ST. MARY'S UNIVERSITY SCHOOL OF GRADUATE STUDIES MBA-PROGRAM

ASSESSMENT OF PROJECT LOGISTICS MANAGEMENT SYSTEM OF OROMIA WATER WORKS CONSTRUCTION ENTERPRISE

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Addis Ababa

DECLARATION

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of Tilaye Kassahun (PhD). All sources of materials used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

_____ _____

Name Signature

St. Mary's University, Addis Ababa **July, 2015**

APPROVAL SHEET

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Approved by Board of Examiners

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Date of submission: _____

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List of Abbreviations and Acronyms

IT:	Information Technology
MMS:	Material Management System
PR:	Purchase requisition
SIV:	Store Issue voucher
SR:	Store requisition
DN:	Dispatch Note
PT:	Property Transfer Note
RN:	Returned Good Receiving Note
SVN:	Sub Version
SWOT:	Strength Weakness Opportunity Threat
OWWCE:	Oromia Water Works Construction Enterprise.

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ABSTRACT

Project logistics management is one of the focus areas to get competitive advantage and complete project on time. The objective of this research is to investigate the project logistics management system of Oromia Water Works Construction Enterprises (OWWCE) by studying the project logistics management practices of the enterprises as a unit of analysis. Both quantitative and qualitative data collection methods are used. The study tries to assess the planning, implementation and evaluation activities of the project logistics system of the enterprise.

Descriptive and quantitative methods of research were used and data were collected by using interview questions, document review and questionnaires data collection tools. Interview questions were used to study the project logistics management system of the enterprise. Document review was conducted to study the current project logistics policies and procedures. The questionnaires data were collected from the logistics fulfillment department employees of the enterprise.

It was found that the project logistics activities of OWWCE is not satisfactory, there are delays in the delivery of suppliers to the project site, not only the current project logistics procedures are not supported by information technology, but also the procures are not implemented efficiently. So the project office are not satisfied with the with the logistics service they provided and it is considered by the enterprise one factor for the delay of projects. From the study it is concluded that the project logistics management system of OWWCE have a huge problem due to both system management and resource problems, which includes transportation, information technology, financial, storage and personnel training. It is recommended to select best practices and provide the necessary resources to strengthen the project logistics management system of the enterprise.

CHAPTER ONE
INTRODUCTION

1.1. Background of the organization

Today's market condition becomes more volatile that increase cost of material, labor and machinery rents in the country. So companies specially those engaged in project related works need to strengthen their planning and execution of their logistics system. High quality, lower cost and shorter project delivery time is the key success factors for any project based company, and its logistics functions have to optimize in order to achieve the cost and service leadership in the market. However, high logistics cost and longer delivery time is the identification of many project based companies in the country, like the company which is chosen as a case for this thesis; which is Oromia Water Works Construction Enterprise (OWWCE)

Logistics is part of the supply chain process that plans, implements, and controls the efficient flow of goods, services, and related information to fulfill customers' requirements (CLM, 1999). Efficient management of construction material planning tasks requires an integrated approach toward various logistical functions. In particular, project operations of facilities, inventory control, and communication planning need to be closely coordinated (Saukkoriipi, 2007).

A project is a complex of activities in which we commit scarce resources in expectation of benefits that exceed these resources, in which investment made on a package of interrelated time-bound activities. Project management deals with planning, scheduling and controlling the complex non-routine activities that must be completed to reach the predetermined objectives of the project (GOPALAKRISHNAN, 2000). Project logistics is one of the most complex activities of project component. Undertaking project consists of several phases where many different participants are involved during each phase. Project could be considered as a temporary organization, and project owners are interested in high efficiency while keeping the overall costs as low as possible (Agerberg, 2010).

Most projects are affected by several factors that have a high impact on the efficiency of the workforce by reducing their overall productivity. This affects quality, time and costs of the project the reason for this is often poor management of materials, equipment and human

resources; proper management of these three important components could increase productivity significantly. These components should be accurately managed on project, in order to complete projects successful. (Almohsen and Ruwanpura, 2011)

Improving logistics by reducing activities that do not add value to the final product could be one possible solution to lower the costs. Activities that do not add value to the final product are defined as "waste" which is directly related to the logistics issue. It is concluded that reduce the costs by minimizing the total amount of waste lead to efficient and effective utilization of project resources (Saukkoriipi, 2007).

1.2. Background of the Organization

OROMIA WATER WORK'S CONSTRUCTION ENTERPRIS (OWWCE) is a government construction enterprise which is engaged in water related construction projects. It is establishment in 1999 G.C. by Oromia water bureau with a mission of "To play its role in the effort to increasing the clean water and irrigation supply to the Oromia state people" and with a long-run vision of "becoming one of the leading enterprise in water construction, by providing quality and efficient services to the customers". The head office is located at Addis Ababa, Kality sub-city, Since its establishment OWWCE has been completed 22 projects and currently the company is undertaking 39 construction projects, the projects includes irrigation, water supply, drainage, road, buildings and dams construction. Currently the enterprise has 2003 permanent employers, one PVC pipe manufactory plant, U-PVC Production Factory, three stone crashers and one steel Pipes Producing Factory. OWWCE recorded two billion Birr authorized capital of which one billion Birr is paid-up capital. (*Source:* www.oowwce.com.et)

1.3. Statement of the Problem

OWWCE has been doing lots of water related construction projects. These projects are planned with the aim of gaining adequate returns to provide for future development with their own resources. But enterprise experience shows that there are several problems in the ultimate success of the projects. In the enterprise projects have taken longer time to complete than was initially estimated; Most of the projects which are constructed by OWWE are delayed. Since its establishment in 1999 OWWE has successfully finished 20 projects among 39, even there are some projects that the company abandoned. This is very small achievement for big budget company like OWWCE (*Source: OWWCE newsletter January/2014*). When

projects are running out of time, it is obvious that the capital costs will be larger than initially expected. So, inadequate project logistics management system is one of the major reasons for project delays and resource wastage. Failed to closely control the logistics system of the project will increase the machinery, raw material and human costs. In the current economic situation the cost of materials which is important for construction sectors fluctuates greatly from time to time. So, appropriate logistics management system to finish projects on time is very important in the company.

As mentioned above in OWWCE there are many delayed projects, this means logistic resources which are machineries rented and owned are costing extra, even though they are not working and permanent employees are getting unnecessary allowance and contract employees' costs unnecessarily the organization. The delay and the cost increase makes the organization not to get the necessary return form its projects, the cost increase makes the organization profit to decrease and the delayed projects on the pipeline hold up the organization resources idle (equipment and employees) and makes the organization not to engage in new projects because of resource shortage.

In addition to that recently about 20 officials of the enterprise are arrested by police and punished by the court, with the allegations of corruption that are related with machinery rent and resource wastage of different projects. All this evidence shows that the project management system of the enterprise have weakness. So the overall intention of this study is to assess the project logistics management system of OWWCE.

1.4. Basic Research Questions

The study is in general, aimed at answering what is the logistics management system of Oromia Water works Enterprise, and more specifically to find answers to the following basic research questions.

- What type of strategy, policy and procedure OWWCE are used for managing project logistics?
- How effective is the logistics system management in practice at OWWCE?
- What are the challenges of logistics management system of OWWCE in practices?

1.5. Objectives of the Study

The general objective of this study is to assess the project logistics management of Oromia water works constriction enterprise.

Specific Objectives:-

- To assess the weakness and strength of project logistics strategy, policy and procedure in managing the logistics system of the organization?
- To analyze how the logistics system of OWWCE work in practice.
- To identify the challenges of the current logistics system of OWWCE.

1.6. Hypotheses

To infer the sample for the general population hypotheses was prepared based on the current practices of the project logistics management system of OWWCE. Hypotheses for demand request, supply fulfillment, storage place and control system, information technology and control systems, and Communication and Evaluation system were tested by one sample T-test.

H01: The existing Project Logistics Management Performance of OWWCE is in line with the project requirement and plan.

H02: Projects logistics Demand Request of OWWCE are processed based on the demand request procedure of the enterprise.

H03: Project supplies fulfillment process of OWWCE is timely and based on project request.

H04: The storage place is adequate to manage projects logistics needs of OWWCE.

H05: The current Information technology systems of OWWCE are sufficient to support the project logistics system.

H06: The project logistics Communication and Evaluation system of OWWCE is organized in the way that satisfies the project needs.

1.7. Definition of Terms

- *Supplies, commodities, goods, products, and stock*. All items that flow through the logistics system. (*US aid Logistics handbook, 2011)*
- *Users, patients, clients, and customers*. The people who receive or use supplies.
- *Consumption dispensed, dispensed-to-user, usage data*. Data on the quantity of goods actually given to or used by customers. (*http://www.PMBOOK.CE.CM.EDU, February 1/2014*)
- *Logistics Pipeline*. The entire chain of physical storage facilities and transportation links through which supplies move from the storage to other storage or to projects or sites. (*http://cscmp.org/aboutcscmp/definitions.asp, December 15/2014*)
- *Lead time.* Time between when products are ordered and when they are received and available for use. (*http://cscmp.org/aboutcscmp/definitions.asp, December 15/2014*)
- *Logistics Requisition system*. In a requisition (pull) system, the receiving of the supplies the quantities of supplies required. (*US aid Logistics handbook, 2011)*
- *Logistics Allocation system*. In an allocation (push) system, the issue the quantities of supplies required. (*US aid Logistics handbook, 2011)*
- *Materials Issues data*. Information about the quantity of goods moved from one storage facility to another (either between levels or within a facility). (*http://www.PMBOOK.CE.CM.EDU, February 1/2014*)
- *Logistics Product integration*. Combining the management of some or all logistics commodity categories. (*http://cscmp.org/aboutcscmp/definitions.asp, December 15/2014*)
- *Economic order quantity:* the calculation addresses the question 'how many parts will we order?' The trade-off this time is between the cost of placing an order and inventory carrying cost. (*http://www.PMBOOK.CE.CM.EDU, February 1/2014*)

1.8. Significance of the Study

Project logistics management is important part for organization which engaged in project implementation; and for organization like OWWCE is more than important because it all deals with projects. Wining a bid and preparing a well-organized project plan seems great but it must be demonstrated that the project is provided with necessary supplies on time. To implement the project plan in to action a well-organized logistics management system is needed. Well-organized logistics system adds value for projects, so quickly fulfilling projects equipment, personals and materials at the needed time is one of the corner store for

project success. In return it saves the project from delay and unnecessary cost. This all are what this research deals about and this all are so significant and important to the organization profitability or at least existence. The study will have the following importance:

It helps management of OWWCE to see how the already implemented project logistics management system works performance, challenges and correction points. And it also serves as a spring board to conduct further and more detailed study in this area, which can be used as a reference for any interested management, staff or researcher.

1.9. Delimitation/Scope of the Study

Even if the concept of project logistics management is a broad which consists of supply of human, material and machinery resources to projects, information processing, purchasing, inventory control to the projects,. This is due to the fact that the time and cost constraints to cover all the movement of those logistics attributes, the study will stress on the company's overall logistics planning and controlling management activities, inventory management, and logistics information flow between projects and hade office; which excludes most of the project site aspects.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The literature review has been done in order to identify and study what has been done earlier within the field of project logistics management. Exploration of domestic and international books and articles will create a scientific background for the thesis. The literature review is a theoretical part of the study and consists of ten sections, which is categorized to cover all the issues the thesis have to include most of the review parts are logistics and project related.

Logistics Definitions

As logistics is the main issue of this paper it is worth to give clear definition of the specific concept.

> *Logistics includes the "assembling of supplies, stores, quarters, etc., necessary for the support of troop movements, expeditions, etc".(* Oxford English Dictionary, 206)

Another definition by the Chartered Institute of Logistics and Transport in the UK says that

> *Logistics is the procedure of designing and managing supply chains including purchasing, manufacturing, storage and transport. (*Chartered Institute of Logistics and Transport, 2006)

The comprehensive definition of logistics given by Taylor was developed by the US Council of Logistics Management.

> *"the process of planning, implementing and controlling the efficient, cost-effective flow and storage of raw materials, in – process inventory, finished goods and related information from point of origin to point of final consumption for the purpose of conforming to customer requirements". (Sullivan. 2010)*

In other words, it can be consider logistics activities as the operational component of supply chain management, including quantification, procurement, inventory management, transportation and fleet management, and data collection and reporting. Supply chain management includes the logistics activities plus the coordination and collaboration of staff, at different levels, and functions. The supply chain includes global manufacturers and supply and demand dynamics, but logistics tends to focus more on specific tasks within a particular activity.

Development of Logistics management

Logistics management is that part of the supply chains that plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customer requirements. The occurrence of environment is portrayed by uneven distribution of resources. Some areas of the earth are endowed with abundant supply of certain resources while others are not and vice-versa. This has made it difficult for some people to consume exactly what they want, where and when by limiting their choices to just what is available to them in fewer locations. This is explained by the fact that, in some developing countries, it is very likely to find people living in small, self-sufficient villages where most of their needed goods are produced or acquired in the immediate vicinity, thereby limiting production efficiency and a general decreased in standard of living (Andersson, 2007).

Improved logistics systems will create opportunity to shipped economically to other producing areas, and needed goods not produced locally were imported which is explained by the principle of comparative advantage. This same principle, when applied to world markets helps to explain the high level of international trade that takes place today. Efficient logistics systems allow world businesses to take advantage of the fact that lands, and the people who occupy them, are not equally productive. Logistics is a very essence of trade. It contributes to higher economic standard of living for us all. Efficient logistics systems (transport) can move product quickly over long distances, so there is no need for a traditional warehouse built close to customers (Waters, 2003).

The rapid evolution of our business environment during the 1990s which is described by importance of information flow, shorter-lead times, flexible processes and increased customer concern has made the logistics system very indispensable to the success of the organization (Andersson, 2007).

Logistics functions

The component of a typical logistics systems according to are: customer service, demand forecast, distribution communications, inventory control, material handling, order processing, parts and service support, plant and warehouse site selection (location analysis), purchasing, packaging, return goods handling, salvage and scrap disposal, traffic and transportation, and warehousing and storage.

Logistics process should be aimed at decreasing the company's costs and increase the company's receipts through high customer service in order to achieve the company's overall profitability, therefore identifying those parameters that affect logistics performance, it is essential to classify these activities according to the measurement of their contributions to the firm. Ballou separated these activities as key and support activities since he believes that certain activities will generally take place in every logistics channel, whereas others will take place depending on the circumstances, within a particular firm (Ballou, 2004).

The key activities are deemed to contribute most to the total cost of logistics or they are essential to the effective coordination and completion of logistics task, though some support activities may be as critical, as the key activities in any particular circumstance, they are considered here as contributing to the logistics mission (Ballou 2004).

A logistics process is said to be performance /efficient if the result is translated in terms of superior customer value at less cost, and this customer values comes from tailored services, responsiveness and reliability. According to (Christopher, 2005), customer value might include; quality, service, costs and time. Therefore customer service and cost are very fundamental to measure the performance of a logistics process. Factors affecting customer services may include; delivery frequency and reliability, stock level and order cycle time (Christopher, 2005).

Logistics administration ability is defined as the level of basic activities that are prerequisites for the implementation and control of logistics activity (Lynagh and Poist 1984). Bowersox (1990) classifies logistics management into logistics management as a technology, which stresses traditional logistics management concept as a logical experiment on logistics management techniques, and logistics management as a system, which adjusts and manages logistics service improvement activities from top management with respect to integrated management. Ballou(1985) defines logistics management as "logistics activities implemented to meet demands of customers or a method and system used to economically realize services".

Project Management

A project is a finite endeavor (having specific start and completion dates) undertaken to create a unique product or service which brings about beneficial change or added value. This finite characteristic of projects stands in sharp contrast to processes, or operations, which are

permanent or semi-permanent functional work to repetitively produce the same product or service. In practice, the management of these two systems is often found to be quite different, and as such requires the development of distinct technical skills and the adoption of separate management (Wikipedia, june/2015). According to (James and Albert, 1994), a project is an item of work that required planning, organizing and dedicating resources and expenditure funds, in order to produce a concept, a product or a plant.

Project Management also defined as the systematic application of management and construction expertise-through planning,design and construction processes-for the purpose of controlling the time, cost and quality of design and construction. Although the success of a project is influenced by a variety of factors, in practically all cases, successful project management will improved project quality while helping to maintain project budget and scope (Kuprenas,et al, 1999).

Excellence in Project Management is achieved through a structured process that includes multiple phases: Initiating, Planning, Executing, Monitoring & Controlling; and Closing. The process balances the key project constraints and provides a tool for making decisions throughout the project based on stakeholder values, performance metrics, established procedures and project goals. Contemporary institutions and organizations are increasingly realizing that traditional forms of management—based on the same approach to every project—cannot meet the needs of today's economic, social, and business environment. Additionally, the processes can be streamlined based on technologies and efficiencies not previously available.

Project Requirements: Project inception and preliminary planning require thoughtful definition of goals and needs (Project Scope); master planning to accommodate anticipated future needs; evaluation of project alternatives; identification of site requirements; funding requirements; budget authorization cycles and/or financial impacts; and project phasing.

Scope Management: Project scope is the work that must be performed to meet a client's program goals for space, function, features, impact, and level of quality. Scope management sets the boundaries for the project and is the foundation on which the other project elements are built.

