
# ST. MARY'S UNIVERSITY
# SCHOOL OF GRADUATE STUDIES

# FACTORS AFFECTING EMPLOYEE PRODUCTIVITY IN CONSTRUCTION SECTOR: THE CASE OF DEFENSE CONSTRUCTION ENTERPRISE

**BY**

**SEYOUM ZERAY**

**SGS/0136/2010A**

**JUNE, 2019**

**ADDIS ABABA, ETHIOPIA**

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**A THESIS SUBMITTED TO ST. MARY'S UNIVERSITY, SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ART IN GENERAL MANAGEMENT**


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**ADDIS ABABA, ETHIOPA**

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**APPROVED BY BOARD OF EXAMINERS**

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| **Advisor** | **Signature** |
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# List of Abbreviations and Acronyms

| | |
|---|---|
| DCE | Defense Construction Enterprise |
| KPIs | Key Performance Indicators |
| IBM | International Business Management |
| SPSS | Statistical Package for Social Science |

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# Abstract

*Labor productivity is one measure of the efficiency with which the human labor is assessed. Any variations in labor productivity will affect the construction project. A decline in productivity causes an increase in the time necessary to complete the project and the total cost of the project. The main objective of this study was to assess the influence of design and specification related factors, technological related factors, labor related factors, and organizational related factors on labor productivity in construction building projects in Defense Construction Enterprise as a case study. The research was primarily based on primary data collected through a structured questionnaire. To this respect, a total of 114 questionnaires were distributed to purposively selected employee of defense construction enterprise, which constituted response rate of (77) or 68% and this was adequate for statistical generalization of the study findings. The information was displayed by use of charts and tables. Major design and specification related factors that affect labor productivity at projects are delay in preparation and delivery of drawings, incomplete and inaccurate drawings, and design changes at building projects. Major construction technological related factors that affect labor productivity at projects are lack of construction equipment and tools, an absence of technological advancements for machineries, and frequent damage of equipment. Major labor related factor that affects labor productivity at projects is incompetence of labors at projects. Major organizational related factors that affect labor productivity at projects were cash flow and financial difficulties, poor resources management, absence of working plan, lack of employee motivation, and poor communication in the enterprise. The researcher further employed a multiple linear regression model to analyze the relationship between factors affecting labor productivity and level of labor productivity in building projects. The regression result reveals technological and organizational related factors are positively and significantly influence the labor productivity. On other hand, labor and design and specification related factors were found positive but not significant factor influencing the productivity of labor. The results of the study may suggest that the enterprise need to give more emphasis on technological and organizational related factors to enhance labor productivity in building projects.*



Key Words**: *Project, Labor Productivity, Construction Industry, Ethiopia***

# CHAPTER ONE: INTRODUCTION

## 1.1. Background of the study

Range of construction projects is wide and divided into various segments usually residential buildings, commercial buildings, industrial buildings, road construction, utility construction etc. Construction involves various people, skills, organizations, technologies, contracting methods, financing arrangements and regulatory mechanisms and has different phases such as planning, designing and building, and then they are used, maintained, repaired, renovated and eventually demolished or replaced in their life cycle. This diversity of construction projects makes it difficult to manage. Now a big question is that how can we measure construction productivity considering all these segments, aspects and phases.

The construction industry remains one of the few most labor intensive industries in the developing countries. It is therefore very important to understand the concept of construction labor productivity. In different researches it was argued that productivity measurement techniques could be perceived as theoretical, difficult and expensive for construction companies to adopt.

Good project management in construction must strongly measure and monitor productivity on construction site Chris (2000). Construction productivity has got increased attention from different construction researchers. Researchers and practitioners around the world have provided several contributions on areas related to construction work productivity. In addition, the result of different researches indicated that productivity is a complex issue as many factors influence productivity such as labor, capital, material, equipment, tools and equipment, poor communication or relationship between workers and management, disorganized projects, poor supervision, lack of cooperation and communication between different workers, and unfair workloads are the some of the factors that affect productivity. Technical problems like inadequate designs or incomplete engineering work can also lead to a decrease in construction productivity Dozzi (1993). The main findings of previous studies indicate that the critical areas affecting construction productivity were related to materials, tools, equipment availability, and the Workers' performance.

Increasing the construction work productivity benefits a contractor in several ways: projects can be completed more quickly, project cost will be lowered, the contractor can submit more competitive bids, the project becomes more profitable and in addition it makes the firm to be capable and also helps to have good will among different stakeholders. Therefore measuring productivity, identifying factors affecting productivity and use productivity improving approaches should be a major and continual concern for construction contractors to increase the probability of projects to be completed as per the budgeted cost and specified time.

Defense Construction Enterprise was established in 2010 by Ethiopian ministry of council regulation NO 185/2010 as public enterprise and Ministry of National Defense as supervising authority of the enterprise. It is registered as grade one contractor that is qualified to undertake construction of building, roads, railway, bridge, airport, dam, and other related works.

The purpose for which the enterprise is established is to engage in any construction activity mainly to satisfy the national defense construction and infrastructural development needs. Besides, to engage in the construction of roads, dams, irrigation infrastructure, Buildings and other construction related works in the country.

Henceforth its establishment, the enterprise had completed 18 roads, dam, irrigation, building and real estate projects which worth around birr 4.7 billion in the last seven years. Currently, there are 23 construction projects under construction which worth around 14.7 billion. The enterprise annual income turnover is around 1.7 billion on average for the last seven years.

## 1.2. Statement of the problem

In the construction industry productivity loss is one of the greatest and severe problems. Previous researches shown that, from various project-costs a component such as labors, materials and equipment's, labor component is considered the most risk. Whereas others components (equipment and material) can be determined by the market price. Labor cost in construction industry is estimated to be about 33%- 50% of the entire project cost Hanna (2005). Because labor is more variable and

unpredictable than other project-cost components, it becomes necessary to understand the effects of different factors on labor productivity. Previous research confirms that productivity loss results from various factors, which includes but not limited to various variation in long hour of extra work, poor field management, and extreme climate conditions (Alarcon and Borcherding ,1991;Thomas and oloufa,1995). There are many researches worldwide had been done on labor productivity, which investigating factors that affect labor productivity. But none of them address the factors that affect labor productivity in DCE building construction. The researcher is inspired to assess the factors related to the enterprise context and provide practical suggestion and recommendation aiming to upgrade the knowledge in order to improve the labor productivity in building construction projects in DCE.

## 1.3. Research Question

- What are organizational, technological, labor, and design and specification related factors that affect labor productivity in building construction projects in DCE?

## 1.4. Objective of the Study

### 1.4.1. General objective

- To investigate factors affecting labor productivity in building construction projects at defense construction enterprise.

### 1.4.2. Specific Objectives

- To examine the effect of organizational related factors that affect labor productivity in building construction in DCE.
- To identify the effect of technological related factors that influence labor productivity in building construction projects in DCE.
- To assess the effect of labor related factors that affect labor productivity in building construction project in DCE.
- To identify effect of design and specification related factors that affect labor productivity in building construction project in DCE.

## 1.5. Research Hypothesis

- H1: Design related factors have positive statistical significant effect on labor productivity
- H2: technology related factors have positive statistical significant effect on labor productivity
- H3: organizational related factors have positive statistical significant effect on labor productivity
- H4: labor related factors have positive statistical significant effect on labor productivity

## 1.6. Significance of the study

Productivity has a great significance in the construction industry. Labor productivity a significant part of production input for construction projects. In the construction industry, many external and internal factors are never constant and are difficult to anticipate. This factor leads to a continuous variation in labor productivity. It is necessary to bear in mind that a reduction in productivity affects the schedule of the work and causes delays. The consequences of these delays could result in serious money losses.

Increased productivity in the construction industry benefits the two Contracting; the Client and the Contractor of the project. From the Clients' perspective, increased productivity lowers costs, shortens construction schedules and achieves better returns on investments. From the contractor's perspective, increased productivity leads to a more satisfied customer, leads to faster turnover and increased profits.

The conclusions that will be drawn from this study will be used by the construction practitioners of DCE to take account of these factors at an early stage in order to minimize the time and cost overrun. Besides, the investigated factors can serve as a checklist for construction practitioners to give attention to enhance the productivity of labors so as to make the project to be completed as per the plan.

## 1.7. Scope of the study

The research study attempted to identify and rank factors affecting labor productivity in building construction projects from contractor's perspective. In addition, this research was limited to organizational, technological, labor, and design and specification related factors affecting labor productivity in building construction projects that are under construction in Addis Ababa. The target respondents were top, middle, and lower level managers, project manager and, and senior site and office engineers who work at the head office and projects that are involved in building construction projects management process.

## 1.8. Limitations of the study

The study was envisaged from the contractor's perspective towards factor affecting labor productivity in building construction project and clients and consultant views were not considered in the study. If the view of consultants and clients had been considered in the study there might be a better perspective and results. Since the study takes in to account the influence of organizational, technological, labor and design related factors to labor productivity, the influence of other factors such as natural environment, leadership, etc. which may have significant influence in the project management process and thus was not considered in the study.

