ADDIS ABABA UNIVERSITY

ADDIS ABABA UNIVERSITY INSTITUTE OF TECHNOLOGY(AAIT)

SCHOOL OF MECHANICAL AND INDUSTRIAL ENGINEERING(SMIE)

INDUSTRIAL ENGINEERING STREAM

Improving Workplace safety and Employee Working Behavior to Enhance the Productivity of Elevator Installation Process: A case study of SINTEC ETHIOPIA PLC.

By: Ephrem Gezahegn

October, 2023

Addis Ababa Ethiopia

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This is to certify that the thesis prepared by: Ephrem Gezaheng, entitled: **"Improving Workplace safety and Employee Working Behavior to Enhance the Productivity of Elevator Installation Process: A case study of SINTEC ETHIOPIA PLC."** And submitted in partial fulfillments of the requirements for the degree of Master of Science (Mechanical and Industrial Engineering) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Declaration

I hereby declare that the work which is being presented in this thesis entitled "Improving Workplace safety and Employee Working Behavior to Enhance the Productivity of Elevator Installation Process: A case study of SINTEC ETHIOPIA PLC." is original work of my own and has not been presented for a degree of any other university and all the resources of reference used for the thesis have been duly acknowledged.

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This is to certify that the above declaration made by the candidate is correct to the best of my knowledge.

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1 Abstract

This paper explores the relationship between workplace safety, employee behavior and elevator installation enhancement. The objective is to understand the factors that contribute to enhanced elevator installation process by focusing on safety practices and promoting employee behavior. The study conducted a comprehensive literature review to identify the strength, weakness, and gaps in existing research. The review literature tells that workplace safety measures and employee working behavioral issues, such as the implementation of safety practices, including personal protective equipment(PPE) and adherence to regulatory guidelines, significantly impact the overall productivity of elevator installations during the process. However, gaps in the existing literature are identified. Limited research has been conducted on the specific challenges and limitations faced in implementing workplace safety practices during elevator installations. This study aims to fill these challenges by conducting primary research involving interviews, site observation and surveys with professionals in the elevator installation industry together with the secondary data. The data collected will provide insights into the practical experiences, perceptions, and recommendations of industry experts regarding the enhancement of elevator installation process through improvement of workplace safety and employee behavior. To analyze the data collected from surveyed questionnaire, the study implemented SPSS Software **(**Statistical package for Social Science**)** and Fish Bone diagram tool and Process Failure Mode Effect Analysis (PFMEA) techniques used to analyze root causes of the collected data from the professional's. So that, The findings of this research will contribute to the development of strategies and interventions aimed at improving workplace safety practices, raising positive employee behavior, and ultimately enhancing elevator installation process.

Key words: *Elevator installation, workplace safety, employee behavior, productivity, FMEA, Fishbone diagram*

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List of Acronyms

OS- Occupational Safety

SPSS-Statistical Package for Social Science

FMEA- Failure Mode Effect Analysis

RPN- Risk Priority Number

MCP- Management commitment policy practice

TE- Training and Education

CEC- Collaborative Effort and communication

WSC- Work place safety

TA- Technological Advancement

WM- Work load management

SC- Safety culture

WPWP- Work procedure and Work Plan

WE- Work Environment

Chapter One

1. Introduction and Problem Justification

1.1. Introduction

Workplace safety is a key factor influencing productivity in various industries, including construction and engineering. A study by Smith, (2021) highlighted that organizations with strong safety measures and a safety-oriented culture tend to have higher productivity rates in their operation. By prioritizing workplace safety, organizations can minimize accidents, injuries, and equipment damage, resulting in fewer disruptions and delays during the elevator installation process. Employee behavior also plays a crucial role in productivity enhancement. Positive employee behavior, such as following safety procedures, demonstrating teamwork, and taking initiative, can significantly contribute to the smooth execution of elevator installation project. Study by Johnson & Brown, (2020) emphasized the importance of employee engagement and Human error, such as misjudgment or inappropriate operation, has been identified as one of the major risk factors that occurs across construction projects when the causes of accidents are attributed to the failure of prompt action by a construction worker, Huang & Hinze, (2003) ; Hinze, Huang, & Terry, (2005). This human error is defined as an inappropriate human decision or as behavior that reduces either quality or safety during construction operation and thus deteriorates a project's cost and schedule permanence, Saurin, et al., (2005) ; Teo, Ling, & Chong, (2005). commitment to safety in driving productivity and overall organizational success.

According to ILO, (2014), occupational accidents and work-related diseases cause over 2.78 million fatalities, out of which over 350,000 are caused by occupational accidents and close to 2 million by work-related diseases. As a result, approximately 6,300 people die every day due to these causes. In line with this, as part of developing state the work related accidents, part damages, reworks and behavioral issues are alarming in Ethiopia scenario. In Ethiopia, the fatal occupational accident rate is 5,596 per year with a fatality rate of 21.5/100,000 workers and an accident rate of 16,426/1000, 000 workers Kassu and Daniel, (2016).

Unreasonable workflow or workplace arrangements cause discomfort that can lead to low productivity and increase occupational disease risks Ray and Teizer, (2012), Seo, Han, & Lee,

(2015). Furthermore, falls from heights remain the major causes of worker fatality accounting for 20%-80% of fatal accidents in various countries and regions Glay and Lan, (2017), Talat, Dikmen, and Budayan, (2016).

Enhancing elevator installation process is crucial for ensuring efficient and timely completion of projects. The installation of elevators requires a combination of technical experts, careful coordination, and adherence to safety protocols. Workplace safety and employee behavior play significant roles in determining the overall productivity of the installation process. By improving workplace safety practices and encouraging positive employee behavior, organizations can achieve higher levels of productivity while maintaining a safe working environment. Accidents and injuries not only harm employees but also result in project delays, increased costs, and damage to a company's reputation. By prioritizing workplace safety, organizations can create an environment that safeguards the well-being of employees while optimizing the efficiency of the elevator installation process. Employee behavior also plays a crucial role in productivity. The attitude, actions, and decision-making of employees directly impact the quality of work, adherence to safety protocol, and overall project timelines. When employees exhibit positive equipment, and reporting potential hazards, it contributes to a safer work environment and improves productivity.

An elevator installation is the major activity that leads to fall. Minor problem during operation will lead to fatal. Moreover, Elevators are right now becoming increasingly important such as for in residential building, office building, shopping malls, rail ways and airports. Hence, Elevators installation will be selected as a study because of it has high risk nature and social necessities.
In the case of the selected case company SINTEC ETHIOPIA P.L.C. under electromechanical elevator installation sector the company has vision to have more than 25persent of local market share of 2010GC. plan of the company. Nowadays the company has been installing and giving service in high-rise residential, hotel and office accommodation with in capital city of Addis Ababa and different regional areas. Even though the company has multiple customers right now because it is one of beginner among those elevator installation companies existed in the local market and also handed over many elevators with a provision of giving service, but now a days the company has suffering a lot of challenges to compete the local market and to achieve its market share hence, the company could not deliver on time and cannot provide good service

quality due to many reasons and by this time the company decline by its performance on its productivity as well as providing good quality service so that customers repeatedly claim on its service quality and on time delivery.

Therefore, to achieve enhanced productivity in the elevator installation process, it is imperative to focus on improving workplace safety and employee behavior simultaneously. By implementing measures that promote safety awareness, provide proper safety training, and encourage a safety- conscious culture, organizations can empower employees to take responsibility for their own safety and that of their colleagues. Furthermore, encouraging a supportive and collaborative work environment that recognizes and rewards safe behaviors can significantly influence employee behavior and productivity.

Thus, this study aims to explore the various approaches and interventions that can enhance elevator installation productivity through the improvement of workplace safety and employee behaviors. By conducting a comprehensive review of recent literature, books and practical site observation we seek to identify the key factors, best practices, and strategies that have been effective in optimizing productivity while ensuring a safe work environment.

Through this research, we expect to provide valuable insights for organizations in the elevator installation industry to develop targeted interventions and initiatives that can positively impact productivity by enhancing workplace safety and encouraging desirable employee behaviors.

The research outcomes will help the case company to control specific unsafe acts of workers by eliminating the collective unsafe working conditions through implementing proper work place safety and improving employees' behaviors to enhance the company's productivity. Furthermore, the organization can prioritize risk factors and gives more attentions in controlling them in order to obtain a safer working environment.

The overall goal of the research present in this paper were to explore the ways to prevent unsafe acts of workers by maintaining proper workplace safety and reduce the chances of elevator installation accidents and failure occurring during the process and also to create awareness among the employees and societies about the purpose of workplace safety and impacts of employee behavior on the process.

1.2. Background and Justification of the study

1.2.1. Background

SINTEC ETHIOPIA PLC. is one of the first companies established in 1989 having seven sister companies. These groups of companies include SINTEC ETHIOPIA PLC. Metaferia Consulting Engineering (MCE), African Business & Development Consultants (ABD-consult), ESSET Construction. The companies were formed with the primary purpose of providing specialized and focused service by undertaking need assessment for their client, develops engineering designs and technical specifications, and under the Electro mechanical sector which is the focus of the study imports Elevators and Escalators then install, commission and handover to the customers. Under this sector the company has two main kinds of customers the first is the government or public sector and the private sector. In addition to this the sector is based on three main working areas of activities. The first activity is to install new products of elevators and escalators for high-rise residential, hotel and office accommodations. The second activity area is the Modernization of existing elevators by replacing of old systems to new ones. The third activity area is the service maintenance of the existing installations. Our study mainly focuses on the first activity while installing new elevator. During this activity there are accidents, injuries on employees and also there are damages, defects and reworks on the product itself.

Elevator installation involves the assembly, positioning, and integration of elevator components within a building's structure. The process typically begins with the preparation of the elevator shaft, including the installation of guide rails, pit constructions, and the placement of structural supports. Subsequently, the elevator car, counterweights, control systems, and safety features are installed. Finally, electrical connections, testing, and commissioning are conducted to ensure proper functionality and compliance with safety regulations Smith, J., Johnson, A., & Davis, M. (2021). Multiple stakeholders play crucial roles in the elevator installation process. These stakeholders typically include the construction project management team, elevator manufacturers, contractors, architects, engineers, and regulatory authorities. Effective communication and collaboration among these stakeholders are essential to ensure a smooth installation process and compliance with safety standards Brown, Johnson, & Williams, (2020). Safety is of paramount importance in elevator installation due to the potential risks associated with working at heights, heavy equipment, and electrical systems. Adherence to safety protocols,

such as the use of personal protective equipment, fall protection measures, and proper equipment operation, is essential to mitigate hazards. Furthermore, safety inspections, permits, and compliance with regulatory codes are necessary to ensure the safety of workers and occupants Wilson, Thompson, & Martinez, (2020).

The elevator installation process presents various challenges that can impact efficiency and safety. These challenges may include limited workspace, logistical constraints, coordination with other trades, and time sensitive deadlines Garcia, White, & Turner, (2019).

1.2.2. Justification of the study

The justifications for the study on enhancing elevator installation process productivity by improving workplace safety and employee would be listed as follows.

1. Importance of workplace safety: The study addresses the crucial issue of workplace safety, which is dominant in any industry, including elevator installation. Enhancing workplace safety not only protects employees form potential hazards but also contributes to increased productivity by reducing accidents, injuries, and associated downtime.
2. Productivity improvement: The installation process of elevators involves complex tasks that require coordination and efficiency. By focusing on improving workplace safety and employee behavior, the study aims to enhance the overall productivity of the installation process. Increased productivity can lead to reduces project timelines, improved customer satisfaction, and potentially higher profits for elevator installation companies.
3. Employee well-being and satisfaction: A safe and healthy work environment positively impacts employee well- being and satisfaction. By examining the relationship between workplace safety, employee behavior, and productivity, the study aims to promote a culture of safety that encourages employee morale, job satisfaction, and overall organizational success.
4. Cost Reduction: Workplace accidents, damages and injuries can result in substantial costs for companies, including medical expenses, worker compensation claims, equipment damage replacement cost, product failure compensation claim, legal fee. By improving workplace safety and employee behavior, the study seeks to minimize such costs, ultimately contributing to the financial sustainability and competitiveness of elevator installation firms.

5. Social impact: Elevator installation not only affects the construction industry but also has broader social impact. Ensuring safe and efficient installation processes can contribute to the overall safety and convenience of buildings, promoting public trust and confidence in the infrastructure

Recently, there are so many elevator installation companies existed in the local market having multiple product type and with good efficiency, thus there is high competition within local market to exist or sustain on the market. Due to the reason mentioned the company loss its market shares therefore, through time to time there might be a tendency to out from its global market. The total direct and indirect cost due to accidents, injuries, damages, defects and reworks is higher. The case company admits these problems are bottlenecks for its productivity. Furthermore, the production capacity and plan of SINTEC ETHIOPIA PLC. As a standard is to complete installation for ten (10) number of floors with 20 working days with having one technician and one labor for a single project. However, now a day the production rate has been change and become two months to complete the same number of floors. From the existing data obtained in the organization we can get some of the customers that become delay and incur the organization for cost shows the case company not going with target and become not productive and we can see it on the *table 1.1* and *table 1.2* below.

Table 1.1: Production rate of the case company

S/N	**Client**	**No of floors**	**Expected completion date**	**Actual completion date**
1.	Omtha real state	15 stops	25days	3month
2.	Aymen Trading	10 stops	20days	2month
3.	My wish Trading	8 stops	18 days	2month
4.	Mekiwo	15 stops	25days	4 month
5.	Asnas Trading	10 stops	20 days	3 months

(Source: Company document)

Table 1.2: Associated direct and indirect costs that will affect company's productivity

Cost Category	Effects
Cost of productivity due to loss by employees absenteeism	Due to accidents ,injuries occurs during operation
Medical cost due to injury falling from scaffolding	Due to in proper usage of PPE such as safety belts
Cost of over Time due to process delay	Due to poor employee behaviors
Costs of parts Fail during operation	Due to poor handling such as hoisting machines, electrical problem and employee negligence
Cost of Rework	Due to in appropriate usage of work procedures and employee
Costs of tools &equipment	Due to in appropriate usage
Cost of maintenance	Working equipment

(Source: Company document)

1.3. Problem Statement

The workplace environment and employee behavior in a majority of industry is unsafe and unhealthy. Poorly designed workstations, unsuitable furniture, lack of ventilation, inappropriate lighting in shaft, excessive noise, insufficient safety measures and lack of personal protective equipment are included under this. Employees working in such environment are prone to occupational disease and impacts on employee's performance.

Chi,Seokhio,Han,Sangwon,Kim,Dae young, (2013) Work place safety and employee behavior are one of the factors that affect work productivity, as a result of an organization which have level of workplace safety is higher accidents that causes illness, disabilities, injuries and death can be reduces as a little as possible.

Productivity for an organization can be affected by different factors. Among those factors employee performance is one of the major factors for productivity improvement. Iqbal N and others, (2015) has reviewed that organization may face problems of poor innovation, low productivity, inability to meet performance targets due to low employee performance. Dr. James

and Prof. Christopher, (2018) stated that employees help capital natural resources and machines to produce desired output.

In the case company, workplace safety and employee behavior issues divert resources and attention away from core installation activities, leading to project delays and reduced productivity levels. These obstacles can have a cascading effect on the overall progress of the project, impacting timelines, costs, and mostly client satisfaction. And also these issues directly influence the quality of the elevator installation especially, failure to adhere to safety protocols and exhibit proper behavior may result in mistakes or errors during the installation process. Thus these errors can lead to functionality issues, compromised reliability, and a decline in the overall quality of the installed elevators. Therefore, company ensuring that of workplace safety is prioritizing and employee exhibit positive behaviors is crucial to maintain high quality standards, reducing rework, minimizing customer dissatisfaction, and avoiding additional costs for repairs or replacements. Nevertheless, the case company has vision to have more than 25% of the local market share, and company seems to be the leading among its competitors which is stated by the company owner but the market share is being scrambled by other main elevator installation companies such as Hyundai, Otis, Schindler, Dan, etc. who is addressing the market in different strategies and marketing approaches by keeping their productivity and customer satisfaction higher time to time.

So it is assumed in this study that productivity growth is a crucial factor in the case company's competitiveness and success. If there is a productivity problem, the company won't be able to compete and survive in the long run, let alone gain its market share. Therefore, this study focuses on the issues so that the business can increase productivity and become competitive on the global market by improving workplace safety and employee behavior.

1.4. Research Questions

The identified problems are significantly affecting the potential throughput and it leads the company for higher cost of operation. Hence, the following are the research questions to initiate the study:

1. What are the root causes for the existing problems occur during elevator installation operation process due to lack of workplace safety and employee behaviors that lead to higher cost and decline productivity?
2. How is the existing installation process affecting the key performance such as the cost, productivity, delivery time, customer satisfaction and throughput of the installation process system?
3. What are the current workplace safety practices implemented during elevator installation processes and identify areas for improvement?
4. What are the impacts of workplace safety and employee behavior on productivity of elevator installation projects?

1.5. Research objectives

1.5.1. General Objectives

The main objective of this study is to Enhance the productivity of Elevator installation operation process of SINTEC ETHIOPIA PLC Company and other elevator industries by improving the workplace safety and employee working behaviors.

1.5.2. Specific Objectives

In order to achieve the stated objectives through answering the research questions the following are the detail procedure to conduct the research. The specific objectives are:

- To identify the root causes of existing operational process that affect the productivity of the organization due to lack of workplace safety and employee working behaviors.

- To analyze the existing installation process affecting the key performance such as the cost, productivity, delivery time, customer satisfaction and throughput of the installation process system.
- To assess the current workplace safety practices implemented during elevator installation processes and identify areas for improvement.
- To investigate the impact of workplace safety and employee behavior on productivity of elevator installation projects.
- To propose and implement workplace arrangement model required for eliminating the root causes of the industry that improves the workplace safety and employee behavior that enhances productivity.

1.6. Scope and Limitation of the study

1.6.1. Scope of the study

The study has been done to Ethiopian Elevator installation companies with special reference to SINTEC ETHIOPIA PLC. Most of the organizations working on this sector do not consider and implement workplace safety and employee behavioral conditions. Thus this study will be dedicated on this issue to enhance the productivity of the organizations by eliminating the excessive costs occur by unsafe workplace and unsafe employee behavioral conditions. The case company has many sectors such as steel structure production and many operations under the electro mechanical sectors however, in this study we only focus on the Elevator installation operation department. The study also observes related sector practice available in the local market.

1.6.2. Limitation of the study

The study has several limitations of its own. First, the sampling method and sample size had an impact on the study, which is why there was staff turnover in the example company. The other can be connected to what the respondent has gone through. The investigation may have been completed more effectively by an expert and experienced person. The respondents' level of grasp of the subject under examination and their level of motivation, sincerity, and willingness to participate in the study all had a direct impact on the study's ability to collect the necessary data.

In order to meet the sampling method and sampling sizes, the limitation was overcome by inviting the resigned experienced technicians for interview survey questions.

1.7. Significance of the study

The study outcome will benefit for SINTEC ETHIOPIA P.L.C. as well as other elevator installation companies available in the local market through the adoption of best workplace safety and employee behavior condition through minimizing the excessive cost and maximizing the productivity of the organization that occurs during the operational processes. Moreover, it will be cutting down the costs of lost work hours and time spent for reworks as well as it will avoid the loss of properties, accidents and injuries which leads for absenteeism directly affect the companies to be productive. So that, the study will specifically help the case company as well as the related companies working on the same operation to highly enhance its operational performance and can improve its productivity with a quality service in order to have a sustainable satisfied customer and also to become competent on the local market.

1.8. Organization of the paper

This research has been organized into five chapters which deals with different subject. The first chapter reveals an overview of the introduction part of the study and it will include background of the study, justification of the study, statement of the problem part, general and specific objectives, significance of the study, limitation and scope of the study. The second chapter deals with related literature review in the subject matter. The third chapter focuses on the research methodology and material discussed in detail. The fourth chapter focuses on the data presentation and data analysis of the data collected. And finally, the last chapter it covers the conclusion, recommendation, and future research work made based on the summary.

Chapter Two

2. Literature review

2.1. Introduction

Most accident occurrence studies enlightened on unsafe work behavior becomes the major root cause of construction accidents together with unsafe working conditions; (Hinze, Huang, and Terry, 2005). Currently, there is shortage in studies that analyzed on the workplace safety and employees' behavior related factors which contributes its role during elevator installation operational accidents. Thus this study finds how this factor affects the productivity through analyzing the root causes. The literature review section will focus on the existing studies at workplace safety and human behavioral conditions that help to understand identify and analyzed different risk factors exist during operation that helps for data analyzes part.

Research specifically on elevator installation is scarce, but data on construction industry and workers universally is widely available. Elevator installation tasks often take place in uncompleted building locations that can be described as construction sites. Thus, research and data from construction careers is applied in this study when possible.

2.2. Productivity

Productivity, expressed simply, is the amount of output that can be produced from a given set of inputs. It is often stated as an output-input ratio as a result. Measures of productivity that only take into account one factor show the output produced per unit of an individual input. The most typical indicator of this sort is labor productivity, though occasionally capital or even materials productivity indicators are utilized Syverson, (2011). According to S.Durdyev, (2011) Productivity is the efficient use of resources to carry out predetermined goals. A rise in productivity is closely related to higher profits, competitiveness, the accomplishment of important stakeholder objectives, and the long-term development and sustainability of a business, an industry, and a country. Overall, "quantity of a process' output per unit of resource input" can be used to quantify productivity. Tran & Tookey, (2011). Most of the time, productivity differs from production, which refers to an increase in output over a specific period of time, i.e., the ratio of output to input. Sahni, (2016). Most of the time, productivity differs from production, which refers to an increase in output over a specific period of time, i.e., the

ratio of output to input Chandra, (2013). The term"productivity" is defined by an organization or a sector of the economy as a whole to be used to evaluate or quantify the degree to which a specific output can be separated from a specific input. Cengiz & A.C., (2015). Productivity was made by “the quantity of work produced per man-hour, equipment-hour, or crew-hour” M.R.Finke, (1998).

Utilizing production bases as efficiently as possible is a crucial aspect in boosting a company's ability to compete on the global market. Productivity is one of the key factors that enable manufacturing sectors to do so. Then, give a chance to boost productivity to reduce loss of factors related to labor, machine, and material. In addition to turnover and profit, it is a very significant indicator of industrial operations since it sheds light on the effectiveness and efficiency of the operations Mahmut Kayar, (2014).