Cost Management: Project costs are measured and analyzed in many ways throughout a project, from planning, programming and design to bidding, construction, turnover, and post occupancy.

Schedule Management: A project schedule defines the processes and establishes a timeline for delivering the project. Avoiding missing deadlines for delivery of key project components is a key objective of schedule management.

Delivery Methods: There are many approaches to achieve successful project design and construction. The Delivery Methods are driven by the project's scope, budget, and schedule.

Project Management Plans: A Project Management Plan (PMP) documents key management and oversight tasks and is updated throughout the project as changes occur.

Logistics in Construction industry

Logistics management research can be classified into three broad perspectives: (*i*) competitive strategy, (*ii*) firm focused tactics, and (*iii*) operational efficiencies. Competitive strategy issues have a long-term impact on the firm.

Firms that focus upon tactical issues operate in a shorter time frame. Operational efficiencies involve day-to-day decisions that can be altered quickly (Ganeshan, 1999). The construction industry is greatly concerned with aspects of daily operations, which are typically operational decisions, reflecting day-to-day operations up to 2 weeks ahead. The construction industry attempts to optimize daily operations of facilities through careful planning, organizing, directing, and controlling activities before and during the construction. In terms of construction logistics, multidisciplinary processes are categorized as follows: (*i*) material supply, storage, processing and handling; (*ii*) manpower supply; (*iii*) schedule control; (*iv*) site infrastructure and equipment location; (*v*) site material flow management on a job site; and (*vi*) management of information related to all physical and services flows. Although implementation and operational service management are significant aspects of construction logistics that affect day-to-day operations, one must keep in mind that logistics is rooted in senior-level decision making.

In general, logistics functions in a construction firm can be divided into supply logistics and site logistics. Figure 1 illustrates the construction logistics tasks. Supply logistics are related to activities in the production process that are cyclic. These activities include specification of supply resources (materials, equipment, and person power), supply planning, acquisition of resources, and transport to a site and delivery, and storage control. Site logistics are related to physical flow, namely, planning, organizing, directing, and controlling on-site processes. The management of handling systems, safety equipment, site layout, defining activity sequence and resolving conflicts among various production teams related to the on-site activities are all

part of site logistics (Fred and Francisco 1999). The most appropriate system to describe the material logistics tasks is developed at hierarchical levels at the point of interaction between internal and external systems. It should always be kept in mind that the main objective of a logistics process is to meet the customer's requirements.

Logistics Management Information Systems

Managing logistics functions through information technology makes it possible to attain higher efficiency and performances than the existing effectiveness-oriented logistics management system. This is because LIS utilization ultimately provides an incentive for growth through the strengthening of overall competitiveness as well as simply the benefits of cost reduction and high quality (Groover and Wiginton, 1984)

Projects inevitably generate enormous and complex sets of information. Effectively managing this bulk of information to insure its availability and accuracy is an important managerial task. Poor or missing information can readily lead to project delays, uneconomical decisions, or even the complete failure of the desired facility. With better information, the problem could have been identified earlier, so that alternative suppliers might have been located or schedules arranged. Both project design and control are crucially dependent upon accurate and timely information, as well as the ability to use this information effectively. At the same time, too much unorganized information presented to managers can result in confusion and paralysis of decision making. (*http://pmbook.ce.cmu.edu/14_Organization_and_Use_of_Project_Information.html, January, 2015)*

Information is the engine that drives the entire logistics cycle. We collect information to make decisions; the better information we have, the better decisions we can make. A logistics management information system (LMIS) is the system of records and reports that you use to collect, organize, and present logistics data gathered across all levels of the system. Most important, an Logistic Information System (LIS) enables logisticians to collect the data needed to make informed decisions that will ultimately improve customer service.

Previous authors claim that LIS utilization is essential in generating competitiveness and plays a crucial role in the development of logistics as a management discipline (Stenger 1986). (Bowersox, 1990) and (Germain, 1989) verified empirically that logistics performance is higher for corporations more susceptible to the innovation of logistics information

technology, while (Bardi, Raghunathan and Bagghi, 1994) assert that LIS determines the efficiency and competitiveness of a company in the marketplace, as well as its ability to optimize logistics costs and service levels. Williams, Nibbs, Irby and Finley (1997) insist that LIS utilization can make both suppliers and buyers more cost, product, and process efficient, which translates into advantages over their competitors.

If data are to be collected for decision-making, you need to know what data to collect and how frequently to collect it. To decide what data to collect, look at the decisions you will need to make. Think about the questions logistics managers might ask. What information would they need to answer those questions and make informed decisions (Logistics handbook, 2011)

Logistics management strategies

The strategic capability of a companies, which has thus far been a recurrent thesis in studies on structural relations, is a substantial characteristic in that a company's strategic characteristics are tightly bound with its functional decision making activities(Kotha and Orne 1989). The strategic capability of a corporation indicates the corporation's competency level within its industry. The level of competition shows the corporation's competitive position and the level of competitive superiority within a specific industrial category, and competitive status of a corporation carries significant meaning on the suggestion of strategic direction (Montanari 1978). Robertson and Gatignon (1985) also argue that adopting technical innovation is highly correlated with the competitive environment of suppliers and customers.

Therefore, from this perspective, the proliferation of logistics information technology for the effective execution of logistics activities can be seen as closely related to the competitive business climate of suppliers and customers. Lenz and Engledow(1986) back up such assertion. They contend that individual corporations gain distinct levels of competency through opportunities and risks resulting from industrial environment, and the competitive position of a corporation within an industry has much to do with the acceptance of information technology.

Logistics Resource Management Strategy Development

Building a successful long-term Logistics Resource Management **(**LRM) strategy requires considering the options available from two separate but interlinked perspectives. The process should begin first with the development of an effective internal analysis targeted at

understanding the true logistics needs of the organization and gaining the support of company members. Once completed, the next step is to research the critical criteria necessary to guide logistics management in choosing the best LSP partners. Merging both sets of activities should provide a company with the right information to make the right decisions concerning their LRM outsourcing strategy.

Applying logistics systems and seeking control over the deliveries to the construction site is critical for the construction industry, as elaborated by. According to (Josephson and Saukkoriipi, 2005) a large part of the total cost of construction is hidden in form of waste occurs when there is lack of coordination of the logistics and when the material is insufficiently handled or when resources are used insufficient. Studies made by (Larsson, 1983) suggest that low productivity is an effect of poor planning and logistics and that common factors between projects with low productivity are delays on-site, wastage and breakage of materials. When applying a robust logistics system, (Bertelsen and Nielsen, 1997) claims that an increased productivity is to be expected. (Agapiou et al. 1998) claims that when designing a robust logistics system there should be a focus on developing partnering relationship between the participants in the logistics organization this in order to improve the communication and coordination between project participants. The internal aspects of a LRM project should consist of the following steps.

Logistics Analysis: Common to all outsourcing initiatives, the formulation of a logistics outsourcing strategy should begin with an analysis of the tradeoffs between using in-house logistics functions and the benefits of outsourcing them to a LSP.

Support for the Customer Strategy: When performing the analysis of internal logistics strengths and weaknesses, companies must be careful to consider their marketplace cost and service strategies. The LRM strategy implemented must exploit the best combination of in-house and LSP logistics capabilities to realize competitive advantage targets.

Select a Technology Solution: Logistics technologies are evolving rapidly and are becoming increasingly more sophisticated. Companies can take advantage of these tools by either acquiring the expertise or by partnering with a provider who has built the capability.

Gain Company Buy-in: Similar to any strategic project, logistics planners must be careful to gain the support of three critical groups. To begin with, a senior executive must sign-on as the project's advocate on the top management team. This project champion should be a force in the organization, be a supporter of e-business tools, and be prepared to negate any internal resistance to change.

Start Small: Consultants and practitioners alike stress the need to build creditability by beginning the LRM outsourcing project by achieving some short-term wins. Achieving, *Performance Measurements:* Finally, no logistics strategic effort should be undertaken without charting expected performance measurements.

According to Agapiou, et al. (1998) the main focus of logistics should be the interface between parties involved focusing on information exchange. As there are many different participants in a construction project the communication can be complex but is eased by applying a logistics system. Karlsson (2009) elaborates that effective material handling, planning and coordination of the logistics in construction industry in form of an on-site logistics organization, expert in logistics or Logistics Manager should be used on every project just as the projects uses experts in fields such as engineering. Moreover this expert should be hired at an early stage in order to maximize the possibility to influence the project outcome.

Performance measurement in logistics management

It will be apparent from the previous comments that the logistics management is to plan and co-ordinate all those activities necessary to achieve desired levels of delivered services and quality at lowest possible cost. Logistics performance is about creating *value*- value for customers and suppliers of firm, and value for the firm's stakeholders. So one best approach to improving performance in logistics is to define and measure those parameters that affect performance. Logistics performance is described as superior customer value at less cost.

These customers' values are derived from tailored services, responsiveness and reliability while a cost advantage comes through capacity utilization, asset turns and synchronous supply (Christopher M. 2005).

Therefore if the logistics process is going to make a contribution to the company's overall profitability, then two aspects must be put forward: The first aspect is to decrease the company's costs and the other aspect is to increase the company's receipts through high customer service (Andersson 2007). Consequently, customer service and costs are very essential values to measure to see if the logistics process fulfills the overall mission for the logistics, to create good customer service at low cost (Aronsson, 2004).

According to him, three groups of measurable values exists which includes; tied up capital, Time and Customer services. Each of these groups constitutes the following examples; *Tide up capital*: average value in stock, work in progress, and product value, *Time*: lead-time, throughput time, and inventory turnover, *Customer service*: Lead-time, information,

flexibility, customer adaptations, delivery capacity and delivery dependability. Measurement of logistics systems will quantify the efficiency and effectiveness of actions leading to performance, so any evaluation of logistics performance needs to reconcile these two aspects of performance measurement (Mentzer and Firman, 1994). Therefore, performance is a function of effectiveness and efficiency since effectiveness will measure the extent to which customer satisfaction is reached through improved logistics processes whereas efficiency will measure the level of cost minimization in delivering these services (Gleason and Barnum, 1986).

Keebler (1990) indicated that an excellent measurement system should produce three primary benefits; reduced cost, improved service, and generation of a healthy growth. The efficiency parameters that define a company's material flow efficiency and affect the profitability of business can be expressed in terms of customers' services and costs (Mattsson, 2002). This customer service according to him constitutes three parts such as; delivery, information, and logistics services, and each part possesses the following efficiency parameters; *Delivery service*: inventory service level, delivery capacity, delivery dependability, delivery time, and delivery flexibility. *Logistics service*: Includes the complementary service of the electronic data interchange (EDI) which place orders, Item coding to track the movement, and Electronic fund transfer (EFT) that arrange payment. *Costs* includes tied up capital, capacity utilization, volume and product mix flexibility.

This implies that customer services and cost are essential values to measure to see if a logistics process fulfills the overall goal for the company (Aronsson, 2004).

According to (Ballou 2004), a product or service is of little value if it is not available to customers at the time and place that they wish to consume it. Business generally creates four types of values such as: Form, time, place and possession; but logistics creates two out of these four values. Manufacturing creates "*form*" value as inputs are converted to output (raw materials are transformed into finished goods). Logistics controls the "*time*" and "*place*" values in products, mainly through transportation, information flows and inventory.

Possession value is often considered the responsibility of marketing, engineering, and finance, where the value is created by helping customers acquire the product through such mechanisms as advertising (information), technical support, and terms of sale (pricing and credit availability).

The component of a typical logistics systems according to Ballou customer service, demand forecast, distribution communications, inventory control, material handling, order processing, parts and service support, plant and warehouse site selection (location analysis), purchasing,

packaging, return goods handling, salvage and scrap disposal, traffic and transportation, and warehousing and storage. Logistics process should be aimed at decreasing the company's costs and increase the company's receipts through high customer service in order to achieve the company's overall profitability, therefore identifying those parameters that affect logistics performance, it is essential to classify these activities according to the measurement of their contributions to the firm. Ballou separated these activities as key and support activities since he believes that certain activities will generally take place in every logistics channel, whereas others will take place depending on the circumstances, within a particular firm. Overall, logistics can be said to possess the following seven critical operating performance objectives (Ballou 2004)

Empirical Research

(Khanittha Arayapan & Piyanut Warunyuwong, 2009) on their work develops a model. The models are developed based on the supply chain management theory in order to achieve the lowest cost, responsiveness and shared objectives. 2 delivery planning optimization models, container loading for fixed slitting and loading pattern and container loading for pallet loaded material, are formulated. Also, delivery mode selection is constructed by using optimization concept to determine the best alternative. Furthermore, freight forwarder selection process is created by extending the use of the delivery mode selection model. The results express that safety stock, loading pattern, transport mode, and minimum order quantity (MOQ) significantly affect the total logistics cost. Including hidden costs, long transit time and delay penalties, leads freight forwarder selection process to become more realistic and reliable. Shorter processing time, ensured optimal solution, transparency increase and better communication are gained by using these optimization models. However, the proper boundaries must be defined carefully to gain the feasible solution.

Van der Aalst (2010) study a framework for the modeling and specification of logistics systems is presented. This framework is based on a hierarchical high-level Petri net model. Within this framework we developed a language, called Expect, to specify systems in terms of this Petri net model. This specification language is supported by a software package, also called Expect, which facilitates the modeling and analysis of complex dynamic systems. We have modeled and analyzed many logistics systems with Expect. Most of these applications resulted from the TASTE project. These practical experiences show that there is a need for a method to facilitate the modeling of complex logistics systems. We propose a systematic

method, which is presented in this paper. This method is based on a complete taxonomy of the goods and information flows inside a logistics system. Based on this taxonomy we have developed a toolkit of standard logistical components that can be combined graphically, thus yielding an Expect specification which can be used to analyze the logistics system under consideration.

(Narimah, 2011) in his study seeks to identify the implementation of ICT for materials management processes in construction projects. The findings from the case studies reveal that the implementation of ICT in the materials management processes for construction projects in Malaysia is at early stage. Microsoft Excel Spreadsheet and handheld devices are found to be the common ICT tools adopted in the materials management processes. The main barrier is found to be the cost involvement at the initial stage or overall implementation of ICT in the materials management processes. Finally, this paper concludes the finding from interviews towards the ICT implementation of materials management in the construction projects.

(Anil Kumar, 2008) undertake a study about the existing procedures related to procurement and logistics and to explore, suggest and implement various new ideas so as to complete power infrastructure project of Andaman-Nicobar profitably. As the project was totally different, new ideas, and some better ways, were suggested related to procurement, especially logistics part, enabling the company to complete the project in the most efficient way.

(Hyounseung, Jeffrey, russell & June; 2003) undertake a study about the framework for construction material logistics in customer satisfaction from owner to project manager level. This paper examines how construction logistics affect a project manager's level of satisfaction. A survey established the general importance that a project manager must place on the construction logistics. Accordingly, the most significantly correlated factors in customer satisfaction were obtained from a project manager's point of view. Two hundred twenty-three experienced project managers provided valuable data to the study. Five important factors related to satisfaction were found through interviews with project managers and a literature review. These included personnel, material flow, schedule adherence, contractor's organization, and information flow. The study results suggest that material flow and information flow are worthy of the most attention. Satisfying the above factors will greatly improve the construction logistics that will, as a result, immensely increase the project manager's level of satisfaction.

Improving Construction Logistics A case study of Residential Building Project researched by (Valeriy Matouzko, 2012). This study concerns logistics at the construction projects. Most construction projects suffer from unnecessary activities on site which indicates the need for improving construction logistics. Hence the purpose of this paper was to investigate, through site observations and interviews, the current logistics situation on the construction site and to suggest possible solution for improving construction logistics. The main focus of this study was on material deliveries and time that craftsmen spend on handling materials. The study actualizes the importance of construction logistics which is often underestimated. The study also showed what consequences ineffective logistics solution could have on the construction project; while on the opposite, proper logistics planning gives benefits to the project.

(Jimmy Dahlstrom, 2011) writes an article with title of Organizing Robust Logistics Systems in Major Construction Projects. The article aims to analyze these critical incidents and their contribution to the complexity in order to use the analysis as feedback material in order to be able to build robust logistics systems in the future. This article concludes that in order to build robust logistics systems construction projects should implement a thorough stakeholder/impact analysis in order to map the different stakeholders and their possible contribution to the complexity of the project, moreover the report concludes that every project in the construction industry should have an on-site logistics organization of some sort that should be implemented at an early stage in order to take in to account the complexity of the project from a logistics point of view.

(Anna, Agata, Krzystof, 2005) wrote a paper, the paper discusses selected aspects of logistics with regard to a construction company as an organization and as a participant in a construction project. On the basis of a recent research in Poland, patterns of development of logistics systems and relations between the participants of construction projects have been presented. The project delivery systems and their connection with possible supply models have been analyzed focusing on supply logistics. Experience of construction companies and comparison of supply systems cost simulations point out, that outsourcing of supply logistics processes may significantly reduce total logistics costs.

The paper of (*Timo Ala-Risku, Mikko Kärkkäinen, 2005) discussed about* emerging project management methods for construction projects generate new kinds of challenges for the delivery process of materials. The rationale of such methods is to create short-term schedules, based on a constraint analysis of resources, for project tasks. This approach has two

requirements for material deliveries: transparency of material availability and short response times in the supply chain. We propose a potential solution for managing the material logistics of construction projects. The empirically validated solution proposes a shipment tracking-based approach to provide inventory transparency, and a pro-active delivery approach for efficient material deliveries.

