

ANKARA YILDIRIM BEYAZIT UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES



**ANALYSIS OF SAFETY AND QUALITY MANAGEMENT
PROBLEMS AND SUGGESTED SOLUTIONS IN THE FIELD OF
CONSTRUCTION**

M.Sc. Thesis by

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January, 2023

ANKARA

**ANALYSIS OF SAFETY AND QUALITY
MANAGEMENT PROBLEMS AND SUGGESTED
SOLUTIONS IN THE FIELD OF CONSTRUCTION**

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by

Sayed Mansoor IBRAHIMI

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M.Sc. THESIS EXAMINATION RESULT FORM

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ANALYSIS OF SAFETY AND QUALITY MANAGEMENT PROBLEMS AND SUGGESTED SOLUTIONS IN THE FIELD OF CONSTRUCTION

ABSTRACT

The goal of this study was to conduct analysis of issues with safety and quality management in the construction industry and potential fixes specifically for Afghanistan. Safety and quality control have been identified as two issues that project managers are becoming more and more concerned about. Costly repairs may be necessary if a built facility has flaws or fails. Reconstruction may be necessary even in the case of small flaws, which would affect facility operations. Delays and increased expenditures follow. Failures might, at worst, result in fatalities or serious injuries. The results of the study showed that construction-related accidents can also lead to serious expenses and human casualties. Due of the higher direct expenditures, insurance, inspection, and regulation, indirect costs are rising quickly. A good project manager makes an effort to guarantee that the task is done correctly the first time and that there are no significant accidents on the project.

Keywords: Safety, Quality, Management, Construction, Afghanistan

İNŞAAT ALANINDA GÜVENLİK VE KALİTE YÖNETİMİ SORUNLARININ ANALİZİ VE ÇÖZÜM ÖNERİLERİ

ÖZ

Bu çalışmanın amacı, inşaat sektöründe güvenlik ve kalite yönetimi ile ilgili sorunların ve özellikle Afganistan'a yönelik olası düzeltmelerin analizini yapmaktır. Güvenlik ve kalite kontrol, proje yöneticilerinin giderek daha fazla ilgilenmeye başladığı iki konu olarak tanımlanmıştır. İnşa edilmiş bir tesiste kusurlar veya arızalar varsa maliyetli onarımlar gerekebilir. Tesis operasyonlarını etkileyecek küçük kusurlarda bile yeniden yapılandırma gerekebilir. Bunu gecikmeler ve artan harcamalar takip eder. Arızalar en kötü ihtimalle ölümlere veya ciddi yaralanmalara neden olabilir. Çalışmanın sonuçları, inşaatla ilgili kazaların da ciddi masraflara ve insan kayıplarına yol açabileceğini göstermiştir. Artan doğrudan harcamalar nedeniyle, sigorta, muayene ve düzenleme dolaylı maliyetleri hızla artıyor. İyi bir proje yöneticisi, görevin ilk seferinde doğru yapılmasını ve projede önemli bir kaza olmamasını sağlamak için çaba harcar.

Anahtar Kelimeler: Güvenlik, Kalite, Yönetim, İnşaat, Afganistan

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NOMENCLATURE

ANDS	Afghanistan National Development Strategy
GDP	Gross Domestic Product
CSM	Conventional Safety Management
ABC	Associated Builders and Contractors
AGC	Associated General Contractors
OSHA	Occupational Safety and Health Administration
VPP	Voluntary Protection Program
TQM	Total Quality Management
PPE	Personal Protective Equipment
BRE	Building Research Establishment
CITB	Construction Industry Training Board
BIM	Building Information Modelling

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CHAPTER 1

INTRODUCTION

1.1 Background

Safety and construction quality management is a very important and essential component to facilitate modern techniques and practices of construction. Currently, it is very important to make the implication of all the safety and security factors that could also impact the environment positively, the "environmental impact assessment" in every domain is important to evaluate, analyze and consider the clear and unclear impacts of environmental effects throughout the planning and development of design contemplations for construction projects. Safety and construction quality management emphasize the betterment of the construction process. This study helps to evaluate and determine the consequences of the implementation of construction project. These consequences are the possible potential changes that will occur in the environment. These changes involve people living after the adaptation and implementation of construction as well. "Quality management" can be explained by "meeting the legal, aesthetic and functional requirements of a project". These necessities and requirements are sometimes easy and sometimes difficult. It is the belief of some of the design professionals and experts that the measures of quality by the beauty of the services and facilities they design and plan. As far as safety in construction management occurs, safety also possesses great importance in the field of construction. Safety in construction running and management is commonly taken as unnecessary and secondary to the main business and construction function. Hence, the value of construction safety management in the construction industry is often taken too lightly [1]. Furthermore, the theory of "quality management" is the linkage between "the management of quality and safety" [2]. As over the past decades, the construction rate is rapidly increased in Afghanistan, the need for safety and construction quality management is also increasing. And for this purpose, the adaptation of new tools and technology is very important. The construction industry is huge, and "safety and

quality" control are two important factors that will help to improve the performance level. The objective of "quality management" is the investigation and improvement of inconsistency or unwanted results in the construction process. For "health and safety management", the inconsistency and discrepancy are in the forms of a workplace incident, mishap, and foundations of human error. The resemblance of "safety and quality management" are evident as both have various similar characteristics regarding their design. Take an example of "OSHA 1996)", this act suggests that an effective safety management program must be grounded on commitment of management, employee involvement, identification of hazards and control, training, and investigation of accidents [2]. Various researches have been conducted regarding the issues concerning safety and quality management because the construction industry covers a major part of the economy of every country. Research proves that this sector is lacking in following the laws and measures that are important for every construction site [2]. Moreover, poor safety and lack in achieving the quality can create construction defects, and these defects can lead to failure. Substandard quality and unsafe practices in the construction area can be a big threat to the safety of the building, and it is one of the major causes of system failure in construction industry. It is essential to identify the causes and reasons for safety problems and quality management concerns in the construction sites. High-quality material increases the durability of design; otherwise, it can be the reason for installation complexities. Quality review is a good approach to checking the deliveries of construction material. Usually, complex designs are more difficult and challenging. To cater for this problem, it is important to understand the nature of the design parameters and all the complexities that are involved in such kinds of construction projects [3].

In this present research, it is focused on the improvement of the quality management system and safety measures in the construction process. This investigation involves the problems associated with "safety and quality management", such as problems concerning the issues in designing of the projects, false use of tools and techniques and risks and problems associated with "health and safety management".

1.2 Problem Statement

The construction industry is known as the slowest industry to adopt innovation and updated technologies. Technological advancement is now implemented in every industry, and successful business organizations of different industries are taking advantage of modern innovative technologies [4]. Now it is time for the construction industry to adopt the new technology and move with the time. Various researches show that several construction projects are going on without adopting the advance technological improvements. Emerging technologies such as artificial intelligence, robots, the Internet of things (IoT), 3D printing, and many more should be adopted to increase quality performance and to avoid safety risks. Furthermore, the major tenacity of the “safety management system” is to eliminate and prevent injuries and mishaps that are caused in the construction of the projects because of various factors in the workplace [5].