## 1.9. Organization of the Study

This study was organized in five chapters. Chapter One discussed the background of the study, the objective of the study which was to assess the factors that influences labor productivity a case of the DCE, the statement of the problem, research questions, significance of the study, limitation of the study, delimitations of the study, and the organization of the study.

Chapter Two covered the literature review which includes theoretical and empirical review of related literature. It has also described the conceptual framework and the knowledge gaps.

Chapter Three consisted of the research methodology that was used for the study. It consisted of the research design, the target population, the sample size and sampling procedures, research instruments, data collection procedures and data analysis

methods. Chapter Four covered data analysis, presentation and interpretation. Chapter Five comprised of the summary of findings, conclusion and recommendations and suggestions for further research.

# CHAPTER TWO: REVIEW OF RELATED LITERATURE

## 2.1.Theoretical Framework

### 2.1.1. Construction Project Management

In the business world project usually means creating something that someone else wants and is prepared to pay for. According to Namho Kim (2007), the construction industry's core business is undertaking projects in generating new buildings or renovating existing ones for a variety of clients. A project is a temporary endeavor undertaken to create a unique product, service or result Project Management Institute (2008). According to Hillson D. (2009), all projects are risky and there are three separate reasons for that. The first reason is that all projects share common characteristics which inevitably introduce uncertainty. Some of this common characteristics are projects are unique, complex, involve assumptions and constraints, performed by people and involve change from a known present to an unknown future. The second reason is that all projects are undertaken to achieve some specific objectives. The final reason is that all projects are affected by the external environment they exist in.

Since the construction industry is mostly project-oriented, the performance of the construction company is dependent on the performance of projects. Projects have a target, which means they have to be built right, within a cost budget, and finished by a certain date. Project management is simply making sure that all these targets are met.

According to the Project Management Institute, the discipline of project management can be defined as follows: Project management is the art of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, cost, time, and quality and participation satisfaction Chris Hendrickson (2000),

### 2.1.2. Construction Performance Management

Many construction companies have to manage their business performance in order to achieve their enterprise purpose. A number of companies have managed to make individual goals be coincident with organizational goals in order to maximize effectiveness against the crisis; rapidly changing business environment. To encounter this change, companies have started to bring in Performance Management, in order to accomplish organizational goal, to enhance their competitive power in the marketplace at the same time Namho , Lee, Moonseo Park and SeungjunRoh (2007).
In order to have good performance for a company, Slack (2001) offer the following description of high-performance operations that most companies aim to accomplish:

- Quality; High-quality operations do not waste time or effort having to re-do things, nor are their internal customers inconvenienced by flawed service.
- Speed; Fast operations reduce the level of in-process inventory between micro operations, as well as reducing administrative overhead.
- Dependability; Dependable operations can be relied on to deliver exactly as planned. This eliminates wasteful disruption and allows the other micro operations to operate efficiently.
- Flexibility; Flexible operations adapt to changing circumstances quickly and without disrupting the rest of the operation. Flexible micro operations can also change over between tasks quickly and without wasting time and capacity.
- Cost; Low cost operations lead to higher profits as well as allowing the company to sell their products to a competitive price.

Traditionally, three indicators have been used to evaluate the success of construction projects: cost, time and quality. Kagioglou (2001) contend that these measures are insufficient, and that many other factors exist that can influence customer satisfaction and the client's willingness to pursue a given procurement route in the future. It has been proposed, for example, that project success should also take into account the project's psychosocial outcomes, which refer to satisfaction of interpersonal relations with project members. Also the absence of criteria related to legal claims has recently been highlighted Chan (2004). The memories of other

people involved and impressions of harmony, goodwill and trust or, conversely, of arguments, distrust and conflict, stay long after financial success or early completion has been attained Ward and Chapman (1991).

The UK best practice programme has launched the 'key performance indicators' (KPIs) for construction [1999]. These KPIs give information on the range of performance being achieved on all construction activity and they comprise of:

1. Client satisfaction – product
2. Client satisfaction – service
3. Defects
4. Predictability – cost
5. Predictability – time
6. Profitability
7. Productivity
8. Safety
9. Construction cost
10. Construction time

These KPIs are intended for use as benchmarking indicators for the whole industry whereby an organization can benchmark itself against the national performance of the industry and identify areas for improvement i.e. where they perform badly. It is clear to see that those measures are specific to projects and offer very little indication as to the performance of the organizations themselves from a business point of view apart perhaps from the 'customer perspective'. Furthermore, none of the measures deals successfully with the 'innovation and learning perspective' apart perhaps from the predictability indicators whose accuracy can illustrate some form of learning from previous projects.

### 2.1.3. Productivity and Related Terms

**Productivity and Profitability**

Profitability is often confused with productivity. The difference between these concepts is that profitability takes into account monetary effects, while productivity relates to a real process that takes place among purely physical phenomena. Like

productivity, profitability is also seen as a relationship between output and input, but the relationship is monetary Stefan Tangen (2001). In the long run, productivity is considered more suitable than profitability as a measure for monitoring manufacturing excellence since profits are influenced by many factors over the short term that can give a misleading indication of long-term success Stefan Tangen (2001). Nevertheless, profitability is a crucial indicator for a company because it shows whether the company is making money with its business Aki Pekuri, HarriHaapasalo, MailaHerrala (2011).

Profitability does not have a direct impact on improvement purposes since it is a result of, rather than a contributor to, the actions and processes in operations. However, profitability is a good supplement to performance and productivity measures since it helps to identify the effects of monetary changes and distinguish them from "true" performance and productivity changes Gru¨nberg, T. (2004)

An integrated analysis of profitability and productivity makes the application of productivity theory more practical for managers. Combining those two ratios can help to clarify the true reasons for increased profits Bernolak, I. (1997).

**Productivity and Performance**

Performance is another concept that is often confused with productivity. Whereas productivity is a fairly specific concept related to the ratio between output quantity (i.e. produced products) and input quantity (i.e. resources that are consumed in the operation process), performance is a broader concept that covers both the economic and operational aspects of an industry. Performance refers to excellence, and includes profitability and productivity among other no cost factors, such as quality, speed, delivery and flexibility.

**Productivity Measurement in Construction sector**

While each contractor or owner is free to use its own system to measure labor productivity at a site, it is a good practice to set up a system which can be used to track productivity trends over time and in varied locations. Considerable efforts are required to collect information regionally or nationally over a number of years to

produce such results. The productivity indices compiled from statistical data should include parameters such as the performance of major crafts, effects of project size, type and location, and other major project influences.

In order to develop industry-wide standards labor productivity, there must be a general agreement on the measures to be useful for compiling data. Then, the job site productivity data collected by various contractors and owners can be correlated and analyzed to develop certain measures for each of the major segment of the construction industry. Thus, a contractor or owner can compare its performance with that of the industry average Chris Hendrickson (2000).

### 2.1.4. Construction Productivity

There is not only one single definition for productivity. It can be measured and defined in many different ways. The word "productivity" was mentioned in an article by Quesnay in 1766 Jarkas, 2012; Soham (2013). The Oxford English dictionary defines productivity as "the power of being productive, efficient and the rate at which goods are produced". At the beginning of the twentieth century, a better understanding and definition was given to productivity. The American Association of Cost Engineers (2008) defined productivity as a "relative measure of labour efficiency, either good or bad, when compared to an established base or norm". More research was done to improve and measure productivity, where many researchers have defined productivity in different ways. Krugman (1994) defined productivity as the "ratio between the output volume and the volume of inputs". In other words, it measured how efficiently production inputs such as labour and capital, are being used in an economy to produce a given level of output. Ailabouni (2012) defined productivity as "the ratio of output of required quality to the inputs for a specific production situation". In the United States the construction industry defines productivity as "to measure the effectiveness with which management skills, workers, materials, equipment, tools and working space are employed at, or in support of, work-face activities, to produce a finished building, plant, structure or other fixed facilities at the lowest feasible cost" Wah Chui (2010).

The Building and Construction Sector Productivity Taskforce BCSPT (2009) sees productivity "as an industry's ability to convert inputs into outputs". Productivity has been looked at as a way to measure performance of construction labor. Durdyeu (2011), defines productivity as "a measure of how well resources are leveraged to achieve set objectives or desired outputs. This agrees with the organization for economic co-operation and development that commonly defines productivity as a ratio of a volume measure of output to a measure of input use. The House of Commons in the United Kingdom defined productivity as how efficiently inputs (labour and capital) are used to produce outputs (goods and services). Many definitions of the word "productivity" exist. For the basis of this study the Merriam-Webster definition will be used. Merriam-Webster defines productivity as the quality or state of being productive. Labor productivity is typically measured as output per worker or output per labor-hour. Although there are endless definitions for productivity, they all refer to productivity as a comparison of input versus output. Productivity = Output/ Input Productivity serves as a source of competitive advantage. Increasing productivity will increase output or the quality of output and if at a faster rate than competition, benefits will be achieved through the value-added through the products McTague (2002).

Productivity is a multidimensional term, the meaning of which can vary, depending on the context within which it is used. However, there are common characteristics that tend to be embraced by the term. In industrial engineering, productivity is generally defined as the relation of output (i.e. produced goods) to input (i.e. consumed resources) However, there are several variations on this basic ratio, which is often too wide a definition to be useful in practice.