(Inger & Scetermo, 2012) explores in their paper about similarities between preparation of major changes of logistics systems and the early phase of projects, i.e. when a project only exists conceptually. Preparing logistical changes and the early phase of projects share a similar challenge in making important decisions based on a limited fact base, and the two disciplines have developed methodologies each other may benefit from. In this paper, we use the preparation of major changes in a railway operation plan as an example of changes in logistics systems.

(Farook R. Hamzeh1, Iris D. Tommelein, Glenn Ballard, and Philip M, 2007), this paper focuses on the role logistics canter may play and the impact they may have on construction supply chains. Construction companies may configure their logistics canter in different ways to match their global and local supply chain strategy, while addressing challenges posed by variation in demand and supply for material, equipment, and services. A hypothesis is those logistics centers are underused in this industry, yet may offer considerable advantage. The ultimate aim of the research that is reported on here is developing a logistics system to support project-based production needs. The authors present a simulation model of a logistics canter that supports multiple site stores on different construction projects facing variations in supply lead times. The objective of the simulation is to find an approach to reduce material management costs while avoiding resource shortages, and enhancing both reliability and responsiveness of the supply chain.

(Bhzad sidawi, 2011) this paper investigates the current problems that the Saudi Electric Company (SEC), Kingdom of Saudi Arabia (KSA) experiences regarding the management of its' remote construction sites. It discusses the opinions of contractors and the SEC's supervision teams regarding the weaknesses in the present communications and management practices. The study found systematic project management problems that have profound negative impact on remote projects' performance and process. The paper suggests that some of these problems can be sorted out by the use of Advanced Computer based Management Systems (ACMS) and these would improve some project management practices. However,

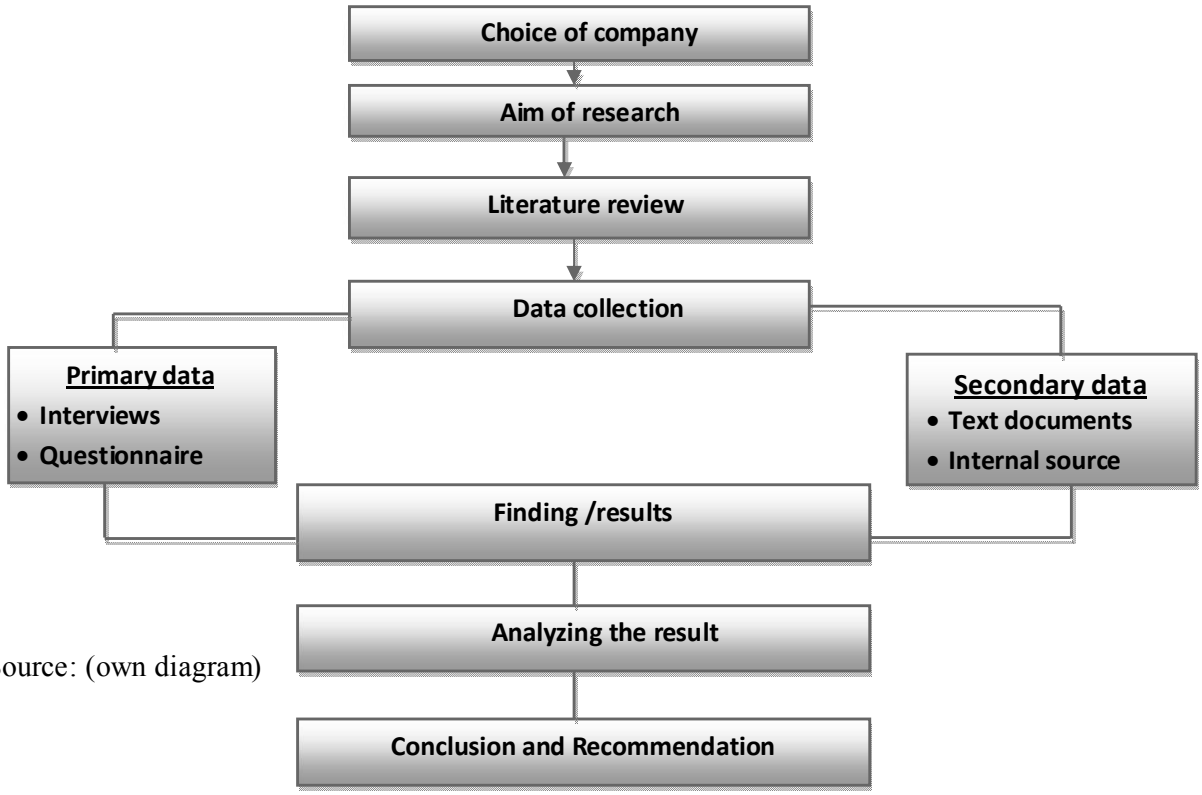
organizational barriers may hinder the potentiality of these systems thus changes to the organization's management system and practices should be carried out to achieve full benefits.

Tae-Hong Shin, Su-Won Yoon and Sangyoon Chin in there research proposes that the equipment used in the construction supply chain process, such as movers, trailers, gates, and hoists, can become main actors in the supply chain process using RFID and WSN technologies. And the proposed equipment and process focused on a solution to the redundancy identification problem, which has been observed in operations that use RFID/WSN-based processes for construction logistics. This paper also presents issues identified through verification and validation of the research results and proposes further studies (Tae-Hong Shin, Su-Won Yoon and Sangyoon Chin, 2012)

Conceptual framework

A conceptual model explains the patterns and connections that have been found in the research material, it provides structure and coherence to the dissertation by simplifying the research task (Fisher, 2007), and the Figure below conceptual framework is developed. For this chapter, the authors would like to defining the concepts and creating a conceptual framework which means of simplifying the research task.

Fig: 3.1 Conceptual Frameworks



Source: (own diagram)

CHAPTER THREE
RESEARCH DESIGN AND METHODOLOGY

3.1. Research design

The main objective of this research is to analyze project logistics management of OWWCE. This study was used both quantitative and qualitative methodology in order to gather the most appropriate data to answer the research questions. Qualitative methodology has been defined as a methodology which allows the researcher to get close to the data thereby develops the analytical, conceptual and categorical components of explanation from the data itself (cooper and schindler, 2006).

3.2. Population and Sampling Techniques

3.2.1. The populations: -

The populations will be the project logistics concerned department of the organization which are the construction management department or the 14 projects currently (janurary/2015) undertaking by the departments (the department deal with the study, implementation and control of construction works of the enterprise) and the logistics department (which are concerned in the mobilization of logistics for the projects of the enterprise), these departments are directly related with the projects undertaken by OWWCE and they are the only population which have full information about the enterprises' project logistic activities in detail. And most of the information which are relevant for this study will be available from these departments' managers, so they are identified as the population of the research. As the total population is only 39 the total population taken to as potential respondents of this research.

Accordingly, 39 respondents were selected which are in the position of logistics officers, project managers or project representative. These officials have the primary users of the project logistics system of the enterprise, so it is believed that they have more information about the practical situations this study concerned, the problems occurred and they may be suggest possible solutions for project logistics management system problems of the enterprise.

3.3. Types of Data and Tools/Instruments of Data collection

Both primary and secondary data collection methods will be implemented in the research

- **Questionnaire**

  For the primary data closed-ended questionnaire was used to dig up the challenges that the company facing in managing the logistics management system, questionnaires were distributed for project managers, logistics officer and project representatives it can be used to assess the project logistics management system performance of the enterprise, communication system, rules and procedures implementation; and the current problems in project logistics process.

- **Interview**

  Closed-ended interview was conducted with the logistics management department head; interview allowed the investigation process some degree of flexibility. Questions in the interview checklist were constructed based on the review of literature.

In the process of preparing, testing and using the instruments, the following procedures have been followed.

  - The questionnaires and interview guides were developed based on literature review relevant to the issue of project logistic management system of the enterprise.
  - Both tools were judged for their validity using professionals in the area.
  - In the final study, the questionnaires and interview were administered both by the researcher.

- **Document Review**

  The review of documents helped the researcher to understand the key facts of the organizations in order to assess the level and type of project logistics problem, different forms which are related to inventory and material deliver are collected and examined, project logistics management guidelines, strategies and operational manual was assessed to investigate the logistic system of the enterprise. The document reviews were used to triangulate the data collection by the questionnaires and interview.

3.4. PROCEDURES OF DATA COLLECTION

- **Secondary Data:** The research was collected the enterprise project logistics system guidelines, procedure, manual and forms. The information communication (reporting

forms) among different levels of the project logistics department and with the project and head offices.

- **Primary Data**: To assess the project logistics system efficiency and effectiveness level interview was undertaken with employees and managers, to understand the communication system, project logistics evaluation standards and logistics procedures and trends, and the difficulties encounters in project logistics activates; information will be gathered by using interview with the logistics department head and questionnaire is distributed/collected from project managers, project representative or logistics officers.

3.5. Standard of Instrument

Reliability analysis

Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability.

In statistics, **Cronbach's α(alpha)** is a coefficient of internal consistency. It is commonly used as an estimate of the reliability of a psychometric test for a sample of examinees.

It is believed for social science study, require a reliability of 0.70 or higher (obtained on a substantial sample) before they will use an instrument. Cronbach's alpha will generally increase as the inter-correlations among test items increase, and is thus known as an internal consistency estimate of reliability of test scores. Inter-correlations among test items are maximized when all items measure the relatively the same response. So, based on this all the six categories of questions are inter consistence.

Table: 3.1 Internal consistency of the questions

S/N	Category	No Items	Cronbach's Alph
1	Existing Project Logistics Management Performance	8	0.833
2	Demand Request Management	3	0.719
3	Supply Fulfillment Management	3	0.718
4	Logistics storage and control	4	0.730
5	Information technology and control	2	0.795
6	Communication and Evaluation	4	0.713

3.6. METHODS OF DATA ANALYSIS

The data collected will be both qualitative and quantitative, thus data will be analyzed:

- The quantitative data is analyzed using descriptive statistics (percentage and mean score) will be used. And the sample result is tested with a *t*-test, which is help to reject or accept the null hypothesis set for the research.
- The qualitative data which are the actual project logistics mobilization schemes of the enterprise will be compared with its own standards, rules and procedures and with theoretical and empirical researches, which the existing OWWCE's project logistics mechanisms are in accordance with its standard and theoretical project logistics system standards. Then problems and inconsistences will be selected and organized to prepare them for recommended solutions.

CHAPTER FOUR
DATA ANALYSIS AND FINDINGS

4.1. Data analysis

In this part of the research, the data that were collected using interview, questionnaire and document review are presented and an attempt is made to discuss the findings of the study according to relevant issues and as per the objective set above.

First Primary data collected through interview and questionnaires were presented after summarizing and grouping them logically. Then relevant information obtained through reviewing relevant documents was presented after analysis, summary, and grouping.

4.1.1. Quantitative data result

In the study 35 questionnaires were distributed to the respondents and 32 questionnaires were returned which consists 91.4% from the total. Three of the respondents 8.6% failed to return the questionnaires.

4.1.1.1. DEMOGRAPHIC DATA

Gender

Table 4.1 indicates that gender allocation of the sample of respondents from the company employees which the research was conducted. As depicted on Table. 4.2 78.1% were male, while the remaining 21.1% comprised of female respondents. This implies that, there is a gender inequality showed in the company.

Table: 4.1 Sex of Respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	25	78.1	78.1	78.1
	Female	7	21.9	21.9	100.0
	Total	32	100.0	100.0	

Qualification

As shown on table 4.2, the respondents qualification levels were divided into two groups i.e. 64% were first degree holders and the remaining 36% were second degree holders. Here, we can say that all the respondents are educated. This implies that the company has taken the advantage of utilizing its human resource for project logistics activities of the company.

Table: 4.2 Highest Qualification and Specialization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Degree	26	81.3	81.3	81.3
	Diploma	1	3.1	3.1	84.4
	Masters	5	15.6	15.6	100.0
	Total	32	100.0	100.0	

Work experience in the company

As can be seen in the table 4.3, most of the respondents have been working in the company for less than 4 years are accounts about 62.5% and 19% of the respondents are working between 5-9 years in the company, 3% of the respondent grouped under 10-14 years' work experience followed by 3% which have more than 15 years experiences.
Small years of experience show that there is a higher employee turnover which makes difficult to improve the project logistics system through experience and learning.

Table: 4.3 Number of Years Working In OWWCE

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	0-4 Years	20	62.5	62.5	62.5
	5-9 Years	6	18.8	18.8	81.3
	10-14 Years	3	9.4	9.4	90.6
	More Than 15 Years	3	9.4	9.4	100.0
	Total	32	100.0	100.0	

Respondent's position

According to table 4.4 majorities of the respondents were project representatives and logistics officers which comprises of 47% and 37.5% respectively, the rest are project managers which accounts 15.7% of the respondents.

Table: 4.4 Work Title

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Project Manager	5	15.7	6.3	6.3
	Project Representative	15	46.9	46.9	62.5
	Logistics Officer	12	37.5	37.5	100.0
	Total	32	100.0	100.0	

4.1.1.2. PROJECT LOGISTICS PERFORMANCE OF OWWCE

An average level mean 2.5 was shows in terms of the current overall project logistics performance of OWWCE from the total respondents for this question. Efforts to improvement project logistics system have increased over the past years performance in OWWCE, it was indicated by respondents mean of 3.4; which is slightly greater than average. From thus results one that understands, the company project logistics system is low for the past years and it shows average results which needs improvement.

All the stakeholders of the logistics personals agreed that the current performance of the logistics system have problems that didn't satisfy the project need and which need improvement in all levels and activities.

Table: 4.5 PROJECT LOGISTICS PERFORMANCE OF OWWCE

	N		Mean	Std. Deviation
	Valid	Missing		
Consistent project logistics system is used.	32	0	2.344	.7874
Information system currently used to facilitate logistics system is sufficient to undertake the work smoothly.	32	0	2.375	.7071
Efforts to improvement project logistics system have increased over the past Years	32	0	3.469	.8026
Logistics to the project are in full and on time.	32	0	2.125	.7513
The logistics procedures and rules are closely aligned among employees of the project.	32	0	2.406	.8747
The logistics performance is closely monitored.	32	0	2.531	.9153
Project teams are very satisfied with the logistics system of the company.	32	0	2.188	.7378
The project logistics system is frequently evaluated.	32	0	2.188	.8206

As can be seen from Annex-3 of table 1 overall response for the question "*Consistent project logistics system is used*" is Disagree, according to the mean which are more or less between 2 and 3. Specifically, 65.6% of respondent's disagree and 15% neutral; the strongly disagree and agree accounts 6.3% and 12.5% respectively. This result shows the company didn't have consistent project logistics system.

For the question that "*Information system currently used to facilitate logistics system to undertake the work smoothly*" the overall feedback from the respondent is week according to

the mean which are 2.38. Only 3.1% and 9.4% of respondents are respondents responded strongly disagree and agree, the majority of the respondents 65.6% and 21.9% respectively responded disagree and neutral for the question; which shows the current information system didn't support the project logistics activity sufficiently.

Much of the respondent for the question "*Efforts to improvement project logistics system have increased over the past Years*" is responded agree, which accounts 65.6%. Which shows the company is try to improve the project logistics systems for the past years. The other respondents 18.8% and 15.6% responded for the question disagrees and neutral for the same question.

The response levels which responded disagree for the question "*Logistics to the project are in full and on time*" is 71.9% and a farther 12.5% is expressing their opinion that they are strongly disagree for the question. This shows that the projects of the company are in short of logistics facilities. The rest 6.3% and 9.4% respondents answers neutral and agree respectively.

2.41 is the overall mean response from the respondents for the question "*The logistics procedures and rules are closely aligned among employees of the project*". 56.3% of the respondents respond disagree for this question. Those choose neutral and agree are 18.8% and 15.6% respectively. For the same question only 9.4%of the respondent are strongly disagree. The respondents' reflection shows the project logistics procedures and rules are not aligned among employees of the project, which have to be improved.

As can be seen from Annex-3 of table 6 overall responses for the question "*The logistics performance is closely monitored*" are 2.53 mean response rate which are more or less between 2 and 3 Specifically, 46.9% of respondent's disagree and 25% neutral; the strongly disagree and agree accounts 9.4% and 18.8% respectively. This result shows the company didn't monitor the project logistics performance closely.

Most of the respondents which is 71.9% responded disagree for the question "*Project teams are very satisfied with the logistics system of the company*". This shows that the overall logistics service given for the project team is not satisfactory. There are three respondents for each strongly disagree, neutral and agree categories.

Disagree responses for the question "*The project logistics system is frequently evaluated*" is 59.4%, and 15.6% of respondents are expressing their opinion that they are strongly disagree for the question. This shows that the projects logistics system is not frequently evaluated. The other 15.6% and 9.4% respondents answers neutral and agree respectively.

Testing Hypothesis 1:

H01: The existing Project Logistics Management Performance of OWWCE is in line with the project requirement and plan.

Ha1: The existing Project Logistics Management Performance of OWWCE is not in line with the project requirement and plan.