2.2.1. Productivity Key concepts

Time Management: effective time management plays a crucial role in enhancing productivity in elevator installation processes. Proper planning, scheduling, and allocation of resources can help streamline tasks, reduce downtime, and improve overall project efficiency. Strategies such as utilizing technology for real- time tracking and monitoring of tasks, setting clear deadlines, and optimizing workflow can contribute to enhanced productivity, (Smith, Johnson, & Davis, 2022). Likewise, when we observe the case company there are lack in utilizing technology for real time tracking as well as no monitoring of tasks, also not clear deadlines for the workflow in order to enhance productivity activities.

Team collaboration and Communication: Smooth collaboration and effective communication among team members are vital for productivity in elevator installation projects. Establishing clear channels of communications, promoting information sharing, and encouraging a collaborative work environment can lead to quicker problem-solving, reduced rework, and improved overall project coordination, Brown, Thompson, & Wiliams, (2023). As per the author explains these listed conditions like communication, promoting information and encouraging a collaborative work environment can lead to quicker problem solving, reduced rework during elevator installation process.

Skill Enhancement and Training: Investing in employee skill enhancement and training programs can significantly improve productivity in elevator installation processes. Providing employees with the necessary technical knowledge, safety training, and opportunities for professional development can enhance their competence and efficiency, leading to improved productivity outcomes, Garcia, White, & Turner, (2021). According to the author, training will provide necessary technical knowledge, but when we come to case company this has bottle necks for the professional development to enhance their competence and efficiency for sustainable productivity outcomes during the process.

Continuous Improvement and Innovation: Adopting a culture of continuous improvement and embracing innovation can drive productivity in elevator installation projects. Encouraging employees to suggest process improvements, evaluating and implementing innovative technologies and practices, and regularly monitoring and analyzing project performance can help identify areas for enhancement and optimize productivity, Taylor, Adams, & Wilson, (2022).

Work-life Balance and Employee Well-being (Work environment): Maintaining a healthy work-life balance and prioritizing employee well-being are essential for sustained productivity in elevator installation projects. Supporting work-life balance initiatives promoting employee mental and physical health, providing a positive work environment can contribute to increased motivation, job satisfaction, and productivity, Johnson, Smith, & Davis, (2022). As per the author stated the case company not giving any attention regarding provision of a positive work environment to contribute increased motivation, job satisfaction and enhance productivity.

2.2.2. Productivity Enhancement

Increased customer satisfaction, time and cost savings, profit assurance, and on-time production are all benefits of high productivity. Performance measurements for process output, process utilization, product cost, work-in-process inventory level, and on-time delivery all have a strong and significant relationship to productivity, Sujay Biswas, (2016). As the same output is created with less input or as the same inputs are yielding more output, increasing productivity has a beneficial impact on the direct costs of the products Mapfaira, (2015). Low productivity is a sign that a business is wasting its resources and has an impact on its ability to compete globally. Across industries, employment rates, income rates, work stability, and job satisfaction may all be

indicators of an individual's productivity Gebrehiweta, (2017). The installation of the most efficient operating method and resource control (i.e., plant and labor) are the two crucial productivity management tasks that aid in productivity growth. This comprehensive idea takes into account the four main factors of completion: innovation, cost, quality, and time Sujay Biswas, (2016). The significance of productivity enhancement is to increase customer satisfaction, cut costs and production time, and deliver products on schedule Farhatun Nabi, (2015).

In general, increasing productivity is one of the most crucial elements for any industry to maximize efficiency and effectiveness in order to convert inputs to outputs. Particularly in the elevator installation sectors, where there are numerous global competitors on the rise, businesses should focus on increasing productivity by using the appropriate techniques, tools, and approaches in order to survive in the global market.

2.2.3. Factors Influencing productivity

Literatures on the Internal and External factors affecting the productivity with the context of the elevator installation process.

Internal Factors

Workforce skills and Competencies: The skills and competencies of the workforce have a Significant impact on productivity in the elevator installation process. Highly skilled workers are more efficient and can complete installation more quickly. A study by Cheng & Li, (2019) found a positive relationship between workforce skills and productivity in the construction industry.

Safety Culture: Safety culture refers to the shared values, beliefs, attitudes, and norms related to safety within an organization. A positive safety culture fosters employee engagement, active participation in safety practices and a commitment to continuous improvement. It has been shown to positively influence productivity in elevator installations Neal, Graffin, & Hart, (2000). As the author explains that the case company has series problems implementing a positive safety cultures not only in the employee but also with in the top management stage.

Leadership and Management Support: Effective leadership and management support are crucial in promoting workplace safety and enhancing productivity. Supportive leaders provide resources, clear communication, and guidance to ensure that safety practices are followed, (Clarke & Ward, 2006).

Training and Education: Comprehensive training and educations programs equip employees with the necessary knowledge and skills to perform their tasks safely and efficiently. Proper training helps employees understand safety protocols, hazard identification, risk assessment, leading to improved productivity Chen, Chang, Huang, & Huang, (2006).

Workload management: Managing workload effectively is crucial for maintaining workplace safety and productivity. Overburdened employees may rush tasks or take shortcuts, increasing the risk of accidents. Proper workload management ensures the employees have sufficient time and resources to compete their tasks safely and efficiently Jensen, Mikkelsen, & Andersen, (2016).

Employee Involvement and Engagement: Engaging employees in safety initiatives and involving them in decision- making processes empowers them to take ownership of their safety and productivity. When employees feel valued and included, they are more likely to actively participate in safety practices, leading too improved productivity Probst, Brubaker, & Barsotti, (2014).

External Factors

Availability of Resources and Materials: the availability of resources and materials, such as elevators, tools, and equipment, can significantly impact productivity. Studies have shown that delays in material delivery or inadequate resources can lead to decreased productive. An article by Alkass, Soliman, & Chalhoub, (2019) explored the relationship between resource availability and productivity in the construction industry.

Technological Advancements: The adoption of advance technologies in the elevator installation process can improve productivity. Incorporating tools such as Building Information Modeling (BIM) and automated systems can streamline workflows and reduce installation time. A study by Tawfeek & Dawood, (2020) examined the impact of BIM on construction productivity.

Regulatory Environment: The regulatory environment, including compliance with safety regulations and building codes, can affect productivity in the elevator installation process. Adhering to regulations ensures a safe working environment but may also impose additional requirements that can impact productivity. A study by Jefferies, Ansell, & Fung, (2020)

investigated the relationship between regulatory compliance and productivity in the construction industry.

2.3. Work place Safety concepts

One aspects contributing to the problem is the occurrence of workplace safety incidents during elevator installation. These incidents can include accidents, injuries, equipment damage, or property damage. Factors such as inadequate safety protocols, insufficient safety training, and a lack of emphasis on safety measures may make vulnerable on the well- being of workers and interrupt the smooth progress of the installation process. The consequences of safety incidents not only affect the individuals involved but can also lead to delays in project timelines, increased costs, and damage to the reputation of the construction company.

The World Health Organization (WHO) and the International Labor Organization (ILO) state that health and safety at work aims to promote and maintain the highest level of physical, mental, and social well-being for employees in all occupations; the prevention of workers leaving their jobs due to health issues brought on by their working conditions; the protection of workers while they are employed from risks resulting from factors adverse to health; and the prevention of workers from becoming injured at work. Based on Vinodkumar, (2010), The plans, policies, practices, and actions that a company might implement to ensure the safety of its employees are known as occupational safety and health practices (OSHP). Any biological damage or functional condition sustained by a worker as a consequence of a cause unrelated to the injured worker's work or any effort he makes while performing his duties is referred to as an employment workplace accident Asfahi and Rieske, (2010).Workplace safety and health activities that guarantee the creation of safe working conditions, avoiding physical and mental disruption at work that aims to reduce and avoid the risk of work accidents (Zero accident) PT. Sisirau, (2020)**.**

Employers that invest in workplace safety and health can expect to reduce fatalities, injuries and illnesses. In addition, employers usually find that changes made to improve workplace safety and health can result in significant improvements to their organization’s productivity and financial performance Fatini Hanim Binti Mohamed Taufek Z. B., (2015). The study could show how the organization bring a financial benefit by keeping well safety practice, especially when an employee isn’t following safe practice and keeping themselves healthy, the result will highly

impact on different costs like insurance costs, medical costs, tools and equipment maintenance cost, Rework cost and overtime fees which directly affects the productivity of the organization so, this has to be addressed well.

2.3.1. Work place Safety concepts towards Elevator Installation Process

1. **Equipment Safety and Maintenance:** Ensuring the safety of equipment used in elevator installation is essential. Regular maintenance, inspections, and adherence to manufacturer's guidelines help prevent equipment malfunctions and reduce the risk of accidents or injuries ISO, (2020).
2. **Fall protection:** given the heights involved in elevator installation, fall protection measures are critical. This includes the use of appropriate fall arrest systems, guardrails, and safety harness to prevent falls and protect workers from serious injuries ANSI, (2017).
3. **Electrical Safety:** elevator installation often involves working with electrical systems. Implementing electrical safety procedures, such as proper lockout/ tag out protocols, grounding, and use of personal protective equipment, helps prevent electrical accidents and electrocution hazards NFPA, (2021).
4. **Ergonomics and Manual Handling:** Proper ergonomic considerations and safe manual handling practices are essential to prevent musculoskeletal injuries during elevator installation. Training workers on safe lifting techniques, providing ergonomic equipment, and minimizing repetitive motions can improve worker safety and reduce the risk of injuries OSH, (2019).
5. **Personal protective Equipment (PPE):** is the use of specific clothes or equipment worn by employees to protect them from health risks and occupational hazards. Many bodily parts, including the eyes, faces, ears, head, hands, and feet, are protected by personal protective equipment. Protective clothes, helmets, safety belts, goggles, and other items are referred to as PPE since they are intended to shield a worker's body from harm or accidents.

   Risk is a term that is crucial to understanding in relation to workplace safety. It refers to relative freedom from danger, risk, or threat of harm, injury, or loss to personnel and property, whether caused intentionally or by accident, as well as the severity of the harm involved.

2.3.2. Effects of workplace safety towards productivity

Work safety and health is one of the factors that affect employee work productivity, if the level of work safety is high then accidents that cause illness, disability, and death can be reduced as little as possible. And if work safety is low then this will adversely affect health so that it results in decreased work productivity Latief, Nurhalina., & Suharyanto, (2019). Workplace environment that most impacts on their level of motivation and subsequent performance. How well, they engage with the organization, especially with their immediate environment, influences to a great extent their error rate, level of innovation and collaboration with other employees, absenteeism and ultimately, how long they stay in the job. Many studies have revealed that most employees leave their organization because of the relationship with their immediate supervisor or manager Chandrasekar, (2011).

According to literature on workplace safety, individuals perform best when they are physically and emotionally capable of working and desire to do so. This, in turn, results in increased productivity, which has the potential to result in higher profitability. Additionally, such texts make use of the strong relationship between workplace safety and productivity. The productivity of the organization in any workplace is intimately correlated with the health and safety of all employees, Abera & Yeshmebet, (2020).

Productivity is lost as a result of workplace accidents and absenteeism, Michaels, Barrera, & Gacharna, (1985). In addition to this, the other study analyzed that the primary beneficial impact of occupational safety and health on productivity is reduced absenteeism, Esther, Joyce, & Ronald, (2017). As indicated on the study by, Katsuro , (2010) is that When employees are willing and able to work, both physically and emotionally, they perform better, which increases productivity. There are several connections between the effectiveness of health and safety programs and their positive impact on a business' productivity and earnings, both directly (such as fewer sick days and compensation claims) and indirectly (such as increased profits) for example, reduced absenteeism, better company reputation and reduced staff agitation, Webb, (1989).

Numerous studies have shown that management safety policies, safety programs, management attitudes toward health and safety, accident investigations, supervisors' safety, and staff training for OSH on safety all have an impact on employees' productivity. Industries in developing countries are typically marked by inadequate workplace design, poorly structured occupations, a

mismatch between job requirements and worker abilities, unfavorable settings, subpar human-machine interfaces, and improper management programs, Ramazan, et al., (2016). These issues result in workplace dangers, poor employee health, injuries from mechanical equipment, and disabilities, which lower employee productivity, lower the quality of their work, and raise the cost of their products Shikdar & Sawaqed, (2003).

WHO (2009), states that injury-related unplanned worker absenteeism, incapacity, and premature death results in economic losses that can lower a company's productivity and efficiency, which may negatively affect its earnings and profits, its capacity to reinvest profits in new capital development, and subsequently lower the likelihood of wealth or consumption.

2.3.3. Safe work procedures

Safe work procedures are an essential to all workers to ensure their company in a safer work place environment with implementing safety and health practices to manage damages, injuries and accidents in the workplace Fatini Hanim Binti Mohamed Taufek*, (2015). Hagan P. , (2001) favorable and unfavorable outcomes are the determination of employee's behavior to know their future behavior. According to Gordon, Flin, & K.Mearns, (2005), they said workplace injuries can be decreased or avoided and all the employees can manage the human error properly if proper procedure's safety implementing for employees. According to Hagan, Montgomery, & O'Reilly, (2001), many accidents happened when the employees using facilities that have safety work procedures. The employees have to follow the safety work procedures at workplace to reducing the rate of injuries or accidents that will lead for the organization to not be productive. The employer must fair in actions towards their employees. In order to ensure the workplace safer, employees must follow safe work procedures Yule, Flin, & Murdy, (2007). Alli, (2008), the employers and employees must aware of the importance of establishing safe working procedures. Griffin, (2000) addressed that injuries or accidents in the workplace may happen because of employees were ignores the safe work procedures and it will increase the risks of behavioral injure.

2.3.4. Occupational Workplace practice and Improvement approaches

Occupational safety and health practices are defined in a variety of ways by academics, but the core idea is constant. According Reynolds, (2011), The researchers further claimed that the OSH system should not be viewed as a separate process but rather as a component of how business

activities are conducted. According to occupational safety and health administration OSHA, (2016), The recommended fundamental components for workplace safety and health practice include management leadership, worker participation, hazard identification and assessment, hazard prevention and control, education and training, program evaluation and improvement, communication and coordination for hos employers and staffing agencies. Accordingly, the fundamental elements of OSH practice are management commitment, staff training and engagement, safety regulations and procedures, and OSH policy, Vinodkumar, (2019).

Employee Training and Participation: Muthukumar, (2019), The health and safety programs, which involve organizing and teaching people to prevent injury and catastrophe at work while maintaining their attitude toward safe production, are the most important OSH practices. According to, Othman, (2012) , The amount of accidents, injuries, legal liability, employee compensation, equipment damage, and employee absences from the job can all be reduced with the help of good training programs.

Management Commitment: Additionally, top management should be included in the OSH training that is provided for staff as well. There is a need for further study on upper level management because they can establish priorities and have a bigger impact on organizational strategy, Kassu & Daniel, (2016). For the safety management to be effective, every level of management needs to commit to and show their support for the safety and health program, Shekh, (2015). In addition, because management has authority over the company's resources, they are typically accountable for the majority of safety-related issues Othman, (2012).

Safety rules and Procedures: are crucial components of an organization's OSH policies that allow employees to follow safety rules and consequently preserve staff welfare. Regular safety inspections, supervisory enforcement of safety rules and effective safety and health regulations, procedures at workstations to prevent accidents, and changes in workers' safety habits are all part of the safety rules.

OSH policy: The first step in creating an effective OSH management practice is to create a clear documented OSH policy and plan. Companies are encouraged to create their own organizational OSH policies by national OSH policy. The health and safety policy statement must include the provisions and processes for how all OSH concerns are handled, but it need not include all the specifics of every operation HSE, (2004)

Policy and leadership development, planning and change management, organization development, implementation, checking and taking corrective action, management and performance review are all aspects of the management system improvement strategy, Kassu J. , (2020).

The three "E" symbolic approach is one of several approaches that organizations can use to improve workplace safety practices. According to Charles (2003), The first one deals with the process' engineering design and organization. The second is education, which includes training and concentrating workers. Enforcement, which deals with OSH policy and process execution, is the final one. The approach took into account risk management, managerial commitment, training, and empowerment as success criteria for OSH practices. In addition, it served as a template for self-evaluation by taking into account results of improvement from the perspectives of the business, employees, and society Susana, et al, (2014). Six key variables for improvement were found in a study on the integrated system model creation for OSH practice in manufacturing industries: knowledge dissemination, OSH management, collaboration, appropriate technology application, workplace innovation, and lean workstation. They are combined and prioritized in order to establish a special model for OSH enhancement Kassu J. , (2020).

Four key components for OSH improvement were found in another study that was site-specific in its focus on manufacturing companies' OSH programs. Top management involvement in OSH, which seeks integration with key business functions, and top management decision-making Improvements in the human and material resources for hazard analysis, control, and prevention, ongoing education and training, both for permanent and contract employees, and employee participation in OSH management structures like the OSH committee, hazard analysis procedures, and accident investigation strategies, LaMontagne, et al., (2004).

As a result, just like any other system, OSH practice improvement strategies depend on the environment, nature of the industry, climate for safety, current problems, and existing practices. Every industry must therefore create its own improvement strategy in line with the aforementioned need by tailoring to its current practices.

2.4. Employee Behaviors concepts

Employee behavior plays a crucial role in ensuring the effectiveness and efficiency of the elevator installation process. However, inconsistent adherence to safety procedures, lack of attention to detail, poor communication, and suboptimal teamwork can hinder productivity and compromise safety. Employees who neglect safety guidelines or fail to report hazards promptly increase the risk of accidents or errors. Additionally, negative behaviors such as resistance to change, complacency, or lack of motivation may impede the successful completion of the installation process and contribute to reduce productivity.

Effective safety communication involves the exchange of safety-related information among employees during the elevator installation process. A study by Clarke & Ward, (2019) highlighted the importance of open and transparent safety communication in enhancing employee awareness, engagement, and safety performance. Research by Zohar, (2020) indicated that accurate risk perceptions among employee was positively related to their safety behavior and overall job performance. Nielsen & Abildgaard, (2020) found that employee who exhibited proactive safety behavior contributed to improved safety performance and overall project success in the construction industry. A study by Huang, Chen, & Chen, (2021) demonstrated that effective safety leadership positively influenced employee safety behavior and contributed to a safer working environment. Safety motivation encompasses employee's internal drive and willing to prioritize safety during elevator installation tasks. Research by Hofmann & Stetzer, (2019) highlighted the role of safety motivation in influencing employees' safety behavior and preventing accidents.

2.4.1. Worker's behavior conditions related factors that are leading to accidents

Productivity for an organization can be affected by different factors. Among those factors employee performance is one of the major factors for productivity improvement. Iqbal N and others, (2015) has reviewed that organization may face problems of poor innovation, low productivity, inability to meet performance targets due to low employee performance. It is known that employees are the most important resources and assets of any organizations if employee are this much important and the performance of employee has impact on the organization performance therefore, all organization should focus on employee performance to

enhance the organization productivity. Dr. James and Prof. Christopher, (2018) stated that employees help capital natural resources and machines to produce desired output. A study by, Clarke, (2019) revealed that leaders who actively promote safety, provide support, and encourage employee participation lead to higher levels of employee performance. A positive work environment that promotes employee well-being is closely linked to higher productivity levels, by their study, Bakker & Demerouti, (2017) highlighted the importance of enhancing employee well- being to improve performance and productivity. Nielsen & Daniels, (2021) found that teams characterized by strong communication, cooperation, and mutual support demonstrated higher levels of safety performance and productivity. The organization's culture and safety climate significantly impact employee behavior and productivity, Zohar & Luria, (2020) found that a strong safety climate, along with a supportive organizational culture, encourages positive safety behaviors and enhances productivity. Garrett and Teizer, (2009) in the same way these authors investigated that organizational and supervisory human factors and workers' mental and physical conditions has direct impact to human errors on their working activities, as a result they proposed human error awareness training and discussing the role for site safety control. Saurin and Guimaraes, (2008) These authors tried to analyzed factors that contribute for poor and stressful working conditions such as lack of worker's perceptions on how to work on scaffolding safely, inappropriate inspection, failure in safety planning and control and inadequate PPE use.

2.4.2. Relationship between workplace Safety, Employee behavior, and productivity

Several studies have highlighted the positive impact of workplace safety on productivity. Smith & Sainfort, (2018) found that organizations with effective safety program experienced higher levels of employee productivity and performance. Also employee behavior plays a crucial role in maintaining workplace safety. Research by Probst & Estrada , (2020) demonstrated that positive safety behaviors, such as adherence to safety protocols and active hazard reporting were associated with improved safety performance and reduced accident rates. A study conducted by Christian, Garza, & Slaughter, (2019) a positive safety climate, characterized by strong leadership commitment and employee involvement, encourages employee engagement and contributes to higher productivity. Effective safety training program enhance employee knowledge and skills, resulting improved safety performance and productivity, Wang, Lu, & Siu,

(2021) found that organizations investing in comprehensive safety training reported higher levels of employee performance and productivity. Employee participation in safety activities positively influences job satisfaction, which, in turn, has a direct impact on productivity. This was confirmed by a study by Sinclair, Martin, Pritchard, & Smith, (2020), which causes for accidents. Shapira and Lyachin, (2009), and Tam and Fung, (2011) In these studies they analyzed that the work procedures and the requirements of equipment such as tower crane during operation and the working conditions were the great role factors for affecting safety. Miranda, Punnett, Gore, and Boyer, (2011) Stated, that the determinant of injury risk is the attitudes and safety and health practices in the workplace. Awan and Tahir, (2015) According to this, an atmosphere that attracts individuals and motivates them to join its workforce and gives them the opportunity to perform well is known as an appealing environment or a supportive environment, and it aids in recruiting and helps people stay in their jobs.

2.5. Elevator installation process

Elevator installation involves the assembly, positioning, and integration of elevator components within a building's structure. The process typically begins with the preparation of the elevator shaft, including the installation of guide rails, pit constructions, and the placement of structural supports. Subsequently, the elevator car, counterweights, control systems, and safety features are installed. Finally, electrical connections, testing, and commissioning are conducted to ensure proper functionality and compliance with safety regulations Smith, J., Johnson, A., & Davis, M. (2021).

2.6. Major Risks, Accidents, Injuries, Damages and Associated Factors in Elevator Installation Process

2.6.1. Major Risks

According to Classification Standards for Injuries and Causalities of corporate employees working on Elevator installation, potential safety accidents might occur during operation process are classified in to five categories, namely falls from height, mechanical injuries, lifting injuries, object attacks and electric shock, Yong-nan, (2018).