Moreover, they are commonly intended as the true focus of a “safety program”. There is a necessity to evaluate and investigate why the various misfortunes and casualties still at an intolerable number. It is essential to discover any gaps in imposing the requirements and needs of "safety Acts" or any faults in reviewing and inspecting construction locations [5]. The major problem is the lack of understanding of the risk and safety factors at the construction site. Even though the casualties and fatalities were reported to concerned departments, nevertheless the information and research are still not sufficient according to the increasing construction needs. The problems regarding the health and safety issues must be primarily understood and grasped. Attentiveness to health and safety is essential and crucial for the construction industry. “The Occupational Safety and Health Act 1994 (OSHA)” is a self-regulation law that needs to be followed during the construction process [3]. Delays, security problems, corruption, technical and technological problems in construction sector are the major problems that are faced by Afghanistan.

1.3 Importance of the Research

The rationale of selecting safety and quality management in construction projects is that construction being a dangerous sector of work, needs attention towards the

problems related to quality and safety management. It is very important to discover and discuss the most influenced factor, that are impacting the "quality and safety" in construction these factors may include, use of damaged equipment's and low quality materials, failures by suppliers and vendors, miscommunication between the stakeholders, last minute changes, mishandling by sub-contractors, safety training, teaching workers and managers to have good habits of safety, proper use of PPEs, keeping an eye on the safety and quality of resources used in the project; maintaining close supervision of the workers and so on [3] . This research helps to improve the "quality and safety" concerns of the construction sector as well as impact positively on the environment.

Furthermore, the rationale is to further evaluate the scope and relationship between the quality and safety factors in the field of construction, as they both are the most important factors that need to be considered during the design of the project. The present research uncovers significant factors that lead to successful construction processes, which are essential because several accidents and mishaps are caused due to poor safety management and quality issues [1]. The conclusions and findings of the research suggests the critical safety factors that must be the main concern of the management of the construction organization; safety significance must be the top priority of the management practices.

Furthermore, safety management involves the commitment of management, involvement of employees, identification and controlling of hazards, education, and training of the workers. These safety management factors will result in the reduction of injuries and fatalities, reduce the cost associated with accidents and reduce the worker's compensation premiums. This research highlights most influenced factors and throws light on the important aspects which are lacking and resulted in increasing site incident numbers. This study is essential, because safety and quality both are the most important factors that need to be considered during the designing phase of the project. The proper planning and strategies are important for these factors to ensure the smooth running of the construction phase.

1.4 Aim

The aim of this research is to identify new approaches and technologies concerning the “safety and quality management” of the small construction industry of Afghanistan.

1.5 Objective

The objective of this research is to find out most influenced critical factors associated with the safety and quality of the construction industry in Afghanistan. To achieve this objective, sub objectives are also required such as: analyzing the safety and quality awareness in the construction sector. Highlighting the important parts regarding quality and safety management and investigate appropriate solutions for them.

1.6 Research Questions

According to the above research objectives, the research questions that should be answered through the current research includes:

1. What are the important factors of safety and quality management problems at the workplace in Afghanistan and the possible solutions?
2. What are the variations in perceptions concerning the current construction management aspects present between the safety and quality experts?

1.7 Significance

The investigation of “safety and quality management” of the construction sector will be significant for the construction industry because it will benefit in decreasing accidents and raising quality standards without adding cost loads or reaching the accidents to tolerable rates. In the construction sector, there are various factors that need attention, this study is significant to highlight the major aspects of the construction industry of Afghanistan and investigate pros and cons associated with the technology and approaches utilized in this sector. This research is significant for highlighting several problems such as poor design quality, lack in performance of quality management, use of inappropriate equipment, inexperienced human resources,

opposing working scenarios, use of toxins and airborne fibers, wrong material handling and other hazards and risks of accidents. This investigation is important for the people who relate to the construction industry. It is important for the people because, it ensures the safety and quality of the construction projects. It contributes to the improvement of the projects and will decrease the accident rate.



CHAPTER 2

METHODOLOGY

2.1 Introduction

Chapter two is related to the methods and approaches used in this research. Based on the primary goal of this research work, the methodology is designed to highlight the key challenges with safety and significant quality management concerns and issues in the construction sector. The research work is done through mixed of qualitative and quantitative, the thematic analysis has been done using qualitative data, and the analysis and results are obtained through quantitative analysis. A comprehensive questionnaire is initially created to analyze the impact of the related issues that have an impact on workplace safety regulations and quality management concerns. Both types of questions related to safety and quality issues comprise the questionnaire. In the secondary stage, a questionnaire is sent out to Afghans connected to the country's construction industry, data are collected, and then a completed questionnaire is gathered to obtain responses from the respondents. The questionnaires were distributed to various job experts such as site managers, civil engineers, site supervisors, safety engineers, quality supervisors, and personnel accountable for safety and quality. Professionals not directly involved in the construction process are not included in this process. The sample size is based on the professionals in Afghanistan's modest construction sector. To assess the outcomes and conclusions of the research, various analyses have been done on the sample. Those analysis include survey inspection, landform measurements, climate condition review and history of the site so that a final proceeding can be done to engage the workers in respective beginning procedures for the civil work. The findings are based on the completed questionnaire. They are implemented in the final stage to improve the construction sector by analyzing and evaluating safety and quality management concerns. Both primary and secondary methods are used to get the data and information. Questionnaires are used to get essential information. The secondary data is gathered through earlier studies and inquiries. Regression analysis is performed to determine whether a variable or factor

is influencing the building process's safety and quality. The technique is used because it can forecast, model time series, and identify cause-and-effect relationships between variables.

2.2 Research Design

The approach research will cover the type of research approach used, the conceptual foundations of the research, how the research data will be obtained, and how the data will be analyzed for a relevant conclusion [6].

The design of the research is primarily based on qualitative research techniques. The qualitative research methodology will use in investigating the issues of safety and significant quality management issues and concerns in the sector of construction.

The research philosophy will then be interpretivism-based, also known as interpretivism, which involves the researcher defining the literature's components. Interpretivism thus incorporates people's knowledge into the research. As per interpretivism, the study will grasp that public structure, which includes tools, ordinary sense, consciousness, and language, is obligatory to disclose the truth. Interpretivism, phenomenology, and constructivism are only a few examples of the various ideas and processes that can be connected by the investigator according to interpretivism, which is associated with the philosophical position of certainty. Additionally, by using the "interpretivism research philosophy," it is possible to assure that the study will employ a wide range of methods to address the problem's many facets [44].

The part of this chapter that follows will discuss data collecting. The study technique uses secondary data from various sources, including journal articles, papers, and research resources. The section on data collection will go into more depth about this. The "data analysis" of "secondary research" will be the final topic covered in this chapter. This procedure takes the position of analysis of the data obtained by various researchers to meet various goals. The researcher is be able to interpret the significance of project management and provide detailed information about the data according to the qualitative technique. The primary data has been collected by distributing 23 questionnaires to the people who are linked with the construction sites and are involved

in the activities associated with the safety and quality of Construction in Afghanistan. This primary data will help in analyzing the research questions.

2.3 Research Approach

The qualitative research will use a traditional inductive methodology to highlight the significance project management [7]. By consuming the below steps, this policy helps in offering an appropriate solution to the question:

- Condensing research-based documentation into a concise, influential form.
- Create a direct connection between the research questions and the summaries that were drawn from the raw data.
- Develop a model that is based on the key concepts of the study questions and that the raw data can support.