Table: 4.6 One-Sample T-Test on Logistics Management performance system of OWWCE

	Test Value = 3					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Consistent project logistics system is used.	-4.715	31	.000	-.6563	-.940	-.372
Information system currently used to facilitate logistics system is sufficient to undertake the work smoothly.	-5.000	31	.000	-.6250	-.880	-.370
Efforts to improvement project logistics system have increased over the past Years	3.304	31	.002	.4688	.179	.758
Logistics to the project are in full and on time.	-6.588	31	.000	-.8750	-1.146	-.604
The logistics procedures and rules are closely aligned among employees of the project.	-3.840	31	.001	-.5938	-.909	-.278
The logistics performance is closely monitored.	-2.897	31	.007	-.4688	-.799	-.139
Project teams are very satisfied with the logistics system of the company.	-6.230	31	.000	-.8125	-1.079	-.546
The project logistics system is frequently evaluated.	-5.601	31	.000	-.8125	-1.108	-.517

Based on the table 4.6 the one sample T-test from the eight variable that are used to measure Project Logistics Management Performance, the significance level all are less than 0.05 ($p<0.05$) except logistics performance monitoring ($P=0.07$). Therefore, the null hypothesis; "*The existing Project Logistics Management Performance of OWWCE is in line with the project requirement and plan.*" is rejected, whereas the alternate hypothesis "*The existing Project Logistics Management Performance of OWWCE is not in line with*

the project requirement and plan" is accepted. From this, it can be concluded that OWWCE project logistics management system is week in which that need improvement.

4.1.1.3. Demand Request Management

In terms of demand request management of OWWCE; the average level of mean is 2.79 response rates from this category of questions. In relation to the question "*Specification of logistics requirements, requested from the project office is in line with the real market and project necessity*", it was indicated by participants of the respondents overall mean 3.18; which is higher than the average. From thus above results one that understand, the company demand request management is relatively low for the past years and it shows average results which needs improvement.

Table: 4.7 Demand Request Management

	N		Mean	Std. Deviation
	Valid	Missing		
The Project has sent the required logistics needs on time to head office	32	0	2.563	.9136
The project keeps long time inventory of resources to meet project delivery, demand and scheduled changes	32	0	2.656	.9019
Specification/requirements of logistics requirements, requested from the head office is in line with the real market and project necessity	32	0	3.063	.7594

As can be seen from Annex-4 of table 1 overall response for the question "*The Project has sent the required logistics needs on time to head office*" is Disagree, according to the mean which are more or less between 2 and 3. Specifically, 63.8% of respondent's disagree and 28.1% neutral; the strongly disagree and agree accounts 9.4% and 18.8% respectively. This result shows the projects of the company didn't send the required logistics requests on time to logistics department which is the center of resource pool for all projects of OWWCE.

For the question "*The project keeps long time inventory of resources to meet project delivery, demand and scheduled changes*" the overall feedback from the respondent indicates that the enterprise didn't keeps the necessary inventory that meet project needs. The response expressed by overall mean of 2.65; disagree is the highest choose by the majority which is 53.1% and neutral accounts 18.8%. 3.1% and 25% of respondents are respondents responded strongly disagree and agree respectively. From this response we can understand that the majority of the projects didn't keep long time inventory resources that can make them meet project delivery, demand and scheduled changes.

Much of the respondent for the question "*Specification of logistics requested for planning is from the head office is in line with the real market and project necessity*" is responded neutral, which accounts 53.1%. Which shows Specification/requirements of logistics requested from the head office is relatively in line with the real market and project necessity. The other respondents 15.6% and 28.1% responded for the question disagree and agree for the same question; only 3.1% are responded strongly disagree for the question.

Testing Hypothesis 2:

Table: 4.8 One-Sample T-Test on Demand request process of OWWCE

	Test Value = 3					
					95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
The Project has sent the required logistics needs on time to head office	-2.709	31	.011	-.4375	-.767	-.108
The project keeps long time inventory of resources to meet project delivery, demand and scheduled changes	-2.156	31	.039	-.3438	-.669	-.019
Specification/requirements of logistics requirements, requested from the head office is in line with the real market and project necessity	.466	31	.645	.0625	-.211	.336

Based on the table 4.8 the one sample T-test from the three variable that are used to measure demand request process, the significance level are less than 0.05 ($p<0.05$) except

Specification of logistics requirements process effectiveness (P=0.645). Therefore, the null hypothesis; "*Projects logistics Demand Request of OWWCE are processed based on the demand request procedure of the enterprise*." is rejected, whereas the alternate hypothesis "*Projects logistics Demand Request of OWWCE are not processed based on the demand request procedure of the enterprise*" is accepted. From this, it can be concluded that in OWWCE project logistics demand request process are not in line with the project needs that need improvement.

4.1.1.4. Project Supply Fulfillment Management

2.36 is the aggregate average mean for the questions under Supply Fulfillment management of OWWCE. The particular question "*Efforts to improvement project logistics system have increased over the past years*", has the higher mean which is 3.4, which is greater than the overall average. The result indicates the enterprise project supply fulfillment management performance is very low for the past years, beside that the respondents agreed the enterprise is try to improve the project supply management system for the past years but it didn't meet the project requirement and the standards.

Table: 4.9 Supply Fulfillment

	N		Mean	Std. Deviation
	Valid	Missing		
The requested supplies are delivered at the right quality, time and place in the project.	32	0	2.188	.7803
The logistics system is flexible enough for the schedule and requirement changes from the project office	32	0	2.688	1.0298
The logistics systems consistently meet project requirements	32	0	2.219	.7507

The response levels which responded disagree for the question "*The requested supplies are delivered at the right quality, time and place in the project.*" is 65.6% and a farther 12.5% is expressing their opinion that they are neutral for the question. This shows that the requested supplies didn't deliver at the right quality, time and place in the project. The rest 12.5% and 9.4% respondent's answers strongly disagree and agree respectively.

2.68 is the overall mean response for the question "*The logistics system is flexible enough for the schedule and requirement changes from the project office*". 59.4% of the respondents respond disagree for the question. Neutral and agree respondents are 3.1% and 28.1% respectively; only 3.1% and 6.3% of the responses are strongly agree and neutral for the question. The respondent's reflection shows the logistics system is not

flexible enough for the schedule and requirement changes from the project office, which have to be improved.

As can be seen from Annex-5 of table 3 overall responses for the question "*The logistics systems consistently meet project requirements*" is 2.21 according to the mean which are a little more than 2 (Disagree). Specifically, 60% of respondent's disagree and 21.9% neutral; the strongly disagree and agree accounts 12.5% and 6.3% respectively. This result shows the logistics systems are not consistently meet project requirements.

Testing Hypothesis 3:

H03: Project supplies fulfillment process of OWWCE is timely and based on project request.

Ha3: Project supplies fulfillment process of OWWCE is not timely and based on project request.

Table: 4.10 One-Sample T-Test on Supplies Fulfillment process of OWWCE

	Test Value = 3					
					95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
The requested supplies are delivered at the right quality, time and place in the project.	-5.890	31	.000	-.8125	-1.094	-.531
The logistics system is flexible enough for the schedule and requirement changes from the project office	-1.717	31	.096	-.3125	-.684	.059
The logistics systems consistently meet project requirements	-5.887	31	.000	-.7813	-1.052	-.511

Based on table 4.10 the one sample T-test from the three variable that are used to measure project suppliers fulfillment process, the significance level are less than 0.05 ($p<0.05$) except The logistics system is flexible ($P=0.095$). Therefore, the null hypothesis; "*Project supplies fulfillment process of OWWCE is timely and based on project request.*" is rejected, whereas the alternate hypothesis "*Project supplies fulfillment process of OWWCE is not timely and based on project request*" is accepted. From this, it can be concluded that

OWWCE are project logistics supplies fulfillment process are not in line with the project needs.

4.1.1.5. Logistics storage and control

The overall aggregate mean for the logistics storage and control category questions are 2.6 one of the question in the category "quality & quantity assurance is undertaking", it was indicated by participants of mean 3.2; which is greater than average. From thus above results one that understands, the company project Logistics storage and control is low for the past years and it shows average results which needs improvement.

All the stack holders of the logistics personals agreed that the current performance of project logistics storage facility and control procedures of OWWCE have problems that didn't satisfy the project need and which need improvement in all levels and activities.

Table: 4.11 Logistics storage and control

	N		Mean	Std. Deviation
	Valid	Missing		
When materials received quality & quantity assurance is high	32	0	3.250	1.0473
Inventory documentation is well managed.	32	0	2.875	.9755
The project has strong logistics materials control procedure. (losses and obsolescence)	32	0	2.156	.6773
The project has strong procedure for tracking order quantity, lead time and emergency orders. Based on the schedule of the project	32	0	2.219	.7064

Most of the respondents which is 53.1% responded agree for the question "*When materials received quality & quantity assurance is undertaking*". This shows that when materials received quality & quantity assurance is undertaking. In other side 21.9% and 6.3% of the respondents response is disagree and strongly disagree for this question.

It is positive response for the question "*Inventory documentation is well managed*" which is 34.4% and 31.3% responses are neutral and agree, but 25% and 9.4% of the respondents express their opinion as disagree and strongly disagree respectively. The result indicates that the inventory documentation is at average level with the overall mean of 2.9.

For the question that "*The project has strong logistics materials control procedure. (Losses and obsolescence)*" the overall feedback from the respondent is week according to the responses overall mean 2.15; only 9.4% and 6.3% respectively respondents are responded strongly disagree and agree, the majority of the respondents 71.9% responded disagree and 12.5% are choose neutral the question; which shows currently the projects didn't have strong logistics materials control procedure

As can be seen from Annex-6 of table 3 overall responses for the question "*The project has strong procedure for tracking order quantity, lead time and emergency orders. Based on the schedule of the project*" is disagree, according to the mean which are more or less between 2 and 3. Specifically, 65.6% of respondent's disagree and 18.8% neutral; the strongly disagree and agree accounts 9.4% and 6.3% respectively. This result shows the company didn't have strong procedure for tracking order quantity, lead time and emergency orders based on the schedule of the project.

Testing Hypothesis 4:

H04: The storage place is adequate to manage projects logistics needs of OWWCE.

H04: The storage place is not adequate to manage projects logistics needs of OWWCE.

Table: 4.12 One-Sample T-Test on logistics storage place & control system of OWWCE

	Test Value = 3					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
When materials received quality & quantity assurance is undertaking	1.350	31	.187	.2500	-.128	.628
Inventory documentation is well managed.	-.725	31	.004	-.1250	-.477	.227
The project has strong logistics materials control procedure. (losses and obsolescence)	-7.048	31	.000	-.8438	-1.088	-.600
The project has strong procedure for tracking order quantity, lead time and emergency orders. Based on the schedule of the project	-6.256	31	.000	-.7813	-1.036	-.527

Based on the table 4.11 the one sample T-test from the three variable that are used to measure project suppliers fulfillment process, the significance level are less than 0.05 ($p<0.05$) except material quality & quantity assurance is undertaken ($P=0.187$). Therefore, the null hypothesis; "*The storage place is adequate to manage projects logistics needs of OWWCE*." is rejected, whereas the alternate hypothesis "*The storage*

place is not adequate to manage projects logistics needs of OWWCE" is accepted. From this, it can be concluded that OWWCE are storage facility have to be improved and the logistics control system have to be strengthened.

4.1.1.6. Information technology and control

In terms of project Information technology and control system of OWWCE. At an average response of 2.1 is stated. This shows the enterprise project logistics Information technology and control system performance didn't meet the standard required and desired by the stakeholders.

Table: 4.13 Information technology and control

	N		Mean	Std. Deviation
	Valid	Missing		
Sophisticated information system for information sharing between logistics management system of head office and the project.	32	0	2.188	.7803
The information technology is updated based on the change in the process and procedures of logistics system.	32	0	2.031	.7399

Much of the respondent for the question "*Sophisticated information system for information sharing between logistics management system of head office and the project.*" is responded disagree, which accounts 65.6%. This shows the company logistic information system is in poor level. And information sharing about logistics management between head office and the project site using information technology is minimum. The other 12.5% respondents respond with strongly disagree and neutral for the same question.

The disagree response level for the question "*The information technology is updated based on the change in the process and procedures of logistics system.*" is 65.6% and a farther 18.8% is expressing their opinion that they are disagreeing and strongly disagree for the question. This shows that the information technology is not updated based on the change in the process and procedures of logistics system. The other respondent 9.4% and 6.3% answers neutral and agree respectively.

Testing Hypothesis 5:

H05: The current Information technology systems of OWWCE are sufficient to support the project logistics system.

H05: The current Information technology systems of OWWCE are not sufficient to support the project logistics system.

Table: 4.14 One-Sample T-Test on Information technology & control systems of OWWCE

	Test Value = 3					
					95% Confidence Interval of the Difference	
	t	Df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Sophisticated information system for information sharing between logistics management system of head office and the project.	-5.890	31	.000	-.8125	-1.094	-.531
The information technology is updated based on the change in the process and procedures of logistics system.	-7.407	31	.000	-.9688	-1.235	-.702

Based on the table 4.13 the one sample T-test from the three variable that are used to measure project logistics information technology and control systems, the significance level are less than 0.05 ($p<0.05$). Therefore, the null hypothesis; "*The current Information technology systems of OWWCE are sufficient to support the project logistics system.*" is rejected, whereas the alternate hypothesis "*The current Information technology systems of OWWCE are not sufficient to support the project logistics system*" is accepted. From this, it can be concluded that OWWCE project logistics information technology and control systems is not in good condition.

4.1.1.7. Communication and Evaluation

Communication and evaluation of project logistics activities of OWWCE described as poor by the respondent of the questions. The mean for this category of questions is 2.4 which shows the project logistics communication and evaluation system of the enterprise need improvement.

Table: 4.15 Communication and Evaluation

	N		Mean	Std. Deviation
	Valid	Missing		
There is frequent interaction with logistics department to achieve reliability, the responsiveness and improving some basic standards for your project	32	0	2.469	.8793
The project logistics needs are frequently evaluate.	32	0	2.375	1.0080
The changes in the project logistics needs are quickly and executively discussed with logistics department.	32	0	2.438	.8400
The project office is strongly participated in logiest forecasting process	32	0	2.281	1.0234

As can be seen from Annex-8 of table 1 overall responses for the question "*There is frequent interaction with logistics department to achieve reliability, responsiveness and improving some basic standards for your project*" is 2.46 according to the mean which are more or less between 2 and 3. Specifically, 50% of respondent's disagree and 25% neutral; the strongly disagree and agree accounts 9.4% and 15.6% respectively. This result shows the enterprise there lack of frequent interaction with logistics department to achieve reliability, responsiveness and improving some basic standards for the projects.

Most of the respondents which are 53.1% and 15.6% responded disagree and strongly disagree respectively for the question "*The project logistics needs are frequently evaluate*". This shows that the project logistics needs are not frequently evaluate. The other respondent which accounts 15.6% and 21.9% responded natural and agree for the same question.

The response levels which responded disagree for the question "*The changes in the project logistics needs are quickly and executively discussed with logistics department*" is 50%; and 28.1% of respondents expressed their opinion as neutral for the same question. This shows that the changes in the project logistics needs are not quickly and exhaustively discussed with logistics department. The remaining respondents' 9.4% and 12.5% answers strongly disagree and agree respectively for the question.

For the question "*The project office is strongly participated in logiest forecasting process*" 46.9% of the respondents respond disagree. Strongly agree and Neutral respondents are 21.9% and 12.5% respectively. The other 18.8% of the respondent

respond for the question as agree. The respondents' reflection shows the project office is not strongly participated in logiest forecasting processes, which need to be improved.

Testing Hypothesis 6:

H06: The project logistics Communication and Evaluation system of OWWCE is organized in the way that satisfies the project needs.

Ha6: The project logistics Communication and Evaluation system of OWWCE is not organized in the way that satisfies the project needs.

Table: 4.16 One-Sample T-Test on Communication and Evaluation system *of OWWCE*

	Test Value = 3					
					95% Confidence Interval of the Difference	
	t	Df	Sig. (2-tailed)	Mean Difference	Lower	Upper
There is frequent interaction with logistics department to achieve reliability, the responsiveness and improving some basic standards for your project	-3.418	31	.002	-.5313	-.848	-.214
The project logistics needs are frequently evaluate.	-3.507	31	.001	-.6250	-.988	-.262
The changes in the project logistics needs are quickly and executively discussed with logistics department.	-3.788	31	.001	-.5625	-.865	-.260
The project office is strongly participated in logiest forecasting process	-3.973	31	.000	-.7188	-1.088	-.350

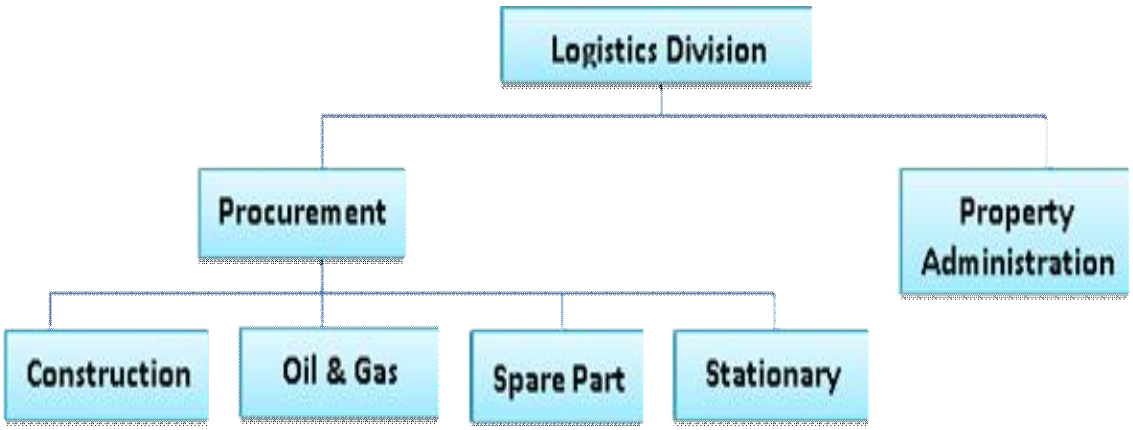
Based on the table 4.15 the one sample T-test from the three variable that are used to measure project logistics Communication and Evaluation system, the significance level are less than 0.05 ($p<0.05$). Therefore, the null hypothesis; "*The project logistics Communication and Evaluation system of OWWCE is organized in the way that satisfies the project needs.*" is rejected, whereas the alternate hypothesis "The project logistics Communication and Evaluation system of OWWCE is not organized in the way that satisfies the project needs" is accepted. From this, it can be concluded that OWWCE project logistics Communication and Evaluation system is not in good condition which need improvement.