Falls from height

Among the scenarios that could result in falls from a height include falls from scaffolds, falls from edges or cave entrances, falls in hoisting materials, falls during ladder operations, and falls during demolition projects. Analysis reveals that the primary factors contributing to falls' height are **1.** Operator's lack of safety awareness, lack of comprehension of hazards, or lack of protection against hazards (safety belts are not fastened or are not attached in the proper location, and helmets are not used during work at heights or are not securely fastened);**2.** Operators break the law, and managers at all levels provide illegitimate orders; **3.** There are no safety precautions performed on construction sites, or there are insufficient safety precautions available (such as damaged scaffolds); **4.** extreme operating environments (such as bright illumination, unobstructed apertures, or harsh natural conditions); and **5.** improper safety inspections on building sites, a lack of explanation of safety technologies by safety management employees, and insufficient monitoring. **Mechanical Injuries**

Various power-driven electric devices, such as electric welding machines, metal and concrete drilling machines, winches, and tiraks, as well as various mechanical items, such as loaders and hydraulic lifters, as well as tools, such as wrenches, hammers, and pliers, are examples of equipment that could result in mechanical injuries. There are two general groups of mechanical injury causes: **1.** Faulty actions performed by the operator (such as inappropriate use of protective measures, tension, attention, or the erroneous operation), **2.** Extrinsic factors, such as safety concerns in the design of the machine or equipment, insufficient supervision as a result of insufficient safety inspection, abnormal working conditions, or an emerging harsh climate

Lifting injuries

Lifting slings, a large elevator component, and the falling of major hoists or guide rails are the two main potential causes of lifting injuries. In general, there are two groups into which lifting injury causes fall. One category of causes includes improper operations by operators, a failure to take preventative action in the event of an accident, a lack of ability, or a slow response to situations. The other types of causes include inadequate field inspection and supervision, quality issues in lifting appliances, and flaws in lifting slings and other accessories.

Object Attack

Attack by objects falling from a side perpendicular to the attacked during crossover operations or at a passageway's entrance is the most common type of object attack. Injury caused by stones or components falling from heights or by discarded objects falling from above are the main

potential sources of object attack. For instance, because to poor protection of landing doors, personal accidents result when foreign objects fall into hoist ways from outside the doors. These factors include failure to wear a helmet, poor tool use habits, a lack of safety signals or protective measures while disposing of debris, and difficulties in effectively blocking falling objects due to insufficient flat or fine mesh protection.

Electric shock

If a mechanic is using a power tool that isn't grounded while installing an elevator, electric shock could result. If there are exposed wires or conductive materials nearby, shock may also occur.

Not using personal protective equipment(PPE) properly

Every worker at a construction site needs to have the appropriate safety gear, and it's crucial that they are instructed on how to use it properly.

Getting struck by the elevator

As the installation process progress, a worker could be struck by the elevator begins to travel along the hoist way, they need to have ample time to get out of the way.

2.6.2. Causes of safety Accidents in Elevator installation process

Yong-nan, (2018), In general, there are a variety of rather complex risk elements, including people, objects, the environment, and management, which interact with one another to cause safety mishaps during the construction of elevators. However, these elements can generally be split into subjective and objective elements. While objective elements include harmful situations and environmental factors of things, subjective factors are people's unsafe actions QiaoFa, (2014).

People’s Unsafe Behavior

People's risky behaviors include those that compromise safe work or operation or cause accidents while those tasks or operations are being carried out. Accidents are unavoidable once risk variables go out of hand. People are the most fundamental and immediate causes of accidents when it comes to causes. In general, mistakes rarely have predictable outcomes since they can be caused by a variety of things, including exhaustion, mental instability, lack of focus, inexperienced equipment use, environmental effects, and extreme psychological stress. People generally engage in the following risky practices while conducting business: -

Fluke Mind

Because of the following, workers have bizarre minds. I'll start with empirical errors. For instance, if no operations against the rules have ever resulted in an accident or if no accidents have occurred in years, workers will have psychologically weaker risk consciousness. Second, fail to comprehend. Some employees are quite tolerant of their risky actions because they believe that accidents don't happen frequently or that injuries wouldn't be very significant even if they were sustained. Therefore, people's unsafe activities are strongly prohibited, and corrective measures must be performed after the first rule violation.

Psychological Paralysis: The following traits describe psychological paralysis. First off, some individuals don't see risk since they become accustomed to doing what they regularly do. Second, they don't give a damn about what they've done time and time again. Thirdly, they go about their business as usual because they don't worry about unusual occurrences. Fourthly, they are careless and try to get by for as long as they can.

Expedience: Obligatory safety regulations, safeguards, and gear are thought to be barriers to achieving objectives. The mental habit of expedition and short cuts is one that elevator workers learn over the course of their sustained employment. For instance, some workers choose not to wear helmets when working at heights out of convenience, or they enter hoisting zones that are off-limits without permission to save time, or they destroy safety equipment to avoid difficulties.

Antagonism: The main indicator of animosity is continuing with bad habits rather than embracing wise and sympathetic criticism and counsel. For instance, if a worker is expected to hoist equipment in accordance with operating protocols, he might not follow these processes if he feels unqualified to do so.

Unsafe conditions and Environmental Factors of Things

Accidents have an immediate cause that is an unsafe environment and things. By accurately identifying the precise unsafe state of things and the environment and managing its development, it is directly realistically significant for preventing and reducing accidents. Lei, (2014). In general, unsafe state of objects and environments exists in several forms as follows:

1. Protection against Specifications, including Inappropriate Height or Strength
2. Lack of Necessary Protective Equipment
3. Unsafe design of Machines and Tools
4. Unreasonable Equipment Layout and Arrangement

5. Poor lighting or Intense Light
6. Narrow Workplaces and Passageways

2.7. Costs of workplace safety and Employee behavior and their Economic Impacts

Companies that engage in occupational safety and health benefit economically and socially, according to recent studies like, Boileau, (2016) have also proven OSH's advantages for a company's efficiency and competitiveness. Accidents on the work and component damage come with both direct and indirect costs. Hospitalization costs, benefits for any disabilities a worker may have as a result of the accident, replacement of damaged elevator components as well as the cost of working tools and equipment as a result of worker negligence are all considered direct costs. The indirect cost consists of wages for the time spent hiring and selecting staff, overtime payments required to make up for lost production, and the expense of recalling an additional employee. Additionally, the company faces hidden costs such as training expenses, wasted hours, output declines, and others (Robert & John, 2004). Due to decreased accident costs, fewer sick days, and fewer product complaints, a properly established and efficiently run workplace safety program can result in significant financial savings Jan, (2012). The majority of research have found that the cost of promoting a safe working environment and OSH status has an impact on production costs; consequently, a good workplace with knowledgeable, safe, and healthy employees is lucrative in the long term for business productivity.

2.8. Concepts of Failure Mode Effects Analysis (FMEA)

The tool was first proposed by NASA in 1963 for their obvious reliability requirements. Since then, it has been extensively used as a powerful technique for system safety and reliability analysis of products and processes in a wide range of industries – particularly aerospace, nuclear, automotive and medical Ebeling, (2001). FMEA is an easy to use and yet powerful pro-active engineering quality method that helps to identify and counter weak points in the early conception phase of products and processes Plaza, Ube, Medrano, & Blesa, (2003). In other words, this tool can minimize disaster errors which can cause severe damage to the company.

In the recent years, various tools such as total quality management(TQM), value engineering, lean manufacturing, sigma and failure mode and effects analysis(FMEA), have been applied to

decrease the amount of dissipation, to increase productivity and to improve quality in different production processes Saghaei & Habibi, (2008). FMEA a tool which today is widely studied in car manufacturing, aerospace, electronics, chemical and other sections of manufacturing industries in order to identify, prioritize and remove the failures, losses and potential problems in manufacturing process before implementing the process Rhee & Ishii, (2003). Results of FMEA help the manager in identifying the potential failures, their effects and solution before implementing the process or design Ebrahimpour, Rezaie, & Shokravi, (2010).

Developing, boosting, and controlling the likelihood value or price of failure recognized from the source (input) is the goal of an FMEA, according to Novyanto (2007). It also aims to lessen the repercussions that the failure occurrence results in. A cross-functional team of subject matter experts from diverse departments performs FMEA. Typically, a team is created based on a concurrent engineering method during the planning stage of a new product Sellappan & Palanikumar, (2013). The team examines each product's component and subsystem in search of failure modes. The possible causes and effects are then identified. Based on the risk priority number (RPN), the likelihood of each failure is given a higher priority. This is mathematically shown RPN= **D x S x O** Rafie & Samimi Namin, (2015)

Severity (S), Occurrence (O), and Detection (D) are the three ratings that make up the RPN decision factor. Stamatis (2003) uses a scale of 1 to 10 for these ratings.

Naturally, the risk of the failure mode under consideration is higher the higher the RPN. The goal of calculating RPN is to rank and prioritize the failure modes according to their significance Mohammad Gheibia., (2019).

The fundamental steps of an FMEA are to identify the underlying causes and possible issues before generating an RPN that can focus improvement efforts on the areas that need it most. After then, steps are done to lessen the risk that the failure mode presents Crites & Kittinger, (2009).

2.8.1. The Functions and objectives of FMEA

One of the best features of FMEA is its action manner rather than reaction in dealing with failure. In other words, this is an action before failure rather than after, because usually a lot of money will spend to resolve problems and damage caused. One of the best features of FMEA is its action manner rather than reaction in dealing with failure. In other words, this is an action

before failure rather than after; because usually a lot of money will spend to resolve problems and damage caused Bahrami, (2012).

2.8.2. Mechanisms of FMEA

Failures are ranked in order of severity, frequency, and ease of detection, and we need to know what cycle activities or process of procedures in this method would be done during stages of FMEA completely engineering and precise with keep pace with this cycle Carison, (2012)**.**

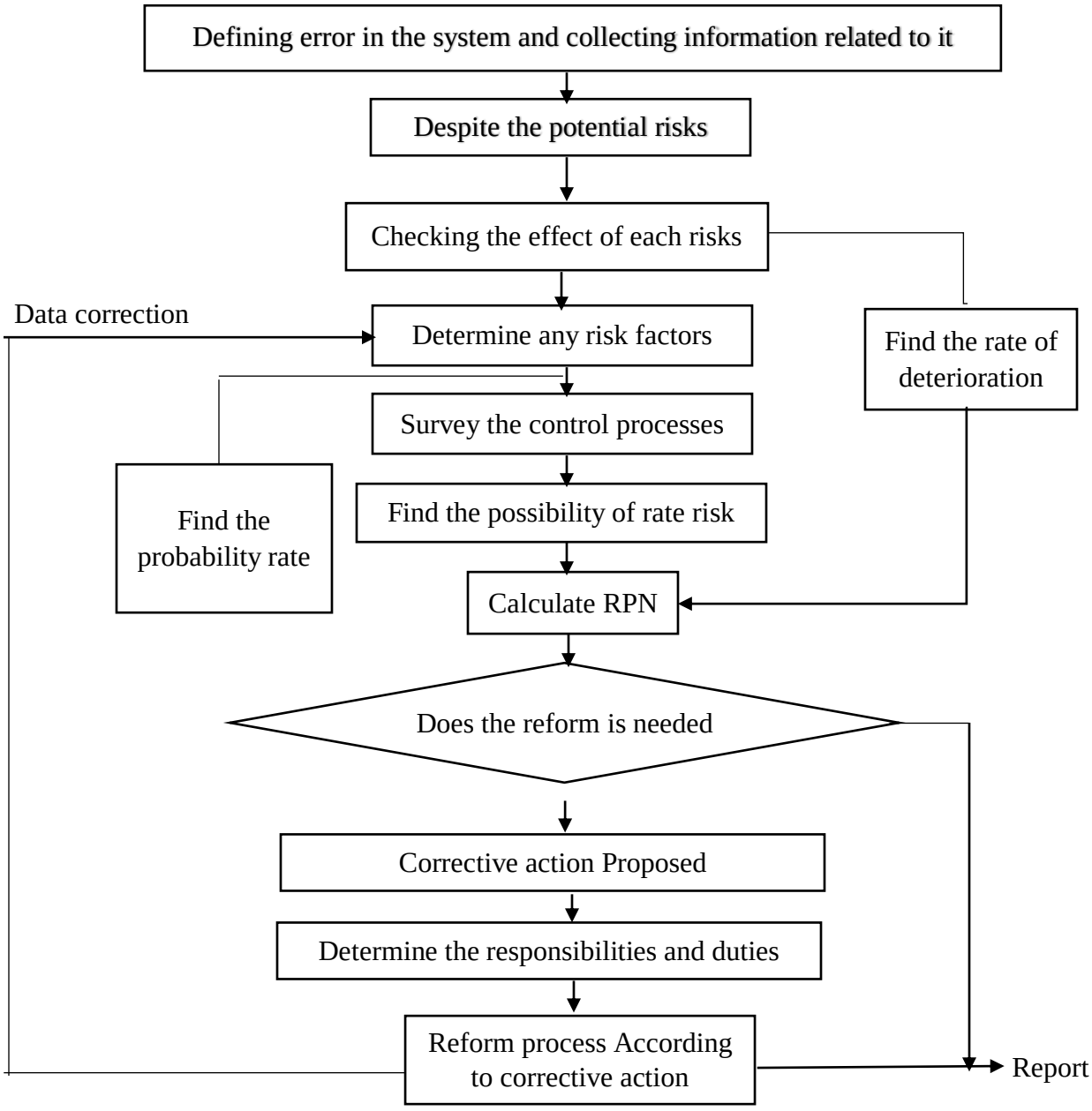

Figure 2.1: Cycle implementing FMEA techniques

In general, this study prefers FMEA to analyze because there are so many risk factors in the organization as well as with in the society so that this wide variety of risks would be analyzed by this method hence, the primary goal of this method is to identify the potential modes of failure in the system components and their causes of Elevator installation process it can evaluate their effects on system performance and it also ultimately determines the ways in which can mitigate the chances of occurrence of different component failure and improves their detectability.

Cost of heavy causalities and destructions of equipment and devices has led the organization to implement systematic processes in order to eliminated or reduced the excess cost of production and also by two method helps to prevent loss of life in the process and control of equipment failures in order to sustainably produce safe and highly qualified product that will help to enhance productivity of the organization.

2.8.3. Root cause analyses

A popular method for learning from patient safety accidents and near-misses is root cause analysis (RCA). Although health care risk managers in a variety of settings are familiar with the phrase, the manner RCA is applied might differ greatly between and within organizations due to different regulatory frameworks, organizational cultures, or internal processes. It is a general method to identifying the systems-level causes and contributing elements behind an event or near-miss Card rather than a specific, well-defined strategy, Ward, & Clarkson, (2012).

The complete summary of the literature review conducted on Enhancing Elevator Installation process through improvement of safety and work behavior from the global context were gathered and presented in Table 2.1

Table 2.1: Summary of the main articles

Author	**Title**	**Technique used**	**Benefit derived**	**Identified gaps**
Smith & Sainfort, (2018)	The relationship between workplace safety and productivity: A comprehensive literature review.	A cross-sectional based study close-ended structured questionnaire was used	Found that organizations effective safety program experienced higher level of productivity and performance	The study deals with only focused on safety and ignores the employees behavioral impact because major causes of injuries were caused due to this issues.

Abera & Yeshmebet, (2020).	The effect of OSH Program on Organizational Productivity	Descriptive and explanatory types of research designs stratified sampling method, questionnaire was conducted	Chemical, psychological and accidental hazard control program have positive and significant effect on organizational productivity.	The study only measured the effect of OSH program on organizational productivity and it didn't consider its effect with respect to other organizational performance in addition to this not assess other aspects of OSH such as major work related injuries, illness impact and their associated factors.
Ramazan, et al., (2016)	Effect of Occupational Health and Safety Practices on Organizational Commitment, Work Alienation and Job Performance.	The survey data set obtained from private sector enterprises was analyzed by structural equation modeling using least square method	The findings of the analysis suggested that such OSH practices as safety procedure and risk management, safety and health rules, first aid support had a positive effect on organizational commitment	The study only concerned on health and safety practices for organizational commitment it neglects the work behavioral issues besides major causes of injuries, absenteeism were not investigated for better organizational commitment and performance.
Shikdar & Sawaqed, (2003).	Worker Productivity and Occupational health and Safety issues in selected industiries.	By developing of a checklist that included questions to production managers, Managers and workers	Identify factors that affected worker productivity, occupational health and safety in selected industries	The study only identifies the factors affected workers productivity with relative to health and safety not show how much it affects the organization in terms of cost and productivity.
Christian, Garza, & Slaughter, (2019) a	Work engagement: A quantitive review and test of its relations with task and contextual	Used meta-analytic path modeling to test the role of engagement as	To identify an agreed-upon definition of engagement, to investigate its	The limitation of the study was it only focuses on leadership commitment and

	performance.	a mediator of the relation between distal antecedents and job performance	uniqueness, and to clarify its nomological network of constructs.	employee involvement encourages employee engagement and contributes to higher productivity but there are other factors like employee behavioral factors to be studied well for better work engagement and productivity
Awan and Tahir, (2015)	Impact of working Environment on employee's productivity	A closed ended questionnaire was developed to get feedback from target audience and different statistical method was used	To measure the impact of working environment on productivity of employees	Impacts of Environmental were not studied well towards elevator installation process in terms of productivity effect.

2.9. Summary and Identified Gaps

The literatures mentioned above that have been evaluated offer readers a theoretical perspective on the study issues and frequently contain conceptual frameworks for the research on frameworks. Along with the fundamental research questions and overall study goals, the literature review chapter discusses issues with employee working behavior, occupational safety theories, and obstacles linked to elevator installation in particular. As discussed in the in the literature review the major gaps which is drawn from past researches can be summarized, several studies have examined the impact of safety and work behavior on productivity in different industries in case of Ethiopia. However, there is no studies shows its impact on Elevator installation process in case of Ethiopia. Besides this the existing research as examined in the literature review most of them suggests that a safer work environment leads to improved productivity, reduced accidents, and fewer delays. However, there is a lack of research

specifically investigating the relationship between workplace safety and employee behavior incur for the company to high cost and this affects towards Enhancement of elevator installation during the process.

By conducting thorough research on the major causes of work-related injuries, absenteeism, illness, root causes of accidents, root causes of failures to damage and rework which influence on labor productivity, as well as decline organizations productivity as well, this research paper reveals to address and fill the gaps on occupational safety and work behavioral practices improvement in order to Enhance the Elevator installation process.

2.10. Conceptual Framework

Based on the theoretical and empirical literature, a conceptual framework can be developed to explain the relationship between Workplace safety, employee behavior and organizational productivity. The framework can be presented as follows:

Independent Variable: - This refers to the internal and external factors that drive an employee to achieve organizational goals. Factors that contribute to better workplace safety and employee behavior can include workforce skill and competence, technological advancement, training and education, collaboration efforts and communication, project planning, risk assessment, organizational leadership and work procedure.

Dependent Variable: Organizational Productivity - This refers to the output or results of the organization's operations

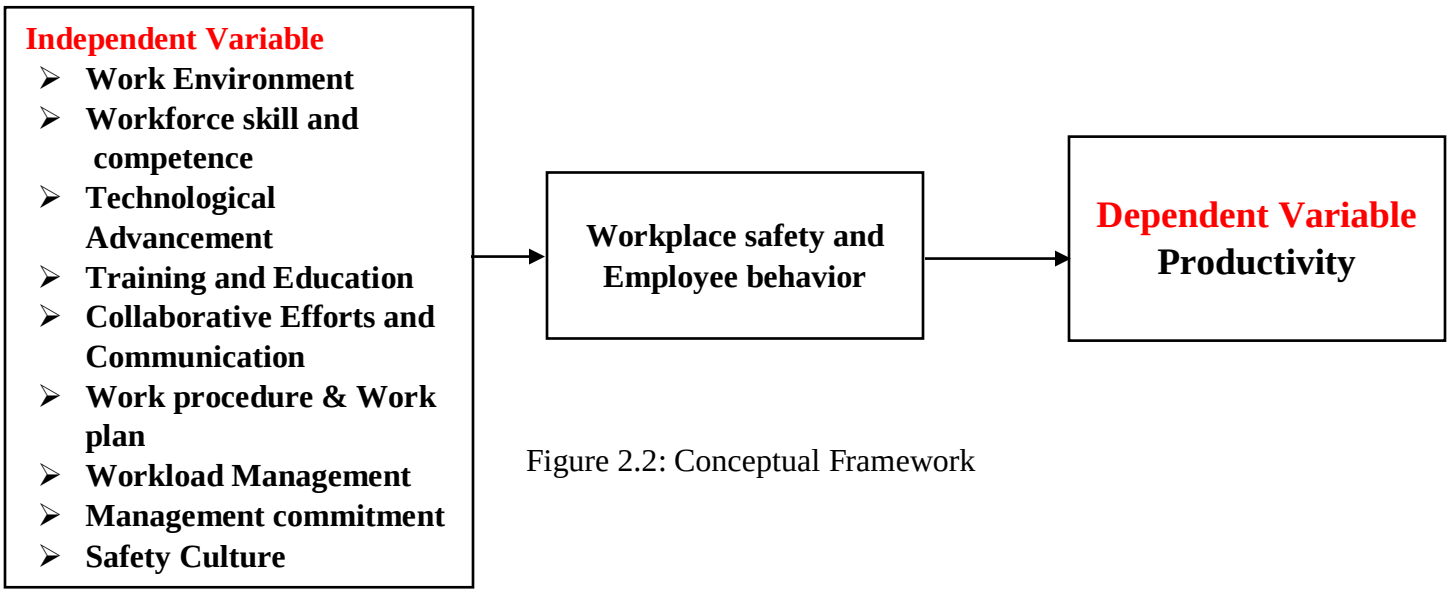

Figure 2.2: Conceptual Framework

Chapter Three

3. Research Methodology

3.1. Introduction

Research methodology is an essential aspect of any research study as it provides a systematic and structured approach to the investigation of a research question or problem. It includes the methods and techniques used to collect, record, and analyze data, as well as the design of the study itself. In this study the methodology for the literature review searching, reading and review of different journals, articles, books and different research papers regarding on workplace safety and employee's behavior, productivity enhancement and unsafe acts of works and unsafe working conditions related to risk factors. The research methodology for the data collection will be applied primary and secondary data collection method, for data analysis quantitative and qualitative data analysis method will be use for the study.

3.2. Research Design

The research design for this study shall be applied descriptive research method to describe the theoretical and practical aspects of the occupational workplace safety and employee behaviors and also to assess the weaken practices and existing challenges with a particular reference faced to the case company. According to Creswell (2013), there are three types of research designs. These are qualitative, quantitative and mixed research. Qualitative research design gathers data in the form of description not in numbers and don't quantify results through statistical analysis. Qualitative research design collects data using techniques of focused group discussion, in-depth interview, observation and case study. Thus in this study mainly concentrates on qualitative research.