This traditional inductive approach will make it feasible to analyze qualitative research data in a methodical way and obtain reliable, correct answers. Even if it has been demonstrated that the inductive technique is less successful than other analytical ways for model or theory establishment, the proper way to generate findings in relation to targeted evaluation research questions is through a simple and uncomplicated methodology [44].

Qualitative research analysis was the first step in inductive interpretation, which leaned more toward generalizations and abstract concepts. The research attempts to develop empirical generalization and emphasize prior linkages as the researcher moves on with the work while using an inductive technique, starting with the research questions [7]. The researcher will face a difficult phase of the research till the study and reading are finished to understand the nature and kind of the research discoveries. Theories are not produced in the early stages of the research [6]. The study's emphasis will move from certain fundamental issues with safety to severe problems with quality control in Afghanistan's construction sector. The researcher may start with precise measurements and observations before drawing clear patterns and themes from the data. Eventually, the investigation's findings enable generalizations to be made regarding the study questions.

2.4 Research Methods

The methodology is planned in accordance to highlight the core problems of safety and important quality management concerns and issues in the construction sector, is based on the main objective of this research work. The mixed methodology is used to analyze this research work. At the initial stage, a complete questionnaire is prepared to measure the significance of the associated problems that influence the safety measures as well as the quality management issues at the workplace. The questionnaire is based on both types of questions related to safety and quality concerns. At the secondary stage, the questionnaire is distributed to the people of Afghanistan linked with the construction industry of Afghanistan, and then a filled questionnaire is collected to get the results from the respondents. The questionnaires have been distributed to a range of job professionals such as site managers, civil engineers, site supervisors, safety engineers, quality supervisors and personnel accountable for safety and quality, who are directly associated with the construction site, because they can easily evaluate the relationship between the safety and quality. Those professionals who are not linked directly with the construction process are excluded from this process. The sample size is based on the professional of the small construction industry of Afghanistan. Different analyzes are conducted on the sample to evaluate the results and outcome of the research. In the final stage, the outcomes are based on the filled questionnaires to analyze and evaluate the safety and quality management problems concerns and implement steps for the betterment of the construction industry. The data and information are collected by primary and secondary means. The primary data is collected through questionnaires. The secondary data is collected by reviewing past research and investigations. The regression method is used to identify that which factor or variable is impacting the safety and quality of construction process. The method is adopted because it is forecasting, time series modeling and finding the cause-and-effect relationship between factors.

2.5 Methods of Data Collection

There are chiefly three types of data collection methods, primary, secondary, and mixed, i.e., both secondary and primary methods are utilized. In the current research, the researcher utilized the third type of data collection method, i.e., the mixed method. This chapter's part on data collection will go into detail. Secondary source research, which employs recent data relevant to the study objectives, is the main approach for acquiring data. To make the qualitative investigation more effective overall, recent data is gathered and summarized. However, this investigation includes collecting data through both secondary and primary means.

Primary research involved in the collection of information and data by distributing the questionnaires; these questionnaires have been distributed to the people who are dealing with construction sites in Afghanistan. In addition to this, the collection of secondary data and research includes resources of academic research published and journals and articles of scholars, and other related documents [6]. The mentioned resources are accessible at public libraries, websites, and information available from already achieved questionnaires and surveys, and so on. Some governmental and non-governmental organizations also protected information and data that could be utilized in the objectives of the research and can be utilized to deduce the research answers.

Information that is published in the relevant academic, institute, and related journals is sometimes referred to as coming from "secondary research sources." These materials are found in many different areas, such as online, in public libraries, in survey findings, etc. The purpose of the study can be advanced, and conclusions drawn using the data archives of several governmental and non-governmental organizations [7].

Secondary research is less expensive than other investigation methods as it employs the most current info and data set. "Primary research", in contrast, collects info straight from dealings or parties, or on their behalf through a third party.

Secondary data are a great resource to find in public libraries. Public libraries provide access to high-quality research on handling safety and quality in the construction sector. The researcher used their existing libraries of papers from earlier investigations. A wide range of resources is available in many libraries to help researchers with their

work, including government publications, company directories, journals, newsletters, market research reports, and books about research [6].

However, there were several limitations, which are discussed in more detail in the sections that follow. Internet surfing is one of the best and most practical ways to obtain secondary information. Using the internet makes it simple to find information that is instantaneously accessible or visible online. Online, the most recent study data is frequently accessible for free or a nominal fee. Companies and organizations provide a ton of content that prominently showcases their research on their websites. When browsing the web, the researcher must only consider reliable, and correct information [7].

2.6 Data Analysis

The data is typically unstructured and useless once the researcher has done collecting it unless it is properly categorized and arranged. The full data collection must first be interpreted by the researcher. The initial step in data analysis is to organize the structure and classification of the data. As a result of the research's quantitative nature, it is necessary to classify and arrange the data using statistics and graphs to transform it all into appropriate language and easily understandable formats [46]

2.6.1 Validation of Data

Data validation, the first phase in data analysis, tries to determine, to the degree that is practicable, if the data collection was carried out accurately and in accordance with the pre-established parameters. It involves four steps, including:

- Participants were recruited after being screened to verify that they complied with the study's conditions; it would be fraud if it could be demonstrated that each response was really questioned [47].
- A method to ensure that the data gathering procedure is carried out properly.
- Completeness guarantees that all the responder's concerns—and not just the most important ones—have been considered.
- To do this, analysts would need to randomly choose a sample of survey replies and analyze the results.

2.6.2 Data Editing

Data editing follows data analysis since mistakes usually occur in large data sets. Respondents could unintentionally walk across blank fields, for instance. To make sure that there are no such errors, the researcher must perform fundamental data checks, look for outliers, and modify the raw research data to locate and delete any data points that could lower the accuracy of the conclusions. The researchers will pick up techniques along the way that will help them make use of each unique piece of information when it is pertinent to the study question [47]. To organize, develop, and deliver answers to the study questions, the researcher must frequently return to the research questions. The researcher also used a tabular format to clearly correlate and link the study aim with the inquiry data to increase visual clarity. These methods are mainly meant to avoid working with unstructured data, halt incorrect data interpretation, and maximize the information already acquired. Without the aid of these tactics, the researcher won't be able to discover the findings required to fulfill the study's aims [6].

2.6.3 Coding of Collected Data

Data reconstruction is followed by the third stage, which creates a link between the data and the research. Along the process, the researchers will learn strategies that can assist them in utilizing each unique piece of data when it is relevant to the research issue. The researcher must continually revisit the study questions to organize the data and provide responses. To boost visual clarity and effectively link the study data with the research goal, the researcher additionally adopted a tabular format [48]. These methods are mainly meant to avoid working with unstructured data, halt incorrect data interpretation, and maximize the information already acquired. The researcher would not be able to find the information required to accomplish the study's objectives without these tools. The regression method is used to identify which factor or variable is impacting the safety and quality of the construction process. The method is adopted because it forecasts, time series modelling and finds the cause-and-effect relationship between factors.

2.6.4 Analyzing the data

The next step in the data analysis process is to properly validate the data. This stage must come first since the data's accuracy is crucial for qualitative research. The researcher must always keep an eye on the data validation process. Therefore, it needs to be seen as an ongoing process [49].