### 2.1.5. Labor Productivity in Construction Projects

In construction, productivity can be regarded as a measure of outputs that are obtained by a combination of inputs. The input resources are labor, material, equipment, plant, energy and capital, but they are not limited to only these sources. Dozzi (1993) defined labor productivity in construction as "the physical progress achieved per hour".

All construction projects rely on the productivity of equipment and workers to achieve good results. Due to its importance, productivity is one of the most frequently discussed topics in the construction industry. As stated previous researcher's labor can cost up to 50% of the overall project budget, and reducing laborer's cost can be achieved by improving labour productivity. Poor productivity of labor can cause delay to projects, and additional cost to the overall budget. Delay can be defined as extra time that can lead to financial distress. Delay can also cause customer dissatisfaction, because delays, project failures, and cost overrun can result in the client no longer doing business with this construction company. The aforementioned problem can be eliminated by improving labour productivity Sambasivan (2007). It can also be stated that labour productivity is particularly important especially in developing countries where most of the building work is still carried out on a manual basis. The problem with productivity does not just have a direct effect on project success, cost, delay and customer satisfaction but it also has indirect effect on the workers and the organization in their motivation and teamwork Sambasivan (2007). The definition for productivity with regards to construction is the measurement of the output of construction goods and services per unit of labor McTague (2002). McTague (2002) of "Productivity Improvements on Alberta Major Construction Projects" compiled the following list of commonly used definitions to measure productivity in the construction industry:

Labor Productivity = Output/ Labor Cost or

Labor Productivity = Output/Work Hours

In case the input is a combination of various factors, productivity is termed as

Total Factor Productivity and is measured as Total Factor Productivity = Total Output/ Labor + Material + Equipment + Energy + Capital Implication of Time and Cost Overrun

### 2.1.6. Importance of Labor Productivity in Construction Projects

Labor productivity is one of the most serious factors that affect the physical progress of any construction project Durdyeu (2011). In order for any construction industry to keep improving project success, it first needs to improve the standard of labor

productivity to reduce the cost of any construction project. Every contractor, subcontractor and employer has to agree to a contract for the project to start. These contracts have a start date, plan, budget, work scope, duration, finish date and other important factors for any project. Hammad (2011) pointed out that "Every year companies and contractors are hit with billions of dollars in construction claims as a result of lack of labor productivity". Improving labor productivity in construction projects will, not only result in project success, but will also result in a significant impact on improving the GDP, which affects the economy and reputation of any country.

## 2.2.Empirical Review of Related Literature

### 2.2.1. Construction Projects and Labor Productivity

Since each project has its own climate, technology, materials, budget, design and so on, Labor productivity in every construction project depends on a number of factors that are affected by various reasons. To achieve the income expected from any construction project and make sure the project is successful, it is important to have good control of the productivity factors that can affect the labor. This agrees with what Soham (2013) has stated in his research paper "critical factors affecting labour productivity in construction project; case of South India", that solving factors that affect labour productivity can have a direct effect on the project success, and can save time and cost. Identification and study factors affecting labor productivity on construction projects has become a major issue facing both project managers and contractors in increasing labour productivity Attar (2012). This agrees with Atkinson (1997) that "it requires an understanding of the various indicators of productivity as a path to understanding the performance of the project" to increase labour productivity in construction projects.

In most construction projects, project managers give a great deal of their construction activities to sub-contractors in order to decrease the project costs Ghoddousi (2012). Working with such a method makes the sub-contractor base earn profit on the volume they perform, so there is no doubt that they put in a constant tireless effort to produce as much as possible. The sub-contractors are then responsible for supplying

human resources and are paid in relation to the volume of the completed work. This method agrees with the conclusion reached by Ailabouni (2009) that "subcontractors are not interested in the factors affecting labour productivity (performance) and improving them" because they think it's a waste of time and paying attention to such factors doesn't make a difference to the construction project success.

Although many researchers have studied the factors affecting labour productivity, there are still productivity problems that remain unknown and need to be further investigated in developing countries Soekiman (2009). Jarkas (2012), has stated that factors in developing countries are different from those in developed countries, and that labour in developing countries can handle more tasks with unfair wages just to keep an income for their families. Olabosipo (2011) indicated that "influencing factors are rarely constant and may vary from country to country, from project to project, and even on the same project depending on the circumstances, anything influencing them can subsequently affect productivity". This disagrees with Durdyeu (2011) in a similar research done in New Zealand stating that "Although major productivity factors may vary amongst projects, companies, and geographical areas, some similarities in issues obstructing productivity could be observed. Therefore, lessons learned to overcome productivity challenges at one project may be useful to be applied at another project for productivity improvement".

Sanders and Thomas (1991) in their study reveals that an accident that causes an injured person to be hospitalized results in a work decrease of the crew for which the injured employee worked. Small accidents resulting from nails and steel wires can stop work and, thus, decrease productivity

Inefficiency of equipment and poor quality of the raw material are factors which cause low productivity. The productivity rate of inefficient equipment is low. Old equipment is subject to a great number of breakdowns, and it takes a long time for the laborers to complete the work, thus reducing productivity. Poor-quality material used for work is the other factor because poor materials generally lead to unsatisfactory work and can be rejected by supervisors, thus reducing the productivity.

Alum and Lim, (1995); Guhathakurta and Yates (1993). In their studied Material management factor is one of the most important factor in construction industry. Productivity can be affected if required materials, tools, or construction equipment for the specific are not available at the correct location and time. If the improper tools or equipment is provided, productivity may be affected.

Casey jo kuykendall (2007) on her thesis on key factors affecting labour productivity in the construction industry found out that good communication is necessary to efficiently complete a project. Lack of sufficient communication can lead to lack of worker motivation.

Vivek Kumar Patel, Sohit Agrawal, Dr. Mukesh Pandey (2017) did their study on factors affecting labor productivity. From the results it was found Changes in orders and order variation during the project causes low productivity. Materials and tools shortage lead to low productivity. Continuous work without proper break causes stress and fatigue and overwork consequently affecting productivity

### 2.2.2. Factors affecting labor Productivity in Construction Projects

Identification and evaluation of factors affecting construction labor productivity have become a critical issue facing project managers for a long time in order to increase productivity in construction Motwani, J. Kumar, A. and Novakoski, M. (1995). Understanding critical factors affecting productivity of both positive and negative can be used to prepare a strategy to reduce inefficiencies and to improve the effectiveness of project performance.

Knowledge and understanding of the various factors affecting construction labor productivity is needed to determine the focus of the necessary steps in an effort to reduce project cost overrun and project completion delay, thereby increasing productivity and overall project performance. The results will be useful information to improve construction productivity in Ethiopia.

There are a wide range of factors that influence the productivity of construction industry. Much has been published about the factors that affect construction productivity and several key factors are usually cited in the literatures. Based on past researches, supervision, resource availability, project uniqueness, organization of the

work, labor availability, changes in technology, management (poor or good), labor organizations, wages, training of workers, motivation, training of the work force, weather conditions, uncertainty, location, monitoring of performance and others have been identified as factors affecting construction labor productivity.

Different researchers have studied the factors that affect construction productivity and the key factors are summarized and categorized based on their characteristics as stated bellow

According to Carl T. 1999, the factors are summarized and categorized in groups according to their characteristics, namely: Project Uniqueness, Technology, Management, Labor Organization, Real Wage Trends and Construction Training.

David Stied.1998, groups the factors as; Motivation and experience of the workforce, Organization of the work, Type and condition of tools and equipment provided to the worker, and Continual monitoring of performance.

Allison L. 2009 categorizes the factors as: Skilled labor availability, Technology utilization, Offsite fabrication and modularization and Use of industry best practices.

The casual factors for low productivity is critically reviewed from the above researches and in this research the factors are summarized and categorized in to four groups according to their characteristic; Design and specification related factor , Labor related factor , equipment and Technological related factor and the organizational related factor.

#### 2.2.2.1. The Effect of Design Related Factors on Labor Productivity

Generally, projects come across some design, drawings and specification changes during construction. If drawings or specifications are with errors and unclear, productivity is expected to decrease since laborers in the field are uncertain about what needs to be done. As a result, task may be delayed, or have to be completely stopped and postpone it until clear instruction. As it is studied in different researches, there is a 30% loss of productivity when work changes are being performed Thomas (1991). The following are design related issues that lower labour productivity: - Design changes, incomplete drawing and Inaccurate designate design related .

#### 2.2.2.2. The effect of organizational Related Factors on Labor Productivity

Management complicates progress in productivity within the construction industry. Past studies found that poor management was responsible for over half of the time wasted on a job site Business Round Table (1983). Good management is required for profitability and success. As the previous researches show there is currently a lack of formal training in the construction industry. The workforce of contractors is highly mobile. For this reason, contractors are often reserved to invest capital to train those who may soon be someone else's employees. The result may be a decrease in the construction workforce average capability level. These also affect the productivity of the site as they are the providers of most resources to the construction project. Poor scheduling and communication between the project office and the head quarter contribute a lot in causing disruption of projects temporarily.