The population to be target for the study will compose technicians, supervisors, operation manger, and executive director of the case company. Respondents will be selected on the bases of a criterion which demands at least three years of installation operation on site within the organization; because it is believed that they can give enough exposure to the occupational workplace safety and employees behaviors and also the human resource personnel.

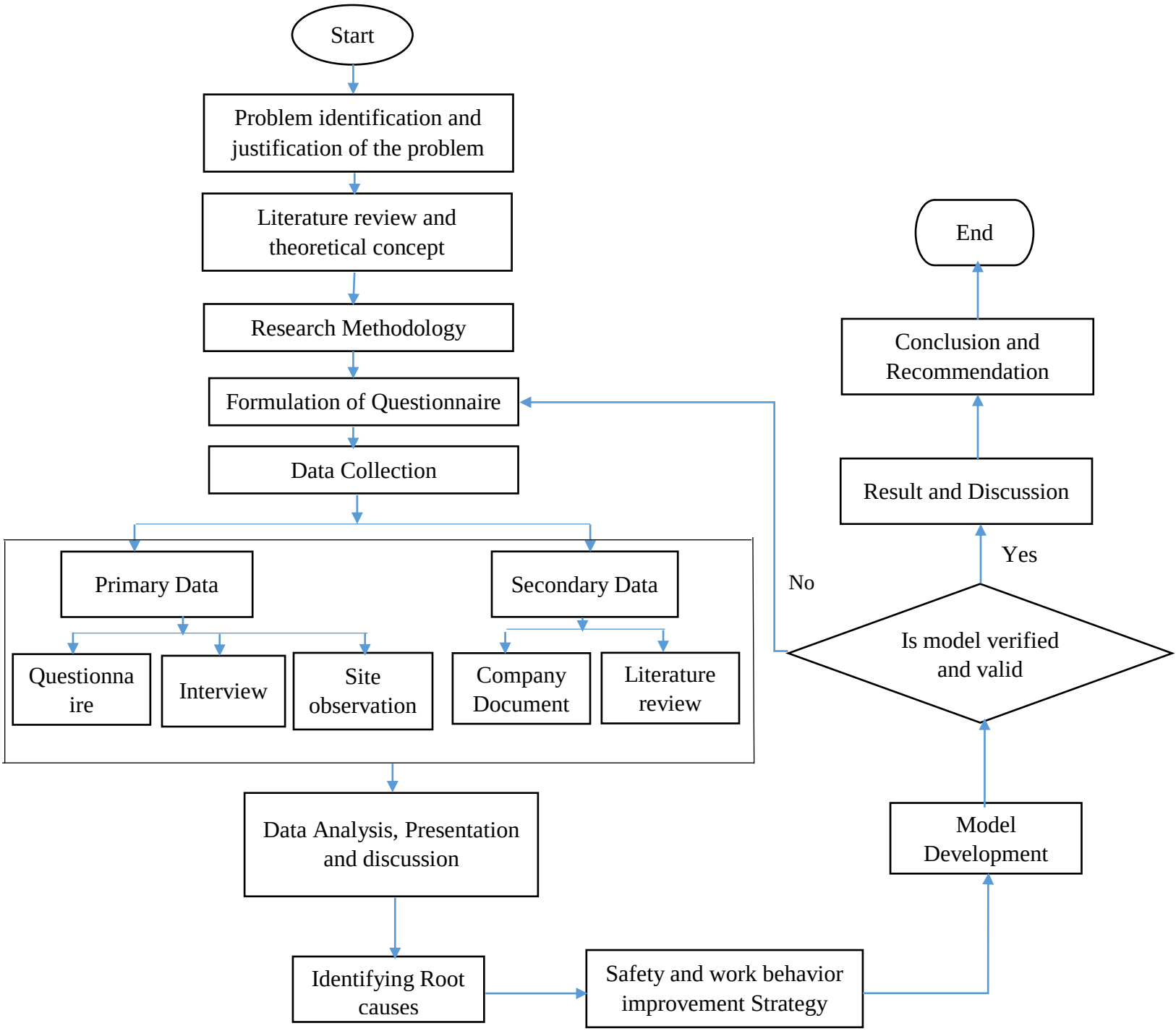

Figure 3.1: Research design procedure

3.3. Study Area

The study conducted in Addis Ababa city which is capital city of Ethiopia on workplace safety improvement in order to enhance Elevator installation process particularly reference to a case of SINTEC ETHIOPIA PLC. It is almost the former Elevator installer company in the town. This time there are a number of competition in this sector either local company or company out of the country, so that to compete the market the company should be productive well. However, the company's productivity decline time to time, hence there are issues needs to study the root causes area that leads the company not to become much more productive and competent.

3.4. Data Source

Throughout the study time, several sources are identified and used to obtain concepts and provide input for the research methodology. The literature review, primary data sources, and secondary data sources are examples of the types of data sources used in the study. Different recently released journals, articles, papers from international conferences, thesis papers, and books have all been evaluated for the literature study. The evaluation approach aids in locating enhancement tools, various workplace safety concerns, working environment elements, employee engagement, employee behaviors, and work procedures that have an impact on operator performance and lower organizational productivity.

Quantitative data can provide precise measurements of workplace safety, employee behavior and productivity, such as through numerical ratings on surveys or performance metrics. This type of data can be analyzed using statistical methods to identify patterns and trends, and can provide insight into the factors that contribute to workplace safety, employee behavior and productivity. For example, analyzing survey responses from employees about their workplace safety condition and well-being and satisfaction levels can reveal correlations between these factors and organizational productivity.

Qualitative data, on the other hand, can provide insights into the context and meaning behind numerical data. This type of data can be collected through methods such as interviews or observations, and can reveal employee attitudes, beliefs, and behaviors that may contribute to their workplace safety and productivity. For example, conducting interviews with employees about their experiences at work can provide insights into the organizational culture, leadership style, and work environment that impact their productivity.

Overall, data is crucial for understanding workplace safety and employee behavior and its impacts on organizational productivity. By collecting and analyzing data from various sources, can gain a comprehensive understanding of the factors that contribute to workplace safety and employee behavior and identify strategies for improving organizational productivity.

3.5. Sampling techniques

A few customers and internal employees were chosen to participate in the research as respondents. Due to their easy accessibility and close proximity to the researcher, the population is therefore too vast, making it difficult to enroll each and every participant in the study region. So, the study made use of random sampling techniques

3.6. Population and Sample size determination

3.6.1. Population

The population to be target for the study will compose technicians, supervisors, operation manger, and executive director of the case company. Respondents will be selected on the bases of a criterion which demands at least three years of installation operation on site within the organization; because it is believed that they can give enough exposure to the occupational workplace safety and employees behaviors and also the human resource personnel.

3.6.2. Sample size determination

The term "population" refers to the entire group of people who share the traits that the researchers are interested in. Both the purposive and stratified random sampling methods will be employed to pick the research subject. Purposive sampling will be employed to purposefully select the case company. Stratified sampling will be applied to determine the desired sample size. Purposive sampling will also use to select staffs such as HR, Sales and Service teams with the desired experience and representativeness with minimum criteria at least three years' experience for the study, therefore in general in the case company there are 197worker thus, the study only focuses on the elevator installation sector hence, under this sector there are 31 workers who are directly engaged to the installation operation thus, the study focuses on these groups and also 5 of the respondents includes from the management team as well as related departments such as Administration department which is totally the target population is 36 in number.

3.7. Data collection Method

Both primary and secondary data collection techniques were employed to get the information needed for the investigation. The use of well-designed questionnaires, well-structured interviews, and direct observation using checklists were all used to gather primary data. Based on the established sample size, a total of 36 questionnaires were delivered. The surveys were written in English. In addition to the questionnaires that were completed and the direct observation data records made on the site of the case company, primary data was also gathered via structured interviews. The interviews were prepared for Top Management member, Director of the department, Operation Manager, Supervisor, Administration head and Safety personnel. A check list was also employed to facilitate the direct observation made on site operation to collect data with regard to work environment, machineries and equipment, employee safety implementation, supervisor inspection, electrical installation as well as different aspects in line with workplace safety and employee behavior practice. Secondary data was gathered through case company operation department and Administration head department referrals, as well as through reviews of the pertinent literature. Other Elevator workplace safety and employee behavior issues in relation to the study's topic were also addressed.

3.8. Data Analysis Tool

Based on the collected data, the failure that incur the case company for unnecessary cost will be developed using the following parameters such as, frequency of the product and working tools and equipment failure or damage, number and type of accidents and injuries during elevator installation operation process. For such a case, Failure analysis is best methods among different methods to collect and analyze the process data to determine a cause that will happen throughout the operational process. Failure analysis will be the good methods that fit to apply to both for a product as well as to a process. The data and information gathered throughout the paper will be summarized and analyzed using the following methods and tools.

SPSS software for data analysis (Statistical package for Social Science**)**

FMEA (Failure Mode Effect analysis)

In this study, Failure Modes and Effects Analysis(FMEA) is employed to analyze workplace safety and employee behavioral issues under Elevator installation process. The FMEA is known to be a systematic procedure for the analysis of a system to identify the potential failure modes,

and their causes and effects on system performance Gandhi & Agrawal, (1992). The analysis is performed at the early stage of a system so that removal or mitigation of the failure mode is the most cost effective, Stamatis D., (1995). An important index in the FMEA is Risky Priority Number (RPN), which is the product of Occurrence(O), Severity(S) and Detection(D) ratings as shown in equation, Tay & Lim, (2006).

RPN= O x S x D

Where O stands for "occurrence of failure," indicating the likelihood that the failure mode will manifest itself as the result of a particular cause; S for "severity," indicating the seriousness of the impact the potential failure mode will have on the process when it manifests itself; and D for "detection," indicating the likelihood that a potential failure will be discovered during the process.

Risk factors with a high RPN should be carefully examined. RPN can be used to rank failures and to prioritize actions because it is a measure of the risk of failures. Actions will be done in accordance with the priority rated by RPN for the failure.

The FMEA procedure is summarized as follows, Tay & Lim, (2006); Teng & HO, (1996).

1) Define the scale table of Severity, Occurrence, and Detection
2) Study intent, purpose, goal and objective of a product/process, generally, it is identified by interaction among components/ process flow diagrams followed by task analysis.
3) Identify potential failures of product/ process, this includes problems, concerns, and opportunity of improvement.
4) Identify consequence of failures to other components/ next processes, operation, customers.
5) Identify potential root causes of potential failures.
6) First level method/ procedure to detect/ prevent failures of product/ process.
7) Severity rating: rank the seriousness of the effect of the potential failures.
8) Occurrence rating: estimation of the frequency for a potential cause of failures.
9) Detection rating: likelihood of the process control

3.9. Method Data Analysis

In order to answer the research questions and achieve the study's goal, the main and secondary data that had been gathered had been evaluated and presented. Both qualitative and quantitative

data analysis techniques were used by the researcher. Preparing the data for analysis, conducting an analysis, and evaluating the results are the three procedures that make up data analysis in the majority of research investigations Marczyk et.al. (2005). As a result, all pertinent data was meticulously prepared, and descriptive and inferential statistics (Mean, Frequency, and Percentages for quantitative data and narrative forms for qualitative data) were used to analyze the acquired data.

For better analysis interpretation, statistical tools including figures, tables, graphs, charts, and diagrams were also used, along with data analysis software like SPSS version 20 and Microsoft Excel. To determine whether there is a correlation between the independent and dependent variables, Pearson's chi-square test and its matching 95% confidence interval (CI) were calculated. P values less than 0.05 were considered statistically significant, and the Multi Regression results offered promising findings for the study. The core causes of poor workplace safety and employee behavior issues are further addressed in a Fishbone diagram for the root cause analysis portion of an FMEA. As a result, the findings from the structured interview are combined with the employee questionnaire responses and findings from the direct observation, and the theoretical foundation of the study is briefly analyzed. Finally, the analysis results are interpreted to arrive at reliable conclusions.

3.10. Validity and Reliability of the research

Validity is the idea of how well a test or measuring approach assesses the things it is intended to measure. Validity is a concept that aims to address the following: Does the instrument or measuring approach measure what it is intended to measure? Marczyik, DeMatteo, & Festinger, (2005).

Hence, to maintain validity the researcher will develop well-structured questionnaire, in order to collect valid data from the respondents. The researcher will better to evaluate the developed tools by advisors and other colleagues for feedback and to be sure the collected data all necessary and relevant to the study. The representative sample of the total population will be selected to keep the content valid throughout the study. In order to decrease bias during data collection the researcher himself will distribute and administer the questionnaire. To preserve the validity of the instruments the researcher will try to adopt the instruments from different interrelated literatures thus for the instrument to truly measure what it intends to measure. Furthermore,

while developing the questionnaires the researcher will link the questions to the objectives of the study.

Additionally, the research's validity was examined utilizing the SPSS software tool and Cronbach's alpha value. The reliability test for those questions with a Likert-Scale measurement was calculated using Lee Cronbach's Cronbach's Alpha tool, which assesses the degree of internal consistency within a group of items Cronbach, (1951). As a result, reliability coefficients of 0.7 or above are thought to be sufficient for a measurement to be used to look at associations.

Table 3.1: Cronbach's alpha results for each productivity Measurement.

Work place safety &Employee behavior Measurement	**Reliability Statistics**	
	Cronbach 's alpha	**No of Items**
Management Commitment practice	**0.92**	**7**
Training & Education	**0.95**	**10**
Collaborative efforts and communication	**0.953**	**11**
Work force skill and Commitment	**0.984**	**10**
Technological advancement	**0.945**	**8**
Work load management	**0.878**	**6**
Safety culture	**0.926**	**7**
Work Environment (Physical Environment)	**0.881**	**9**
Work procedure & work plan	**0.934**	**7**

(Source: own survey result)

The scales employed in this investigation met the advised threshold of $\alpha \geq 0.70$, which calls for extremely high levels of internal consistency between measurement sections.

3.11. Ethical Consideration

The questions are prepared to include clarification regarding the study purpose, briefing on respondent' right and protection, and agreement to obtain information. This research study has taken care in protecting respondent' confidentiality and respecting the developed codes of ethics. As a result, the participants could participate in the questionnaire and interview sessions without worrying about bias and were given assurances of their privacy and confidentiality throughout the study. Therefore, to preserve the work and the confidentiality of the participant's information for the third party, this study maintains a high level of confidentiality during the data gathering procedure.

3.12. Result Dissemination Mechanism

The results of this study will be shared with the appropriate parties, including the Elevator installation businesses and Addis Abeba University, which is the most important. As a result, the research's findings will be submitted to and presented at the School of Mechanical and Industrial Engineering at the Addis Abeba Institute of Technology. Additionally, the findings of the study will be specifically shared with SINTEC ETHIOPIA PLC's Department of Elevator Installation Operation to improve its current manner of doing things. Finally, a try will be made to publish the study's findings in national or international publications.

Chapter Four

4. Data presentation and Analysis

4.1. Introduction

This chapter deals with the analysis of data collected from the questionnaire, which consists of two parts: demographic data and questions about modern management techniques and their impact on workplace safety and employee behavior and organizational productivity. The significance of Workplace safety and employee behavior on organizational productivity is crucial in the contemporary business world, as motivated employees lead to increased productivity. The questionnaire used in this study aims to investigate the role of modern management techniques in improving the workplace safety and employee behavior and increasing productivity by analyzing the responses gathered from the questionnaire. The first part of the questionnaire collects demographic data to ensure a diverse sample, while the second part focuses on modern management techniques, such as workplace safety practice, impact of workplace safety on productivity, Employee behavior practice in the organization, training and development, and collaborative efforts and communication, to understand how they affect organizational productivity. The study's findings will provide insights into the relationship between employee Workplace safety and employee behavior on organizational productivity.

4.2. Data Analysis from the Questionnaire

4.2.1. Methodology

This study employed a cross-sectional survey to investigate the influence of productivity of Elevator Installation process through Improving work place safety and Employee behavior with its related factors. These factors included: Safety management policy practice, Training & Education, Collaborative efforts and communication, Work force skill and Commitment, Technological advancement, Work load management, Safety culture, Work Environment (Physical Environment), Work procedure & work plan. The participants of this study were operators, Middle and Top managers at Sintec Ethiopia P.L.C. The ease of obtaining data and information that is pertinent to the research object's primary problem is taken into account while choosing a research objective. 36 firm employees received a thoughtful survey that was issued by the company. After gathering the data, it was analyzed with (SPSS, Version 20). The most common questions utilized in this study were based on earlier investigations, and the current literature served as the main source for selecting the questions' substance. There were two main sections to the survey. The assessment of workplace safety and employee behavior for elevator installation is covered in the first section of the questionnaire. Items were evaluated using a five-point Likert scale with 1 representing "Strongly Agree" and 5 representing "Strongly Disagree." On a five-point Likert scale, from 1 ("Very low") to 5 ("Very high"), employers were asked to rate their Impact on Productivity of Elevator Installation process. The results analysis for the data that was gathered are reported in the part that follows.

4.2.2. Results Analysis and Discussion

In this section, the findings are presented in the following analysis (1) response rate and demographic analysis (2) Reliability Test (3) Descriptive analysis -mean and standard deviations (4) Inferential analysis the Pearson Correlation, and (5) Multiple Regression.

4.2.3. Response rate and demographic analysis

A total of 36 questionnaires were distributed within the department and 36 were collected. The rate of response is 100% all of the targeted respondents participated which makes the

study reliable. The respondents' demography includes gender, age, education level, position, Work place safety & Employee behavior of Elevator Installation. So, they exhibited the following report in table below.

Gender of the respondents

Table 4.1: Gender of the respondents

Gender	Frequency	Valid Percent
Male	30	83.3
Female	6	16.7
Total	36	100.0

Source: own survey

As indicated on Table 4.1 regard to sex of the study participants the majorities were male that is 30(83.3%) and remaining respondents were female which takes 6(16.7%). The finding showed that there are more male employees on this sector than that of female this might attribute to the labors nature of Elevator installation process as it requires reasonably energy and fitness of workers on job.

Age of the respondents

Table 4.2: Age of the respondents

Age	Frequency	Valid Percent	Cumulative Percent
Below 20 years	4	11.1	11.1
From 20-29 years	16	44.4	55.6
From 30-40 Years	7	19.4	75.0
From 41-54 Years	5	13.9	88.9
Above 55 Years	4	11.1	100.0
Total	36	100.0	

Source: own survey

With regard to age of participant respondents, 4(11.1%) of employees belonged to below 20 years followed by the 20-29 years' group in 16(44.4%) and 30-40 years' age group in 7(19.4%) and 41-54 years' age group in 5(13.9%) and the remaining above 55 years' age group in 4(11.1%). This finding reveals that most of the employees were under age group of 20-29 years which means majority of theme were relatively young.

Work Experience of the respondents

Table 4.3: Work Experience of the respondents

Work Experience	Frequency	Valid Percent	Cumulative Percent
Below 1 year	3	8.3	8.3
From 1-2 year	4	11.1	19.4
From 2-5 year	6	16.7	36.1
From 5-10 year	16	44.4	80.6
More than 10 year	7	19.4	100.0
Total	36	100.0	

Source: own survey

With regard to work experience among the participant's majority of respondents were und 5-10 years' work experience which is 16 (44.4%), and 3(8.3%),4(11.1%) and 6(16.7%) served for ≤5 years, and the remaining 7(19.4%) were above ten years. Therefore, the finding point out that the study relay on highly experienced workers.

Educational Background

Table 4.4: Educational Background

Educational Back Ground	Frequency	Valid Percent	Cumulative Percent
Diploma and certificate	21	58.3	58.3
BSC/BA	11	30.6	88.9
MSC/MA	4	11.1	100.0
Total	36	100.0	

Source: own survey

The educational background shown on table 4.4. the majority 21(58.3%) attended diploma and certificate (Most of the installers were under this group), 11(30.6%) attended BSC/BA (Supervisors and department heads) and the remaining 4(11.1%) of the respondents attended MSC/MA (Operation managers and top management members). The findings showed the majority of the respondent's educational status ranged under Diploma and certificate holders.

Employment Level

Table 4.5: Employment Level

Employment Level	Frequency	Valid Percent	Cumulative Percent
Low level	17	47.2	47.2
Middle Management	14	38.9	86.1
Top Management	5	13.9	100.0
Total	36	100.0	

Source: own survey

Regarding their level under the company, 17(47.2%) work at low level, 14(38.9%) of respondents were under middle management level and the remaining 5(13.9%) were assigned under top management level. The result indicates that majority of respondents 17(47.2%) work in low level in the installation operation department.

4.2.4. Descriptive Analysis

Table 4.6 tabulates the mean and standard deviation for work place safety and Employee behavior factors. Training and education has the highest mean score 4.11 and followed by mean score 3.64 for Safety culture as the second highest with close range with work force skill & commitment 3.53 and sequenced by work force skill and commitment, technological advancement, management commitment practice, collaborative effort and communication, work plan and work procedure work load management and work environment. According to Zaidaton and Bagheri, (2009) the mean score below 3.39 was considered as low, the mean score from 3.40 up to 3.79 was considered as moderate and mean score above 3.8 was considers as high as illustrated by Comparison bases of mean of score of five point Likert scale instrument.

Table 4.6: Descriptive results

Work place Safety & Employee behavior variables	**Number of population(N)**	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**
MCP	36	1	5	3.64	1.437
TE	36	1	5	4.11	1.116
CEC	36	1	5	3.08	1.481
WSC	36	1	5	3.53	1.483
TA	36	1	5	3.42	1.381
WM	36	1	5	1.97	1.23
SC	36	1	5	3.64	1.437
WPWP	36	1	5	3.47	1.464
WE	36	1	5	1.422	3.75

(Source: own survey)

The result from Table 4.6, were conducted from questionnaires survey related questions were covered issues such as: Training and Education, Employee collaborative efforts and communication, safety culture, Technological Advancement issue, employee workload management, working environment management safety policy practice and work procedure and work plan were discussed very well each in average of 10 questions. Accordingly, the respondents were guided the following Likert scale approach: Strongly Disagree(SDA)=1, Disagree(DA)=2, Neither Agree nor Disagree=3, Agree(A)=4, and Strongly Agree(SA)=5. So that, the result of each respondents' result was summarized and reviewed as in Table 4.7 shown.