4.1.2. Qualitative Data analysis

The Logistics directorate is one of the directorates of the Oromia Water Works Construction Enterprise which coordinates all the logistics activities of the enterprise. The directorate has

two main divisions and under each division there is subdivision; as of the new organizational structure: The two main divisions are “Procurement” and “Property Administration”. In the “Procurement” division there are four different sub-divisions such as “oil and gas”, "Stationary”, “Spare Part” and “Constriction”.

Figure: 1 The organizational structures of the Logistics division of OWWCE



Source: OWWCE Logistics Department

4.1.2.1. Project Demand Forecasting

Project demand forecasting is the major part of project logistic system which have to done at different levels of the enterprise every year and use different methods of estimation. The most common estimation methods experienced in the enterprise is previous consumption estimation, and estimation based on size of project and the activities planned to undertaken in that year. Even if accurate forecasting of stock needs can be aid the procurement process, for ordering adequate stock and securing appropriate financial capacity throughout the forecasted year; but according to the interview result in the enterprise most of the time because of the project scheduled are not undertaken according to the plan the logistics forecasting also didn’t implemented according to its prior plan. Appropriate stock availability and appropriate forecasting at all levels of logistic system can reduce wastage due to oversupply which have to be practiced in OWWCE.

4.1.2.2. Procurement and contract

Procurement division of the enterprise acquiring supplies based of the government procurement regulation as can be seen (Annex 1). Determining the projects current and future demand; and the storage capacity will have a significant impact on the procurement process.

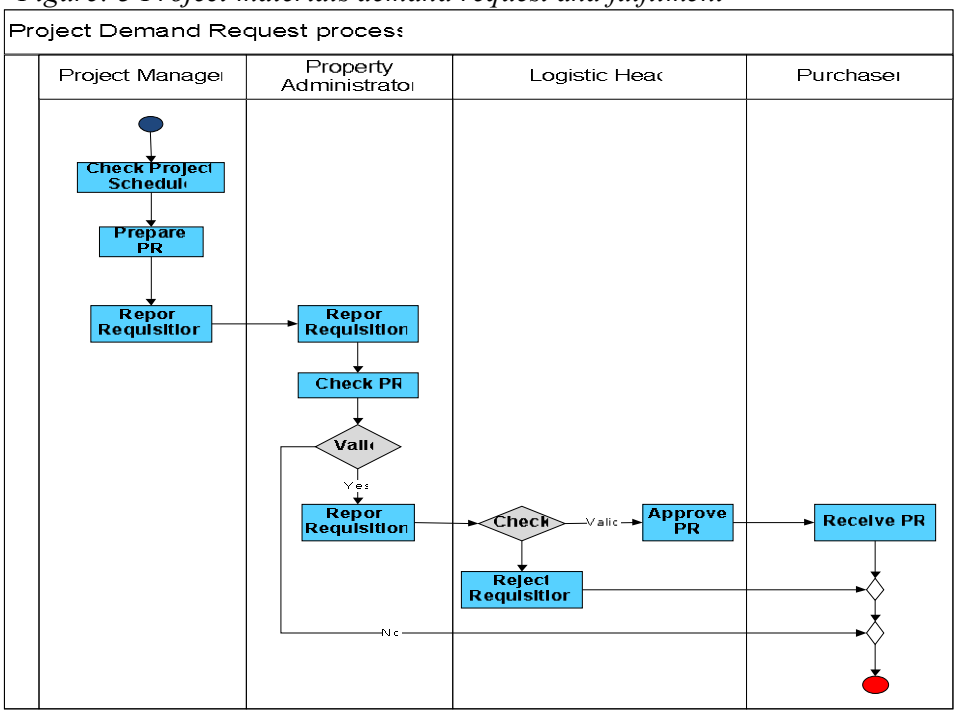
Procurement can occur under several different models in the enterprise including annual purchasing, perpetual purchasing, or scheduled purchasing. The acquisition can be from private or public suppliers through purchases from manufacturers, distributors, or other retailers. The interview result shows the procurement process of the enterprise is seriously challenged by the price variation of the goods in Ethiopian market, the financial shortage of the enterprise itself; and the project office requirements are confusing that are not compatible with the lead time of the delivery and the forecasted procurement plan for that year is not aligned with the project schedule. Planed procurement can lead to procuring the right goods in the right quantities at the lowest possible price while ensuring recognized standards of quality; which in turn reduced stock shortages and stock-outs and achievement of the lowest total cost at each level of the project logistics process based on purchasing schedule, quantities ordered, and safety stock levels.

Sometimes the contracts and grants process in the enterprise is not clearly specify the technical requirements of the goods required and the terms and conditions of the contract. Critical details of the technical requirements include specification of the goods required quality standards, packaging, price and payment terms, and dates of shipment are always the necessary condition for perfect procurement process which have to be implemented by the enterprise for efficient and effective project logistics system.

4.1.2.3. Project materials demand request and fulfillment

Demand request can be performed with a push or pull system. Different rules and guidelines for estimating the need for stock are used to create the requisition. Transmitted requisitions are submitted to the appropriate store and then go through a validation and approval process. Even the procedure looks simple the interview result shows untimely project request, financial problems and market price fluctuation are the major problems that faced demand fulfillment process. In this process seen below, the project Manager prepares Purchase Requisition for requested out of stock materials and also for Annual Plan.

Figure: 3 Project materials demand request and fulfilment



Flow of Events:

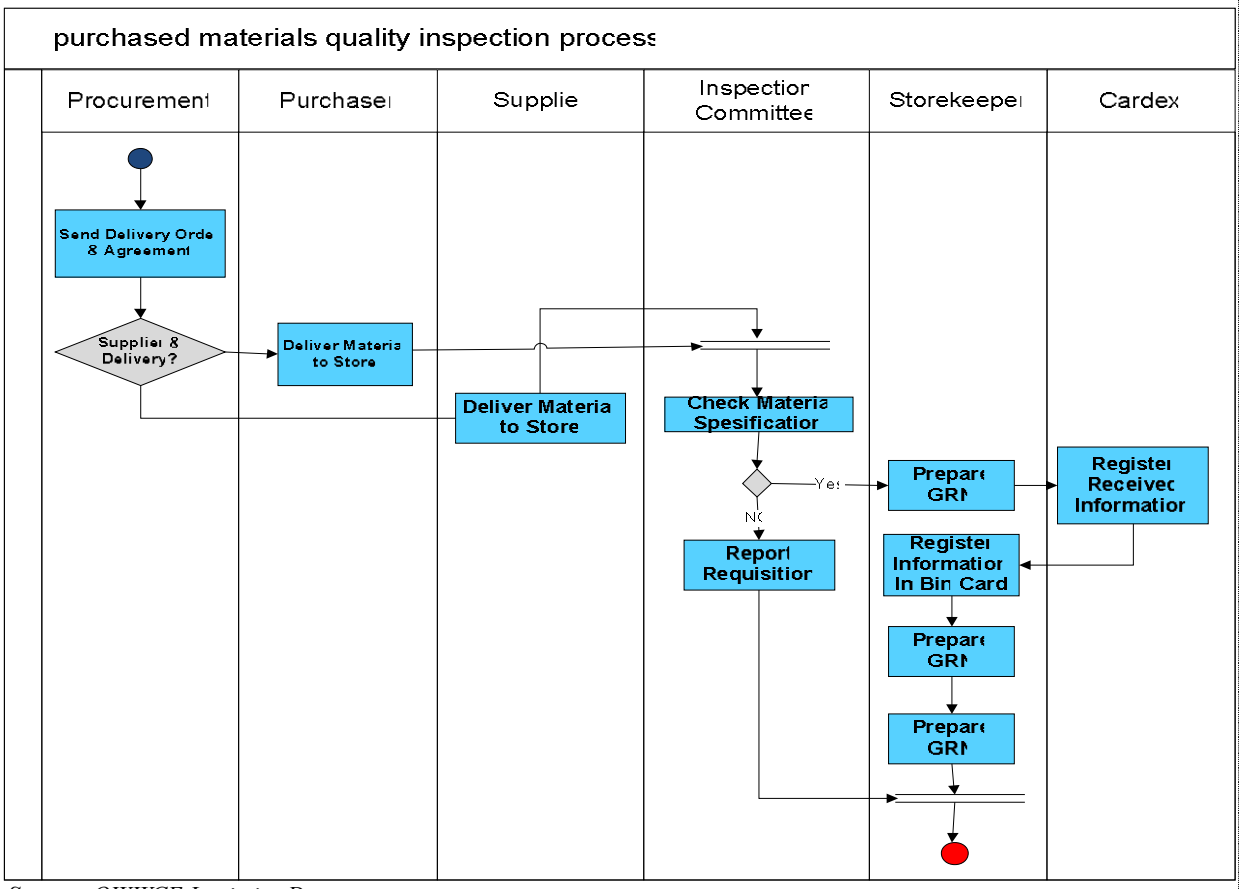
1. The project manager prepares and report Purchase request for the given material to Property Administrator.
2. The Property Administrator should report the requisition to the procurement head.
3. The procurement head approve the Requisition and send to Purchaser.
4. End of the process.

Source: OWWCE Logistics Department

4.1.2.4. Purchased material quality inspection

The receiving business process describes the process at all levels of the system within a logistics system. The activities of receiving are often performed by different individuals or functional roles based on the level at which material receiving is taking place. The manner in which arriving goods will be handled will depend on the requirements of storage and site. According to the interview result the main problem of receiving material form the suppliers are schedule and quality. For some materials the suppliers didn't provide the material on the agreed schedule, and the other one is the supplier try to provide poor quality material in which sometimes passed the inspection stage. This process is responsible of overall managing the flow of the received material from user to store. The inspection committee, procurement head verify the requisition of materials and should give the material to the Store Keeper. The full purchased acceptance process are shown the below flow diagram.

Figure: 4 Purchased material quality inspection



Source: OWWCE Logistics Department

Flow of Events:

1. The procurement head send Delivery order and argument to the purchaser.
2. The purchaser delivers the purchased materials to the store Keeper.
3. The Inspection committee checks for the purchased materials Quality Assurance information is Ok
4. Store Keeper checks the materials list (Quantity and Specification) information of the purchased materials list found in the **"Purchase Order"** is OK
5. The Store Keeper puts the materials in their appropriate location and registers the materials information in the **"Bin Card"** and Prepare **"GRN"** and Invoice for the material is recorded.

Store Keeper distributes the copies of the **"GRN"** to concerned departments. The **GRN** original copies should be given to the finance head and the two copies of this **GRN** will be given to the purchaser and Store keeper with "**Stores Document Transferring Voucher**" information attached.

4.1.2.5. Storage and inventory

The company has three group of warehouses intended to store raw materials, spare parts, other equipment's in the head office and every projects have their own temporary warehouses. on average around 25% materials stored in the central warehouses. Standard warehousing and inventory management practices like labeling, categorizing, and record keeping are well implemented in both raw material and equipment warehouse, even though, there is no any tracking system in place. FEFO (first expiry first out), a policy that enforces

issue by expiry is well practiced and product arrangement in the warehouse facilitates the implementation of the policy. There are two types of material delivery system in the enterprise the first one is the project requisitions can be received from central stores or site store which is called a "pull" system or the other is a "push" system which is regularly scheduled based on a previously planned scheduled. The second process is the main difficulty of the enterprise in which projects activities and scheduled are not implemented according to the plan. The issuing process diagrams for raw materials, fixed asset and oils are presented in annex 2, annex 3 and annex 4 consecutively.

According to the interview result in OWWCE since updating the requested and issued materials amount, price of materials, shortage or overage information is performed manually; it takes too much time and is error prone to make inventory and recording from "Bin Card" on the "Inventory Count Sheet" and moving "Bin Card" to demand assessment committee is time taking. The entire inventory counting procedure is time taking and labor intensive activity. the overall inventory procedure of the enterprise is attached at annex 5

4.1.2.6. Transportation and material distribution to site store

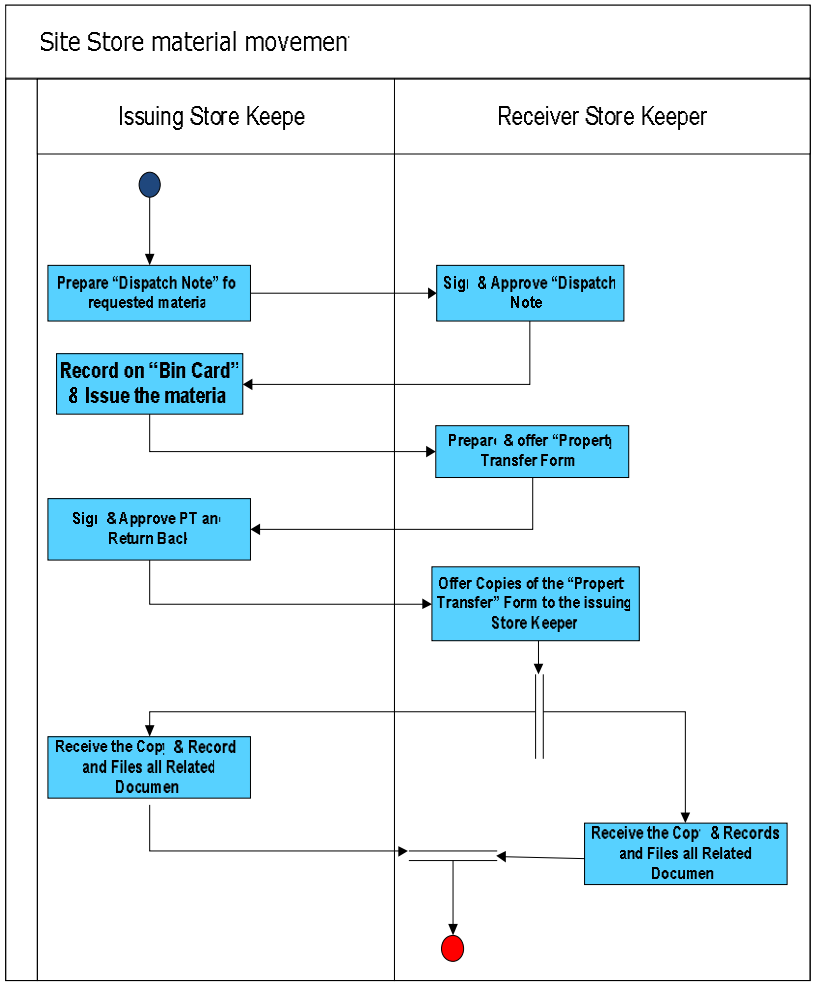
Transportation of deliveries can be on a fixed schedule or on demand. Deliveries of materials are often grouped into trips in order to efficiently and effectively utilize transportation resources to the project sites. Even if planning for efficient and effective storage and movement of goods and materials are very important the enterprise has difficulty in coordinating the transportation system based on the planned procedure.

Transportation issues are determined based on the location of stores and the project quantity demand. The management of movement of material to Site store is responsible for managing material transfer using a "Dispatch Notes" for material transportation. And a "Property Transfer Notes" Form is used to show the movement of material in addition to the material information it includes responsible person information from whom the material is received and information about the person to be responsible for receiving the material in the other store.

Figure: 5 Transportation & material distribution to site store

Flow of Events:

1. Issuing Store Keepers prepares **"Dispatch Note "** Form for the requested material
2. receiving Store Keepers signs and approves the "**Dispatch Note**" Form
3. Issuing Store Keepers register the materials information on the **"Dispatch Note "** Form
4. Issuing Store keeper record on the **"Bin Card"** and issue the material for transfer.
5. The Receiving Store Keeper prepares the "**Property Transfer**" Form offers to the Issuing Store Keepers for approval.
6. The Issuing Store Keepers Sign and Approves the Form returns it back.
7. The Receiving Store Keeper offer copies of the "**Property Transfer**" Form to the issuing Store Keeper.
8. The Receiving Store Keeper record the material Information on "**Bin Card"**
9. Both Store Keepers records and Files all related document.



