual information systems, is the logistics information system more effective or not? Please explain your justification.

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.....

13. Please indicate to what extent the following distribution management practices have been implemented in your organization

Distribution Management	Very small extent	small extent	moderate extent	great extent	Very great extent
Real time delivery of goods and services					
Avoidance of product reject/return					
Time utility Enhancement					
Transportation service of the projects is flexible.					
The project site transportation service gives quick response to special requests.					
The Project site community has high access in transportation service.					
The Project transportation can receive bulky load in short period of time.					

14. To what extent does Koysha HPP's logistics activities network include each of the following logistics techniques? (multichoice)

Logistics Techniques	Very small extent	small extent	moderate extent	great extent	Very great extent
Just-In-Time Delivery <i>(Delivery of construction materials at the exact time of requirement)</i>					
Demand Smoothing <i>(identifying</i>					

<i>the entire value chain beforehand and smoothing activities to reduce the amount of transport resources, materials and labor needed)</i>					
Construction Consolidation Centers <i>(a centralized distribution centers used to supply materials in the required quantities to one or more construction projects)</i>					
On-site Marketplaces <i>(a temporary storage area for consumable materials, fixings and small tools)</i>					
Pre-assembled and offsite manufacturing site					
wholesaler's distribution center					
Inventory management software					

B. CHALLENGES IN IMPLEMENTING LOGISTICS AND TRANSPORTATION STRATEGIES AT KOYSHA HPP

15. Please indicate to what extent the following transportation performance measurement parameters affect Koysha HPP's logistics activities.

Inventory Management	Very small extent	small extent	moderate extent	great extent	Very great extent
Reliable transportation means					
Delay in travel time					
Variation in travel cost					
Availability of capable vehicles					
Road accessibility					
Physical condition and connectivity of network of infrastructure for freight movement					

16. This section aims at determining the various challenges experienced in transport and logistics implementation at KOYSHA HPP.

Transport and logistics Challenges	Very small extent	small extent	moderate extent	great extent	Very great extent
There- is an increase in the number and types of intermediaries in the logistics supply chain					
Increased cost in implementation process					
The. managements are reluctant in venturing into new logistics and transportation practice					
The employees lack the adequate training to coordinate new logistics practices					
There is lack of adequate funds to advance from the manual transport and logistics operations					
There are low acceptance levels for the logistics and transportation practices by the employees					

17. What are the challenges that are experienced in transport and logistics implementation at KOYSHA HPP? Please explain.

.....

C. LOGISTICS PERFORMANCE AT KOYSHA HPP

18. Please indicate to what extent the following measure of Logistics performance at KOYSHA HPP have been enhanced by the use of logistics and transportation.

Operational Performance	Very small extent	small extent	moderate extent	great extent	Very great
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	extent				extent
Efficiency					
• Reduced Production costs					
• Reduced Distribution costs					
• Reduced Transaction cost					
Flexibility					
• Customer satisfaction					
• Delivery Flexibility					
• Exceptional orders					
• Volume Flexibility					
Logistics Differentiation					
• Percentage of on time delivery					
• Percentage of Damage free deliveries					
• Forecasting accuracy					
• Lead time (time between order and delivery)					
Quality					
• Product quality					
• Process quality					

19. Are there any ways in which logistics and transportation enhances operational performance at KOYSHA HPP?

.....

20. In your own opinion, to what extent would you rate the effectiveness of logistics and transportation in enhancing operational performance at KOYSHA HPP?

- a) Very small extent ()
- b) Small extent ()
- c) Moderate extent ()
- d) Large extent ()
- e) Very large extent ()