Table 4.7: Summary of respondent's opinion on each Section

No	Independent Variables	Respondents Opinion (Impacts on safety and employee behavior)	Frequency	Percent	Mean	SD
1.	**Training and Education**	Very low	4	11.1	4.11	1.116
		Low	5	13.9		
		Medium	6	16.7		
		High	6	16.7		
		Very High	15	**41.7**		
2.	**Collaborative Efforts and Communication**	Very low	7	11.9	3.08	1.481
		Low	7	11.9		
		Medium	7	11.9		
		High	6	10.2		
		Very High	9	**15.3**		
3.	**Work force skill and commitment**	Very low	4	6.8	3.53	1.483
		Low	6	10.2		
		Medium	8	13.6		
		High	7	11.9		
		Very High	11	**18.6**		
4.	**Technological Advancement**	Very low	5	8.5	3.42	1.381
		Low	5	8.5		
		Medium	7	11.9		
		High	6	10.2		
		Very High	13	**22**		
5.	**Workload**	Very low	18	30.5	1.97	1.23

	Management	Low	8	**13.6**		
		Medium	5	8.5		
		High	3	5.1		
		Very High	2	3.4		
6.	**Safety Culture**	Very low	1	1.7	3.64	1.437
		Low	3	5.1		
		Medium	5	8.5		
		High	9	15.3		
		Very High	18	**30.5**		
7.	**Work Environment**	Very low	4	6.8	1.422	3.75
		Low	4	6.8		
		Medium	5	8.5		
		High	7	11.9		
		Very High	16	**27.1**		
8.	**Work Procedure and Work plan**	Very low	5	8.5	3.47	1.464
		Low	5	8.5		
		Medium	6	10.2		
		High	6	10.2		
		Very High	14	**23.7**		
9	**Management safety Policy practice**	Very low	1	1.7	3.64	
		Low	5	8.5		
		Medium	3	5.1		
		High	9	15.3		
		Very High	18	**30.5**		

Respondents attitude towards Training and Education impact

Respondents were asked to indicate their level of agreement on each independent variables and results were summarized and discussed as follows. As it can be seen from Table 4.8, on Training and Education, majority, or (15) 41.7% of the respondents strongly agree or they responded on the questionnaire TE has very high impact on safety and employee work behaviors. Whereas, 4(11.1%) of the respondents responded very low impact, 5(13.9%) respond low impact, 6(16.7%) of them responded medium impact and the remaining 6(16.7%) of respondents respond high impact.

According to the survey finding the organization has huge limitation towards provision of giving Training and Education on Elevator installation process. As per Chen, Chang, Huang, & Huang, (2006) giving proper training to employees will help to understand safety protocols, hazard identification, risk assessment knowledge and will lead to improve productivity. Hence, the company should allocate adequate budget and resources towards provision of job specific trainings for employees.

Respondents attitude on collaborative effort and Communications impact

It can be seen on Table 4.8 respondents responded on collaborative effort and communication issues, 7(11.9%) of respondents respond very low impact on safety and behavior, 7(11.9%) low impact ,7(11.9%) Medium impact, 6(10.2%) of respondents responded high impact and remaining 9(15.3%) of the respondent responded that they strongly agree on miss collaboration and miss communication effect has very high impact to have good and safe work environment. According to Brown, Thompson, & Wiliams, (2023) establishing clear channels of communications, promoting information sharing, and encouraging a collaborative work environment can lead to quicker problem-solving, reduced rework, and improved overall project coordination, Therefore, the organization should give serious attention on it to improve and enhance its installation process.

Respondents on workforce skill and commitments impact

Respondents on workforce skill and commitment responded as it can be seen on Table 4.8 that 4(6.8%) very low impact, 6(10.2%) low impact, 8(13.6%) medium impact or neither agree or disagree on it and 7(11.9%) of them responded high impact or agree on the importance of WSC and the remaining 11(18.6%) of the respondents strongly agree that WCS

has high impact on employees' safe work and behavioral issues so that, in order to be effective on the process and to be productive the company should improve WCS strongly either it can be through training or serious site inspection.

Respondents attitude towards Technological Advancement impact

Employee were responded regarding the Technological advancement as it can be seen on Table 4.8 for implementing effective safety practices and employee work behavior. Among the participants 5(8.5%)of them very low impact, 5(8.5%)Low impact, 7(11.9%) neither agree or dis-agree and 6(10.2%) were responded high impact and the remaining 13(22%) were responded strongly agree or very high impact on the operation process. Therefore, as it is observed on the findings, majority of them requires technological advancement with in their work activity in order to have effective result on safety issues while they are hoisting massive elevator parts at a long height. Therefore, company should allocate adequate budget and resources towards provision of technological advancement in order to enhance the operation process.

Respondents attitude towards on Workload Management impact

Majority of the participants were responded that as it can be seen on Table 4.8 which is 18(30.5%) very low impact on their work activity ,8(13.6%)low impact, and 5(8.5%) neither agree nor disagree on the issues and 3(5.1%) of them responded high impact on OS and employee behavior and the remaining 2(3.4%) were responded very high impact. Therefore, from the findings employees were not have WM issues during work activities.

Respondents attitude towards Safety Culture impact

Employees were asked different questions regarding weather their organization has provision of safety culture with in the employee and employees by themselves have SC. Among the participants as it can be seen on Table 4.8, 1(1.7%) were responded very low impact whereas, 3(5.1%)Low impact and 5(8.5%) were neither agree nor disagree and 9(15.3%)of them were responded high impact and the remaining 18(30.5%) were Strongly agree or very high impact. Furthermore, form the respond majority of them have poor safety culture(SC) even the top management coherent with the results occupational injuries, regular PPE usage and job satisfaction factors of poor implementation of SC in the organization. Hence, the top management should work hard towards ensuring safe work environment improving employees PPE usage, occupational safety awareness and to improve satisfactory work

environments in order to maintain their wellbeing and enhance productivity during the process.

Respondents attitude towards work environment impacts

As it can be seen on Table 4.8 respondents responded that 4(6.8%) very low, 4(6.8%)Low impact ,5(8.5%) neither agree nor dis-agree and 7(11.9%) were responded high impact and the remaining 16(27.1%) were strongly agree on the impacts of work environment for implementing appropriate occupational safety and good satisfaction for employee behavior. Hence, employees were working long time at customer's work environment, if the environment were not clean, comfortable with different infrastructures employee might get dissatisfies on their work activity and it directly impacts wellbeing of employee they might injure due to poor work environment and they are wasting time looking for different infrastructures such as toilet, water, power very far away from their working site hence, these issues deteriorates productivity of the installation process therefore, the organization should work strictly with the client to have comfortable working environment.

Respondents attitude towards Work Procedure and Work Plan impacts

As it can be seen on Table 4.8 participants were responded, 5(8.5%) very low impact, 5(8.5%) Low impact, 6(10.2%) neither agree nor disagree and 6(10.2%) were high impact and the remaining 14(23.7%) were responded very high impact or strongly agree on WPWP has strong impact on occupational safe work and employee work behavior. From survey findings majority of them were not have appropriate work procedure and work plan and by this most them were exposed to work accident and also causes to production delay. Therefore, the organization should do a lot on these issues to enhance the Elevator installation process.

Respondents attitude towards Management Safety Policy practice impacts

As it can be seen on Table 4.8 participants were responded that 1(1.7%) very low impact, 5(8.5%) Low impact, and 3(5.1%) neither agree nor dis-agree on the issue and 9(15.3%) were high impact and the remaining 18(30.5%) were responded very high impact or strongly agree on MSP has strong impact on the occupational safety practice and employee work behaviors. From the findings majority 18(30.5%)of the workers confirmed that management safety policy practice has lacked in commitment in ensuring effective safety practice within the installation process. According to Shekh, (2015) Success of OSH practices depends on the commitment of top management at all levels. Given that these participants were asked many

questions regarding whether there is regular supervision towards effective application of safety standards and proper inspection of employee work behaviors, implementing regular supervision is thus one of the markers of management commitment. Even though the company did not have a safety officer at the time of the study, this shows that the management's commitment to effectively implementing occupational safety practices during the elevator installation process is severely constrained. Since OS factors and employee work behavior should be taken into account on an equal footing with other commercial and productive components of the company, management should take fast action.

4.2.5. Inferential Analysis - Pearson Correlation

Pearson Correlation used to determine the relationship between the independent and dependent variable. Desired level significant is 0.01. Based on Table 4.8, the result indicates positive correlation between Training & Education and work place safety & Employee behavior (r=0.703) significant at 0.01, Work environment and Work place safety & Employee behavior (r=0.612) significant at 0.01, Safety culture & Work place safety & Employee behavior (r=0.610) significant at 0.01, Work force skill & commitment and Work place safety & Employee behavior (r=0.563) significant at 0.01, Work procedure & Work plan & Work place safety & Employee behavior (r=0.533) significant at 0.01, management commitment practice and work place safety & Employee behavior (r=0.299) significant at 0.01, Technological advancement and Work place safety & Employee behavior (r=0.264) significant at 0.01, Collaborative effort and Work place safety & Employee behavior (r=0.184) significant at 0.01 There is a negative correlation between work load management and Workplace safety & Employee behavior (r=-0.039) significant at 0.01.

Table 4.8 shows Correlation between Independent variable (Management commitment practice, Training & Education, Collaborative efforts and Communication, Work force skill and Commitment, Technological advancement, Work load management, Safety culture, Work Environment (Physical Environment), Work procedure & Work plan) and Dependent variable (Productivity of Elevator Installation process).

Table 4.8: Pearson Correlation

		behaviore of e evator Installation	Environment (Physical Environment)	Work load management	Workforce skill and Commitment	Training & Education	Technological advancement	Safety culture	efforts and commun catio n	Safety management policy practice
Work plan safety & Employe behaviore of elevator Installation	Pearson Correlation		.612**	-.039	.563**	.703**	.264	.610**	.184	.299
	Sig. (2-tailed)		.000	.820	.000	.000	.119	000	.281	.076
	N	36	36	36	36	36	36	36	36	36
Work Environment (Physical Environment)	Pearson Correlation	.312**	1	.094	.753**	.444**	.415*	324	.187	.585**
	Sig. (2-tailed)	.000		.586	.000	.007	.012	054	.276	.000
	N	36	36	36	36	36	36	36	36	36
Work oad management	Pearson Correlation	-.039	.094	1	-.010	-.087	-.119	-.019	-.077	.159
	Sig. (2-tailed)	.820	.586		.955	.615	.488	912	.655	.355
	N	36	36	36	36	36	36	36	36	36
Work force skill and Commitment	Pearson Correlation	.563**	.753**	-.010	1	.495**	.550**	210	.122	.465**
	Sig. (2-tailed)	.000	.000	.955		.002	.001	219	.470	.004
	N	36	36	36	36	36	36	36	36	36
Training & Education	Pearson Correlation	.703**	.444**	.087	.495**	1	.328	.525**	.028	.228
	Sig. (2 tailed)	.000	.007	.615	.002		.051	001	.871	.181
	N	36	36	36	36	36	36	36	36	36
Techno ogical advancement	Pearson Correlation	.264	.415*	.119	.550**	.328	1	177	.190	.314
	Sig. (2 tailed)	.119	.012	.488	.001	.051		302	.267	.062
	N	36	36	36	36	36	36	36	36	36
Safety culture	Pearson Correlation	.610**	.324	-.019	.210	.525**	.177	1	.029	.198
	Sig. (2-tailed)	.000	.054	.915	.219	.001	.302		.867	.248
	N	36	36	36	36	36	36	36	36	36
Collaborative efforts and communication	Pearson Correlation	.184	.187	-.077	.122	.028	-.190	029	1	-.115
	Sig. (2-tailed)	.281	.276		.478	.871	.267	867		.505
	N	36	36	Double-click to activate	36	36	36	36	36	36
Safety management policy practice	Pearson Correlation	.299	.585**	.159	.465**	.228	.314	198	.115	
	Sig. (2-tailed)	.076	.000	.355	.004	.181	.062	248	.505	
	N	36	36	36	36	36	36	36	36	36

Source: own survey

4.2.6. Multi Regression result model

The R value measures the strength associated between independent variable and dependent variable. Referring to Table below, the R square value is 0.695 which suggest 69.5% of the variation in work place safety and employee behavior that explained by the independent variable and the remaining 30.5% may be influenced by other variables that is not included in this study.

Table 4.9: Multi Regression result

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.833[a]	.695	.589	.715

a. Predictors: (Constant), Work procedure & work plan, Work load management, Collaborative efforts and communication, Safety culture, Safety management policy practice, Technological advancement, Work Environment (Physical Environment), Work force skill and Commitment, Training & Education

Meanwhile, results of ANOVA presented in table. The F value =6.57 and p <0.05. This means that at least one of the 9 independent variables can be used to explain work place safety and employee behavior in the Sintec Ethiopia P.L.C.

Table 4.10: ANOVA of Workplace safety &Employee behavior factors and Productivity of Elevator Installation.

ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	30.259	9	3.362	6.574	.000[b]
Residual	13.297	26	.511		
Total	43.556	35			

a. Dependent Variable: Work plan safety & Employee behavior of elevator Installation

b. Predictors: (Constant), Work procedure & work plan, Work load management, Collaborative efforts and communication, Safety culture, Safety management policy practice, Technological advancement, Work Environment (Physical Environment), Work force skill and Commitment, Training & Education

The Table 4.11 shows, depicts the correlation between the Workplace safety & Employee behavior Variables and Productivity of Elevator Installation. There is a significant relationship between Safety culture and Workplace safety & Employee behavior (B=0.342, p<0.05), Training & Education and Workplace safety & Employee behavior (B=0.219, p<0.05), work

environment (B=0.216, p<0.05), work force skill & commitment (B=0.118, p<0.05), work procedure & work plan (B=0.097, p<0.05), There is no significant relationship between work load management and Workplace safety & Employee behavior (B=-0.029, p>0.05), Technological advancement and Workplace safety & Employee behavior (B=-0.098, p>0.05), Safety management policy & Workplace safety & Employee behavior. Hence, TE, SC, WE, WFSC, and WPWP are accepted and WLM, TA & SMP are rejected.

Table 4.11: Coefficients relationship Workplace safety & Employee behavior variable and Productivity of Elevator Installation.

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.674	.663		1.017	.318
Safety management policy practice	-.034	.104	-.046	-.325	.748
Training & Education	.219	.156	.282	1.405	.172
Collaborative efforts and communication	.061	.093	.081	.657	.517
Work force skill and Commitment	.118	.158	.146	.748	.461
Technological advancement	-.098	.113	-.128	-.868	.393
Work load management	-.029	.103	-.032	-.280	.782
Safety culture	.342	.138	.342	2.478	.020
Work Environment (Physical Environment)	.216	.151	.275	1.428	.165
Work procedure & work plan	.097	.155	.129	.625	.537

a. Dependent Variable: Work plan safety & Employe behaviore of elevator Installation

4.3. Data Analysis of Interview and Company Records

4.3.1. Interview data Analysis

Well-structured interviews were prepared as part of data collection to Top management members, Directors, Managers, Supervisors and Safety concerning persons. Accordingly, from the planned eight interviews, seven were performed with success rate of 87.5%. As shown in Table 4.; representation of interviews. Some of the questions in the interview part were difficult to give response by respondents, it needs further investigation by reviewing secondary data of case company records.

Table 4.12: Tabular representation of interview

S/N	Respondents	Date of interviews	Duration/Time
1.	Top Management member	5/6/2023	30min.
2.	Directors	9/6/2023	40min.
3.	Operation Manger	12/6/2023	45min.
4.	Service Manger	14/6/2023	40min.
5.	Human resources	17/6/2023	30min.
6.	Safety personnel	22/62023	35min
7.	Technic manager	28/6/2023	30min.

The major points collected during the interview were analyzed, summarized and presented as follows:

Regarding the interview raised on employee workplace safety awareness, behavior and implementation issues almost all of the respondents give similar idea, most of the respondents indicated that even though, there were some safety awareness and training provided by the agents for supervisors and operation managers via online bases and by inviting other collaborative attending parties from local, there is a huge gap in conducting this training to the employees because, it was highly reflected on employee that of ignorance and lack of safety knowledge, failure to follow safety procedures and behaviors towards safety that included not wearing personal protective equipment's (PPE), unsafe work conditions, lack of skill and also employees' failure to identify unsafe conditions during work process these are highly observed when we visit site every of the time. Directors of the department responded that employees'

mental and physical conditions, unsafe behaviors usually led to human errors on a work site and impacting safe work or operation in the process during operation. Besides they don't care much about what they have done repeatedly, they operate as usual as they are not concerned about abnormal phenomena and also they are irresponsible for their job. Finally, they suggested and proposed that a worker should provide a human error awareness training and need to discuss with direct engaged workers regarding the potential for site safety control mechanisms.

Regarding to the effect of work place safety on labor productivity, respondents reflected that work-related accidents, injury, and product damage has directly affected the productivity the organization and performance of employee by increasing employee absenteeism and sick leaves due to injury so that these leads the company to incur additional cost of production and also costs due to raising compensations and medical payments. In addition to these, respondents emphasized on some of the employees by not maintaining appropriate workplace safety and their poor behavior they damage expensive Elevator components which cannot not find easily from local market even they could not afford to pay the cost thus, to replace the component it takes too much time. Accordingly, the project become delay and it directly affects the productivity of the operation also, the customer becomes dissatisfied. Moreover, the technical manager responded that employees do not give any attention for the tools and equipment they damaged them by negligence especially for the power driven machines, and hand tools and equipment so by this, there is higher maintenance cost incur on the company. Therefore, they suggested that employees should get proper training and awareness how to handle the tools and equipment. Hence, the type of required tools or equipment would determine operation procedure, working positions, or proper material handling processes an appropriate operation is necessary for safety operation. According to Human resource respond some of the employees resign from their job due to poor work place safety as there were suspected sever injuries and even injured body parts while operating on scaffolding from height hence, by this we lost two of productive technicians from their work. During accident higher rate were identified as resulting from falling, struck by or against, caught in between elevator parts, electrical shock accidents and likelihood of having hospitalized injuries was much higher than the likelihood of having non- hospitalized injuries.

Regarding the given interview question on the role of work environment, work plan and work procedure towards workplace safety almost all the respondents give similar response. Operation

Manager responded that Risky environment has high impact for their workplace safety for instance, the deep shaft 50m height with no appropriate safety protection guards against different openings such as door opening and shafts with poor lighting or Intense light, unsafe design of equipment such as weak and risky scaffolding and also using unsafe and un maintained equipment and tools (He mansions as an e.g. there is only one hoisting machine(Tirak) with in the company not maintained properly working for long time on different sites which is very risky machine one day it release its break and cause damage on the Elevator components unfortunately, no accident occur on employees.). Narrow workplaces and passageways occur on some sites and this causes damage on the components while employees trying to hoist Elevator parts. Besides these, customers not providing suitable storage and putting Elevator parts around their workplace and this cause for poor work environment even sometimes parts are stolen from site and ambiguity raised between the company and the customers in meantime the project delayed and directly affects the productivity of the organization. Therefore, they finally suggested that employees should be given enough awareness of the risk and dangers inherent in their workplaces before commencing works, employees should familiarize themselves with their working environment, as well as requirements for safe working procedures and any regulations applicable to.

Regarding the top Management, Managers and Supervisors commitments, most of the respondents argued that until two years ago the organization was dedicated fulfilling occupational safety and health practices two times within a year and properly allocated an annual budget for the implementation of safety practices of the company. However, some of the respondents agreed that this time the organization could not provide adequate safety equipment to their employees' even on a semi- annual basis. One of the Top Management member responded that the project manager role has very low commitments on the level of workplace safety on installation sites through the enhancement of safety management processes and not give any attention to personnel behaviors. Instead they should have identified a number of important safety concerns such as: the identification of unsafe practices, safety procedure review and implementation, proper material handling and hazard identification and proper equipment maintenance and also they should arrange to give brainstorming on safety culture and training and safety inspection and supervision. Furthermore, all the respondents argue that there was huge

gap in workplace safety commitment on all of the accountable organizations representatives by monitoring and controlling safety performance they almost ignore and busy on their routing activities.

Interviews concerning written document on workplace safety policy which were held to the Human administrator and the Directors of the departments responded that the company has a written document concerning safety policy; however, there is a huge gap in its implementation. Even though, the documents are placed on shelf but it not well communicated to the employees as well as middle-level management. The company had safety officer before and there were some visible activities by this department nevertheless, the human resource department covers the safety officer duty this time.

Regarding effective communication and collaboration, respondents determines that there is lack of effective communication and collaborations between the employees themselves as well as with their supervisors, managers and top managements. As indication for this there were poor exchange of information and ideas with employees and organizations, some of the employees take risk by making decision and solving problem with exclusive of their supervisors due to this sometimes this were serious problem or damages of elevator component occur, employees has poor communication between their customers or clients which more likely distorts to build solid relationships and retain clients versus companies. Accordingly, on this issue operation manger emphasize that communication should be open, transparent and as frequent as possible. Moreover, two of the respondent' form the Administrative head and management member argue that there were lack in organization practices of good communication and collaboration in the workplace with employees who are part of an organization thus, more likely to experience decreased job satisfaction. Therefore, they propose that a transparent and trustworthy environment supports employee satisfaction by constructing a harmonious workplace that is enjoyable to work in and keeps employees engaged in their positions and becomes much more productive. In addition to these employees who feel comfortable communication and collaboration with their supervisors and managers are more likely to understand what is expected from them and it creates accountability so, they remain productive throughout the day.

Regarding the availability of compensation mechanism all the participants agreed on the availability of compensation mechanism for employees who exposed to injury as per the

company policy agreement, however the compensation was not enough that much and there was no any update though time.

On the interview questions concerning the main challenges for successful implementation of workplace safety practice indicated on both employee and management side. Respondents argue that the management itself have weak performance on safety practices as well as they were not give any adequate attention to allocate enough budget for periodic provision PPE' in order to implement occupational safety practices, there is also huge challenges from the employees' side it is indicated as most of the employees has poor work practice, carless on their operation and they utilize safety equipment improper manner. Finally, the respondents recommended that employees should get training and awareness regarding how to implement use of PPE proper manner and company should work on their behavioral issues to avoid carelessness on their operation.

Based on the interviews raised on recording and reporting formats for work related injuries all the respondents argue that there were format to be filled when there were suspected injuries. Even though, recording and reporting format filled and placed on shelf there is no any generic activity concerning risk assessment made, no organized hazard prone area identification plan and implementation for monitoring of accidents.

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According to the interviews raised on employee compensation, regarding number of sick leaves and absenteeism days took due work related accidents also the cost of the company incurred for the last two years is presented very well on company records analysis part.

4.3.2. Analysis of Company Records

As well, to the above analysis of the primary data collected via questionnaire survey and structured interview, it is mandatory to analyze the company records in order collect secondary data which more helpful for the study purpose. Company records such as company manuals,

different records from each department and other documents in relation to the subject matter were tried to analyze.