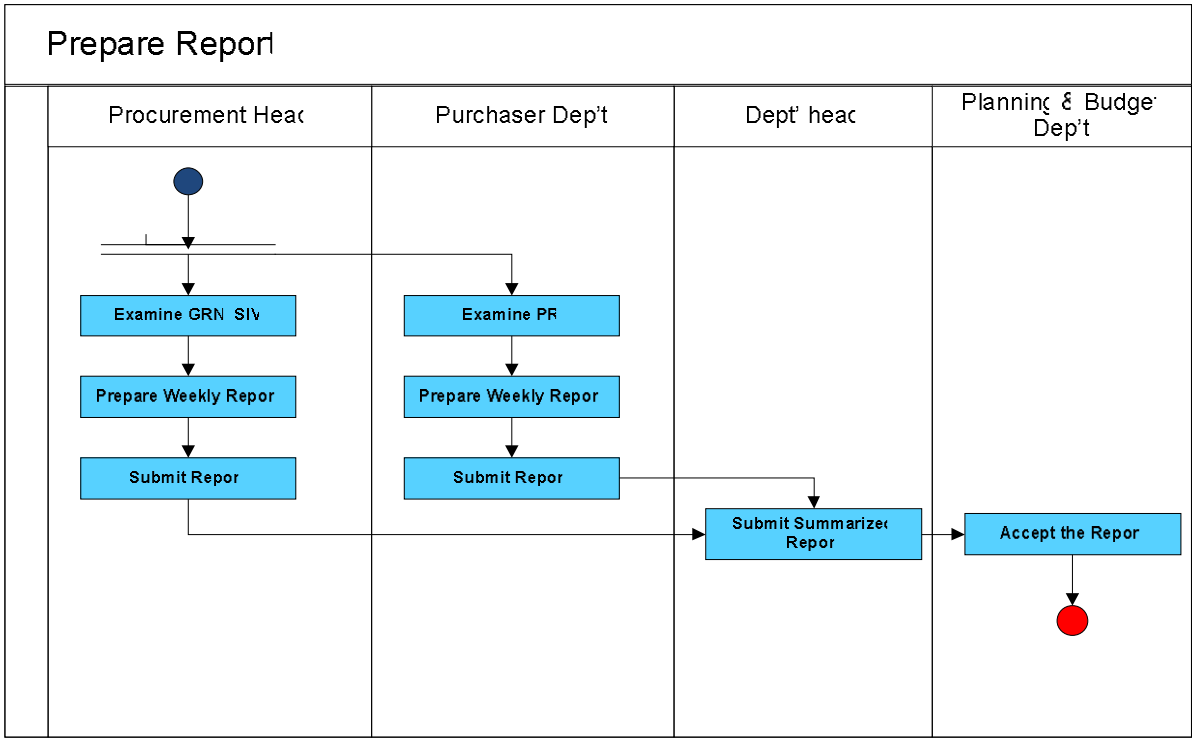
Source: OWWCE Logistics Department

4.1.2.7. Logistics Reporting mechanisms

According to the interview result most of the reports in the Organization are prepared manually using Excel. Since preparing report manually takes time, it is time taking to prepare timely Report. There is also information inconsistencies which create a mistake in report preparation the current manual system lacks centralized system to control and manage the overall logistics process. Information stored in any division is not known for all other divisions, it is difficult to notice the available, the minimum stock or lost materials and ensure there availability on their site.

In the reporting process, each Section workers (Procurement Administrator, Department head, and Purchaser) of (Procurement and purchasing divisions) prepare and submit report to their perspective use.

Figure: 6 Logistics Reporting mechanisms



Source: OWWCE Logistics Department

Flow of Events:

1. Purchaser examines the received/issued materials information on the current week from the "**Purchase Order**"
2. The Purchaser prepares the weekly **"Purchasing Report"**
3. The purchaser submits the report to the Purchasing Head.
4. Purchasing Head approves "**Purchasing Report**" summarizes and submits to The Administrative Head.

4.2. Discussion

4.2.1. Project Logistics planning

The construction industry is characterized by high variations in supply and demand for resources such as material, equipment, and services thus posing a set of challenges on the logistics network. It causes supply-demand mismatches leading to increased lead times, underutilization of resources, increased supply chain costs, and unhappy customers.

In OWWCE demand forecast for projects resources fulfillment is not directly related to construction schedules. Schedules assume a certain start date and duration for site activities which have to be linked with the necessary resource request for each construction activities. Each activity represents a certain scope of work and requires an amount of resources including material. In OWWCE project logistic activity start and duration are uncertain due to uncertainty in construction work schedule, working environment (underground conditions, weather, etc.), design changing, and financial shortage. This variation in construction schedules results in relative variation in logistics activities (Zouein and Tommelein, 1993).

4.2.2. Supply logistics Management

Thus, an effective process should be designed as seamless operation rather than as a series of different elements (Rushton & Alan, 2006). In OWWCE, project supply fulfillment processes have generally been derived to enable each separate function within an organization to undertake its particular role, but they are not streamlined to act across all the enterprises functions as a united. The questionnaire result also showed this shortfall in which 65% of the respondent believed the current system didn't satisfy adequately the supply need of projects. The logistics department implements the supply fulfillment process, but each activity operation didn't integrate with other relevant departments' process. And it is cross functional their duties within the whole process.

4.2.3. Demand Fulfillment Management

The aim of order fulfillment process ensures that a project demand is received, checked, selected and delivered according to the project requirements, with no disruption and with complete accuracy (Rushton & Alan, 2006). In OWWCE the dissatisfaction rate is 71% according to the data gathered through questionnaire. Besides, the demand fulfillment process system is the nerve center of logistics process, project demand fulfillment serves as the communications message that sets the logistics process in motion (Stock & Lambert, 2001).

Project demand request is the most important information within the project oriented organization like OWWCE. The demand information flow across the whole department until the demand has been delivered to the project.

Demand lead time, which is the total time when a request for logistics until the goods delivered at the project site is high based of the questionnaire data which is 65% of the respondents answer.

4.2.4. Logistics Integration

Integrated Logistics system is matured stage of project logistics development. Highly developed project logistics procedure improves the logistics system which becomes a leader in project process and coordination; and it can able to provide the enterprise with a full range of logistics services. The development of logistics integration can be further divided into three levels: self-integration, macro and micro integrated logistics (Feng, 2004).

Based on the interview result project logistics system of OWWCE is short of integrating all the stakeholders in the enterprise. Even if the enterprise designs an integration system for its logistic activities, but in practice it didn't implemented based on the required speed and accuracy. In addition to that the questionnaire data also shows 66% of the respondents reflect there is lack of integration in the project logistics system of the enterprise. So it is easy to see that the project logistics system of the enterprise is fragmented and often uncoordinated set of activities spread throughout various organizational functions with each individual function having its own budget and set of priorities and measurements.

If the different bodies of the enterprise coordinate in order to achieve the project logistics activities in the enterprise, the total distribution costs can be reduced by integrating such distribution related activities and the speed and quality of the projects also improved. Successfully integrating logistics management system ties all project logistics activities together in a system which works to minimize total costs and maintain desired service level (Kenderdine & Larson, 1988). It is necessary to state that, the total cost includes six major cost categories of logistics, which are, user service levels, transportation costs, warehousing costs, lot quantity costs and inventory carrying costs will be reduced significantly if project logistics system is integrated in the enterprise.

4.2.5. Logistics information systems

The correct identification, integration, and implementation of information technology tools is the single most important issue facing project logistics (Richard, Max & Bill, 1995) In

addition, information flow is a key element of logistics operations. Project fulfillment, inventory requirements, warehouse work orders, transportation documentation, and invoices are the common types of logistics information system areas. The uses of technology logistics information systems have made the logistics information exchange more efficiently and effectively. Based on the response of the questionnaire about 66% of the respondents answer the current information technology system that are used to facilitated the project logistics in the enterprise is not sufficient. Logistics information systems are the threads that link logistics activities into an integrated process.

EDI describes both the capability and practice of communicating information between two different projects electronically instead of via the traditional forms of mail, courier or even fax. The capability refers to the ability of computer systems to communicate effectively (Bowersox & Close 1996, 204). ERP (Enterprise Resource Planning) is an enterprise-wide information system designed to coordinate all the resources, information, and activities needed to complete business processes such as order fulfillment and inventory management. An ERP solution is characterized by supporting a variety of business functions such as, supply chain management, project management, and supplier relationship management from a shared data store (Bowersox & Close 1996, 187).

The interview result shows that the enterprise is planning to implement a modern information technology system that can support the logistics system meaningfully which can be on four levels of functionality: transaction, management control, decision analysis, and strategic planning. However, quick information flow is based on good information technology. EDI (Electronic Data Exchange) and ERP (Enterprise Resource Planning) need a strong commitment which is beyond a desire to implement on the enterprise logistic system.

4.2.6. Logistics performance measurement

Performance evaluation assessment system directly affects the target performance level of business operations and development. Good performance measurement system ensures that the enterprise's short-term objectives and long-term goals meet according to the plan.

In order to reflect the operations of the project logistics system, there should be set up with suitable methods of performance measurement and to determine the appropriate target system for performance measurement.

In OWWCE the three objectives for developing and implementing performance measurement systems include monitoring, controlling, and directing logistics operations in not well organized according to the questionnaire and interview result. Monitoring measures didn't

track historical logistics system performance for reporting to management and customer. And controlling measures didn't track ongoing performance and are not used to refine a logistics process in order to bring it into compliance when it exceeds control standards.

Measurement of project logistics performance indicators not only reflect the operating performance of the enterprise, but also evaluate the overall operation of the project logistics performance levels. In actual operation, in order to set up an effective project logistics performance measurement target system directing measures are design to motivate personnel (Donald & David 1996, 670).

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATION

In this chapter, summery of findings is presented. Conclusions are drawn and recommendations were made. The discussions, conclusions and recommendations were made in accordance with research objectives.

5.1. Summary of findings

The objective of this research is to investigate the project logistics management system of Oromia Water Works Construction Enterprises (OWWCE) by studying the project logistics management practices of the enterprises as a unit of analysis. Both quantitative and qualitative data collection methods are used. Data were collected by using interview questions, document review and questionnaires data collection tools. Interview questions were used to study the project logistics management system of the enterprise. Document review was conducted to study the current project logistics policies and procedures. The questionnaires data were collected from the logistics fulfillment department employees of the enterprise. The study tries to assess the planning, implementation and evaluation activities of the project logistics system of the enterprise.

The following major findings were obtained from the different sources of data collection instrument used for this study

1. Both the qualitative and quantitative data analysis shows that there is lack of cooperation between the project office and the logistics department in the planning, implementing and evaluating of project logistics activities. These negatively affect the reliability and responsiveness of the basic project logistics activities.
2. The logistics department prepared its project logistics plan every year, but most of the time because of project schedule didn't implemented according to the plan, the logistics forecasting also didn't implemented according to its prior plan. This can be one of the reasons for high resource wastage in the enterprise.
3. The procurement process of the enterprise is seriously challenged by the project office requirements that are not compatible with the forecasted procurement plan and the procurement lead time for the material requested. In addition to that variation in price of the goods in Ethiopian market and the financial shortage of the enterprise itself are

another problem. The above factors hinder the procurement process not to provide right goods in the right quantities at the lowest possible price for the projects.

4. Even if planning for efficient and effective storage and movement of goods and materials are very important, the enterprise has difficulty in coordinating the transportation system based on the planned procedure. There are two types of material delivery system in the enterprise the first one is the project demands can be received to central stores or site store which is called a "pull" system or the other is a "push" system which is regular scheduled based delivery. Even if the second system is the best to coordinate the logistics activity smoothly, it also the main problem of the enterprise in which projects activities and scheduled are not implemented according to the plan.
5. The inventory and stock management is not supported by information technology, which can greatly support to classify, categorize and prioritize materials in the warehouse. Even in the manual system the enterprise use Bin Card instead of Stock Ledger Card; Bin Card does not hold all details of the product as in ledger, it is impossible to see the current price for any material within the organization.
6. Because of financial problems and miss schedule, most of the time projects of OWWCE didn't keeps long time inventory resources to meet project delivery, demand and scheduled changes; but also the Project didn't submit the required logistics needs to the logistics department on time which create project delay.
7. Specification of the logistics requirements of the project office some time is not in line with the exact project requirements. That creates a problem in purchasing and acceptance process.
8. The logistics system didn't have strong procedure for tracking order quantity, lead time and emergency orders. So, project requested supplies are not delivered at the right quality and time to the projects site.
9. Except the basic application software's and email, OWWCE didn't have logistics information technology system, when changes occur in the logistic process information are not updated automatically. Currently the company is in the process to implement inventory management system, the inventory management system is designed to automate routine inventory, storage, and information management practices in the warehouse.

The results of the above findings indicated that the project logistics management systems used to date in the OWWCE is highly inefficient.

5.2. CONCLUSIONS

The current project logistics system of OWWCE is not consistent enough to fulfill all the requirement of project logistics needs. The major reasons of this problem are the Information system currently used to facilitate project logistics system is not sufficient to undertake the work smoothly; the other problem is even if for the past years the enterprise makes efforts to improve the project logistics system through adaptation of new structure and procedures, thus structure and procedures are not closely aligned among all the stockholders of the enterprise; and this problems are not evaluated frequently by the enterprise.

It is concluded that the project staff didn't send the required logistics need requirements to the logistics department on time; sometimes the request is not based on the initial plan or with wrong specification or quantity. Even if the procedure of the enterprise stated that project offices make an input to the logistics plan of each budget year through the preparation of the Bill of Materials, the actual way of logistics planning in the enterprise is based on the past year data only.

The current project logistics system is not flexible enough for the schedule and requirement changes from the project office. There has never been a project that has the same circumstance and requirements. Instead of squeezing every project into the same template, spend some time crafting milestones specific to the needs of each project. Every job requires specific milestones that meet the schedules of all parties involved.

It is the research conclusion that there is shortage of adequate storage space in both project and head office. Enough storage space at a logistics center can reduce logistics costs due to reduction in inventory costs and possible economies of scale in purchasing.

Projects of OWWCE haven't strong procedure for tracking order quantity, lead time and emergency orders. In the project logistics, the procurement and material/equipment management have to be based on the schedule of the project, but in OWWCE the inventory procedure is determined simply by short term project needs.

The enterprise didn't using electronic communications to help in improving logistics throughout the system. Information system for information sharing between logistics management system of head office and the projects are not practiced.

In OWWCE there is infrequent and unscheduled interaction between the logistics department and the project sites which harm the efforts to make the project logistics system reliable and responsive to the project needs.

5.3. Recommendations

On the basis of the results of this study and the knowledge driven form the literature review, the following recommendations are suggested so as to be considered in the future which are aimed at the improvement of project logistic management system of OWWCE.

Undertaking project logistics system assessment audit

An internal assessment will be critical to the enterprise total understanding of its present and projected project logistics capabilities. The audit has to address "the short-falls, bottlenecks and gaps in the process, and can be identified by the auditing process. It examines & tests the operations of logistics processes in terms of quality, technology, productivity & external factors. It reveals the weaknesses in the system of the company. It measures the capabilities & qualities of logistics operation & highlights resources for rationalization & cost reduction. In order to keep the assessment totally objective, it is always recommended to have it conducted by an outside expert who can independently identify both the gaps and opportunities, and compare them against the best practices in the industry. Then, a project logistics improvement plan can then be developed to close the gaps and seize the opportunities, tempered by the various limitations and constraints of the organization.

Forecasting and Integration of all logistics functions:

Project logistics functions should be driven by forecast, which is based on the activities of the project. Creating a realistic and accurate plan will be dependent on the quality of the input from the different departments of the enterprise. On the other hand, the better planed, the higher the project logistics system success, and the lower the overall cost will be. To invest in a good forecasting function, which will then integrate all of the logistics functions the use of information systems allows improving this area. In all part of the enterprise resources have to share for the functions of the logistics forecasting and would therefore have the same systems and mechanisms for determining needs. Project logistics plan must be clearly defined so that there is no confusion in the minds of the logistics team. This clarity will help to accomplish the desired objectives of the organization. It must be drafted in accordance with the objectives of the organization. Its aim must be to provide timely delivery of goods besides

rendering normal functions of logistics under strict deadlines and in conformity with business goals.

Using third party logistics for transportation activity

Transportation is a contributing factor in breakages in the project logistics support function, because transportation of material will not always arrive at the project site when needed. So, for the transportation functions of the project logistics system of the enterprise, using third party logistics at same capacity can be recommendable. Third party logistics are organizations which are specialists in the field of outsourced logistics services with expertise in pick-up and delivery of shipments on the behalf of their clients. Third party logistics are also beneficial in providing economies of scale as they tend to combine several orders from various customers into a sole shipment. They can also decide on various alternate routes available in cases of delay at the receiving locations of the consignment. This option can lead to cost savings, enhanced efficiency and reduction in the levels of inventory on hand.

Building storage facility:

Storage is a very important function within the logistics cycle. Among other things, it serves to maintain the quality of commodities until they are used. The enterprise has to improve quality of physical storage space, stores layout and shelf arrangement, receiving and issuing routines and stock control procedures. This also includes procedures such as First-to-Expire-First-Out relating to which set or batch of commodities will be released from storage for use first and in which order. Too much variation of or lack of control over these aspects of storage could have significant implications on the performance of quick and accurate delivery of material for the project.