Drawing conclusions from the data, responding to the research questions that served as the study's main objectives, or expanding the body of existing knowledge are some of the last steps in the data analysis process. The finished output includes any findings and suggestions the researcher made that other researchers could find useful in the future [46].

2.7 Inclusion Criteria

There is everything a study requires to satisfy the inclusion requirements. The study's methodology, the kind of intervention it used, the characteristics of the participants or target population, the aims and research questions of the study, and the outcomes that were measured in the study are all given specific weight in the inclusion criteria for a systematic review.

The application of knowledge management in the construction sector is discussed explicitly in each of the publications analyzed in the following review, all of which were published in recent years. It is beneficial to keep the information updated and pertinent. Additionally, all the pieces have been included, regardless of their regions of publication [49].

2.8 Exclusion Criteria

The features that would prevent a study from being included are known as exclusion criteria. The study may be included or excluded depending on a variety of variables. Some exclusion criteria include date, interest, exposure, publication location, target audience and participants, peer reviews, outcomes, goals, study design, and many others [50].

The study that follows has removed the papers that were released long time ago. Furthermore, publications that were written in languages other than English were ignored.

2.9 Ethical Consideration

Ethical considerations may have a significant impact on the study's direction. Moral guidance that is sincere can improve the reliability of study results and inspire researchers to uphold moral principles throughout the research process. The present study's ethical considerations throughout the research process took the data's anonymity into account. Academic integrity was upheld, and none of the supplied data contained any instances of plagiarism. The proper epistemological orientation of the selected articles and the incorporation of information from the most relevant sources are two problems that the study has highlighted [50].

While conducting secondary research, a variety of ethical issues need to be given specific attention. These moral dilemmas do occasionally overlap. These ethical issues include "voluntary engagement," "informed permission," "anonymity," "confidentiality," "potential for harm," and "disclosure of results." In this study, it has been given each of these ethical issues specific consideration. Any type of harm, whether social, psychological, physical, or other, is absolutely prohibited. The report properly cites credible journals, websites, and publications at every turn. It has been ensured that no biased language or viewpoints would cause harm to a third party.

The two main problems with the usage of "secondary data" are the possible harm to specialized research and the question of return for a concern. Nowadays, secondary data contains a greater range of contemporary sources of proof. The study does not need to be extensively reviewed by the ethics committee if it meets with academic integrity standards, is clear of material that may be used to prove the researcher is a plagiarist and is adequately hinted to avert the investigator from satisfying the requirements. The data will be chosen as unidentified by the group [51].

Additionally, since reputable "ethical committees" evaluate the work, the researcher may encounter issues if the data and resources utilized in the study are false or breach academic integrity. The researcher refrained from using information or resources from

earlier investigations without permission. Instead, they will only extrapolate information and understanding from those earlier investigations. The researcher goes through the justification for choosing specific study components [52].

Plagiarism is the avoidance of illegal conduct like as plagiarism, the use of faked data, or the overt duplication of another scholar's results. The investigator commences by consuming trustworthy methods, pertinent references, and sincere attempts. As the investigator grows personally because of his experiences and education, he carefully examines how to use the data. The investigator is aware that upholding academic honesty within the setting of the university has important objectives, such as creating an ethical framework for use in reaching decisions and resolving issues, as well as having finished the knowledge acquisition required to establish the core competencies and skills for the given profession [50].

2.10 Limitation of the Research

The scope of this study is to resolve the problems associated with the construction industry, the quality and safety management based on the construction practices followed in Afghanistan. Other developed countries are practicing different methods of safety and quality to improve operational tasks. However small construction industry of Afghanistan is facing some serious kind of safety and quality management issues that are highlighted in this study. The scope of this investigation is to highlight most influenced problems linked with safety and quality issues in Afghanistan construction industry in last 10 to 15 years. And suggest possible solutions to tackle the situation for coming 20 years. The main question to answer the scope of this study work is to examine the important causes of the “safety and quality management” problems at the workplace and the possible solutions.

CHAPTER 3

LITERATURE REVIEW

The chapter of the Literature review is based on the aim and objectives, research questions and methodology highlighted in the first chapter. The literature review highlights research gaps of the study. It explores insights into the Safety and Quality Management in the Construction Industry of Afghanistan. This part of the thesis elaborates the research from previous research journals, published articles and books. Furthermore, the literature review also explains the relevant theories to Safety and Quality Management in the small Construction Industry of Afghanistan. This literature review helps to find out the influential factors associated with the safety and quality of the construction industry in Afghanistan.

3.1 Historical Background

This investigation focuses on the history of safety and quality management in the industry of construction in Afghanistan to identify new practices including approaches and technologies concerning the "safety and quality management" of the small construction industry of Afghanistan [40]. The construction industry of Afghanistan has been facing several challenges regarding quality and safety at construction sites. To overcome delays and cost overruns. In several developing frugality, productivity is a problem of particular significance in Afghanistan. This has been considered one of the planned objectives of the "Afghanistan National Development Strategy (ANDS)" to bring out the state's growth cycle more than the post-conflict condition. There is a deficiency of research adequacy on the "quality and safety of construction industry of Afghanistan" [8]. The industry of construction procedures is a major portion of any state's financial output. Enhancing and developing methods, approaches, and techniques increase the financial output of the construction industry. Hence, every country stresses the improvement of the construction industry. The statistics show that the construction industry of Afghanistan contains a 25 per cent share of "GDP", and this industry ranked on number third in the economy of the country [9]. The

construction industry shared 9.2 per cent of GDP in the time “2008 to 2009”, and this has been growing at the rate of 10% between the time of "2007/08 and 2008/09" [10]. Even though the construction industry signifies a large part of Afghanistan's economy, the performance and enhancement in construction productivity over the last decades have been taken too lightly and underestimated. Safety and construction quality management is a very significant and important factor to facilitate modern techniques and Construction. There are several aspects that are lacking in this domain [10]. The problems in safety and quality management in Afghanistan outcomes in the cost overruns, delays because of the incidents and site mishaps, deficiency in the productivity linked with the delivery of milestones and major infrastructure tasks and projects, for example, power plants, roads, high rise buildings and so on [39]. The major concerns of the activities of Construction in Afghanistan are deficiency of security, sustainability inefficiency, and absence of management competence in private and civic zones. Insufficient development in the productivity of construction chiefs to the increment of the cost of construction activities, thus, source to unfavorable communal significances and deteriorating effort for the industry of Construction [51]. Construction has been considered one of the most dangerous works. Additionally, the industry of Construction has been under an endless inspection for quality of work. Joining the methods of management of safety and quality methods and values capitalizes on the resemblances between these two aspects of management concepts to create alone a 'synergistic' system of management for enhancing “safety and quality”. To improve and enhance the "safety and quality" of the construction industry, the government of Afghanistan has taken many actions over the past ten years. Investigators have calculated that workers' recompense premiums cost contractors anywhere from “1.5% to 6.9%” of entire costs related to a project [8]. The injuries or mishaps in the industry of construction impacts the probability of sales of the projects in many ways, such as it impacts the status of the stakeholders associated with the projects, it creates doubt in the eye of people, it lowers the efficiency of the products, it discourages the other working staff and creates a sense of trauma for the other workers as well [42]. Injuries and accidents in the industry of construction impact the budget of the project as well, such as it adds the indirect medical case income and costs, it restricts the activities of the project, the lost-workday damages have been

expected at a “4.2 and 20.3” ratio to direct budgets [11]. In terms of productivity, efficiency and quality, the track record of the industry of construction is not showing an impressive record [12].