It was detected that there were different work-related accident formats for recording occupational injuries, thus I can have observed there were formats filled by operation department and placed in human resource section, number of accidents, number of injured persons, amount of sick leave taken in days and payment issue for medical cost and compensation performed for the accidents on four (04) elevator installation technicians besides this I observed records from technical department that of costs incur the company due to poor workplace safety such as cost for maintaining working tools and equipment as well as employees easily damage elevator components by negligence, lack of awareness or skill. In addition to this records found from the operation department there were rework cost due to employee poor work place safety concerns and also there is over time cost this one raise due to employee behavioral issues, intentionally employee delay the project beyond the schedule as a result of lack in motivation, incentives so this will deteriorate the company to be productive time to time. Therefore, all these records were reviewed and summarized focusing on the last two consecutive years in the following table 14 below.

Table 4.13: Observed Accidents Injury and product damages occur due to lack in workplace safety in the company

S/N	Injury, Accidents and damages	Causes	Years	
			2022	2023
1.	Fall from scaffolding	Scaffolding was not properly constructed and employee not using proper PPE(Safety belt& Helmets not worn during work at height)	Asnaku Zenebe (Elevator technician)	
2.	Injure his figure putting in driving sheave	Miss communication with his coworkers		Bereketab Mengesha (Elevator technician)
3.	Hoisting machine (Tirak) release its safety gear	Working by unmaintained and preventively unchecked equipment		Car damaged (Ahimed Argaw site)
4.	Fall from scaffolding	Scaffolding was not properly constructed and employee not using proper PPE(Safety belt &Helmets not worn during work at height)	Bizuwork Get. (Elevator technician)	
5.	EBD Boards failed	Not using a propitiate tools , lack in skill and awareness	Ato Isaac site Qty= 04 elevators	Dr. Wubdil site Qty= 02 elevators
6.	Electric shock	Not using proper PPE and lack in skill and awareness	Zewudu Bizuneh (Elevator technician)	Ermias Abebe (Helper)
7.	Employee damage Elevator parts	Human error / negligence inappropriate acts of work	Sensor	Photocell

(Source: own survey)

The observed recorded cost found from the operation department due to employee poor work place safety that are deteriorating the company productivity is reviewed and structured in the table as follows.

Table 4.14: Company cost analysis due to different safety issues by 2022 and 2023E.C

S/N	Category		Cause description	Salary/day/ birr	No of days	Price /day/ birr	Total
1.	**Employee**	**Qty.**	Absent from work due to accidents/injury				
	Technician-1	01	Fall from height from scaffolding 15th floor to 13th floor and injured on her leg.(Not using Safety belt& Helmets not worn during work at height)	8,000.000	60	266.66	15.999.60
	Technician-2	01	Technician injured on his finger, while adjusting rope under the car other operator drive the motor putting his finger in sheave/pulley (Miss communication)	7,000.000	30	233.33	7,000.00
	Technician-3	01	Fall from height from scaffolding 14th floor to 11th floor and hit on head by scaffolding wood.(Not using Safety belt& Helmets not worn during work at height)	8,000.000	180	266.66	47,998.80
	Technician-4	01	Personal injuries arise from fall of foreign objects in to hoist ways from outside the doors owing to inadequate protection of landing doors.(Not using Safety belt& Helmets not worn during work at height)	8,000.000	45	266.66	11,999.70
2.	**Medical Compensation**						
	Technician-1		5% of Gross salary x 5years	8,000.00	60	266.66	
	Technician-2		2% of Gross salary x 5 years	7,000.00	30	233.33	

	Technician-3	4% of Gross salary x 5 years	8,000.00	180	266.66	
	Technician-4	3% of Gross salary x 5 years	8,000.00	45	266.66	
3.	**Elevator parts and working equipment damage cost**					
	Employee released sensor from his hand form height	Human error / negligence inappropriate acts of work	-	-	12,000.00	
	Car itself fall from second floor to basement	Due to not safe operation (loading on car above optimum capacity) car modification cost	-	-	155,000.00 Estimated cost	
	EBD board fail (Emergency Battery Drive) ,SEP board fail (Shaft Electrification panel)..etc.	• Inappropriate utilization of multi meter (Lack of skill) • Lose connection • Client power problem/ not testing the delivered power using appropriate tool.	-	-	110,000.00	
	Light portable power driven	• Frequently damaged due to inappropriate utilization of employees • Employee loses the tool and equipment from site • Operators' illegal operations	Concert drill m/c	11pcs	5,500.00	60,500.00
	machines maintenance cost such as concert drill, metal drill machine , Hoisting machine(Tirak) and hand tools	•	Metal drill m/c	09 pcs	4,650.00	41,850.00
			Grinding m/c	08 pcs	4,275.00	34,200.00
			Hoisting m/c maintenance paid for experts	01 pcs	24,000.00	24,000.00
4.	**Process rework cost**					
	Re-construction of modified cars, correcting damaged Elevator parts during process		- Technician cost=sale. 8,000birr - Labor cost =sale 4,000 birr	04days	266.66 +133.33	1,599.70
5.	**Over time cost**	Employee having poor behaviors due to many reasons	5 sites additional 8	05 technicia	10640+6000	16,640.00

		hence, projects delays In order to meet customers' due date.	weekend(Sunday) for each site	n & helper		
					Total cost	**259,787.8**

(Source: own survey)

From this data we can conclude that the organization getting deteriorates due to different unexpected costs particularly component damages, absenteeism, project delays and tools and equipment maintenance cost these are due to unsafe acts of work and employee poor work behavioral conditions so that, the organization should give serious attention on this issues to enhance the process.

4.4. Data Analysis of Elevator Installation Site Observation

Direct observation was made on site for gathering additional data to the study requirement during Elevator installation process. The direct observation was conducted by developing well organized and structured checklist as shown on (Appendix-) consists of parameters that can expose the state of workplace safety and employee behavior conditions during the process and that can have filled by the researchers himself. The checklist contains the general occupational workplace safety practices such as how employees implement proper use of PPE, availability of safety regulation and safety procedure, availability of first aid kit, fire extinguishing equipment and appropriate emergency exit. Moreover, the work environment weather they are suitable for the employees to be productive or not.

The main things observed on site while employees were under operation can be stated as a great limitation for maintaining appropriate workplace safety for instance, employees were observed without wearing the necessary PPE's like (Safety belts, Helmet and, safety shoe) which has high impact and vulnerable to accident and injury. Even they were working at height closer to 50meter but they do not wear safety belts thus, this was a very serious and scary issues which I observed on site.

Working condition were also very poor and it easily exposed them for accidents as shown on Figure 4.1, Figure 4.2 and Figure 4.3 there were electric cables not properly handled as you see on the figure the doors are open with no safety guards for fall protection so employees as well as any other persons works at risk because, they can easy enter to the deep shaft, even the shaft has

no enough lighting, and has too much dust while employees drilling the shear wall. Moreover, scaffolding they were using was not strong enough and lack of ergonomic fit for their operation hence, the span of the scaffolding too wide to reach for the drill position this also have high risk.

The other observation, there were no any availability and accessibility of proper safety precaution signs which can avoid hazard sever such as placing safety guards on hazard /risky places like open doors, and during risky operations while motor and heavy elevator components hoisting, signs for fire extinguisher position, hence, all risky areas within elevator installation process that needs warning and safety precaution should be identified and posted on visible areas with clear signs written in both local and foreign languages thus, the operations are dangerous in nature.

Finally, observation held on how employees handle their working tools safely, as my observation employees did not give any attention for the tool and equipment they were working unsafely even they were working with defective and damaged tool and equipment.

In general, what I have concluded from my observation that employees have poor work practice regarding safety concerns, poor safety culture and safe work behavior so that, employees need serious safety inspection and supervisor on site unless these are the major factors affecting the workplace safety and employee behavior and also it directly affects the company productivity.

In addition to this risks observed on site would be reviewed and summarized due to workplace related factors and employee related factors in the table form as well as in form of figure as shown below.

Table 4.15: Risk factors and causes during elevator installation process that are affecting productivity due to lack in workplace safety and employee behavior

Variables Category	**Risk factors**	
Work Environment condition	• Weak and improper construction scaffolding, while employee working at height • Not considering Ergonomic Factors Inappropriate usage of PPE • Not considering Ergonomic factors • Unavailability of supportive infrastructure such as water, toilet, electric power • Narrow workplace and passageways • Client shaft quality, poor lighting condition, dust, noise • In appropriate working condition due to client perform other civil works	Workplace related factors affecting organizational productivity And Employee behavior related factors affecting organizational productivity
Collaborative effort and communication	• Lack of skill, awareness, commitment, accountability of employee • Lack of unity around common goals • Poor leadership • Poor engagement among team members as well as management members	
Technological Advancement	• When new technologies were adopted. • Lack in provision of working updated manuals. • Lack in safety risks in new machine or equipment design	
Safety work procedure and work plan	• Lack in employee attitude & skill towards following safe work procedure, following proper work plan. • No availability of proper safety work procedure and plan on site. And not proper aware employees • Ignoring safety symbols or signs • Lack of training how to use PPE • Working the process under shaft door opening. • Sticking to wrong practices instead of accepting correct and kind- hearted advices and criticism	
Work force skill and commitment	• Lack in how to handle tool and equipment	

	• Using not preventively maintained hoisting equipment • In appropriate acts of work • Inappropriate utilization of proper tools during installation process • Lack in commitment	
Safety culture	• Lack in leadership, clear direction, and instruction • Poor attitude and behavior • Poor supervision • Employee carelessness	
Work-load Management	• Having to go beyond the routine range • Not having accurate project schedule • Not distributing work activities fairly	
Training and Education	• Lack in aware of safety issues, skills & knowledge how to implement safety procedures • Lack in risk assessment for each activity to identify the risks associated with them. • Lack in appropriate PPE usage	
Management commitment practice	• Lack in holding appropriate budget • Not assigning safety officer and Weak site inspection • Not providing training and awareness towards occupational safety to employees • Lack in equipment maintenance, provision of new technologies which simplifies work activity • Lack of providing appropriate safety work procedure manuals • Lack of Employee expectations towards salary increment incentives, bones and empowerment & lack in working on employee behavior.	

Figure 4.1: Shows damaged elevator parts due to in appropriate operation (Human Error)

Figure 4.2: Shows how employees working at **50m** height without keeping safety procedure and safety equipment observed on site.

Figure 4.3: Shows how poor work environment seriously affect the workplace safety which was observed on site

4.5. Root cause Analysis

A root cause analysis also called an Ishikawa Diagram or sometimes called Fishbone diagram is a simple but effective tool that is used to identify different causes of a problem. A cause and Effect diagram is used to find the root causes of some identified problems or Effects. The root cause analysis of major defects identified in this section shows that the major causes can be categorized under Personnel, Management, Method, Work environment, Equipment and tools and Trainings and awareness which were performed as a benchmark of information from questioner, interview, site observation and different secondary data.

Figure 4.4: Poor workplace safety and Employee behavior factors fish bone diagram

Based on the findings of the root causes analysis discussed above, mitigation strategy is developed by using Failure Mode and Effect Analysis. Failure mode and effect analysis is a risk identification and prioritization that is overlooked in the installation process. The development of FMEA follows based on the finding of Interview, Secondary data and site observation records, thus, findings of the root cause analysis and tries to prioritize failures and to develop improvement solution of mitigation strategies. In the following table 18 FMEA tool is developed and applied to Elevator installation process.

Table 4.16: FMEA of New Solutions for the Company

Potential Failure mode	**Potential causes of Failure**	**Potential effect of the Failure**	**S**	**O**	**D**	**RPN=S x O x D**
Work Environment condition	Weak and improper construction scaffolding.	Fall from scaffolding from height, injury or accident occur, Elevator component damages	3.9	3.6	2.8	39.3
	Not considering Ergonomic factors	Very far breaker position, socket position and wider span of scaffolding	3.6	3.5	2	25.2
	Unavailability of supportive infrastructure such as water, toilet, electric power	Project delay due to power, employee work motivation	3.7	3.2	2.2	26
	Narrow workplace and passageways	Elevator components damaged, and employee injure while hoisting massive parts.	3.8	3.6	2.8	38.3
	Client shaft quality, poor lighting condition, dust, noise, etc.	Decrease employee motivation, decline productivity of workers hence, Poor shaft quality took much time while chiseling in order to install.	3.2	3	2.2	21.1

	In appropriate working condition due to client perform other civil works	Injury /accident occur on employee and personal injuries arise from fall of foreign objects in to hoist ways from outside the doors(hit by falling object)	3.7	3.4	2	25.1
Collaborative effort and communication	Lack of skill, awareness, commitment, accountability of employee	Injury /accident occur due to poor communication among teams during process.	3.8	3.6	1.8	24.6
	Lack of unity around common goals	It declines employees problem solving effort together for common goal.	3.2	2	1.4	9
	Lack of Poor leadership	Maximize rework	3.3	3.2	1.8	19
	Poor engagement among team members as well as management members	Creates poor relations with client Poor collaborative b/n employee result tools & equipment damage. For example, Tirak machine(hoisting tool) got trouble repeatedly during loading and unloading	3.6	3.4	1.9	23.2
Technological Advancement	Lack of awareness when new technologies were adopted.	If there is any change in technology ,they stuck and operation become delayed.	3	2	1.6	9.6
	Lack in provision of working updated manuals.	Employees working by their former knowledge and this leads for rework	3.1	2.2	1.8	7.1
	Not implementing advanced technologies at workplace for facilitating work activities safely	Maximize workload on employees and increased damage on elevator parts as well as employee it selves while lifting large loads.	3.4	3.5	2.7	28.5

Safety work procedure and work plan	Lack in employee attitude towards following safe work procedure, following proper work plan.	Rework occur, injury and accident occur, and Elevator component damage.	3.3	3.6	2.6	30.8
	No availability of proper safety work procedure and plan on site. And not having proper awareness of employees	Rework occur, injury and accident occur, Elevator component damage and working tools and equipment damage.	3.4	3.5	2.5	29.7
	Ignoring safety symbols or signs at workplace	Injury and accident occur on employee or other staffs	3.2	3.3	2.4	25.3
	Lack of training how to use PPE	Rework occur, injury and accident occur, Elevator component damage and working tools and equipment damage.	3.6	3.4	2.6	31.8
	Working the process under shaft door opening.	Injury and accident occur on employee or other staffs	3.8	1.5	2	11.4
Safety culture	Lack in leadership, clear direction, and instruction	Increased incidents towards accidents and injuries	3.6	3.5	2.2	27.7
	Employee having Poor attitude and behavior	Damaged components both working tools/equipment and Elevator parts	3.7	3.3	2	24.4
	Poor supervision	Absenteeism, turnover, poor work practice	3.6	3.2	2	23
	Employee carelessness	Repetitive human error, Injury, accidents occurs	3.5	3	1.5	15.7
	Operating conditions are harsh	Damaged components both working tools/equipment and Elevator parts and rework occur	3.3	3.4	2	22.4

Work load Management	Having to go beyond the routine range	Maximize high turnover and staff shortage	3	2.2	1.8	11.8
	Not having accurate project schedule	Increased absenteeism	3.3	3	1.9	18.8
	Not distributing work activities fairly	Maximize high turnover and staff shortage	2.5	2	1.5	7.5
Work force skill and commitment	Lack in how to handle tool and equipment	Rework, tool and equipment damage, elevator component damage.	3.8	3.6	2.4	32.8
	Using not preventively maintained hoisting equipment	Damaged components both working tools/equipment and Elevator parts.	3.6	3.4	2.5	30.6
	In appropriate acts of work	Rework, tool and equipment damage, elevator component damage.	3.7	3.5	2.4	31
	Inappropriate utilization of proper tools during installation process	Rework, tool and equipment damage, elevator component damage. E.g. Elevator boards fail repeatedly	3.6	3.3	2.3	27.3
	Lack in commitment and Operators' illegal operations	Project delay, productivity decrease Especially, due to lack in employee commitment there are parts not available to replace from local market it might take much time to replace it and to complete installation.	3	3.2	2	19.2
Training and Education	Lack in aware of safety issues, skills & knowledge how to implement safety procedures	Repetitive human error, Injury, accidents occurs	3.8	3.7	2.8	39.4
	Lack in risk assessment for each activity to identify the risks associated with them.	Damaged components both working tools/equipment and Elevator parts	3.6	3.5	2.6	32.7
	Lack in appropriate usage of PPE	Injury and accident occur, and Elevator component damage.	3.4	3.8	2.8	36.2

Management Commitment practice	Lack in holding adequate budget	Employee not wearing protective equipment and exposed them for injury and accidents.	3.5	3.9	2.8	38.2
	Not assigning safety officer and Weak site inspection	Rework and illegal operation occur	3.6	3.8	2.7	36.9
	Not providing training and awareness towards occupational safety to employees	Employees with having poor knowledge of implementing safety procedures and responsibilities	3.5	3.6	2.8	35.3
	Lack in equipment maintenance, provision of new technologies which simplifies work activity	Project delay and Productivity decrease.	3.6	3.2	2.6	29.9
	Lack of providing appropriate safety work procedure manuals	Project delay and Productivity decrease.	3.8	3.7	2.8	39.4
	Lack of Employee expectations towards salary increment, incentives, bones and empowerment & lack in working on employee behavior.	It will decrease employee motivation and satisfaction for their work and accordingly, it declines the productivity of company.	3.9	3.8	2.8	41.5

For assessing the root causes of workplace environmental conditions, safety culture, collaborative effort and communication, safety work procedure and work plan, workload management, training and education and management commitment practice a five point (5), Likert- type scale is employed, in which represents the most possible in occurrence (most serious in severity and most detectability) and (1) is for the least. The selected population (36) members were requested to provide their scales on evaluation of occurrence, severity, and most detection for potential causes of failure, which were average for calculating RPN the results were shown as in Table 17. On the basis of RPN calculated from occurrence, severity and detection of potential causes of failure, a specific risk is graded, its acceptability is determined. The acceptability of the root causes is classified in to four scenarios, including acceptable, moderate, undesirable, and unacceptable (as shown on Table 18.)

Table 4.17: Criteria weighting

Grade of risks	Consequence	RPN	Acceptability
5.	Catastrophic	26<RPN	Unacceptable
6.	Critical	10<RPN ≤26	Undesirable
7.	Significant	5<RPN≤10	Moderate
8.	Low Significant	1<RPN≤5	Acceptable
I.	Insignificant	1	

In this study, the acceptability of the potential root causes of risks of Work Environment condition, Collaborative effort and communication, Technological Advancement, Safety work procedure and work plan, Safety culture, Management commitment, Work force skill and commitment, and Training and Education is shown in Table 19 as follows.

Table 4.18: Acceptability of risks and Measures for root causes Management

Potential Failure mode	Potential causes of Failure	RPN	Acceptability of root causes	Measures for root causes
Work Environment condition	Weak and improper construction of scaffolding	39.3	Unacceptable	Be aware of it and inform to supervisors to reinforce it and use personal fall arrest system.
	Not considering Ergonomic factors	25.2	Unacceptable	Re position or re-construct a work devices to eliminate a long/ excessive energy and causes of accident
	Unavailability of supportive infrastructure such as water, toilet, electric power	26	Unacceptable	Enforce client in order to facilitate all infrastructures before commencing operation.

	Narrow workplace and passageways	38.3	Unacceptable	Keeping all safety precautions and personal protection equipment
	Client shaft quality, poor lighting condition, dust, noise, etc.	21.1	Undesirable	Enforce client in order to facilitate all infrastructures before commencing operation.
	In appropriate working condition due to client perform other civil works	25.1	Undesirable	Keeping all safety precautions and personal protection equipment
Collaborative effort and communication	Lack of skill, awareness, commitment, accountability of employee	24.6	Undesirable	Providing training and proper inspection
	Lack of unity around common goals	9	Moderate	Providing training on employee attitude
	Lack of Poor leadership	19	Undesirable	Providing training and proper inspection
	Poor engagement among team members as well as management members	23.2	Undesirable	Giving employees flexibility
Technological Advancement	Lack of awareness when new technologies were adopted.	9.6	Moderate	Providing training to employee when new technologies arrived
	Lack in provision of working updated manuals.	7.1	Moderate	Providing updated manual to employees
	Not implementing advanced technologies at workplace for facilitating work activities safely	28.5	Unacceptable	Recommending the company to avail advanced technologies
Safety work procedure and work plan	Lack in employee attitude towards following safe work procedure, following proper work plan.	30.8	Unacceptable	Providing training on employee attitude

	No availability of proper safety work procedure and plan on site. And not having proper awareness of employees	29.7	Unacceptable	Providing training to employee how to implement proper safety work procedure
	Ignoring safety symbols or signs at workplace	25.3	Undesirable	Providing training on employee attitude and site inspection
	Lack of training how to use PPE	31.8	Unacceptable	Providing training to employee and proper supervision
	Working the process under shaft door opening.	11.4	Undesirable	Providing training on employee attitude and site inspection
Safety culture	Lack in leadership, clear direction, and instruction.	27.7	Unacceptable	Training to improve leadership quality
	Employee having Poor attitude and behavior	24.4	Undesirable	Providing training on employee attitude and behavior
	Poor supervision	23	Undesirable	Assigning better supervisor
	Employee carelessness	15.7	Undesirable	Providing training on employee attitude
	Operating conditions are harsh	22.4	Undesirable	Supervision and inspection
Work load Management	Having to go beyond the routine range	11.8	Undesirable	Prioritize tasks more efficiently, improve the balance of work across your team
	Not having accurate project schedule	18.8	Undesirable	Preparing proper project schedule and follow-up
	Not distributing work activities fairly	7.5	Moderate	Prioritize tasks more efficiently, improve the balance of work across your team
Work force skill and commitment	Lack in how to handle tool and equipment	32.8	Unacceptable	Training how to handle tools and equipment.
	Using not preventively maintained hoisting equipment	30.6	Unacceptable	Arrange proper preventive maintain ace schedule
	In appropriate acts of work	31	Unacceptable	Proper Supervision and frequent

				inspection
	Inappropriate utilization of proper tools during installation process	27.3	Unacceptable	Proper Supervision and frequent inspection
	Lack in commitment and Operators' illegal operations	19.2	Undesirable	Providing Training
Training and Education	Lack in aware of safety issues, skills & knowledge how to implement safety procedures	39.4	Unacceptable	Providing Training on safety precaution and PPE implementation.
	Lack in risk assessment for each activity to identify the risks associated with them.	32.7	Unacceptable	Training on how to assess risks at site
	Lack in appropriate usage of PPE	36.2	Unacceptable	Providing Training on safety precaution and PPE implementation.
Management commitment	Lack in holding adequate budget	38.2	Unacceptable	Analyze the budget and allocate properly
	Not assigning safety officer and Weak site inspection	36.9	Unacceptable	Assign adequate safety officer and Proper inspection
	Not providing training and awareness towards occupational safety to employees	35.3	Unacceptable	Management should arrange a schedule to each employees to give workplace safety training.
	Lack in equipment maintenance, provision of new technologies which simplifies work activity	29.9	Unacceptable	Assess the glob market and work on equipment
	Lack of providing appropriate safety work procedure manuals	39.4	Unacceptable	Avail safety work procedure manuals at each site and serious inspection.
	Lack of Employee expectations towards salary increment, incentives, bones and empowerment & lack in working on employee behavior.	41.5	Unacceptable	Consider employees benefits at every aspects.