Establishing logistics management information system:

To effectively evaluate a system, a manager needs relevant information. Information drives the logistics system; without it, the logistics system cannot run smoothly. The enterprise recommended implementing an ERP (Enterprise Resource Planning) which is an enterprise-wide information system designed to coordinate all the resources, information, and activities needed to complete business processes such as order fulfillment and inventory management. Managers gather information about each activity in the system and then analyze that

information to make decisions. In order to support this function the enterprise has to implement Logistics Management Information System. Information technology systems can be effective and essential means of providing key information for planning, implementing and evaluating the project logistics system; as well as monitoring the distribution of material to site.

Building staff capacity

A logistics system can only work when the staff are well-trained and operate in a supportive environment. Project logistics must be organized to provide the appropriate resources to complete logistics activities. All staff involved in logistics functions must understand the project logistics procedure and make them a top priority. They must have the right tools to do their jobs, whether they place orders, coordinate, deliveries, or keep a warehouse functioning effectively to ensure that the right product, in the right quantity, is delivered to projects.

Developing and maintaining a standard operating procedure manuals

A standard operating procedure manual fully documents the system as it was designed has to prepare by the enterprise. The standard operating procedure manual provides instructions about how to do the logistics activities without ambiguity. The manual can include completing the forms, properly storing commodities, roles and responsibilities of all individuals in the system. And any time a change is made to the logistics activity procedure, the standard operating procedure manual must be updated and the updates must be disseminated to necessary staff.

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Annex

Annex: 1

St .Mary's University, School of Graduates Studies

Master of Business Administration (MBA) Program

Questionnaire to be filled by project managers,

project representative & Logistics officers

Dear respondent,

I am under taking research on "***project Logistics management system"*** by taking your organization Oromia Water Works Construction Enterprise as a case, to fulfill partial requirement of MBA study. This questionnaire is designed to collect sufficient and relevant data for this research use solely.

Your answers to the questions contained in the Questionnaire will be a great help for evaluating the status quo and finding some solutions for offering effective Project logistics system. Any information you present will be kept absolutely confidential and will be used for academic purpose only. Your cooperation and prompt response will be highly appreciated.

Thank you very much in advance!

Henok Yigremew

(Graduating student)

Instruction

- Writing your name is not necessary,
- You can give more than one answer for some of the questions in the Questionnaire,
- Please put "√" for your choice in the box or write appropriate answer in the blank spaces.

Section one

Responder personal attributes:

1. Your Sex: Male Female
2. Your Highest Qualification and specialization: _____

3. How long have you been working in OWWCE?

   ☐ 0-4 Years ☐ 5-9 year's ☐ 10-14 years ☐ more than 15 years

4. What is Your work title

   ☐ Project manager ☐ Project Representative ☒ Logistics officer

5. How long have you been on your current position?

   ☐0-4 Years ☐5-9 year's ☐10-14 years ☐ more than 15 years

Section Two

Indicate the extent to which you agree or disagree with each statement, please make a tick (√) mark in the space provided.

The item scales are five-point Likert type scales with: **1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree**

1. Project logistics performance of OWWCE

S/N	Existing Project Logistics Management Performance	SD	D	N	A	SA
		1	2	3	4	5
1.1	Consistent project logistics system is used.					
1.2	Information system currently used to facilitate logistics system is sufficient to undertake the work smoothly.					
1.3	Efforts to improvement project logistics system have increased over the past years					
1.4	Logistics to the project are in full and on time.					
1.5	The logistics procedures and rules are closely aligned among employees of the project.					
1.6	The logistics performance is closely monitored.					
1.7	Project teams are very satisfied with the logistics system of the company.					
1.8	The project logistics system is frequently evaluated.					

2. Factors which can affect project logistics management system performance (demand Request, supply fulfillment, Logistics storage and control, information technology, Communication and Evaluation) of your organization.

S/N	Factors	SD	D	N	A	SA
		1	2	3	4	5
Demand Request						
2.1	The Project has sent the required logistics needs on time to head office.					
2.2	The project keeps long time inventory of resources to meet project delivery, demand and scheduled changes.					
2.3	Specification/requirements of logistics requirements, requested from the head office is in line with the real market and project necessity.					
Supply Fulfillment						
2.4	The requested supplies are delivered at the right quality, time and place in the project.					
2.5	The logistics system is flexible enough for the schedule and requirement changes from the project office.					
2.6	The logistics systems consistently meet project requirements.					
Logistics storage and control						
2.7	When materials received quality & quantity assurance is undertaking.					
2.8	Inventory documentation is well managed.					
2.9	The project has strong logistics materials control procedure. (losses and obsolescence)					

S/N	Factors	SD	D	N	A	SA
		1	2	3	4	5
2.10	The project has strong procedure for tracking order quantity, lead time and emergency orders. Based on the schedule of the project.					
Information technology and control						
2.11	Sophisticated information system for information sharing between logistics management system of head office and the project.					
2.12	The information technology is updated based on the change in the process and procedures of logistics system.					
Communication and Evaluation						
2.13	There is frequent interaction with logistics department to achieve reliability, the responsiveness and improving some basic standards for your project.					
2.14	The project logistics needs are frequently evaluate.					
2.15	The changes in the project logistics needs are quickly and executively discussed with logistics department.					
2.16	The project office is strongly participated in logiest forecasting process.					

3. How do you rate your company's project logistics management system?

☐Very Unsuccessful ☐Neutral ☐Very Successful ☐Unsuccessful ☐Successful

4. How do the central logistics department receive reports about the status of project logistics system

☐Telephone call ☐ written report ☐ meeting ☐ supervisor visit

☐ Database ☐ Others Please specify_____

5. Forecasting is undertaking at list ones per.

☐Yearly ☐semi-annually ☐Quarterly ☐ monthly ☐ other please specify here:

_____

6. Central-level logistics staff communicate with the project office

☐ Yearly ☐ semi-annually ☐ Quarterly ☐ monthly ☐ other please specify here:

_____

7. Is the exiting storage place capacity adequate to handle project logistics need at maximum level?

☐Yes ☐No

8. Are logistics workers of the project have given necessary training about the procedures of the logistics system.

☐Yes ☐No

9. If the answer for question number 8 is No, give suggestion what kind and in which part of logistics training in needed for employees?

_____

10. Any additional comments:

_____

_____

Annex: 2

Interview with the logistics manager

Date: _____

Department: _____

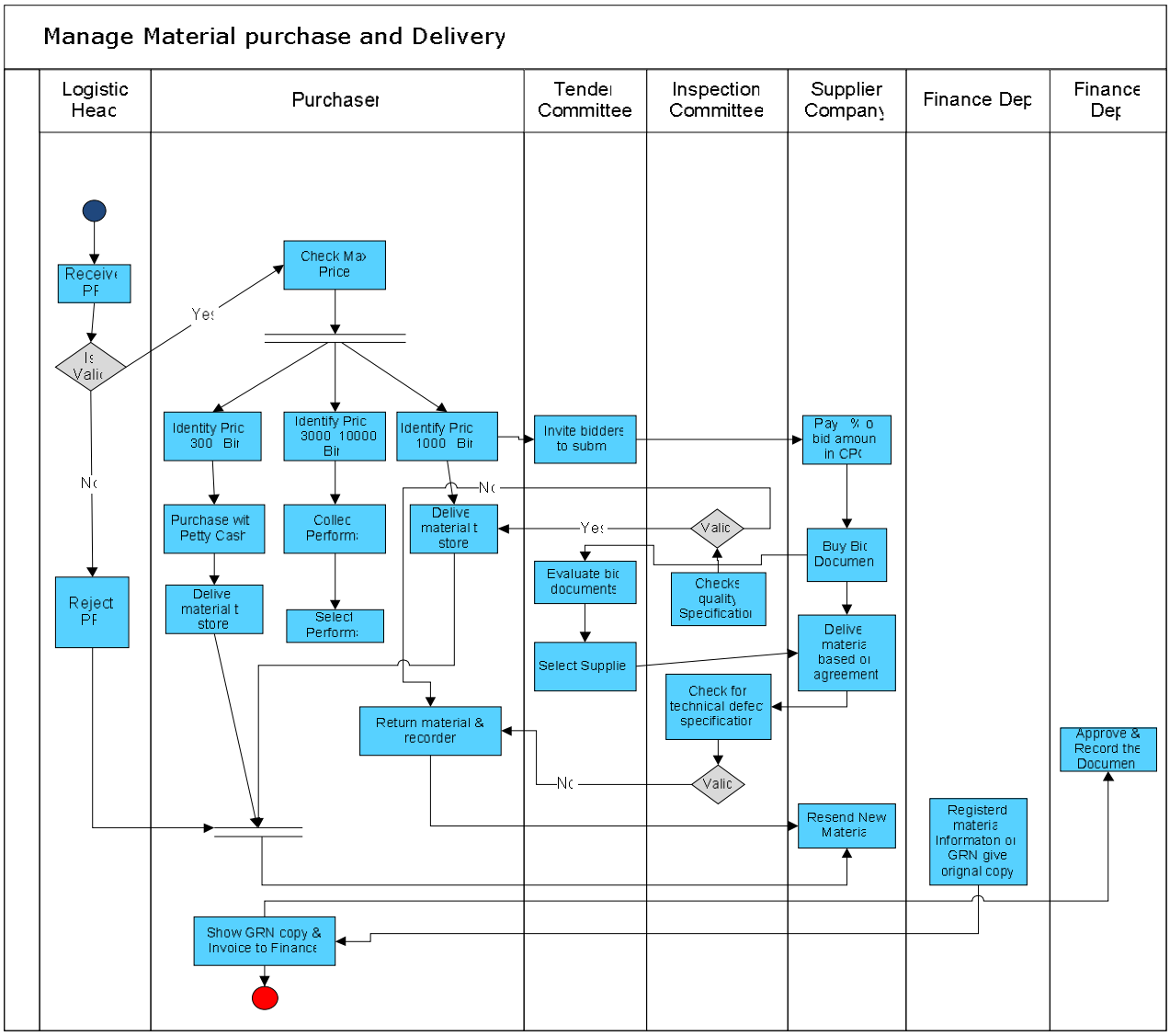
Person Interviewed: _____

Position/Title: _____

1. Please explain the overall project logistics system/process of OWWCE
2. How is the Project Demand Forecasting determined in the enterprise
3. How is procurement and contract administrated in the enterprise and what are the controlling mechanisms
4. In what way the logistics department process and fulfill the project logistics demand request
5. Please explain the storage and inventory management of the enterprise
6. How is the project transportation and material distribution to site managed
7. Please explain the project logistics Reporting mechanisms.
8. Please elaborate the current major challenges and threats in the area of project logistics management identified by the company.
9. What are the measures taken or planned to be taken to improving performance of project logistics system?

Annex: 3

Manage Material Purchase and delivery process flow

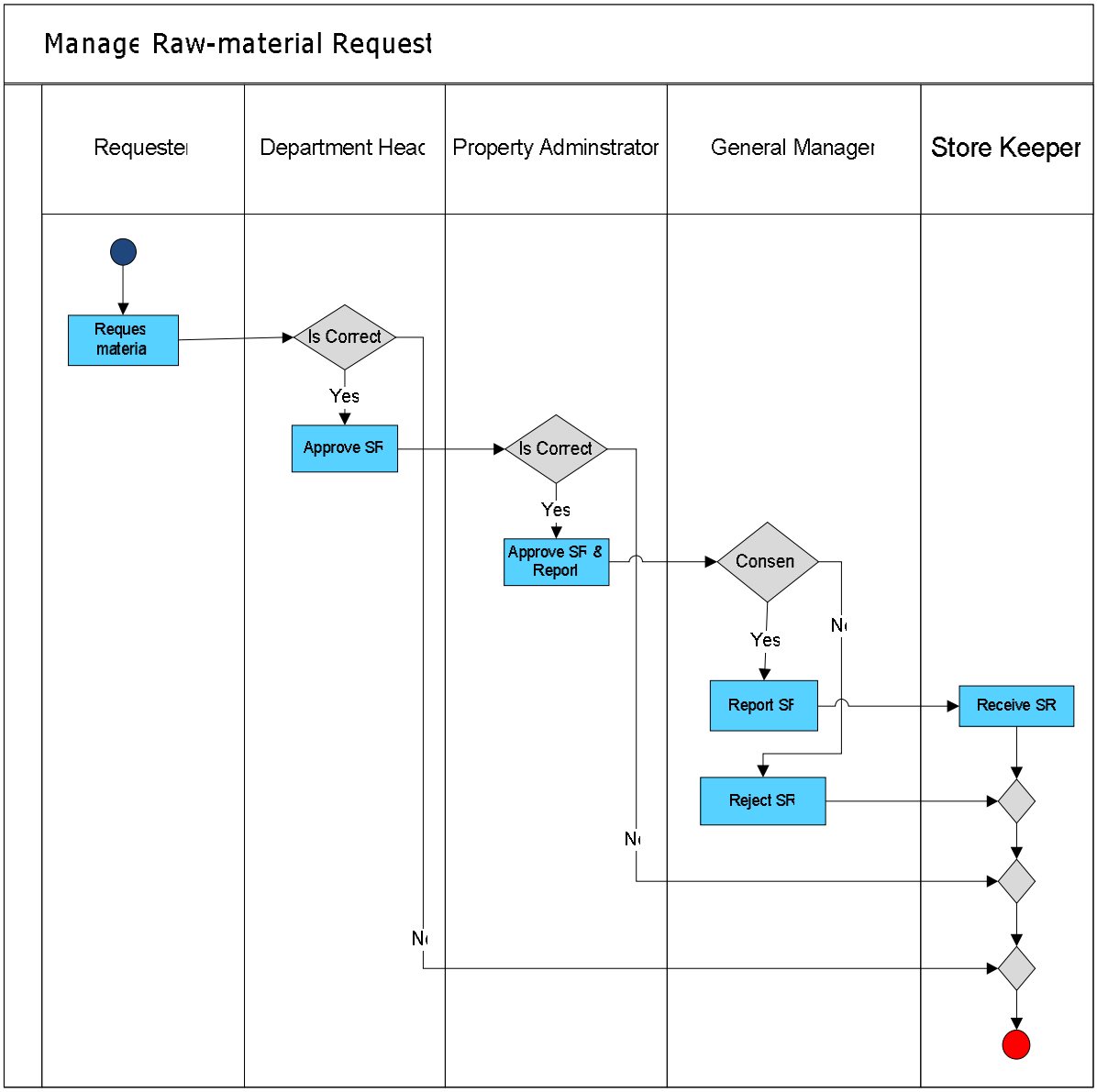


Flow of Events:

1. The Procurement and Distribution Head approve and the "**Purchase Requisition Form**" and send to Purchasing department.
2. The Purchase department will assign a purchaser.
3. The Purchaser estimates the price of the material.
4. The Purchaser receives cash from the Finance department.
5. Purchaser prepares **"Purchase Order"**.
6. The purchaser receives **invoice** from the supplier industry.
7. Purchaser transports and delivers the material to store.
8. The Store Keeper registers material information on **GRN** and gives the original copy to the purchaser.
9. The purchaser shows the **GRN** copy and **invoice** to Finance department.
10. The Finance department approve and record the documents.

Annex: 4

Manage Raw-material request



Flow of Events:

1. Material Requester prepares SR.
2. Department head check SR.
3. Department head approve SR and send to the Property Administrator.
4. Property Administrator approves SR and send to the general manager.
5. The General manager consent on the material request and send to Store Keeper
6. The Store Keeper receives approved "Store Requisition"' form.
7. End of Business use case

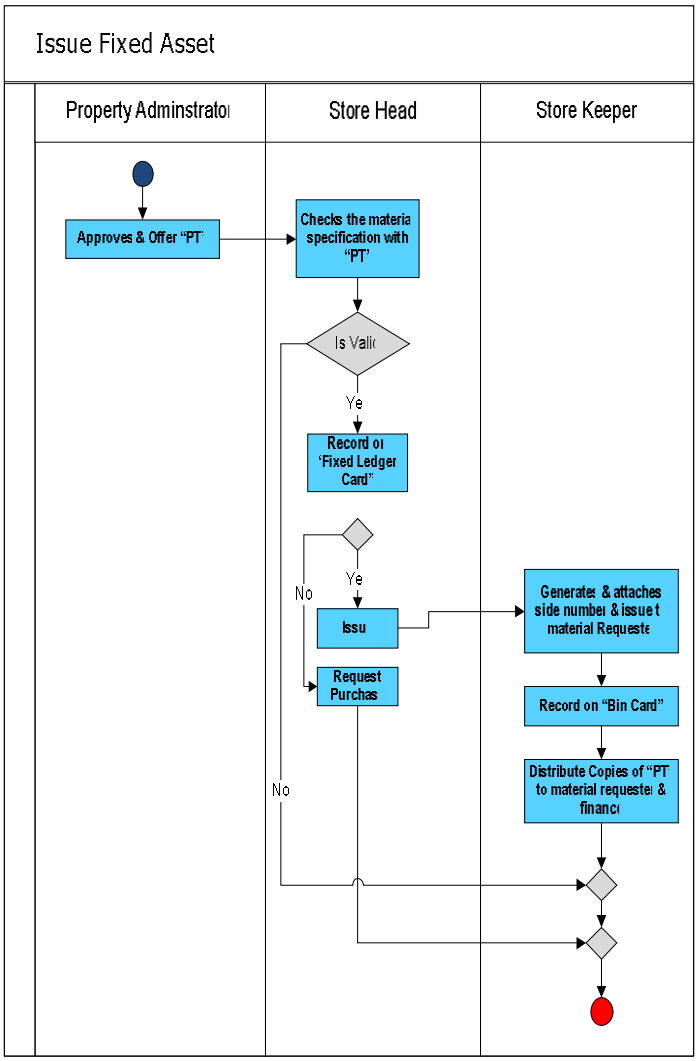
Annex: 5

Issue Fixed Asset:

The store keepers manage issued materials from stores by internal departments and external customers.