According to Gundecha; Managers' skill and attitudes have a crucial bearing on productivity. In many organizations, productivity is low even though the latest technology and trained manpower are made available. Low productivity is because of inefficient and indifferent management. Experienced and committed managers can obtain surprising results from average people. Employees' job performance depends on their ability and willingness to work. Management is the catalyst to create both. Advanced technology requires knowledgeable laborers who, in turn, work productively under professionally qualified managers. It is only through sound management that optimum utilization of human and technical resources can be secured.

Businesses exist to be successful. However business objectives are to be achieved through people; and people are the most difficult resource to manage. People or employees in the organization may not perform in the way they are expected to if they are not interested and are not driven into action from within. That is - they need to be motivated. Motivation is one of the important factors affecting construction labor productivity. Motivation can best be accomplished when labors personal ambitions are similar to those of the company. Factors such as payment delays, a lack of a financial motivation system, non-provision of proper transportation, and a lack of training sessions are grouped in this topic DeCenzo and Holoviak (1990).

#### 2.2.2.3. The effect of labor related factors on labor productivity

Literatures show that to achieve good productivity, labor plays a significant role. The following are the major causes for low productivity on construction projects those are related to labor. There should be sufficiently skilled and experienced laborers on projects in order to make the projects productive. If labors are unskilled and in lack of experience, they take longer time to complete specified task and there will be a possibility of rework, therefore incompetence of labors can be considered as one of the possible causes for the decrease in productivity.

Misunderstanding among laborers creates disagreements about responsibilities which lead to a lot of work mistakes resulting rework and consequently it decreases labor productivity. Lack of compensation and increased laborer age negatively affect labor productivity because labor speed and strength decline over time and reduce productivity Heizer and Render (1990).

Overcrowded labor force on projects is found out to be one of the main reasons for low productivity. This is caused when work planners hire too many workers for the estimated work scope and duration. One of the causes for overstaffing is the false assumption that increased manpower will always result in increased work productivity.

Lack of labor experience, high absenteeism of labors, incompetence of labors, use of alcohol and drugs, overcrowded labor force, poor relationship between labors, indiscipline labors, and personal problems are the main factors which negatively affects labor productivity.

#### 2.2.2.4. The effect of technological Related Factors on labor productivity

Inappropriate type and size of construction equipment often affects the productivity of construction projects. In order to increase job-site productivity, it is beneficial to select equipment with the proper characteristics and a size most suitable for the work conditions at a construction site. Lack of equipment and frequent damage of equipment are investigated from previous researches as the main casual factors for

low productivity because it takes a long time for the laborers to complete the specific work.

Technology advancement has also an effect on overall productivity on construction site. Tools and machinery have increased both in power and complexity. These advances in technology can significantly change skill requirements. Goodrum and Haas have shown that when the technology is becoming more advanced, the productivity of labors will be improved by 30 % to 45 %.

Literatures describe that technology can enhance productivity of individual tasks. Note that while technology can generally improve labor productivity, there is a cost associated with employing technology. Improvement in labor productivity is not an ultimate goal. For example, capital investment in technology can be increased to improve labor productivity, but this approach may not be the optimal solution when overall costs and benefits are considered Allison, Robert, and David (2009),.

Decrease in productivity is usually caused when there is insufficient quantity or quality of tools and equipment to meet the needs of the project, frequent damage of equipment and absence of technological advancements for machineries.

## 2.3. Research Gap

Literatures show that to achieve good productivity, labor plays a significant role. The following are the major causes for low productivity on construction projects those are related to labor. There should be sufficiently skilled and experienced laborers on projects in order to make the projects productive. If labors are unskilled and in lack of experience, they take longer time to complete specified task and there will be a possibility of rework, therefore incompetence of labors can be considered as one of the possible causes for the decrease in productivity.

As it is studied in different countries construction projects worldwide have been experiencing significant cost and time overruns, with low labor productivity identified as a major reason for project delays and cost overruns.

In order to enhance the construction industry in Ethiopia, improving of labor productivity has a significant role due to the fact that the construction industry

involves an employment of huge number of employees to carry out the work. In line with this all the related stakeholders of the construction industry including the government should take their parts in the improvement of construction labour productivity.

It is known that most of the contract types of the construction projects in Ethiopia are fixed rate types; hence Contractors specially face serious problems due to lower labor productivity in their projects. The contractors should study and identify internal and external factors influencing the productivity of labors to minimize the impact on the performance of their projects. Furthermore it is very vital to identify opportunities that enable the construction productivity to be improved.

As it is assured by various studies most of the labor productivity influencing factors is related to contractors' inability to supply of materials, deployment of machineries, and assignment of competent personnel, financial stability and overall project management.

Different previous studies indicate that issues related to the responsibilities of Consultants and Clients are among the major factors affecting labour productivity. Factors related to incompleteness of design, lack of appropriate supervision, technical competency of Engineers and unclear specification are the major gaps forwarded by many studies as a major gaps of consultants attributes for lower labour productivity in the construction projects.

On the other hand employers interference, variation orders and delayed issuance of payments are the major factors related to Clients that influences the productivity of labor in the construction projects.

Effect of bad weather, rain, wind, high/low temperature and unforeseen conditions (Eg. ground condition) are among the critical reasons for lower labor productivity.

Like other countries, the construction industry in Ethiopia has a significant role in the development of other industries. Accordingly the improvement of the growth of the construction industry contributes for the growth of many other sectors. Improvement of construction labor productivity is therefore critical.

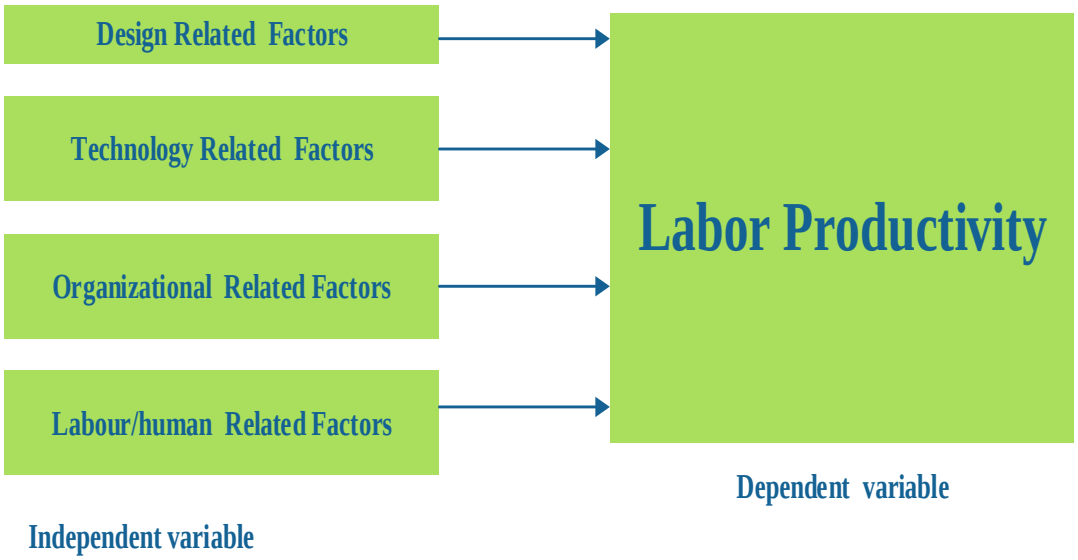
A critical attention should be given by the construction professionals in Ethiopia to improve the productivity of labor in the construction projects. In order to improve

the construction productivity identifying the influencing factors is very vital. After productivity factors are identified, all the related stakeholders can take respective actions to mitigate these issues.

Hence, this study aims to identify the critical factors relating to organizational, technological, labor, and design and specification influencing labor productivity in building construction projects.

## 2.4. Conceptual Framework

The conceptual framework in this study was used to show various variables that affect the labor productivity in building construction projects.




Source: own construction (2019)

**Figure 2.1.Conceptual framework**

# CHAPTER THREE: RESEARCH METHODOLOGY

## 3.1.Introduction

This chapter outlines the methodology used in the research study. It describes the type of research design that was used, target population, sample size and sampling procedure, Research instruments, a description of tools used in collecting the data, the measurement of variables and the techniques used in analyzing the collected data reliability of data collection instruments, data analysis techniques and ethical considerations.

## 3.2.Research Design and Approach

### 3.2.1. Research Approach

The researcher adopted quantitative approach to research. Quantitative research involves the collection of data so that information can be quantified and subjected to statistical treatment in order to support or refute "alternate knowledge claims" Creswell (2003). Creswell (2002) asserts that quantitative research originated in the physical sciences. The researcher uses mathematical models as the methodology of data analysis. Three historical trends pertaining to quantitative research include research design, test and measurement procedures, and statistical analysis. Quantitative research also involves data collection that is typically numeric and the researcher tends to use mathematical models as the methodology of data analysis.

### 3.2.2. Research Design

The researcher used descriptive and explanatory type of research method. These types of research method help the researcher describe and explain the labor productivity and the variables or factors affecting labor productivity in building construction project that are under construction by defense construction enterprise in Addis Ababa city.