4.6. Result discussion and Improvement strategies

4.6.1. Result discussion

Table 4.6 summarizes the analysis results. Based on the result the analysis statistically distinguishes and answers which one has highly significant correlations between independent variables with dependent variable. In this case majority of the employees as well as the top management were chosen Training and education become the major root causes to unsafe acts of works and a means to poor work behavior in Elevator installation process. As analyzed on Table 4.7 Training and Education were having result total of **41.1%** of respondents chosen with a mean value of 4.11 hence, from the finding we could analyze that Training and Education have a strong relationship between work safety and employee work behaviors thus, the company should work on this in depth by providing proper training schedule on practical as well as theoretical by considering different topics. Next to this both Safety culture and Management commitment safety policy practice had similar results **30.5%** of respondents were strongly agree on its impacts on workplace safety and means for poor work behavior if company should not give appropriate attention on it especially, based on survey questions majority of employees have poor safety cultures in terms of maintaining appropriate personal protective equipment and also they have poor material handling techniques this will lead them for poor installation performance. Moreover, the management also needs to be committed well for better safe acts of work during Elevator installation process, by providing adequate budget, assigning skilled safety officers, supervisors and giving series attention on field activity by evaluating, analyzing each work activities and causes for project delays. Whereas respondents responded on Technological Advancement, work procedure& work plan and work environment have medium impacts on safe acts of work and work behavior when compare to the above which results a total of **22%, 23.7%** and **27.1%** respectively these might be have medium correlation was found towards sustainable work safety and employee behavioral issues. Among these work environment has highest rank and it has direct impact at workplace towards client side as well as the employee side hence, in both ways the company should give series attention for wellbeing of the operation as well as workers itself. They were highly interrelated with each other based on the survey findings Technological Advancement for a better working environment can be linked to the related condition factors such as the required tools or equipment, the working conditions, working

surfaces. For instance, lack of supervision or in appropriate PPE use may result in a higher chance of being hit by surrounding moving or falling objects. Poor working environment such as surface conditions, in scaffolding operation may require a higher level of safety device installation. Moreover, based on the respondent's result, collaborative efforts & communication, and workforce skill & commitment results lower impact for safe acts of work and work behaviors which is **15.3%** and **18.6%** respectively. However, Workload managements was one of the independent variables for enhancing installation process but majority of the employees strongly disagrees that this has no influence on their safe acts of work and behavioral issues which they give **13.6%** of the respondents gives strongly disagree result so the company should not bother on the employee work load issue.

As per the Pearson Correlation to determine the relationship between the independent and dependent variable. Desired level significant is 0.01. Based on Table 4.8, the result indicates positive correlation between Training & Education and work place safety & Employee behavior (r=0.703) significant at 0.01, Work environment and Work place safety & Employee behavior (r=0.612) significant at 0.01, Safety culture & Work place safety & Employee behavior (r=0.610) significant at 0.01, Work force skill & commitment and Work place safety & Employee behavior (r=0.563) significant at 0.01, Work procedure & Work plan & Work place safety & Employee behavior (r=0.533) significant at 0.01, management commitment practice and work place safety & Employee behavior (r=0.299) significant at 0.01, Technological advancement and Work place safety & Employee behavior (r=0.264) significant at 0.01, Collaborative effort and Work place safety & Employee behavior (r=0.184) significant at 0.01 There is a negative correlation between work load management and Workplace safety & Employee behavior (r=-0.039) significant at 0.01.

Based on the interview raised on employee workplace safety awareness, behavior and implementation issues almost all of the respondents give similar idea, most of the respondents indicated that even though, there were some safety awareness and training provided by the agents for supervisors and operation managers via online bases and by inviting other collaborative attending parties from local, there is a huge gap in conducting this training to the employees because, it was highly reflected on employee that of ignorance and lack of safety knowledge, failure to follow safety procedures and behaviors towards safety that included not wearing personal protective equipment's (PPE), unsafe work conditions, lack of skill and also

employees' failure to identify unsafe conditions during work process these are highly observed when we visit site every of the time. Directors of the department responded that employees' mental and physical conditions, unsafe behaviors usually led to human errors on a work site and impacting safe work or operation in the process during operation. Besides they don't care much about what they have done repeatedly, they operate as usual as they are not concerned about abnormal phenomena and also they are irresponsible for their job. Finally, they suggested and proposed that a worker should provide human error awareness training and need to discuss with direct engaged workers regarding the potential for site safety control mechanisms.

And also, from the field observation based on the prepared checklist contains we can have discussed as follows: the general occupational workplace safety practices such as how employees implement proper use of PPE, availability of safety regulation and safety procedure, availability of first aid kit, fire extinguishing equipment and appropriate emergency exit. Moreover, the work environment weather they are suitable for the employees to be productive or not. There were many things observed on site during operation such main things observed were while employees were under operation can be stated as a great limitation for maintaining appropriate workplace safety for instance, employees were observed without wearing the necessary PPE's like (Safety belts, Helmet and, safety shoe) which has high impact and vulnerable to accident and injury. Even they were working at height closer to 50meter but they do not wear safety belts thus, this was a very serious and scary issues which I observed on site. The other observation as discussed earlier , there were no any availability and accessibility of proper safety precaution signs which can avoid hazard sever such as placing safety guards on hazard /risky places like open doors, and during risky operations while motor and heavy elevator components hoisting, signs for fire extinguisher position, hence, all risky areas within elevator installation process that needs warning and safety precaution should be identified and posted on visible areas with clear signs written in both local and foreign languages thus, the operations are dangerous in nature.

4.6.2. Improvement Strategies

The outcomes of the study should give a clear indication of the effect of Elevator installation condition on the safety and working behavior status of employees and oblige the necessity of taking enough measures to improve the practices and thereby the wellbeing and productivity of employees. Effective implementation and improvement of occupation safety (OS) and workers' behavior system warrants the safety of workers and safeguards their wellbeing and has a significant role in improving their productivity as well as organizational efficiency.

According to WHO (2018), improved and harmless workplaces can avoid at least 1.2 million fatalities every year so that, promoting good safety practices and considering employee behavioral issues during the process might be costly and have effect on production cost however, sustainable workplace, skilled, safe and productive employees are gainful in the long run.

Therefore, based on the findings as well as the major problems, limitations and challenges were identified the following areas of intervention are forwarded. Employee training, awareness, Safety culture awareness, collaborative effort and communication skills improvement, Technological advancement, employee implementing proper work procedure and work plan, Management safety policy practice commitments; job- related injuries, illness and associated absenteeism, hazard prone areas identification and prevention , supervision and provision of job specific PPE's and series site inspection as well as maintenance of safe working environments , working tools and equipment, taking safety measures , signs and ergonomics are major identified OS intervention areas which needs to be improved.

In general, as we have seen from the study we need to improve occupational safety and working behavior in order to Enhance Elevator Installation process. To achieve that, an integrated risk management is connected with Deming's cycle (Plan-Do-Check-Act) (P-D-C-A) as shown in Figure 4.5: -

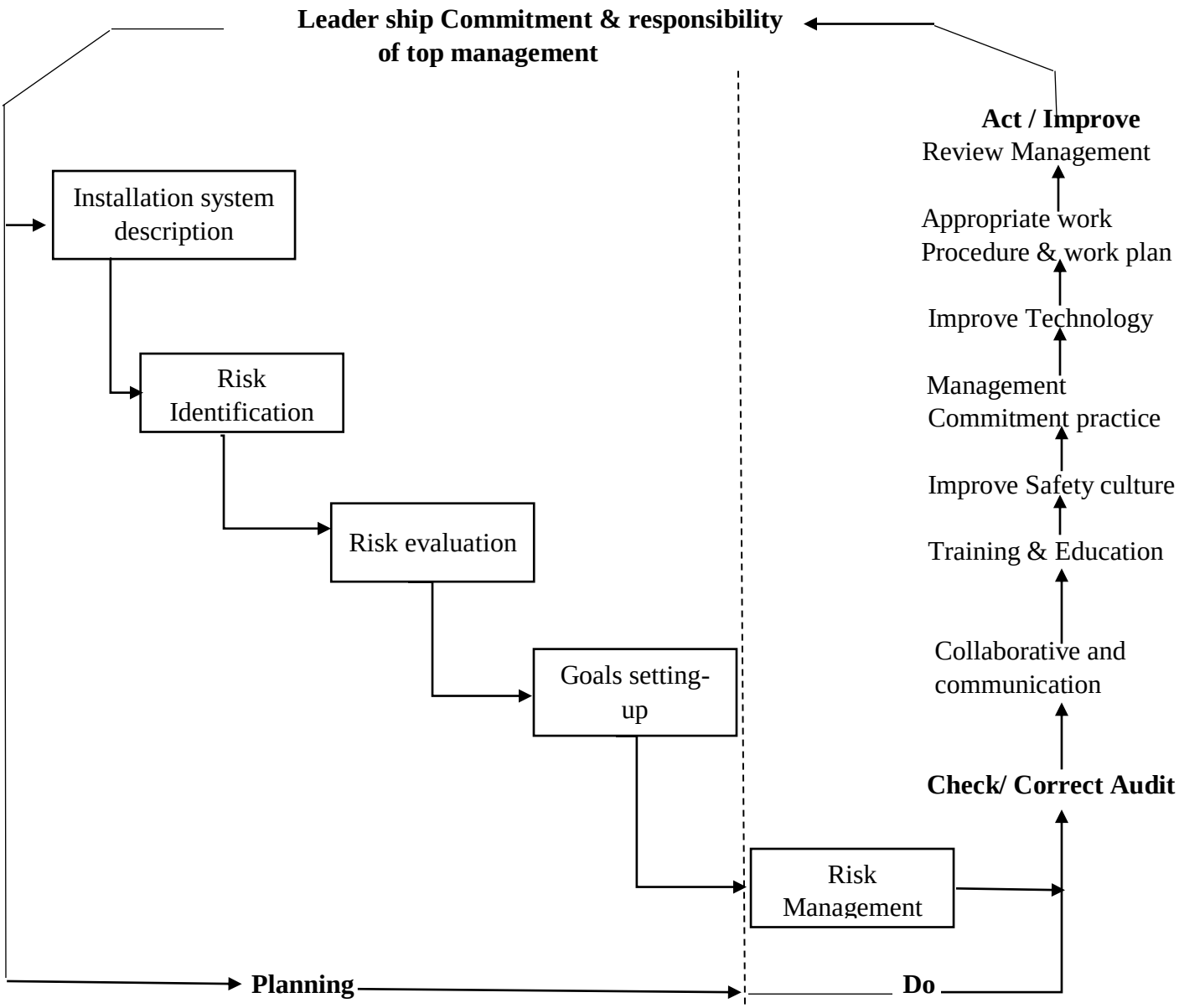

Figure 4.5: A-P-D-CA cycle for improving safety and work behavior strategy

Each management system involves a significant amount of documentation, written working procedures, a working plan, checks, control forms, and other paper work both in the office and on the job site in order to reach the targets. As a result, it is thought that an integrated risk management system could prevent effort duplication and reduce resource inputs. Refer to Figure 4.5. for the P-D-C-A cycle of integrating risk management. For the purpose of establishing workplace safety and work habits, "planning" involves risk identification, risk assessment, and

description of the construction system. Setting goals or Objectives and managing risks outside of the management system are incorporated in the P-D-C-A cycle's "do" process, which helps to avoid analyzing the same risk more than once. The dedication and accountability of the senior management, supervisors, and safety officials are crucial for a contractor during the P-D-C-A cycle. In order to retain employees' working behaviors, the top management must personally be involved in conveying and participating in the organizational goal as well as developing future plans for inspiring and rewarding personnel. For the integration process and subsequent construction risk management measures, top management's support and dedication are essential Zeng et al., (2008).

Therefore, it is necessary to plan for the implementation of safe working environment with minimum defect, injuries, part damages P-D-C-A cycle approach in the early stage of project become an effective and efficient for better result to be achieved.

As a result, the fundamental elements of the suggested OSH ongoing improvement strategy are addressed in the sections that follow.

4.6.2.1. Leader ship Commitment & responsibility of top management

A. OSH Policy

A written occupational safety policy should be established by the business's top management, in consultation with all employees and other stakeholders, including clients, suppliers, and governmental organizations, and it should be distributed to all case firm employees. The policy must show that top management is committed to workplace safety procedures throughout the construction of elevators and to ensuring the welfare of all employees.

- Consist of the overall necessary budget, resources, structure, and staff, emergency plans, necessary activities, performance assessment, audits, status reviews, and corrective measures.
- Make sure that employees are involved in all phases of the program.
- Include both permanent and contract employees.

B. Leadership commitment

The top management of the organization should develop guidelines, put them into effect, and continually review their policy to show their dedication to safety and workplace conduct practices. The management should dedicate sufficient funds, responsible staff, and resources, as well as the essential safety officers, to:

- Make sure that all employees receive routine PPE and health checks.
- Recognize the frequent delivery of training and awareness initiatives
- Hire qualified safety officers and managers.

Additionally, the management must create an organizational structure that establishes responsibility and accountability. A senior management representative must be held responsible for overseeing on-site process execution in a safe manner. A strong safety committee must also be established to support the elevator process's transition into a more sustainable and effective activity.

4.6.2.2. Organization development

A. Responsibility and accountability

In order to develop operational performance of workplace safety and work behavior practices during the elevator installation process and ensure its efficacy in achieving the pre-established objectives, the company should develop organizational structure that establishes responsibility, accountability, and authority. Managers, supervisors, and employees should each have their responsibilities clearly defined, held accountable, and conveyed to all parties. Employees' responsibilities also include:

- Follow all occupational safety procedures and best practices for conduct at work, including using all PPE as directed
- Understand emergency procedures, where the first aid kit and fire extinguisher are located, how to properly lift elevator parts, and how to maintain functional tools and equipment.
- Delivering an accurate report while identifying dangers, accident-prone regions, and activities that are detrimental to the body.

B. Training and Awareness program

Managers, supervisors, as well as permanent employees and assistance, should all get training and awareness programs on a regular basis. In particular, how to lift those large elevator parts at great heights without damage or rework should be covered in both general and job-specific

safety training. It should also include practical demonstrations by professionals who are specialists in the sector. The instruction will:

- Think about safe work practices for elevators, the appropriate use of PPE and tools and equipment, the approach to improving the workplace, unsafe acts of work, accident prevention, risk identification, and risk management.
- If a new version is released to simplify the installation procedure, senior specialists should immediately provide both theoretical and practical training.
- How to collaborate effectively with outside stakeholders

C. Communication and Information

A platform for communication should be set up for internal and external collaboration on occupational safety work. Full employee participation and involvement are ensured by communication. Communication about workplace safety should encourage:

- The organization's and management's commitment towards wellbeing of workers and building safety culture as well as active participation of all workers.
- The dedication of the company and management to fostering a culture of safety and promoting the well-being of all employees.
- A continual and transparent feedback mechanism that keeps track of and responds to both internal and external coordination.
- Employees can get occupational safety information through both formal and informal channels, including as emails, letters, periodic reports, bulletin boards, focus group discussions, and get-togethers. Furthermore, it is advised to use technology-based communication systems, particularly when constructing very tall buildings when it is necessary to use the right equipment.

4.6.2.3. Planning and Implementation

The organization should begin with a clear and comprehensive work plan and work processes in order to develop efficient occupational safe acts of work and good work behavior among employees. All potential solutions, teamwork, and participation from all levels of staff and management must be incorporated into the planning. The planning and implementation process must ensure continual improvement and conform to organizational and national policies.

A. Setting Objectives

To gain the best results from the planning process, the business should define explicit goals that clearly state the aims and provide accountability. The goal must be clear, measurable, doable, pertinent, and time-bound. The OSHA program must:

- Indicate the precise adjustments that need to be made, acknowledge the actions that tangibly monitor the change's progress, and establish a reasonable outcome based on the schedule.
- Establish and allocate the target work units that the initiative will initially cover. Establish a deadline to gauge the achievement of the set goals and demonstrate the goals' importance to the business and the personnel who will be working toward them.

B. Identify necessary resources

For the efficient application of workplace safety, the essential financial, material, labor, and other resources must be well designed and planned for during the elevator installation process. In addition to these costs, the change in the physical environment of the elevator installation location should also be taken into account. The organization should create a well-defined action plan that serves as a roadmap by tracking the progress and identifying opportunities for interventions in order to effectively implement the created occupational safe work initiative.

C. Accident Prevention and control

The business must be dedicated to protecting employees from illnesses and injuries that may result from any hazardous or unsafe practices; assist in preventing or minimizing illnesses and injuries; reduce or eliminate safety risks and unsatisfactory work practices; and offer employees safe and healthy working conditions. In order to prevent control mishaps during the installation of elevators, the business should:

- In order to continue with another control approach, it is necessary to evaluate the methods for risk identification, risk evaluation, and risk management as well as the effectiveness of the current prevention and control plan.
- Develop a hazard control plan and carry it out in accordance with the plan after identifying, ranking, and evaluating alternative controls for hazards.

Both emergency and regular activity hazard control procedures must be included in the control plan for accident prevention and control. Adopt engineering approaches, then safe work

procedures, organizational controls, and the hierarchy of PPE use to prevent hazards during the building of elevators. Additionally, it is advised and updated to incorporate new technologies for hazard prevention because of their efficiency.

D. Hazard prevention, Readiness and Response

Establishing emergency prevention, preparedness, and response plans is a crucial component of elevator installation process safety measures. These plans must identify potential hazards, prospective emergencies, and address related risks to worker safety and behavior. Thus, it would be possible to prevent or reduce the detrimental effects on equipment, worker safety and welfare, brand reputation, and productivity. The hazard mitigation, prevention, and readiness plan ought to:

- Gather, compile, and analyze current data on the risk associated with the installation of elevators, including records of previous injuries and their causes, reports and documents related to employee compensation payments, and information on regularly occurring illnesses and injuries.
- By regularly inspecting all operations, equipment, and work areas, including client work areas, involving workers through their representatives on the series inspection team, maintaining inspections through hazard history logs to confirm the risky conditions are rectified, and including both permanent and helper's workers in hazard control programs, the working site environment can be checked for safety hazards.
- Physiological health risks include working long hours, which can cause stress and sleep disorders as well as depression. Ergonomic health risk factors include heavy lifting, repetitive motions, stretching on scaffolding, vibrations while drilling dense concert, and falling.

In-depth incident investigations based on root-cause analysis should also be performed by the company, along with the identification of hazards related to emergency situations at the elevator installation process workplace, classification of hazards, establishment of control measures, and prioritization of hazards for control. Finally, the company should put the hazard prevention and control into practice through ongoing information exchange and updating in accordance with the situation at hand.

Chapter Five

5. Conclusion and Recommendation

This chapter presents over-all conclusions and recommendations of the research, in line with its findings the points for extra study are also emphasized at the end of the chapter.

5.1. Conclusion

Proactive approach for Elevator installation process improvement is utilized for the prevention of issues that may occur before the installation process begins through the improvement of the workplace safety and Employee behavioral factors by identifying the risk causes that makes trouble on the productivity of the company. As part of industry the Elevator installation process shares many of the work-related accidents, injuries and illness that affect the wellbeing of employee due to its inherent nature. So that, the study focuses in depth investigation of occupational safety and health (OSH) practices, challenges during the process due to workplace safety and finally forwarded an improvement approach of this workplace safety and employee behavior factors through considering Sintec Ethiopia Plc. In order to acquire the required data, the study relay on both the primary and secondary methods of data collection, primary data was mainly compiled through in depth questionnaire, structured interviews and direct observation on site. For secondary data in addition to the company data, manuals and different companies experience was observed and in depth review of OSH studies in Global and Ethiopia Elevator industries were explored and evaluated to prove the identified gaps. As described on the analysis section and summarized in the problem identification part of the study, increased work- related injuries and product damages occurrence were severing problems that affect the well-being of the employee as well as the process which in turn affects the productivity of the company hence, products not found in the local market it directly obstructs the process thus, projects become delay too much thus, this also affects the customer not to be satisfied and complains repeatedly. Moreover, employee work performance, frequent absenteeism and employee behavioral issues related to incentives, motivational factors were decreased moral. The work- related accidents, injuries and product damages also leads the company to incur additional costs due to raising compensation and medical payments, there is much more turnovers within a year and costs due overtime hence, there is project delay for every contract. Therefore, the study identified the

major risks and causes that has roll for a poor workplace safety and employee behavioral issues using Fish bone diagram and Management member interview. Based on the findings any one can conclude the occupational workplace safety practices were not properly practiced when we compared as best practices of global standards.

As shown on the Table 15 the observation records from the operation department shows that the company incur too much cost due to different reasons, hence, considering and working on an appropriate workplace safety and employee behavior will solve this issues and leads the organization to be productive and competent on the global market.

Based on the findings the case company has limited resources by Occupational workplace safety practices not give any attention to employee behavioral issues that directly affects the productivity of the organization for instance, there is lack in availability of safety work procedure and no safety officer at all, there is no organized medical center, not attractive compensation mechanism, no first aid kits on site and provision of PPE there are a lot of limitations with effective workplace safety practice and proper implementation reflects from both the management and employee side. In addition to this, the major limitation and challenges observed were lack of safety training and education, lack of awareness towards safety culture, lack in skill and commitments, less work satisfaction to assigned job, lack of collaboration effort and communication with in employees, weak adherences to safety management policy and regulations, uncomfortable working environments, lack in immediate adaptation to technological advancement and not following proper safety work procedures and not having appropriate work plan and schedule are major identified drawbacks observed in the case company.