Since “quality/productivity stance, worker prices normally signify about 30% to 35% of the overall cost and budget of the project. The previous researchers investigated the manpower negligence, mismanagement and delays of Construction and evaluated that typically 40% to 60% time of the consecration of Labor Day is non-productive or leisure time, and this impacts the quality as well as the productivity of the projects of construction, In Afghanistan it can be seen that most of the daytime of the labor is wasted due to the unavailability of the resources and machineries [40]. Researchers also concluded from the past history of the projects of constructions that prices linked with the rework and redoes of the activities or portion of the activities of construction phase because of the poor and lack in the performance of craftsmanship or alteration in the plan have been found to be as great as 12 to 15% of the total budget of the project and needed as much as 10 to 12% of the whole working hours of the construction project [43]. Research also commented that this cost is not considered and takes into excuse losses because of the delays of schedules, costs legitimation and other such factors of imperceptible prices of low quality. It is obvious that low quality of work and risky conditions of work have resulted in the cost of “billions of dollars” to organizations of construction, holders, and the general sectors of the public while producing too much distress to workers of construction and families of them [13]. Among the risk management techniques that were frequently employed were efforts to increase safety and measures to decrease other project dangers. The extensively used risk management strategies contributed to a higher level of project safety and a decrease in other hazards. Other safety measures included requiring employers to wear cloth face masks, enforcing social distance guidelines, separating construction activities, making COVID-19-related training available, and checking the workplace's temperature before personnel arrived [67].

3.2 Concepts of Safety Management

Overall, the management of safety is an idea that brings forth a more complete and inclusive approach and method [44]. The approach of safety management permits

contribution and efficient participation of all degrees of organization and workers. This approach of management is established from "conventional safety management (CSM)" it covers all the features and characteristics and all the possible levels of risks at the construction site into attention and consideration [41]. Efficient and effective safety management has the ability and potential to enhance competitiveness and progress productivity for an organization. Effective "safety management" has three key objectives, and those are:

- Create an environment that is safe and harmless.
- Make the job of workers and laborers safe
- Make workforces protection and safety conscious

The idea of "Safety management" was raised out of a necessity to convert "safety and health management" from a firm compliance direction to act coordination in which compliance is a significant matter but not the only matter [46]. "Safety and Health" must be a basic feature in a company's plan for attaining competitive benefits in the international marketplace. Controlling quality on the construction site is done through the construction quality management process. Essentially, it ensures that every component of the project is legal and safe. Both internally and externally, inspections are performed [45]. The main purpose of "safety management" is to provide an organization with the modest supportable advantage of a "safe and health" environment of work. Mainly, the concept and idea of "safety management" are the same as that of "quality management" the concept of "safety management" is grounded on a well-thought-out and well-organized system in which the key support for this system is the responsibilities and roles of the advisors or participants included within a particular construction of project. The formation of programs of safety comes in a very broad scope, and there are just no restrictions on the tactics and strategic planning that could be taken to give an effective "health and safety" planning and measures to be accomplished and practiced [47]. The main source of accidents and fatalities in the industry of construction is the construction site of the project; the idea of the safety management that emphasizes the significance of a well-explained company structure and planning of safety eventually this idea have shown the ability and potential on eradicating and eliminating the threats and risks that generally occur on the site of construction [50].

3.3 Concepts of Quality Management

The idea of "Quality management" can be stated as "The optimization of efforts to make sure that the requirements are met efficiently and on the first attempt" [51]. The major aim of "quality management" is that activities should be "done right" at the first attempt, and rework and redo must be avoided. Optimization of the energy and efforts infers that the most effective degree of effort is required. This can be done by minimalizing the total budget quality [48]. Quality in construction projects could not be achieved automatically. Even if every stakeholder's work and effort have the finest aims in the field of construction, human features and factors, for example, rapidity and unawareness, decision making in management such as scheduling and sequencing of activities, the composition of staff members and uncontrollable and intense actions, for example, incompetence and ineffectiveness of vendors and negative and adverse weather condition require the generation of the system to ensure that tasks and activities are completed correctly. Furthermore, sometimes, the client and public or users of the project require a guarantee that the contracted project has been provided. They are providing this assurance, often called "Quality Assurance". Sometimes, the gist of the terms "quality control" and "quality assurance" that have been utilized in the industry of construction is not clear; however, both the terms have been considered and included in the "Quality Management". To achieve the guarantee of quality or 'quality control', normally needed elected workers and tools and efficient tactics are. The groundwork of the program of quality, a general set of documents and precise quality plants are needed by some agreements or contracts to establish one level of effort of quality [49]. The execution of the plan of quality requires precise activities of quality; these activities may include testing of materials being utilized in the project, checking of submittals, tools and equipment recalibration and general control and review of construction work. Training of workers can also be categorized as an activity of quality or characteristic to assure quality. There are various costs and expenditures related to a specific quality. Programs of quality are proper written systems for attaining the quality of the project [12]. They usually involve a statement of policy; this statement states the support of upper management. They also explain responsibilities related to quality and involve the directions about things like documents, training, and general process control. The term "Quality Plan" normally

indicates a "job-specific" request for the program of quality. The plan highlights well-organized and well-controlled details and guarantee activities, for example, evaluation of vendors, checking of the plan, going through the documents of submittals, and testing of material. Some usual components of quality programs are listed in Table 3.1 presents the quality elements of construction [64]. In this scenario, the elements indicated previously as being in the plan of quality would be under the control process [14]. The performance of the program indicates some approaches and methods to determine whether the program is fruitful or cost-effective. This can be done by determining and computing the satisfaction of the client or by the economic outcomes.

Table 3.1 Quality elements of construction

Quality
Document Control
Vendor Selection
Field Trials
Quality Audit Procedures

3.4 Nature of Construction

The major barrier and hurdle in the path to implementation of the efficient system of management is clearly the nature of the process of construction itself. The common reason behind the cause of the decline of the "quality and safety" in the industry of construction is the "nature" of the environment of the work. The basic nature of the construction work is the cooperative or obliging effort of several stakeholders and participants, each with their individual standpoints and rate of interest at hand, to come together for the completion of a plan of the project that will typically be altered numerous times while being the phase of construction, while making efforts to minimize the impacts of the surrounding and environment, hazards of occupation, delays of schedule, not meeting the deadlines, lack of resources and defects of the building in Afghanistan [13]. The entire process of construction can potentially proceed to blunders and inadequacies. The industry of construction has conventionally comprised of the three chief stakeholders and are (i) the client or owner of the construction project, (ii) The architect or designer of the project (iii) The main