## 3.3.Data Sources

This study used primary data sources and data is collected from employees who are working in different building projects and head quarter of the enterprise. Primary

sources of data include close ended questionnaire in that the respondents' level of agreement towards factors affecting the labor productivity was assessed.

### 3.4.Target Population

There are 115 permanent and contract employees in 11 building projects and 33 top, middle and lower level manager in head office of the enterprise. This gives a total population of 159. A summary of the population is given below:

**Table 3.1**: **Sampling Frame**

| S.N | Name of building projects | N | % |
|---|---|---|---|
| 1 | Defense Head Quarter Project | 20 | 12.6 |
| 2 | Kality Apartemtn Phase-1 project | 12 | 7.5 |
| 3 | Kality Apartemtn Phase-2 project | 12 | 7.5 |
| 4 | Sumit Army Foundation project | 11 | 6.9 |
| 5 | Gofa Apartement Phase -1 | 12 | 7.5 |
| 6 | Gofa Apartement Phase -2 | 12 | 7.5 |
| 7 | Shegole Apartment | 14 | 8.8 |
| 8 | Ethiopian Information Network Security Agency | 12 | 7.5 |
| 9 | Janmed Staff Collage | 15 | 9.4 |
| 10 | Debrezeyit Engineering College | 13 | 8.2 |
| 11 | Addis Ababa Children And Youth | 12 | 7.5 |
| 12 | Head Office | 14 | 8.8 |
| | Total | 159 | 100 |

Source: DCE Human Resource and General Administrative Department

### 3.5.Sampling Procedure

Proportional Stratified random sampling procedure was applied in order to select sample from each category of respondent. Yamane (1967) provides a simplified formula to calculate sample sizes.

$$n = \frac{N}{1 + N(e)^2}$$

Where

- n is the sample size,

- N is the population size,
- e is the level of precision.

Given the total popolation of 159 and 95% level of significance (5% level of precision) , the sample size is assumed to be 114 (72%) of the target popolation

### 3.6.Sampling Frame

Given the proportionate of the sample, the sample distribution is given below

**Table 3.2: Sample size**

| S.N | Job Position | total |
|---|---|---|
| 1 | Defense Head Quarter Project | 14 |
| 2 | Kality Apartment Phase-1 | 9 |
| 3 | Kality Apartment Phase-2 | 9 |
| 4 | Sumit Army Foundation | 8 |
| 5 | Gofa Apartment Phase -1 | 9 |
| 6 | Gofa Apartment Phase -2 | 9 |
| 7 | Shegole Apartment | 10 |
| 8 | Ethiopian Information Network Security Agency | 9 |
| 9 | Janmed Staff Collage | 11 |
| 10 | Debrezeyit Engineering Collage | 9 |
| 11 | Addis Ababa Children And Youth | 9 |
| 12 | head office | 10 |
| | **Total** | **114** |

Source: own construction (2019)

### 3.7.Data Collection Tool

#### 3.7.1. Questionnaire

Questionnaires were distributed to top, middle, and lower level managers, and senior office and office engineers as well as to project managers who are located in Addis Ababa and . The research evidence was gathered by using close-ended questionnaires.

In order to be able to select the appropriate method of analysis, the level of measurement must be understood. For each of measurement, there are /is an appropriate method/s that can be applied and not others. In this research, ordinal scale was used. Ordinal scale is a ranking or a rating data normally uses integers in ascending and descending order. Hence, the questionnaires will be structured based on those used by Iyoha and Faboyede (2011), and Sharif (2010). With regard to the close- ended questions, the respondents will be asked to indicate their level of agreement on a five-point Likert scale with the following ratings.

| **Item** | **Strongly Agree** | **Agree** | **neutral** | **Disagree** | **Strongly Disagree** |
|---|---|---|---|---|---|
| **Scale** | (5) | (4) | (3) | (2) | (1) |

On this scale a score of 5 or 4 indicates that the item is perceived to be essential while a score of 3 or 2 indicates that the item is perceived to be fairly important, but not essential, while a score of 1 indicates that the item could be disregarded for being unimportant. Similar scales have been used by Courtis (1992) and Iyoha and Faboyede (2011) and is found suitable. With respect to the open-ended questionnaires the respondents were asked to provide open ended responses to the questions that require opinion and if they have opinions they feel the researcher would find useful.

The relative index technique has been widely used in construction research for measuring attitudes with respect to surveyed variables. Several researches use the relative importance index in their analysis. The respondents will be asked to gauge the identified interface problems on a five-point Likert scale (1 for the not significant to 5 for the extremely significant).Based on the survey response, a relative importance index was tabulated using the following equation. (et tal Hallay, Tayeh,2015)

$$\textbf{Relative Importance Index} = \sum \frac{W}{AN} = \frac{5n5+4n4+3n3+2n2+1n1}{5N}$$

Where W is the weighting given to each factor by the respondent, ranging from 1 to 5, (n1 = number of respondents for strongly disagree, n2 = number of respondents for disagree, n3 = number of respondents for neutral, n4 = number of respondents for agree, n5 = number of respondents for strongly agree). "A" is the highest weight (i.e. 5 in the study) and N is the total number of samples.

### 3.8.Method of Data Analysis

The component part of descriptive statistics such as **Mean** and **Standard Deviation** is used while analyzing and ranking the different factors that affects the productivity of labor.

Furthermore, the relationship between the dependent variable labor productivity and the independent variables such as design and specification related factor, labor related factors, technology Related Factors and organizational Related Factor, are expressed as a linear combination of the independent variables plus an error term.

Following Greene (2003), the multiple linear regression models are specified as:

$$\mathbf{Y= \beta 0 + \beta 1 X_1 + \beta 2 X_2 + \beta 3 X_3 + \beta 4 X_4 + \varepsilon}$$

Where: Y= labor productivity

$\beta_0$ - Constant term

X1= design Related Factor

X2= organizational Related Factor

X3= technology Related Factors

X4= labor/human Related Factors

Where the $\beta_S$ are coefficients of independent variables, Xs are column vectors for the independent variables in this case; design Related Factor , organizational Related Factor, technology Related Factors, labor/human Related Factors, while ε is a vector of errors of prediction. The error was assumed to be normally distributed with an expected value of zero and a common variance.

To do so, the study used **IBM SPSS 21** which the most suitable for descriptive statistics and quantitative analysis.

### 3.9.Reliability of the Instruments

This section presents test of reliability of questionnaire according to the pilot study. The reliability of an instrument is the degree of consistency which measures the attribute; it is supposed to be measuring Polit and Hunger (1985). The less variation an instrument produces in repeated measurements of an attribute, the higher its reliability. Reliability can be equated with the stability, consistency, or dependability of a measuring tool. The test is repeated to the same sample of people on two occasions and then compares the scores obtained by computing a reliability coefficient Polit and Hunger (1985).

Cronbach's coefficient alpha George and Mallery (2003) is designed as a measure of internal consistency, that is, do all items within the instrument measure the same thing? Cronbach's alpha is used here to measure the reliability of the questionnaire between each field. The normal range of Cronbach's alpha value between 0.0 and + 1.0. The closer the Alpha is to 1, the greater the internal consistency of items in the instrument being assumed. The formula that determines alpha is fairly simple and makes use of the items (variables), k, in the scale and the average of the inter-item correlations, r:

$$\alpha = \frac{k\,r}{1+(k-1)\,r}$$

As the number of items (variables) in the scale (k) increases, the value of $\alpha$ becomes large and also if the inter correlation between items is large, the corresponding $\alpha$ is large. Since the alpha value is inflated by a large number of variables then there is no set interpretation as to what is an acceptable alpha value. A rule of thumb that applies to must situations is:

| | |
|---|---|
| $0.9 \leq \alpha \leq 1.0$ | Excellent |
| $0.8 \leq \alpha < 0.9$ | Good |
| $0.7 \leq \alpha < 0.8$ | Acceptable |
| $0.6 \leq \alpha < 0.8$ | Questionable |
| $0.5 \leq \alpha < 0.6$ | Poor |
| $0.0 \leq \alpha < 0.5$ | Unacceptable |

Table 3.3 shows the values of Cronbach's Alpha for each filed of the questionnaire and the entire questionnaire. For the fields, values of Cronbach's Alpha were in the range from 0.7 and 0.91. This range is considered high; the result ensures the reliability of each field of the questionnaire. Cronbach's Alpha equals 0.861 for the entire questionnaire which indicates a Good reliability of the entire questionnaire. Thereby, it can be said that it is proved that the questionnaire is valid, reliable, and ready for distribution for the population sample.

**Table 3.3: Cronbach's Alpha for each filed of the questionnaire**

| s.n | Factors | Cronbach alpha value( α ) |
|---|---|---|
| 1 | Design and specification Related Factor | 0.908 |
| 2 | Organizational Related Factor | 0.7 |
| 3 | Technology Related Factors | 0.865 |
| 4 | Labor/human Related Factors | 0.868 |
| | Overall | 0.861 |

Source: own source (2019)

### 3.10. Ethical considerations

Ethics is one of the major considerations in research. The study is subject to the following ethical considerations. The research work was started after getting the willingness of the stated organization. Respondents were clearly communicated about the objective of the research before they are asked to give their answer. There

was no physical or psychological damage to the respondents because of the research. Respondents were not asked about their name, race, religion, etc.

# CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

## 4.1.Introduction

This chapter provides an analysis of data collected from the primary data source. The results were presented in tables to highlight the major findings. They were also presented sequentially according to the research questions of the study. Mean scores, standard deviations and mean of mean was used to analyze the data collected. The raw data was coded, evaluated and tabulated to depict clearly the results of factors influencing construction projects costs management in defense construction enterprise.

## 4.2.Socio-Economic Characteristics of Respondents

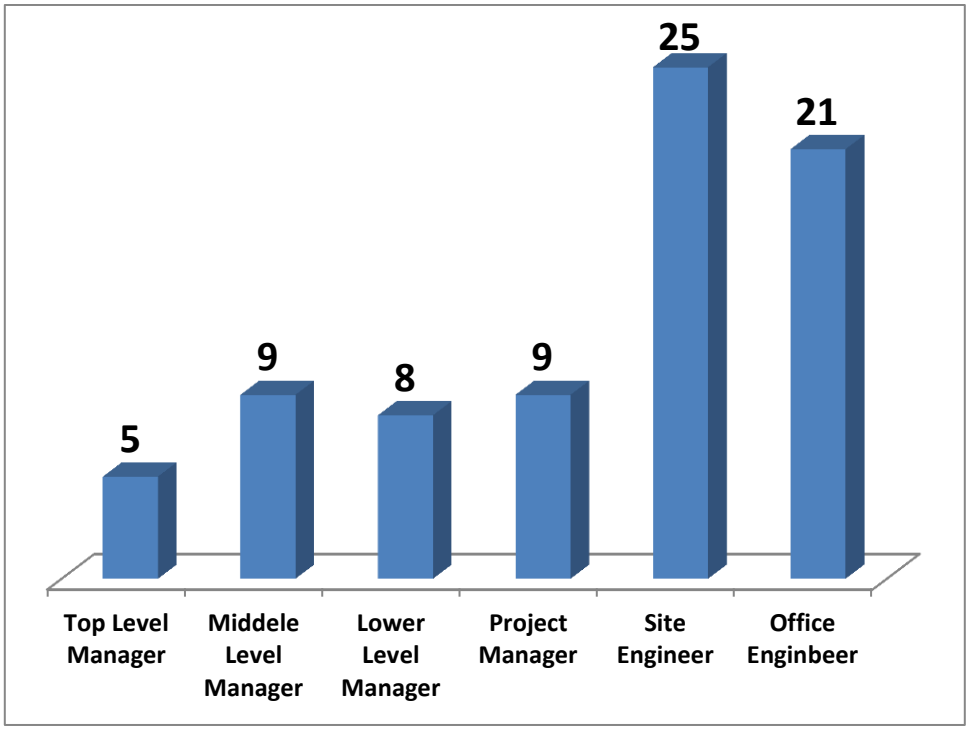
This chapter deals with discussions and results of the study. It is based on the information collected from survey. 114 questionnaires were distributed for employees working at defense construction enterprise and **77** questionnaires were responded. The response rate is 68%, which is assumed to be sufficient for further analysis.

**Table 4.1: Respondent Educational Level, Work Experience, and Job Position**

| | Characteristics | N (%) |
|---|---|---|
| | **Educational Level** | |
| 1 | Degree | 56 (73) |
| 2 | Second degree and above | 21 (27) |
| | **Total** | **77 (100)** |
| | **Work experience** | |
| 1 | Below 5 year | 10 (13) |
| 2 | 6 – 10 year | 23 (30) |
| 3 | 11- 15 year | 18 (23) |
| 4 | Above 15 year | 26 (34) |
| | **Total** | **77 (100)** |

Source: own survey (2019)

The above table shows the respondents educational level and work experience. Most of (73%) were first degree holders. In the case of work experience, most of the respondents were between the range of 6 and 10 years and above 15 years, which indicated that most of respondents have more years of work experience and which is an advantage to the study.




**Source: own survey (2019)**

**Figure 4.1: Job Position of Respondents**

Figure 4.1 shows majority of respondents' job position was site engineer, office engineers, and project manager, which account 25%, 21%, and 9% respectively. This implies that most of respondents are people who are actually engaged in the construction process that provided important information to the study.

## 4.3. Perceived Factors Affecting labor productivity in building Construction Projects

### 4.3.1. Perceived levels of labor productivity in building Construction Projects

The respondents' level perception towards the level of labor productivity in building construction projects is presented in the following table.

**Table 4.2: overall perceived levels of labor productivity in building Construction Projects**

| | N | Mean | SD |
|---|---|---|---|
| There is poor labor productivity in building projects | 77 | 4.22 | 0.995 |

Source: Survey Data (2019)

Table 4.2 shows that most respondents (mean =4.22 and SD=0.995) agree that there is poor labor productivity in building projects.

### 4.3.2. Perceived Design and Specification Related Factors

**Table 4.3: Perceived design and specification Related Factors**

| s.n | Design And Specification Factors | N | Mean | SD | Rank |
|---|---|---|---|---|---|
| 1 | There is delay in Preparation and delivery of drawings | 76 | 3.25 | 1.17 | 1 |
| 2 | There is incomplete and inaccurate drawings | 75 | 3.23 | 1.21 | 2 |
| 3 | There is design changes at building projects | 75 | 3.13 | 1.26 | 3 |
| | mean score | 76 | 3.20 | 1.19 | |

Source: survey data (2019)

Table 4.3 shows respondents' perception level towards design and specification related factors affecting the labor productivity in building projects.

Delay in Preparation and delivery of drawings by consultant was ranked first by respondents with mean= 3.25 and SD = 1.17 that affect labor productivity in building project.

Incomplete and inaccurate drawings was considered by respondents as the second most important (mean = 3.23 and SD =1.21) factor that affect labor productivity. Incomplete and inaccurate design makes employee idle and this result in employee to be without work for some time. This result is in line with Makulsawatudom and Emsley (2003) in that they asserted that recorded incomplete drawings as a major concern, attaining a ranking of the second most critical factor of labor productivity.

Design change was ranked as the third most important design and specification related factor (mean = 3.13 and SD = 1.29) that affect labor productivity in building projects. The result in in tandem with Thomas and Napolitan (1995) calculated an estimated 30% loss in efficiency when design alterations are being performed. They suggest that it is common for the project construction phase to begin before the design has been completed; this frequently results in variations due to constructability problems owing to the design or existing in site conditions.

### 4.3.3. Perceived Technological Related Factors

**Table 4.4: Perceived technological Related Factors**

| s.n | technology related factors | N | Mean | SD | Rank |
|---|---|---|---|---|---|
| 1 | There is lack of construction equipment and tools | 77 | 4.05 | 0.93 | 1 |
| 2 | There is an absence of technological advancements for machineries | 74 | 3.72 | 1.14 | 2 |
| 3 | There is frequent damage of equipment | 77 | 3.60 | 1.09 | 3 |
| | mean score | 76.00 | 3.79 | 1.05 | |

Source: survey data (2019)

Table 4.4 shows technology related factors that affect the labor productivity in building projects. Lack of construction equipment and tools was ranked first by respondents with mean =4.05 and SD = 0.93.The lack of an effective and efficient construction equipment and tools affect the overall performance of the projects. The result is in line with studies conducted by Henry (2007) and Makulsawatudom and Emsley (2003). They found that management needs to furnish workers with new equipment whenever possible as obsolete tools inhibit progress unnecessarily.

Attention must also be paid to the number of workers using a specific tool to reduce the competition for resources.

Lack of technological advancements for machineries was ranked as second technology related factor affecting labor productivity with mean 3.72 and SD= 1.14. Respondents were also tend to agree on frequent damage or failure of construction equipment as third important factor that affect labor productivity in building projects.

### 4.3.4. Perceived labor Related Factors

**Table 4.5: Perceived labor Related Factors**

| s.n | labor related factors | N | Mean | SD | rank |
|---|---|---|---|---|---|
| 1 | There is incompetence of labors at projects | 77 | 3.57 | 0.97 | 1 |
| 2 | There is personal problems at projects | 77 | 2.74 | 0.78 | 2 |
| 3 | There is misunderstanding/poor relationship between labors at projects | 77 | 2.51 | 0.95 | 3 |
| 4 | There is an increased labor age | 77 | 2.48 | 0.84 | 4 |
| 5 | There is high absenteeism of labors at projects. | 76 | 2.29 | 0.94 | 5 |
| 6 | There is Use of alcohol and drugs at project site | 77 | 2.22 | 0.80 | 6 |
| 7 | There is indiscipline labor at projects | 75 | 2.21 | 0.89 | 7 |
| 8 | There is an overcrowded labor force at projects | 77 | 2.19 | 0.99 | 8 |
| | mean score | 77 | 2.53 | 0.89 | |

Source: survey data (2019)

Incompetence of labors at projects was ranked first by respondents with mean= 3.57 and SD =097. Most of respondents tend to agree that incompetency of labor affect labor productivity in projects.