As per my direct observation, there are no effective hazard areas identification and prevention system, no risk assessment mechanism, poor ergonomics while employee working on during the process (for example, using wider span scaffolding to drill walls, poor lighting with in shaft, too much dust, heavy noise), no availability of first aid kits on site, no implementation of safety signs and information around risky operation area especially to those working for other company employee. Awareness on electrical knowledge has major roll on Elevator installation process because each system is sensitive to poor connection and expensive boards are failed easily if we not give proper safety conditions.

Thus the results of the study provide a clear indication of the effect of Elevator installation process enhancement condition by taking adequate measures to improve the practices and facilities of workplace safety and employee behavior issues thereby the wellbeing and productivity of employee. Therefore, improving best workplace safety practices and giving attention to employee behavior as well it can improve their productivity so that an improvement model was developed in line with the findings and gap areas identified.

5.2. Recommendation

Considering the major findings of the study and the conclusion reached, the following important recommendations are provided in particular to SINTEC ETHIOPIA PLC. and industries in general working same sectors to endorse effective workplace safety and employee behavior practices.

- The management should strive hard to continually improve the workplace safety and employee behavior practices of Elevator installation process through active participation of employees as well as customers. By continuous monitoring, evaluation and improvement of workplace safety practice will be capable to maintain the wellbeing of employees so that, organization can boost their productivity, profitability and their customer's satisfaction.
- Risky environments, for instance, the deep shaft with no guards, working at height on weaker scaffolding, shafts with poor lightening needs special attention to protect employees from any hazardous practices on themselves as well as the elevator components. Most of the machineries especially the hoisting machine (Tirak) need to be replaced by new one and some of them should needs immediate maintenance because this machine has to work perfectly with no trait hence, they have direct safety concern. Besides, these employees should be given enough awareness of the risk and dangers inherent in their work. Before commencing works, employees should familiarize themselves with their working environment, as well as requirements for safe working procedures and any regulations applicable to:
    - Evacuation plans
    - Escape routes and exits
    - Possible alarms
    - First aid kit and fire extinguisher presence and location

- Employee response team members

The managers and supervisors have to check whether a proper rescue plan in place or not, including rescue trained people, who have an access to the harness anchor point, and special rescue equipment nearby.

- The existing work safety culture such as work-related injury recording and reporting system should be revised and advanced. Moreover, the organization should do on each employee to report safety incidents and observations hence, they should remember to report injuries happen on site, incidents, Near misses and all safety observations. Company should also develop a unique format for monitoring occupational safety and take remedial measures. PPE's should be job mandatory and constantly monitored for regular usage by employee. Employee adherence to PPE's usage and other safety regulations should be one the performance evaluation system and weighted as same value as productivity aspects.
- Prior to starting work, method planning and risk assessment by supervisor, manager or method specialist need to be identify any possible workplace hazards, including risk of falling, they have to check all of employees' equipment and tools every day before they begin operation. Before starting work, they should check that the methods and identified risks are covering the tasks and workplace conditions. Employees should assess risks before starting their work they are responsible for identifying uncontrolled hazards and they should also ask for support if necessary.
- A worker can fall from a height during elevator installation for many reasons. The structure they are working from might be unsteady, or they might lose their balance. Across the construction industry falls are usually responsible for the greatest number of deaths each year, thus the top management strictly should do on removing the fall hazard, the first step to prevent falling from height is to remove the hazard for instance, there are some examples of ways in which the risk of falling can be eliminated:
    - ✓ Covering holes and other fall hazards
    - ✓ Closing the machines room trap doors
    - ✓ Closing the car doors when working
    - ✓ Eliminating the need to work at fall- risk conditions
    - ✓ Constructing the scaffolding under serious follow up by skilled personnel
    - ✓ Wearing safety belts

And also the company must always be given preference to preventive action training and should provide safety equipment to implement fall arrest system as shown in the ***Figure 5.1on the Apendex***.

- Scaffolding is constructed by a trained and experienced person and that workers are properly trained before they climb on to it.
- A written safety policy, should to be developed, updated and communicated to all employees in form of training. In addition to this management needs to assign the necessary budget and resources and strictly monitor their effective utilization in continual manner. The government also should develop a specific occupational safety policy on Elevator Installation sector and also should enforce its practicality, hence the operation is dangerous in nature.
- Worker at any job site always should be given the right protective equipment for the most protection, it's essential that they are shown how to use it properly.

5.3. Future research area

This research has assessed the practice of safe acts of work and proper work behavior for enhancing Elevator installation process in case of SINTEC ETHIOPIA PLC and forwarded improvement strategies. Further researchers can be carried out on the following areas of investigation.

1. Legal consideration of Occupational safety standards on Elevator installation process in case of Ethiopia context.
2. Socio- economic impacts of Occupational safety in Ethiopian way of processing the installation.
3. Standard Installation procedures.

6. Bibliography

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Appendix I

Addis Ababa University

Addis Ababa Institute of Technology (AAiT)

School of Mechanical and Industrial Engineering

Graduate Program in Industrial Engineering

Survey Questionnaire: On SINTEC ETHIOPIA PLC. Company

Prepared by: Ephrem Gezahegn

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CO-Advisor: Shimelis Nesibu (PHD candidate, Industrial Engineering stream-AAiT)

Thesis Title: Improving Workplace safety and Employee Working Behavior to Enhance the Productivity of Elevator Installation Process: A case study of SINTEC ETHIOPIA PLC.

The objective of the questionnaire is to assess the existing workplace safety and employee factors that have high impact on the productivity and improvement practices of the case company.

Hereby, I would like to be express my gratefulness for your committed cooperation to answer this attached questionnaire. And all the questions are well designed for quick and easy response.

Finally, this questionnaire is conducted for Msc. Thesis, hence I promise you that the information you get from this questionnaire will be revised confidential and will not be transferred to other parties for any other purpose. If you have to need further clarification, please contact me at the above email address.

Survey Questionnaire

I. Respondent Information

a) Gender: _____Male _____Female

b) Current Position in the company_____.

c) Qualification_____1 = Diploma; 2=BSc /BA;3=MSc/MA;4=PhD; 5=Others(Specify)

d) Field of specialization_____

e) Work experience in this or other related company (in years) _____.

II. Company Profile

a) Name of the company_____

b) Ownership of the company:1=private; 2=public;3=private & public_____

c) Total number of employees_____

d) Number of working time per shift_____

Part 1: Interview Questions for Top Management members, Directors, Managers, Supervisors and Safety related personnel.

How do work-related accidents, injury, damage and health due to poor workplace safety affect in elevator installations and its subsequent impact on the productivity of your department? Can you justify the losses in productivity?

1. How do you evaluate your Elevator installation employee' awareness, knowledge, behavior and implementation with regard to workplace safety practices?

2. Does your organization facilitate trainings and awareness program for the employees with regard to workplace safety and employee factors?

3. In your experience, what role does work environment, work plan and work procedure play in influencing the productivity of elevator installation?
4. How do you evaluate the commitment of the Management, Managers and supervisors with regards to workplace safety and employee behavior practice?
5. Is there a written document on workplace safety policy with in your department? If available, how do you evaluate the success of the occupational safety policy and its practice?
6. How do you evaluate effective communication and collaboration among team members to promote workplace safety and enhance productivity in elevator installations?
7. From your perspective, what are the key factors that contribute to the productivity of elevator installation processes, considering both workplace safety and employee behavior?
8. What are the main challenges for successful implementation of workplace safety in your Elevator installation process and what do you recommend to overcome these challenges?
9. Do you have any compensation mechanism for employees who sustain in injury in their work place?
10. Does your company allocate adequate finance and resource such as PPE's to implement occupational safety practice?
11. Do you perform risk assessment to understand about the risks in your organization?
12. How many days were your employees absent from their work due to related accidents and injury within the last two years?
13. Is there a mechanism of recording and reporting work-related injuries on duly basis as well as identification of hazard areas?
14. How much cost did your company incurred due to hospitalization, medication and other occupational injury of your employees with in the last two years?

Thank you for your cooperation!

Part 2: Survey questionnaire for operators

Section-1:-Assessment of <u>Management Commitment practices</u> on work	**Score**

The purpose of this questioner is to collect data on the factors facing on workplace safety and Employee behavior towards your routine work practices in SINTEC ETHIOPIA PLC. that will declines the company productivity. So you are kindly requested to answer correctly and honestly. These questioners are prepared specifically to the employees.

Please rate below questioner to your current organization performance measures and measurement system design, so that ensure the performance measures fulfill the enlisted scale criteria 1= Strongly Agree, 2= Agree, 3= Neither Agree nor Disagree, 4= Dis Agree, 5= Strongly Disagree and please tick (√) mark in the corresponding cell.

I. Respondent Information

a) Gender: _____Male _____Female

b) Current Position in the company_____.

c) Qualification_____1 = Diploma;2=BSc/BA;3=MSc/MA;4=PhD; 5=Others(Specify)

d) Field of specialization_____

e) Work experience in this or other related company (in years) _____.

II. Company Profile

a) Name of the company_____

b) Ownership of the company: 1=private; 2=public; 3= private public_____

c) Total number of employees_____

		1	2	3	4	5
1.	My company assess periodically employee health and safety standards					
2.	We have a formal safety and health reporting in my company.					
3.	My company assess periodically employee health and safety standards					
4.	My workplace ensures that company procedures, Management Commitment and guidelines are clear and accessible to the workers					
5.	My company encourages to report and to record accident that occur at the workplace					
6.	Safety inspector impose penalties when the employer is not compliant					
7.	Hazard assessment is conducted jointly by the management and employee representatives.					
8.	In case of accidents, employee get compensation according to the law.					
Section -2:-Assessment of <u>Training and Education</u> impacts on workplace safety and Employee behavior						
1.	Training or educational programs are provided to employees involved in elevator installation to enhance their understanding of workplace safety and promote positive behaviors.					
2.	My company assess the effectiveness of the training and educational initiatives in improving workplace safety and employee behavior during elevator installation.					
3.	Effective training and education programs that are currently offered to you in relation to workplace safety and productivity.					
4.	I received any safety training in the past year.					
5.	Safety training impacted my awareness of workplace hazards and my ability to work safely.					
6.	My company received me proper training on how to use equipment and machinery safety					
7.	I understand the importance of workplace safety changed as a result of training and education.					
8.	My workplace has competent persons trained to ensure the safe evacuation of all persons from buildings in the event of serious and imminent dangers.					
9.	My company provides safety induction and training to every new employee.					

10.	Before using new tools and equipment my supervisors regularly informs me procedure of use.					
Section-3:- Assessment of <u>Collaborative Efforts and Communication</u> on Workplace safety and Employee Behavior.						
1.	My company promotes effective communication and collaboration among team members during elevator installations to ensure workplace safety and enhance productivity					
2.	My company implemented any specific strategies or tools to encourage employees to report safety concerns, near misses, or suggestions for improving workplace safety during elevator installation.					
3.	My team collaborates effectively to ensure safety and productivity in the workplace.					
4.	My workplace is comfortable in communicating safety concerns or issues with my colleagues and supervisors.					
5.	I have a very positive and good understanding of my rights and responsibilities in relation to workplace safety and employee behaviors					
6.	The leaders actively promoting, supports and encourage employee participation lead to higher levels of employee performance.					
7.	I know who in my department to contact in case of emergency.					
8.	The leaders actively promoting, supports and encourage employee participation lead to higher levels of employee performance.					
9.	Hazard assessment is conducted jointly by the management and employee representatives					
10.	My company encourages employees to report and record accident that occur at work.					
11.	If I notice workplace hazard I would point it out to the management members.					
Section-4:- Assessment of <u>Workforce skill and Commitment</u> impact on both Workplace safety and Employee Behavior that also impact productivity.						
1.	Workers in your company have the necessary skills and training to perform their job safely.					
2.	Your manager provides opportunities for skill development and training.					

3.	I understand how I contribute to the organization's goals					
4.	I recommend my organization to my friends and others concerning safety issues.					
5.	You receive regular feedback and coaching from your manager.					
6.	Do you agree that your manager provides a clear career path for you?					
7.	Do you agree that you receive adequate support from your colleagues?					
8.	How important do you agree it is for workers to have the necessary skills and training to perform their job safely?					
9.	In your experience, have you ever witnessed a safety incident that was caused by a lack of worker commitment?					
10.	Do you agree that workers commitment and skill level affects overall workplace safety and employee behaviors.					
Section-5:-Assessment of <u>Technological Advancement</u> factors on workplace safety and productivity.						
1.	Implementation of new technologies impacted our workplace safety and productivity					
2.	Do you agree technology has impacted your organization's ability to compete in the marketplace?					
3.	My company is comfortable with learning and adapting to new technological advancements for my role.					
4.	Awareness of any potential safety hazards associated with new technologies being implemented in your workplace.					
5.	Do you believe that the implementation of safety technologies in the workplace has reduced the number of accidents or injuries?					
6.	Management prioritizes safety when implementing new technologies.					
7.	There were experienced safety issues due to a lack of technological advancement in your workplace.					
8.	Implementation of new technology can improve safety in the workplace and employee behaviors.					
Section-6:- Assessment of <u>Workload Management</u> factors on Workplace safety and Employee behavior.						
1.	My company distributed tasks to each employee by considering individual's capacity.					
2.	My company over control the workload in my routine work activities.					

3.	Do you feel overwhelmed by the workload in your current job?					
4.	My workplace safety is highly affected by the workload I have during the process.					
5.	I experienced a workplace injury or accident that i believe was caused by workload-related factors.					
6.	Workload management impacts your overall job satisfaction and productivity					
Section-7:- Assessment of <u>Safety Culture</u> factors on work place safety and Employee behaviors.						
1.	How strongly do you agree that safety is a top priority in your workplace?					
2.	I am reporting any safety concerns or incidents that i observe in my workplace.					
3.	Management actively listens to and addresses concerns related to safety and productivity in your workplace.					
4.	Your colleagues taking safety measures seriously in your workplace					
5.	Do you receive any feedback on your safety practices in your workplace?					
6.	All incidents are investigated quickly in order to improve safety at the workplace as soon as possible.					
7.	My company provides notice on all workplace safety issues.					
Section-8:- Assessment of <u>Work Plan & Work Procedure</u> factors on Workplace safety and productivity						
1.	Work procedures you follow are appropriate for ensuring safety and productivity					
2.	Your company encounter situations where following the appropriate work procedures is not feasible or practical for ensuring safety and productivity					
3.	I strictly keep appropriate working procedures for my job.					
4.	Employees are held accountable for following appropriate work procedure					
5.	My company give me appropriate work plan and work procedure for my daily activities					
6.	Do you agree that your work plan is well-organized and documented for safety and productivity					
7.	Work plan you follow are appropriate for ensuring safety and					

	productivity.					
Section-9: -Assessment of <u>Work Environment</u> factors on workplace safety and Employee behavior.						
1.	I feel distracted by environmental factors while trying to work.					
2.	I felt physically unsafe in my work environment due to poor lighting or inadequate equipment.					
3.	Do you agree that your workplace is well- maintained and free of hazards?					
4.	There are clear signs and labels indicating safety hazards and precautions in your work environment					
5.	My workplace makes sure that walking and working paths are clear and free of obstructions.					
6.	I can identify the sources of hazards at my workstations and their effects on me.					
7.	Favorable environmental conditions provided at work will increase my productivity.					
8.	I am satisfied with the health and safety practices implemented in my workplace because it will make me feel safe.					
9.	Management will give a quick response to working environment concerns.					

Section-10:-Assessment of Workplace safety and Employee behavior factors that highly impact on Productivity of Elevator Installation process.		**Score**								
Please, prioritize based on your opinion among the nine root causes, which one highly affects workplace safety and Employee behavior factors using tick mark (√)		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1.	Safety management policy practice									
2.	Training & Education									
3.	Collaborative efforts and communication									
4.	Work force skill and Commitment									

5.	Technological advancement									
6.	Work load management									
7.	Safety culture									
8.	Work Environment (Physical Environment)									
9.	Work procedure & work plan									

Section-10: Assessment of productivity of Elevator Installation based on work place safety and elevator Installation.

(Scale: -1-5, with 1. Strongly Agree, 2. Agree, 3. Neutral, 4. Disagree, 5. Strongly Disagree)

S/N	High Impact of Productivity of Elevator Installation based on work place safety & Employee Behavior	**Score**				
		1	**2**	**3**	**4**	**5**
1	Safety management policy practice					
2	Training & Education					
3	Collaborative efforts and communication					
4	Work force skill and Commitment					
5	Technological advancement					
6	Work load management					
7	Safety culture					
8	Work Environment (Physical Environment)					
9	Work procedure & work plan					

Section 11: Answer the following survey questionnaires using yes or no

1. Have I identified the worst thing that could happen if something goes wrong?
2. Do I have the needed training, knowledge and understanding of the instructions to do this job safely?
3. Do I have all the correct tools?
4. Do I have all necessary Personal Protective Equipment (PPE)?
5. Have I secured or taken control of working equipment?
6. Have I done everything possible to minimize the risk to an acceptable level?

Appendix II

Response rate and demographic analysis of the questioners

A total of …. Questionnaires were distributed to employee, all employees gave response and the rate of response is 100%. The respondents'' demography includes gender, age, work experience, educational background and Employment level. Thus, they exhibited the following report in the table below.

Table: Respondents result

There are specific workplace safety measures are currently in place during elevator installations.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	6	10.2	16.7	16.7
	Agree	6	10.2	16.7	33.3
	Neither agree Nor Disagree	6	10.2	16.7	50.0
	Disagree	6	10.2	16.7	66.7
	Strongly Disagree	12	20.3	33.3	100.0
	Total	36	61.0	100.0	
Missing	System	23	39.0		
Total		59	100.0		

Before using new tools and equipment my supervisors regularly informs me procedure of use.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	1	1.7	2.8	2.8
	Agree	3	5.1	8.3	11.1
	Niether agree nor disagree	5	8.5	13.9	25.0
	Disagree	9	15.3	25.0	50.0
	Strongly disagree	18	30.5	50.0	100.0
	Total	36	61.0	100.0	
Missing	System	23	39.0		
Total		59	100.0		

Workers in your company have the necessary skills and training to perform their job safely.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	5	8.5	13.9	13.9
	Agree	5	8.5	13.9	27.8
	Niether agree nor Disagree	6	10.2	16.7	44.4
	Disagree	6	10.2	16.7	61.1
	Strongly Disagree	14	23.7	38.9	100.0
	Total	36	61.0	100.0	
Missing	System	23	39.0		
Total		59	100.0		

Workload management impacts your overall job satisfaction and productivity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	18	30.5	50.0	50.0
	Agree	8	13.6	22.2	72.2
	Niether agree nor disagree	5	8.5	13.9	86.1
	Disagree	3	5.1	8.3	94.4
	Strongly disagree	2	3.4	5.6	100.0
	Total	36	61.0	100.0	
Missing	System	23	39.0		
Total		59	100.0		

Appendix III

Fall arrest system

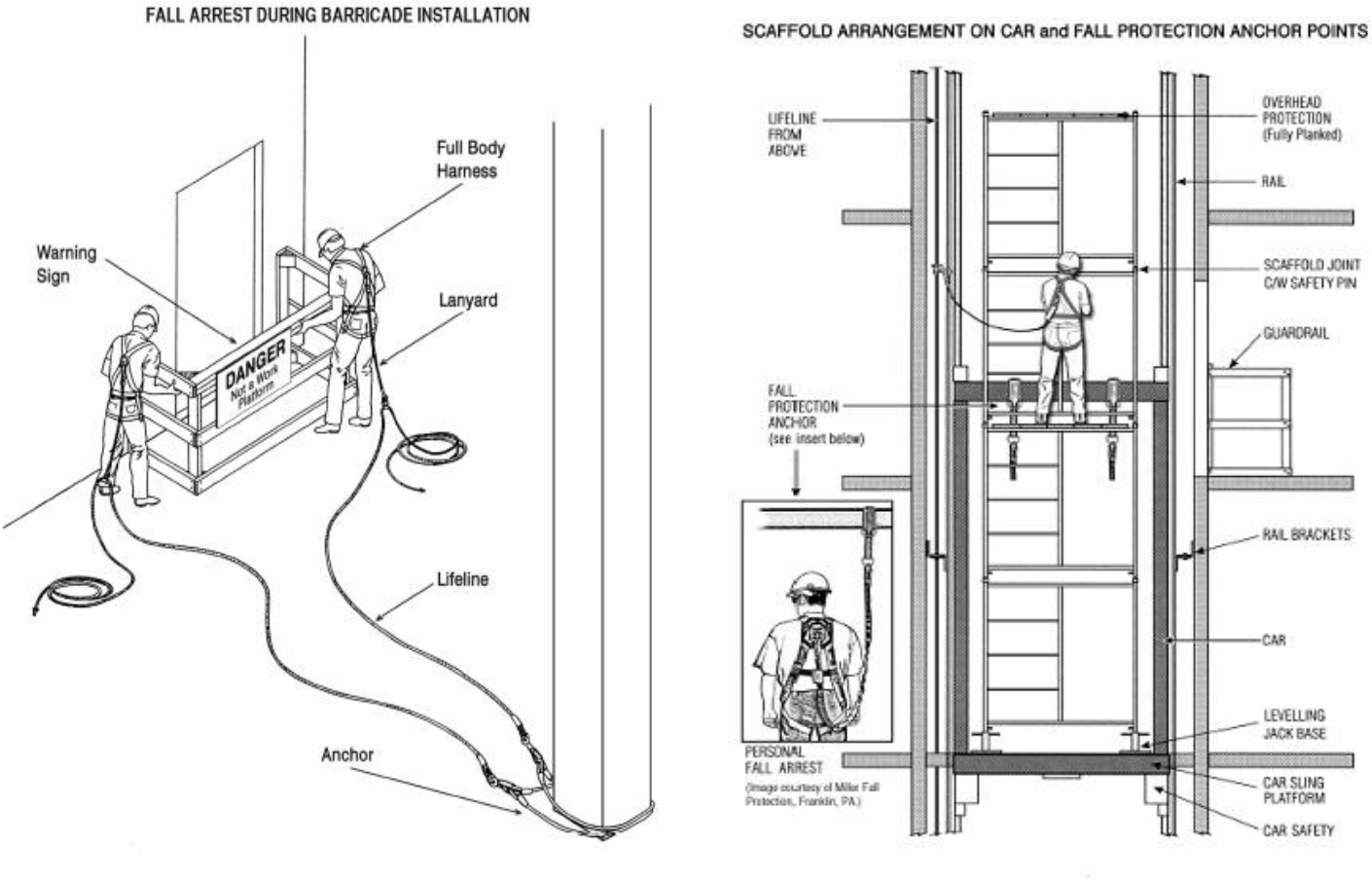

Figure 5.1: Fall arrest system