Flow of Events:

1. Property administrator approves **"Property Transfer Note"** that is submitted by general manager and offers to Store Head.
2. The Store Head checks the material specification with **"Property Transfer Note".**
3. The Store Head should record the "**Property Transfer Note"** information into the "**Fixed Leger card**".
4. The Store Head Issue requested item to the Store Keeper.
5. The Store Keeper generates and attaches side number and Issue Item to the Material Requester.
6. The Store Keeper will record the material as out in the "**Bin Card"**
7. The Store Keeper distributes copies of **"Property Transfer Note"** to Finance department and Material Requester.



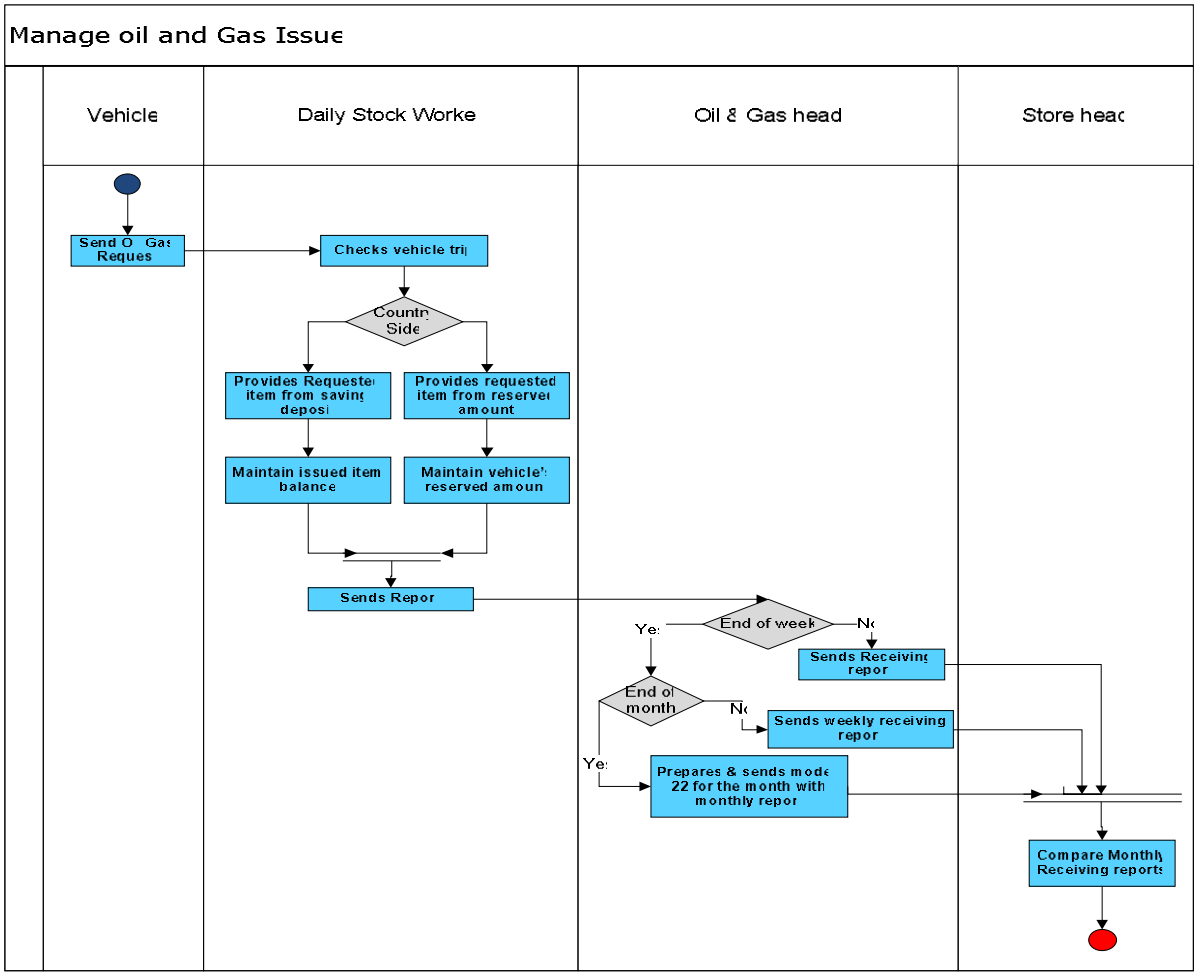
Annex: 6

Manage Issued Oil and Gas:

Oil and Gas department head manages issuance of oil and gas used by the enterprise vehicles. The department head also manages monthly reserved amounts of oil and gas for each vehicle.

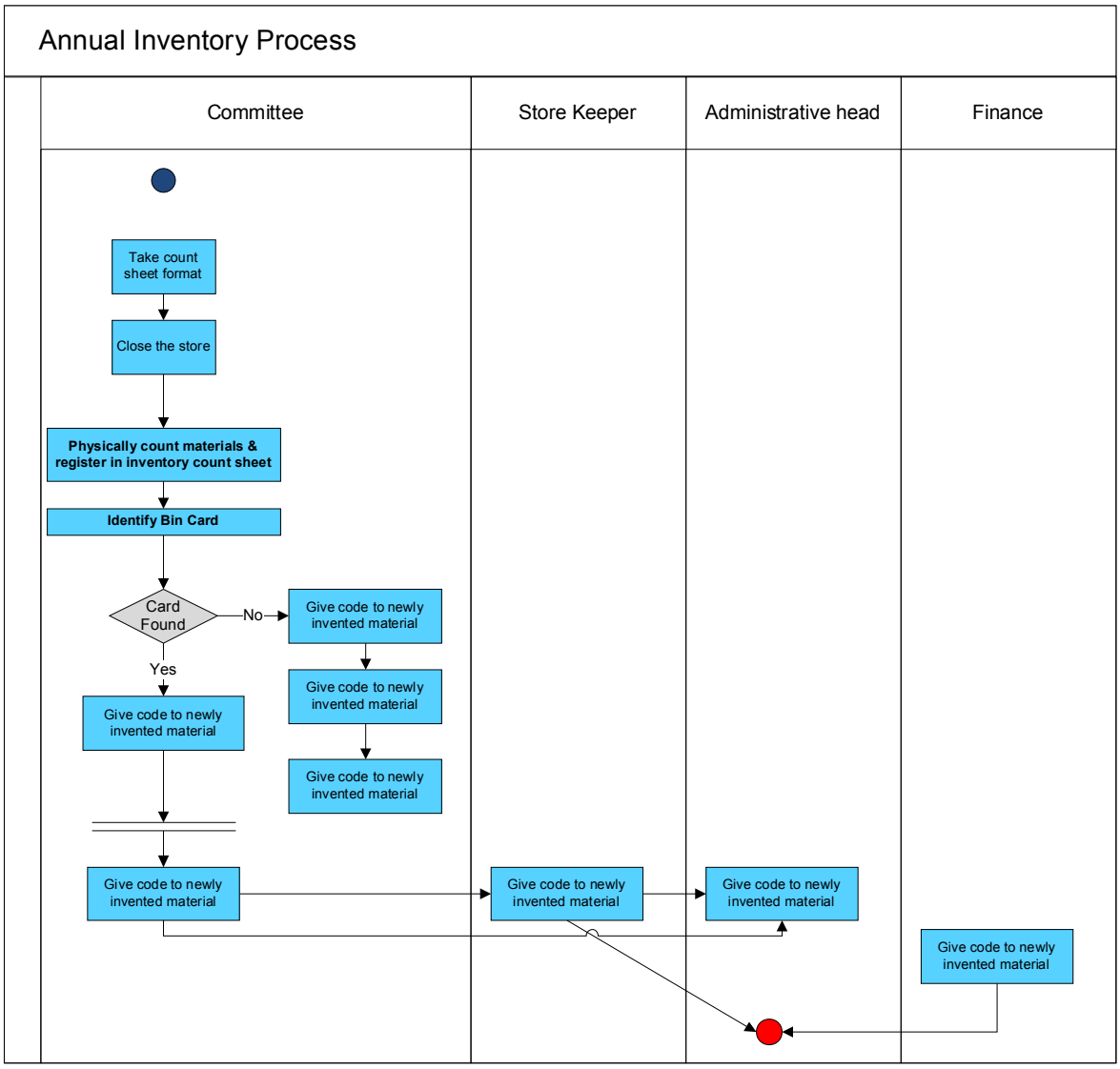
Flow of Events:

1. Oil and Gas requester with a vehicle requests for Oil and/or Gas
2. Daily stock record worker checks remaining items and their amounts intentionally reserved for this vehicle.
3. Reserved quantity is enough as compared to requested amount and item is issued for that vehicle.
4. Daily stock record worker registers issuance and maintain vehicle's reserved items' balance
5. At the end of each week, oil and gas department head prepares a weekly balance report and sends to store head.
6. At the end of each month, oil and gas department head prepares Report for that month and sends to store head



Annex 7

Annual Inventory process of the enterprise



Flow of Events

1. First counting committee is formed from Finance, Construction and workshop department physically count materials in stock and register in **inventory sheet**.
2. The committee take the count sheet format to register counted material information
3. The committee should Closed the store
4. The committee should identify Bin card for each material and registers the (Price/cash) information of the materials on the "Inventory Sheet".
5. The "Inventory Sheet" is distributed to the Store centres, Finance and administrative head.

Annex: 8

Frequency Table Existing Project Logistics Management Performance

Table: 1 Consistent project logistics system is used.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	6.3	6.3	6.3
	Disagree	21	65.6	65.6	71.9
	Neutral	5	15.6	15.6	87.5
	Agree	4	12.5	12.5	100.0
	Total	32	100.0	100.0	

Table: 2 Information system currently used to facilitate logistics system is sufficient to undertake the work smoothly.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	3.1	3.1	3.1
	Disagree	21	65.6	65.6	68.8
	Neutral	7	21.9	21.9	90.6
	Agree	3	9.4	9.4	100.0
	Total	32	100.0	100.0	

Table: 3 Efforts to improvement project logistics system have increased over the past Years

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	6	18.8	18.8	18.8
	Neutral	5	15.6	15.6	34.4
	Agree	21	65.6	65.6	100.0
	Total	32	100.0	100.0	

Table: 4 Logistics to the project are in full and on time.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	12.5	12.5	12.5
	Disagree	23	71.9	71.9	84.4
	Neutral	2	6.3	6.3	90.6
	Agree	3	9.4	9.4	100.0
	Total	32	100.0	100.0	

Table: 5 The logistics procedures and rules are closely aligned among employees of the project.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	9.4	9.4	9.4
	Disagree	18	56.3	56.3	65.6
	Neutral	6	18.8	18.8	84.4
	Agree	5	15.6	15.6	100.0
	Total	32	100.0	100.0	

Table: 6 The logistics performance is closely monitored.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	9.4	9.4	9.4
	Disagree	15	46.9	46.9	56.3
	Neutral	8	25.0	25.0	81.3
	Agree	6	18.8	18.8	100.0
	Total	32	100.0	100.0	

Table: 7 Project teams are very satisfied with the logistics system of the company.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	9.4	9.4	9.4
	Disagree	23	71.9	71.9	81.3
	Neutral	3	9.4	9.4	90.6
	Agree	3	9.4	9.4	100.0
	Total	32	100.0	100.0	

Table: 8 The project logistics system is frequently evaluated.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	15.6	15.6	15.6
	Disagree	19	59.4	59.4	75.0
	Neutral	5	15.6	15.6	90.6
	Agree	3	9.4	9.4	100.0
	Total	32	100.0	100.0	

Annex: 9

Frequency Table Demand Request

Table: 1The Project has sent the required logistics needs on time to head office

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	9.4	9.4	9.4
	Disagree	14	43.8	43.8	53.1
	Neutral	10	31.3	31.3	84.4
	Agree	5	15.6	15.6	100.0
	Total	32	100.0	100.0	

Table: 2 The project keeps long time inventory of resources to meet project delivery, demand and scheduled changes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	3.1	3.1	3.1
	Disagree	17	53.1	53.1	56.3
	Neutral	6	18.8	18.8	75.0
	Agree	8	25.0	25.0	100.0
	Total	32	100.0	100.0	

Table: 3 Specification/requirements of logistics requirements, requested from the head office is in line with the real market and project necessity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	3.1	3.1	3.1
	Disagree	5	15.6	15.6	18.8
	Neutral	13	40.6	40.6	59.4
	Agree	13	40.6	40.6	100.0
	Total	32	100.0	100.0	

Annex: 10

Frequency Table Supply Fulfillment

Table: 1The requested supplies are delivered at the right quality, time and place in the project.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	12.5	12.5	12.5
	Disagree	21	65.6	65.6	78.1
	Neutral	4	12.5	12.5	90.6
	Agree	3	9.4	9.4	100.0
	Total	32	100.0	100.0	

Table: 2The logistics system is flexible enough for the schedule and requirement changes from the project office

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	3.1	3.1	3.1
	Disagree	19	59.4	59.4	62.5
	Neutral	2	6.3	6.3	68.8
	Agree	9	28.1	28.1	96.9
	Strongly Agree	1	3.1	3.1	100.0
	Total	32	100.0	100.0	

Table: 3 The logistics systems consistently meet project requirements

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	12.5	12.5	12.5
	Disagree	19	59.4	59.4	71.9
	Neutral	7	21.9	21.9	93.8
	Agree	2	6.3	6.3	100.0
	Total	32	100.0	100.0	

Annex: 11

Frequency Table Logistics storage and control

Table: 1 When materials received quality & quantity assurance is undertaking

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	6.3	6.3	6.3
	Disagree	7	21.9	21.9	28.1
	Neutral	5	15.6	15.6	43.8
	Agree	17	53.1	53.1	96.9
	Strongly Agree	1	3.1	3.1	100.0
	Total	32	100.0	100.0	

Table: 2 Inventory documentation is well managed.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	9.4	9.4	9.4
	Disagree	8	25.0	25.0	34.4
	Neutral	11	34.4	34.4	68.8
	Agree	10	31.3	31.3	100.0
	Total	32	100.0	100.0	

Table: 3 The project has strong logistics materials control procedure. (losses and obsolescence)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	9.4	9.4	9.4
	Disagree	23	71.9	71.9	81.3
	Neutral	4	12.5	12.5	93.8
	Agree	2	6.3	6.3	100.0
	Total	32	100.0	100.0	

Table: 4 The project has strong procedure for tracking order quantity, lead time and emergency orders. Based on the schedule of the project

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	9.4	9.4	9.4
	Disagree	21	65.6	65.6	75.0
	Neutral	6	18.8	18.8	93.8
	Agree	2	6.3	6.3	100.0
	Total	32	100.0	100.0	

Annex: 12

Frequency Table Information technology and control

Table: 1 Sophisticated information system for information sharing between logistics management system of head office and the project.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	10	31.3	31.3	31.3
	Disagree	15	46.9	46.9	78.1
	Neutral	4	12.5	12.5	90.6
	Agree	3	9.4	9.4	100.0
	Total	32	100.0	100.0	

Table: 2 The information technology is updated based on the change in the process and procedures of logistics system.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	6	18.8	18.8	18.8
	Disagree	18	56.3	56.3	75.0
	Neutral	3	9.4	9.4	84.4
	Agree	5	15.6	15.6	100.0
	Total	32	100.0	100.0	

Annex: 13

Frequency Table Communications and Evaluation

Table: 1 There is frequent interaction with logistics department to achieve reliability, the responsiveness and improving some basic standards for your project

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	9.4	9.4	9.4
	Disagree	11	34.4	34.4	43.8
	Neutral	8	25.0	25.0	68.8
	Agree	10	31.3	31.3	100.0
	Total	32	100.0	100.0	

Table: 2 The project logistics needs are frequently evaluate.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	7	21.9	21.9	21.9
	Disagree	14	43.8	43.8	65.6
	Neutral	3	9.4	9.4	75.0
	Agree	8	25.0	25.0	100.0
	Total	32	100.0	100.0	

Table: 3 The changes in the project logistics needs are quickly and executively discussed with logistics department.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	9.4	9.4	9.4
	Disagree	16	50.0	50.0	59.4
	Neutral	9	28.1	28.1	87.5
	Agree	4	12.5	12.5	100.0
	Total	32	100.0	100.0	

Table: 4 The project office is strongly participated in logiest forecasting process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	8	25.0	25.0	25.0
	Disagree	14	43.8	43.8	68.8
	Neutral	4	12.5	12.5	81.3
	Agree	6	18.8	18.8	100.0
	Total	32	100.0	100.0	