contractor of the project in the construction industry [55]. The basis of the project of construction can be discussed as the client first hires the architect or the designer for the project, and the owner explains the purpose, the need and special requirements to the designer and then places this project for the process of bidding to hire the contractor. The competitive bidding process is adopted by the owner. Through the bidding process, the owner finds an appropriate potential contractor for the project [59]. Then the owner starts the actual work of construction mostly in big projects or in some cases in small size projects as well. Even though the goal of the project for all the primary participants of the project is shared and mutual, that means the completion of the project, but the duties and activities of each participant differ [9]. The contributors hold their individual benefits or what they are required and hope to attain from the process of a construction project. The owner and the client generally agree that they would be happy to use as less as possible to have completion of their wanted project. The designers and architects of the construction business are responsible for providing the construction projects according to the details and requirements explained by the client. The relationship between architect and contractor is unclear. The contractors are required to construct the project according to the details and drawings provided by the architect or the designer of the project. The main contractors are responsible for delivering the project as accurate and efficient as possible to maximize their revenue. However, these things sometimes come out as conflicting and competing for both the parties (Designer and Contractor); apart from interest and profit margin, there are several other aspects as well that lead to many issues and conflicts in the industry of construction. There are various contractors that are part of the construction project, these all contractors are responsible for the insurance or quality and safety of the project [62]. The major contractors that are the part of the project construction include the general contractor who plays the role of construction manager at the site of the construction and supervise the sub-contractor (in the field) and is also occasionally considered by business (such as manufacturing, housing, road, service/repairs). The equipment and material companies that are most often considered suppliers of this industry also fall in the category of sub-contractor in the field of construction; even though the major responsibility is to transport the material and equipment to the site efficiently, they did not take part in the phase of construction.

Contractors vary according to the nature of the project as well as according to the nature of their responsibility. In the U.S., more than 80% of the contractors have less than nine workers that work for their activities. This company also mentions what type of labour force they have, whether "union, non-union or mixed (both union and non-union members)" labour force. Furthermore, the labour force type varies from state to state. Approximately 18% to 20% of the construction industry workers in the U.S. belong to a union labour force [12], same pattern has been observed in the construction industry of Afghanistan [60]. The union labour force provides experts and professional resources that have skilled and safety training regarding the activities of Construction, and the union workforce has more base pay and benefits of insurance to their workers [65]. Investigations also prove that the union workforce has significantly more indebtedness and appreciation for hazards and risks at the site of construction; reports suggest that the union workforce receives a great amount of training regarding safety and ensuring the quality of the construction project as compared to the non-union workforce. Additional benefits may also be provided to "contractors" who come from a background of a "professional Quality and Safety Management in Construction" union, for example, the "Associated General Contractors (AGC)" or "Associated Builders and Contractors (ABC)". From a research stance, these aspects are usually considered as they could add to the formation of industry or programs of management [15].

3.5 Bidding Process in the Construction Industry of Afghanistan

The construction industry in Afghanistan is struggling with issues such as delays and cost overruns. Today, risk management practices in the construction industry have made great strides in reducing risks that negatively impact project objectives, including time, cost, and quality. The process of risk assessment is an integral part of risk management to deal with the uncertainties facing the Afghan construction industry [55]. In the big public projects, the usual process of the bidding gets started with releasing of project description so that the contractors could be publicly allowed to review the description, in the industry of Afghanistan, there is a similar approach of bidding process, and then the contractors are awarded the contracts [16]. The details and information of the construction project could vary, but usually, the details of the

project are specified enough for the bidding process so that the potential contractors may be able to generate a fairly and justly accurate bid for the project. Some of the bidding processes are open to general contractors, who are needed to do contracting of subcontractors after they win the contract. There is distress and issue between contractors over the process of competitive bidding of the project construction. Such as, sometimes contractors make efforts to decrease the number of resources that are allocated for the safety and quality management aspects to maximize the profit margin, this is beneficial for the contractors and may impact the project adversely. Furthermore, any attempt or action that resulted in the reduction of safety and management of quality aspects of the projects could be very expensive to the main contractor if the contractor comes across mishaps and accidents during the construction phase of the project. Contractors also face delays in activities and schedules according to the nature of the construction project [17]. These delays could occur due to many reasons such as weather, lack of workforce, deficiency of pieces of equipment or delays in the delivery of equipment, material shortage, inefficient equipment, mishaps, and accidents at the construction site. Even though competitive bidding is considered a standard practice of bidding, but some general contractors and clients have started realizing the benefits of utilizing either pre-qualification process criteria or partnership criteria for awarding the contracts. In partnership criteria, the general contractor mostly works with a selective group of sub-contractors; a selective group of contractors means they work with whom they have experience of work, and they can trust them and rely on them to meet the needs and requirements of the construction project. Furthermore, in the pre-qualification process of awarding contracts, the bidders are required to encounter the least obligations and requirements of the past performance, experience, safety, or management of quality programs applied for the project. Hence the client and general contractor eradicate the factor of risk of selecting and working with low performer sub-contractors by demanding, such as, a supreme skill modification evaluation (well performance of safety in the past projects) or proof of implementation of a “quality management system” (more consistent work construction project). Poor safety and low quality can create construction defects, and these defects can lead to failure. Substandard quality and

unsafe practices in the construction areas can be a big threat to the safety of the building, and it is one of the major causes of system failure in the construction industry. There are many potential groups for quality and safety control during construction. A typical model is for an organization to have a group in charge of quality assurance and another group that is largely in charge of safety. In larger businesses, the safety and quality assurance department may designate specialized individuals to carry out these tasks for a specific project. These duties may be taken on by a project manager or assistant for smaller projects. In either scenario, the project manager who has overall responsibility for the project is concerned with assuring safe and high-quality construction in addition to personnel, money, time, and other management challenges [60]. The universe's and probability rules' indifference could be the true opponent. Trying to rush through the activity is likely to produce the wrong outcome if there are ten distinct methods to complete the work, and only two of them produce the desired output. Failure has many potential outcomes. Some people are attracted to gamble on both quality and safety due to the element of chance [74].

A project will involve inspectors and quality assurance personnel from different companies. Each entity directly involved with the project, such as the owner, engineer or architect, and numerous construction companies, may have a separate quality and safety inspector [61]. These inspectors may be independent contractors from professional quality control firms. In the construction industry of Afghanistan, to ensure compliance, material samples are often examined by specialized laboratories in addition to on-site inspections. Inspectors are also involved to ensure that legal standards are being followed. Inspectors from environmental, occupational health and safety, and municipal building departments are typical examples [60].

The Occupational Safety and Health Administration (OSHA), in cooperation with U.S. state inspection agencies, frequently visits workplaces; however, this practice is not common in the construction industry in Afghanistan. OSHA inspectors are required by law to issue warnings about any violations of the standards they find. Safety standards cover a wide range of mechanical safeguards and procedures [63]; for example, there are more than 140 laws related to ladder safety. OSHA inspectors have the authority to stop work on a project if there are serious standards violations. OSHA inspectors visit only a small percentage of construction sites, and most accidents at

these sites are not caused by noncompliance with the law. Therefore, the site manager, not the public inspector, bears much of the responsibility for safety issues. In any case, it is emphasized that the inspector is only a formal check of quality control, even though the services of the inspector are required by the many parties involved in the construction process [56]. The primary goal of the project team should be quality control. The responsibility for maintaining and enhancing quality control should rest with the managers. It is important to encourage and promote employee participation in quality control, including the sharing of fresh concepts. The bottom line is that productivity growth can be stimulated by quality improvement. Good quality control can pay off by developing new approaches, preventing rework and avoiding long-term problems. Owners should support effective quality control and look for suppliers who adhere to these requirements [52].