However, most of respondents tend to not agree that labor personal problem, poor relationship in the project, labor age, absenteeism of labors, Use of alcohol and drugs at project site, indiscipline, and overcrowded labor force at projects do not affect labor productivity in building projects. It follows that Overall labor related factors have little impact on labor productivity in building construction projects.

### 4.3.5. Perceived Organizational Related Factors

**Table 4.6: Perceived organizational Related Factors**

| s.n | Organizational Related Factors | N | Mean | SD |
|---|---|---|---|---|
| 1 | There is cash flow and financial difficulties in the enterprise | 77 | 4.56 | 0.80 |
| 2 | There is poor resources management in the enterprise | 77 | 4.42 | 0.75 |
| 3 | There is an absence of working plan in the enterprise | 77 | 3.71 | 0.93 |
| 4 | There is lack of employee motivation in the enterprise | 77 | 3.66 | 0.84 |
| 5 | There is poor communication in the enterprise | 77 | 3.35 | 1.01 |
| 6 | There is lack of Training for workers in the enterprise | 75 | 2.93 | 1.09 |
| 7 | There is frequent change of workers in the enterprise | 77 | 2.58 | 0.91 |
| | mean score | 77 | 3.60 | 0.90 |

Source: survey data (2019)

Cash flow and financial difficulties faced by the enterprise was ranked first by respondents with mean= 4.64 and SD =0.80 to affect labor productivity in building construction projects as it affects the project budget. This result is in agreement with Samson and Lema (2002) because cash flow can give an important evaluation for the cost performance at any stage of project.

Poor resources management in the enterprise was ranked as the second (mean =4.42 and SD= 0.75) that affect labor productivity in building projects.

Absence of working plan in the enterprise was ranked as the third organizational factor (mean =3.71 and SD= 0.93) that affect labor productivity. The result is in tandem with Hendrickson (1998) who asserted that poor scheduling can result in unnecessary waste of time caused by delays as laborers wait for materials of equipment to become available or proceeding tasks to be completed.

Lack of employee motivation in the enterprise was ranked as the fourth organizational factor (mean =3.66 and SD= 0.84) that affect labor productivity. Cooper (2004) suggests that People's behavior is affected by motivation, which in

turn results in a committed energy throughout the workplace. He further elaborate that Some guidelines for increasing motivation within the workplace include provide a safe work environment, recognize good behavior, show appreciation, set attainable goals, develop a fair pay system, and provide adequate training programs.

Poor communication, training for workers, and frequent change of workers in the enterprise were considered as the least factor affecting labor productivity in building construction projects.

### 4.4.Inferential Statistics

Inferential analysis was conducted to generate the regression and correlation results. Regression results included the model of fitness, analysis of the variance and regression coefficients. Before undertaking the correlation and regression, the mean score of each item in the independent variable and dependent variable (mean of performance indicators) was computed using SPSS.

### 4.4.1. Correlation

The study findings were subjected to correlation analysis to determine the relationship between independent and dependent variable. The table shows the correlation between independent variable (design and specification, technology, labor, and organizational related factors and) and dependent variable (labor productivity). Pearson correlation coefficient is a measure of linear dependence between two variables: independent and dependent variable. The researcher correlated the factors that affect labor against labor productivity. The results are provided in Table 4.7.

**Table 4.7: Pearson Correlation Coefficient Matrix**

| | | Labor Productivity | Design and specification factor | Technological factor | Labor factor | Organizational factor |
|---|---|---|---|---|---|---|
| Labor productivity | Pearson Correlation | 1.00 | 0.02 | .399** | 0.02 | .496** |
| | Sig. (2-tailed) | | 0.87 | 0.00 | 0.88 | 0.00 |
| | N | 77.00 | 77.00 | 77.00 | 77.00 | 77.00 |
| Design and specification factor | Pearson Correlation | **0.02** | 1.00 | -0.22 | -.231* | -0.14 |
| | Sig. (2-tailed) | **0.87** | | 0.06 | 0.04 | 0.23 |
| | N | 77.00 | 77.00 | 77.00 | 77.00 | 77.00 |
| Technological factor | Pearson Correlation | **.399**** | -0.22 | 1.00 | -0.02 | .470** |
| | Sig. (2-tailed) | 0.00 | 0.06 | | 0.85 | 0.00 |
| | N | 77.00 | 77.00 | 77.00 | 77.00 | 77.00 |
| Labor factor | Pearson Correlation | **0.02** | -.231* | -0.02 | 1.00 | 0.02 |
| | Sig. (2-tailed) | 0.88 | 0.04 | 0.85 | | 0.85 |
| | N | 77.00 | 77.00 | 77.00 | 77.00 | 77.00 |
| Organizational factor | Pearson Correlation | **.496**** | -0.14 | .470** | 0.02 | 1.00 |
| | Sig. (2-tailed) | 0.00 | 0.23 | 0.00 | 0.85 | |
| | N | 77.00 | 77.00 | 77.00 | 77.00 | 77.00 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | | |
| *. Correlation is significant at the 0.05 level (2-tailed). | | | | | | |

Correlation analysis results between Design and specification related factors and labor productivity attained a positive correlation coefficient of 0.02 with a p-value of 0.87. This was an indication that the result was significant at $\alpha = 5\%$, and if design and specification supply is improved, it would improve labor productivity. Technology related factor and labor productivity attained a positive correlation of 0.399 and a p-value of 0.000, which indicates that there is a statistically significant ($p < .001$) linear relationship between these two variables such that the more technological equipped, the larger that productivity is. Labor related factor and labor productivity had a positive correlation of 0.02 and a p-value of 0.88 and which is not significant. Organizational related factors and labor productivity had a positive correlation of 0.496 and a p-value of 0.000. This meant that organizational related factor had relative influence on labor productivity followed by technological related

factors and then design and specification related factors while labor related factors had the least impact on labor productivity in building construction project.

### 4.4.2. Tests of Normality

**Table 4.8: test of normality**

| Tests of Normality | | | | | | |
|---|---|---|---|---|---|---|
| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
| | Statistic | df | Sig. | Statistic | df | Sig. |
| There is poor labor productivity in building projects | 0.290 | 77 | .000 | 0.735 | 77 | 0.000 |
| a. Lilliefors Significance Correction | | | | | | |

Source: survey data, 2019

The test statistics are shown in the third table. Here two tests for normality are run. For dataset small than 2000 elements, the Shapiro-Wilk test, otherwise, the Kolmogorov-Smirnov test is used. In this case, since there are only 77 elements, the Shapiro-Wilk test is used. From above table, the p-value is 0.000 and thus the null hypothesis is accepted and it can be concluded that the data comes from a normal distribution.

### 4.4.3. Test of Multicoliniarity

**Table 4.9: Test Of Multicollinarity**

| Coefficients[a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | 0.278 | .923 | | .302 | .764 | | |
| | Technological factor | 0.256 | .139 | 0.221 | 1.841 | .070 | 0.693 | 1.443 |
| | Labor factor | .029 | .188 | 0.016 | .154 | .878 | 0.979 | 1.021 |
| | Organizational factor | 0.821 | .239 | 0393 | 3.434 | .001 | 0.763 | 1.310 |
| | Design and specification factor | -0.030 | .171 | -0.019 | -.176 | .861 | 0.877 | 1.140 |
| a. Dependent Variable: labor productivity | | | | | | | | |

Source: survey data, 2019

The test of multicollinearity is shown in the table 4.9. Based on the coefficient, collinearity statistics obtained Variance Inflation Factor (VIF) value of 1.443, 1.021, 1.310 and 1.140 for technological, labor, organizational and design related factors respectively. It implies that the value obtained is between 1 and 10 and thus it can be concluded that there is no multicolonarity symptom among the explanatory variables.

### 4.4.4. Regression Result

The model summary shows that the regression model can explain 54.6 % of the variance in the dependent variable.

**Table 4.10: Results of Multiple Regression Analysis**

| Model | Parameter Coefficients (B) | Standard error | t-value | Significance level (P) |
|---|---|---|---|---|
| (Constant) | | 0.234 | -0.472 | 0.002 |
| Organizational factor | **0.400** | 0.234 | 3.572 | **0.001** |
| Technological factor | **0.242** | 0.132 | 2.126 | **0.037** |
| Design and specification factor | 0.137 | 0.100 | 3.235 | 0.194 |
| Labor factor | 0.045 | 0.190 | 0.444 | 0.659 |
| F statistics | | (4, 72) = 7.661 ,0.00) | | |
| $R^2$ ($R^2$ adj.) | | 0.299 (0.260) | | |

Source: survey data, 2019

As shown in above Table, the coefficients of the regression for organizational related factors (0.001, $p < 0.05$), and technology related factors (0.037, $p < 0.05$), are positive and significant. This means organization and technology related factors are positively and significantly influence labor productivity. This implies the null hypothesis that there is significant and positive relationship between organization and technology related factors labor related factors were found positive but not significant factor influencing labor productivity of project. This implies the null hypothesis that there is significant and positive relationship between design and specification and labor related factors and labor productivity is rejected.

# CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

## 5.1. Introduction

This chapter concentrates on the analysis and interpretation given in chapter four. A lot of findings emerged from the study following the presentation of data. Therefore, summary of findings, conclusion and recommendations is based on the objectives of this study as well as the recommendations of the researcher.

## 5.2. Summary of Major Findings

The study was based on the factors affecting labor productivity in building construction projects at defense construction enterprise. It sought to investigate whether organizational, technology, labor, and design and specification factors influence labor productivity in building construction projects. Based on the objectives of the research stated, the following summaries were made in relation to the findings:

- Delay in Preparation and delivery of drawings by consultant was ranked first by respondents with mean= 3.25 and SD = 1.17 that affect labor productivity in building project. Incomplete and inaccurate drawings was considered by respondents as the second most important (mean = 3.23 and SD =1.21) factor that affect labor productivity. Incomplete and inaccurate design makes employee idle and this result in employee to be without work for some time. Design change was ranked as the third most important design and specification related factor (mean = 3.13 and SD = 1.29) that affect labor productivity in building projects.
- Lack of construction equipment and tools was ranked first by respondents with mean = 4.05 and SD = 0.93.The lack of an effective and efficient construction equipment and tools affect the overall performance of the projects. Lack of technological advancements for machineries was ranked as second technology related factor affecting labor productivity with mean 3.72 and SD= 1.14.

- Incompetence of labors at projects was ranked first by respondents with mean= 3.57 and SD =097. Most of respondents tend to agree that incompetency of labor affect labor productivity in projects.
- Cash flow and financial difficulties faced by the enterprise was ranked first by respondents with mean= 4.64 and SD =0.80 to affect labor productivity in building construction projects as it affects the project budget. Poor resources management in the enterprise was ranked as the second (mean =4.42 and SD= 0.75) that affect labor productivity in building projects. Lack of employee motivation in the enterprise was ranked as the fourth organizational factor (mean =3.66 and SD= 0.84) that affect labor productivity.
- Finally, the coefficients of the regression for organizational related factors (0.001, $p < 0.05$), and technology related factors (0.037, $p < 0.05$), are positive and significant. This means organization and technology related factors are positively and significantly influence labor productivity.
- The regression result reveals organizational and technological related factors are positively and significantly influence labor productivity in building projects.

### 5.3. Conclusion

Based on the objectives of the research stated, the following conclusions were made in relation to the findings:

- Major design and specification related factors that affect labor productivity at projects are delay in preparation and delivery of drawings, incomplete and inaccurate drawings, and design changes at building projects
- Major construction technological related factors that affect labor productivity at projects are lack of construction equipment and tools, an absence of technological advancements for machineries, and frequent damage of equipment.
- Major labor related factor that affects labor productivity at projects is incompetence of labors at projects.

- Major organizational related factors that affect labor productivity at projects were cash flow and financial difficulties, poor resources management, absence of working plan, lack of employee motivation, and poor communication in the enterprise.
- Finally, the regression result reveals organizational and technological related factors are positively and significantly influence labor productivity in building projects. On other hand, labor and design and specification related factors were found positive but not significant factor influencing labor productivity in building projects.

### 5.4. Recommendations

Based on the research findings, the following recommendations should be put into practice for the enterprise who aims at performing better in construction projects.

- The enterprise is recommended to use advance payment properly to avoid the cash flow and financial problems.
- The enterprise has to prepare updated financial statement, the statement of cash flows and income statements are most important for keeping an eye on how money is moving through the enterprise.
- The enterprise has to improve its equipment management system and also need to avoid a carelessness attitude of its workers in handling and improve lack of proper maintenance scheme.
- Ethiopian government should enhance and encourage the accessibility of construction materials, either through local availability or direct imports. This would improve competitiveness among equipment supplier and thus it helps DCE to gain price advantage.
- DCE needs to dedicate its effort to manage those factors that significantly impact on its labor productivity.

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## APPENDIX

**Survey Questionnaire**

# ST. MARY'S UNIVERSITY

# SCHOOL OF GRADUTE STUDIES

## Survey Questionnaire On: ***Factor Affecting Labour Productivity In Building Projects : The Case of Defense Construction Enterprise***

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### Dear Respondent!

I refer to the above subject matter and hereby confirm that I am second year MBA in student of the aforementioned institution, carrying out thesis for academic purposes. All responses given in this regard will be handled in strict confidence.

Your understanding and co-operation are being solicited for providing all necessary information needed to accomplish the objective of this study.

Regards


## Seyoum Zeray

Tel:- 0912-180917

mail: mail2seyoum@yahoo.come

## *Section A: General Information*

1. ***Position***

**Top level manager** □

**Middle level manager** □

**Lower level manager** □

**Project manager** □

**Site engineer** □

**Office engineer** □

2. ***Age in years:***

**20 – 30** □

**31 – 40** □

**41 – 50** □

**Greater than 50** □

3. ***Level of Education***

**Diploma** □

**First Degree** □

**Second degree & above** □

4. ***Work Experience***

**Below 5 year** □

**6 – 10 year** □

**11- 15 year** □

**Greater than 15 year** □

## *Section B: Factors Affecting the Performance of Construction Projects*

5. What is your level of perception towards statements for factors affecting labor productivity at building projects?

   Circle Using a scale of 1 to 5 where

   1 = Strongly Disagree

   2= Disagree

   3= Neutral

   4= Agree

   5 = Strongly Agree

| *s.n* | **Factors Description** | **Strongly Disagree** | **Disagree** | **Neutral** | **Agree** | **Strongly Agree** |
|---|---|---|---|---|---|---|
| **1** | **Design and Specification Related Factors** | | | | | |
| 1.1 | There is design changes at building projects | **1** | **2** | **3** | **4** | **5** |
| 1.2 | There is an incomplete and inaccurate drawings | **1** | **2** | **3** | **4** | **5** |
| 1.3 | There is delay Preparation and delivery of drawings | **1** | **2** | **3** | **4** | **5** |
| 1.4 | There is ambiguous and incomplete Specification | **1** | **2** | **3** | **4** | **5** |
| 2 | **Technology Related Factors** | | | | | |
| 2.1 | There is lack of construction equipment and tools | **1** | **2** | **3** | **4** | **5** |
| 2.2 | There is frequent damage of equipment | **1** | **2** | **3** | **4** | **5** |
| 2.3 | There is an absence of technological advancements for machineries | **1** | **2** | **3** | **4** | **5** |
| **3** | **Labor related Factors** | | | | | |
| 3.1 | There is high absenteeism of labors at projects. | **1** | **2** | **3** | **4** | **5** |
| 3.2 | There is incompetence of labors at projects | **1** | **2** | **3** | **4** | **5** |
| 3.3 | There is an overcrowded labor force at projects | **1** | **2** | **3** | **4** | **5** |
| **3.4** | There is misunderstanding/poor relationship between labors at projects | **1** | **2** | **3** | **4** | **5** |
| 3.5 | There is an increased labor age | **1** | **2** | **3** | **4** | **5** |
| 3.6 | There is indiscipline labor at projects | **1** | **2** | **3** | **4** | **5** |
| 3.7 | There is Use of alcohol and drugs at project site | **1** | **2** | **3** | **4** | **5** |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3.8 | There is personal problems at projects | **1** | **2** | **3** | **4** | **5** |
| **4** | **Organizational (contractor) related factors** | | | | | |
| 4.1 | There is poor resources management in the enterprise | **1** | **2** | **3** | **4** | **5** |
| 4.2 | There is an absence of working plan in the enterprise | **1** | **2** | **3** | **4** | **5** |
| 4.3 | There is frequent change of workers in the enterprise | **1** | **2** | **3** | **4** | **5** |
| 4.4 | There is lack of Training for workers in the enterprise | **1** | **2** | **3** | **4** | **5** |
| 4.5 | There is poor communication in the enterprise | **1** | **2** | **3** | **4** | **5** |
| 4.6 | There is lack of employee motivation in the enterprise | **1** | **2** | **3** | **4** | **5** |
| 4.7 | There is cash flow and financial difficulties in the enterprise | **1** | **2** | **3** | **4** | **5** |

## *Section C: Levels of Labor Productivity*

What is your level of perception towards statement labor productivity level at building projects?

Circle Using a scale of 1 to 5 where

1 = Strongly Disagree
2= Disagree
3= Neutral
4= Agree
5 = Strongly Agree

| *s.n* | ***Performance Description*** | **Strongly Disagree** | **Disagree** | **Neutral** | **Agree** | **Strongly Agree** |
|---|---|---|---|---|---|---|
| 1 | There is poor labor productivity in building projects | **1** | **2** | **3** | **4** | **5** |

# Declaration

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

Seyoum Zerzy ----------

**Name** **Signature**

**St. Mary's University, Addis Ababa** **June, 2019**

## Endorsement

This thesis has been submitted to St. Mary's university, school of Graduate studies for Examination with my approval as a university advisor.

Yirgalem Tadele (PhD) ----------

**Advisor** **Signature**

**St. Mary's University, Addis Ababa** **June, 2019**