In addition to the many organizational bodies involved in construction activities, quality control issues occur in virtually all functional areas of construction activities. For example, maintaining high performance requires providing accurate and helpful information. Procurement, field testing and inspection, final facility close-out, and document control (including changes during construction) are other aspects of quality control [54]. An evaluation of the safety management system revealed that Afghanistan's current practice includes several positive components and characteristics. However, the overemphasis on productivity stops it from having the objectives, vision, and purpose of the safety management system as well as the knowledge and motivation of the management leaders to realize safety. It also asks for more uplifting and helpful guidance on implementing safety management [69]. Safety management also focuses on altering behavior and reducing the likelihood of errors that might cause damage or loss. The current study's findings suggest that Afghanistan have enough legislation for the factor of safety in the construction industry. However, there is room for improvement and amendments within the current legislation [71].

It is essential to identify the causes and reasons for safety problems and quality management concerns in the construction sites [18]. High-quality material increases the durability of design; otherwise, it can be the reason for installation complexities. A quality audit is a good approach to checking the deliveries of construction material. Usually, complex designs are more difficult and challenging. To cater for this problem,

it is important to understand the nature of the design parameters and all the complexities that are involved in such kinds of construction projects as there is a relation between design complexity and safety management, as the contractor has to decide the safety measures according to level of complexity of the design, for instance, if the design of the project mentions that it's a high rise building, then the safety management team has to make safety arrangements according to this [19]. Since "quality and safety" are closely related, it stands to reason that benefits could be obtained by implementing any or all the following ideas: (1) combining quality and safety functions; (2) applying quality theory to safety; (3) enhancing the safety management concept; and (4) applying safety aspect results to quality. The Afghan government has worked hard in recent years to put safety and health measures into practice through legislation enforcement, site safety training, and certificates [68].

It can be concluded that the nature of the construction project and construction represents the barriers and hurdles in the path of the successful "quality and safety" efforts. The nature of the projects starts with the ability of the designer or architect, and it depends on how fine the architect pleads with the requirements and expectations of the client and incorporates the client's need 'needs' into the design of the construction project. The architects and designers have the chance to minimize the chances of the creation of hazards at the construction site by doing effective and efficient safety and protection planning. The approach of competitive bidding procedures gives a chance for the contractors to deduct the substances of "safety and quality" costs in order to get the contract [14]. The deal itself is a representation of responsibility, as it labels the person who is at maximum risk throughout the phase of the construction project. The selection of subcontractors and suppliers for the project could also be complicated if the main contractor has no previous experience of work with them or the main contractor is unable to use the criteria of pre-qualification as a practice of hiring. And lastly, the unwanted and unpredictable factors, for example, weather conditions or 'hidden ground' or constructed glitches, can obstruct and delays a scheduled time and increase the budget for the construction of a project. It would have been seen that a great arrangement of organization, skills or knowledge, and good pre-planning is required to smoothly complete a construction project in a timely manner and within the allocated resources and budget. That is why the researchers have faith that a

combined "safety and quality management system" could be a ground-breaking way to enhance and improve the "safety and quality" performance in the work of construction [48]. To construct high-quality structures, a safety management framework was developed and is being applied with the awareness that improvement is required and desired. Combining safety management with quality results in a more comprehensive approach to safety practice and quality construction [70]. The use of technology in the construction business is growing more slowly than it is in other industries like banking, entertainment, healthcare, and education. Many businesses in these areas always seek fresh, cutting-edge ideas to be productive and competitive. Underinvestment in technology is one of the causes contributing to uneven or even negative productivity in the construction industry [80].

3.6 Relationship and Comparisons between Safety and Quality Management

According to the research on safety, the initial research and thoughts regarding the management of safety suggest that the accidents and mishaps at a construction site are caused due to unsafe actions by the workers and other people who are part of the construction project [57]. The accident rate due to physical hazards is lowered as compared to the unsafe acts due to workers [20]. This thought had been accompanied by an 'innovative management system approach'; this approach highlights both physical hazards as well as hazards due to unsafe behavior of workers. Another research suggests concepts of safety as the "human element" regarding work-related safety or occupational safety. Researchers have found that there is a strong connection exists between successful programs of safety and the commitment of the management to the program safety. The performance of the workers could get better by adopting the great humanistic method in coping and dealing with the workers, better implementation of the procedure of employees' selection, great regular utilization of lead employees training performance, superior degree of housework, good plant environmental potentials, and having steady workforce [11], in addition to this, the quality of the project also impacted by this, as by adopting better approaches and implementation of humanistic method, the management would be able to ensure the quality of the project as these methods can be monitored quickly and can be managed

more efficiently [56]. The result of [11] is similar to that of recommended safety program elements from the occupational safety and health administration's "safety and health program management guidelines (OSHA, 1989)". These program factors include the participation of workers and organization of leadership, analysis of workplace, mishaps and analysis of records, control and prevention of hazards, response to an emergency, and training of health and safety program. These elements of programs of safety have also been outlined for "OSHA's voluntary protection program (VPP) assessment tool (OSHA, 1996)." Thanks to this risk analysis, management may anticipate potential losses from failure and develop alternative solutions [75].

3.7 Quality Control and Total Quality Management

In the investigation conducted by [17], the study related "quality control and total quality management" values to offer a vision of the connection between effective "management and total quality" approaches. The investigation by [17] offers an outstanding outline of the most influential research regarding the "theory of quality". The framework of [21] highlights the systemic industry's nature, the importance and need of leadership, and the need and requirement to minimize the changes in the process of the organization. The framework of [22] includes activities in three sets, and these sets include "planning of quality, control and improvement". This investigation highlights the utilization of statistical techniques and tools to eradicate the flaws. The studies also emphasize the reduction of the cost by improving factor of quality and emphasize that both "high- and low-end products" could have great quality. The investigators suggest that the three basic values of "total quality", i.e. focus on customer, constant enhancement and (joint efforts) teamwork, the implementation of these three basic principles to the techniques of management will help to proceed the business towards the achievement of its objectives and goals and the organization could be able to control and measure the parameters of success [9]. The utilization of the aspects of "Total Quality Management (TQM)" values to enhance the approaches and methodologies of "quality management". The major issue to use this approach is that a lot of people accept this TQM approach and idea without having a complete understanding and in-depth information and knowledge about this idea [23]. Some

part of the blame for having partial expertise and knowledge has been given to the researchers who typically give focus on the constant enhancement principles and values of TQM. The deficiency in the complete knowledge and investigation resulted in leading to some severe issues and problems linked with the utilization of the approach of TQM in the industry of construction [24]. According to another researcher, the three sub-principles must be added to the three original proposed principles to enhance the efficiency of the idea. The three additional values include a culture of the organization, empowerment of workers and provision of training. In a recent study, the researcher stated quality in construction projects as "conformity to established requirements" and connected quality to the degree of performance regarding productivity, protection, and timelines. Other researchers also accept the existence of a strong relationship between "safety and quality management" [8].



Figure 3.1 "Relationship between safety and quality"

3.8 Nature of Project and Process Impact on Quality

In the construction industry of Afghanistan, the project managers are increasingly concerned about quality assurance and safety issues. Construction-related defects or failures can cost a lot of money. Even minor defects may require reconstruction and have an impact on the functionality of the facility. The result is higher costs and delays. In the worst-case scenario, a failure can result in someone getting injured or killed.

Construction-related accidents can also cause serious financial losses and physical damage [54]. As a result of these elevated direct costs, the cost of insurance, inspection and monitoring is rising rapidly. A good project manager puts a lot of effort into making sure that the job is done right the first time and that no major accidents occur [55].

In Afghanistan construction industry, the most critical choices regarding the quality of the finished facility are made during the design and planning phases, not during the construction phase, much like cost control. They define responsibilities related to quality, and provide guidelines for documentation, guidance, and general process control, among other things. Often, the phrase "quality program" refers to a specific work implementation of the quality program [66]. The configuration of components, material requirements and functional performance are all determined during these initial phases. The focus of quality control throughout the construction process is to ensure that these initial design and planning choices are adhered to [53].

While the primary goal of quality control is to ensure compliance with prior design decisions, there are some exceptions. First, unforeseen events, poor design choices, or the owner's desire to make modifications to the facility's functionality may require design choices to be re-evaluated during construction. These modifications provide the opportunity for redesign, with all the associated goals and constraints, even though they may be driven by quality-related issues [58]. Moreover, this theme also highlighted that most of the construction sites are not entirely safe for the people working on the project, whether they are laborers, engineers, or contractors [78].

Another possibility is that some designs rely on sound choices made during the actual construction process. For example, some tunnel construction techniques use studies of soil conditions obtained during tunnel construction to determine the amount of support required at each point. These choices may be more cost effective because they are based on a more accurate knowledge of real site conditions.

The definition of quality requirements in the design and contract documents becomes critical due to the concern for uniformity in the construction process. To ensure that everyone involved in the project is aware of the need for consistency, quality requirements should be transparent and verifiable. Much of the discussion in this

chapter deals with the development and impact of different quality requirements in the construction industry and the issues associated with ensuring consistency [60].

3.9 Nature of Project and Process Impact on Safety

Decisions made during the planning and design phases can have a significant impact on the safety of a construction project. Putting some design or construction plans into effect can be inherently dangerous and complex but implementing them in conjunction with other related plans may significantly reduce the likelihood of accidents. For example, during roadway reconstruction, having a clear demarcation between traffic and construction zones can greatly reduce the risk of accidental collisions. In addition to these design choices, safety during construction depends largely on education, alertness, and cooperation. Employees must always be aware of the possibility of accidents and avoid taking unnecessary risks.

Generally, there are various elements that have the power to influence the performance of safety. Accidents and mishaps at construction sites are the direct outcome of unsafe and inefficient activities and circumstances [76]. The unsafe activities and circumstances can be controlled by efficient management. Studies have generally identified three bases of occurring accidents at the worksite; these include failure to recognize an unsafe situation that might exist before or after an activity starts, not stopping the work in unfavorable conditions and choosing to do irrespective of the dangerous condition of the site. The accidents and mishaps at the site of construction happen due to unsafe actions and site conditions [25]. According to [26], the mishaps are caused because of lack of awareness of safety, deficiency of training, the poor commitment to the organization, lack of technical supervision, wild operations at the worksite, reluctance to contribute resources for the assurance of safety, deficiency of skilled and trained labors, unsafe and dangers use of tools and equipment, deficiency of regulations and laws of safety, unavailability of 'personal protective equipment PPEs', low utilization of innovative and advance technology and poor data analysis system. The study [27] explains the unfavorable conditions (“missing guardrails, defective tools, hazardous conditions, excessive noise, and lack of sufficient light”) unsafe and dangerous behavior such as smoking at the construction site, inefficient utilization of tools and equipment, working without having appliances of safety, not

using equipment of protection and working in a dangerous and unsafe place are the primary reasons of mishaps and workplace accidents [27], Unsafe and dangerous conditions and inappropriate behavior of the workers are the responsibility of the management, as these are established due to lack and disappointment of management to antedate matters such as teaching skills to the workers, maintenance, training and unavailability of safe and protected systems at the workplace. The accidents and mishaps theories of causation are the tools and tactics for "accident prevention programs" [28]. Although many project outcomes are expensive, quality and safety can have long-term effects, which is another aspect of the scope that is shared. Years after the project is finished, quality issues and persistent health hazards can be found [72]. Various theories and studies, (i) Domino theory, (ii) Human factor theory, (iii) Accident or Incident theory, (iv) Epidemiological theory, (v) Systems theory and (vi) Combination theory, these theories help to find the reason for the accident. Moreover, the domino theory is an early theory, not widely used today. The most common reasons that add to construction misfortunes in Afghanistan are insufficient construction scheduling, lack of appropriate training, use of unsafe equipment, following unsafe methods and sequencing, unsafe construction site situations, and not practicing the use of safety equipment that are necessary. The development of explaining construction site safety and healthiness and planning for future maintenance in the design phase of a project. The design for construction safety is everlasting design features that will help to eradicate a hazard or reduce the risk. To reduce the risks, construction managers first need to analyze and identify the potential hazards, then assess the amount of risk for each hazard and apply the hierarchy of control [29]. The construction industry of Afghanistan is not safe for the people working at the construction sites, it is essential for them to follow the above-mentioned theories that help in the prevention of the accidents and misfortunes caused by the negligence of safety factors at the construction sites. Other contractors were looking at their project schedule to see what materials they would need throughout the course of the project and actively contacting vendors to make sure they could make the delivery when scheduled [79].

3.10 Importance of “Safety and Quality Management” in Construction

The "quality and safety management" in the industry of construction shows various remarkable resemblances between these two aspects of management. Programs that have been introduced to enhance the performance of 'quality and safety' have various common factors. In some cases, safety has been considered as a slice of "Total Quality Management (TQM)". The existence of the great relationship between "Quality and safety" suggests that the pros would result from implementing some and all the following below proposals, these proposals include,

- The consolidation of the roles of “safety and quality”.
- Implementation of the concepts and ideas of protection and safety.
- Optimization of the ideas and approaches to the management of safety.
- Implementation of the outcomes of the protection and safety

In the past decades, the government of Afghanistan has made an immense effort in the execution of health and safety policy in the industry of construction through the implementation of strategies or guidelines as well as accompanying seminars and providing certificates related to the safety of construction sites. Construction industry of Afghanistan plays a significant role in the country’s economy. The impacts of a loss of profit and an uncomfortable and unhealthy place of work adversely impact the industry of construction. Presently, the topic of "safety and quality" has been implied and emphasized widely in Afghanistan by means of implementation, for example, by the certification by the organization and local guidelines and regulations. The idea of "management of quality and safety" towards the enhancement of standards of the industry of construction is clearly still new and needs a lot of attention in Afghanistan and other countries. The industry of construction has recorded thousands of accidents and mishaps due to a lack in the quality of the project as well as the negligence of safety and protection methods. However, the construction industry of Afghanistan has shown incredible improvement due to the utilization of new and some advanced technological methods. But with the improvement in the performance of this industry, the rate of accidents and site mishaps also increases due to various factors. In the global market, the workers in the construction industry have approximately three times more

probability of dying and two times more getting hurt as compared to any worker of other cost-effective activity [30]. In Afghanistan, the history show that thousands of employees are being hurt and got injured due to the mishaps related to industries, where the industry of construction has documented 22 percent of the total work-related injuries and mortalities [56].

3.11 Types of Medical Conditions Caused by Construction Injuries

3.11.1 Amputations in Construction Accidents

Construction sites account for around 5% of all accidents. Accident victims who have one or more limbs amputated confront physical and psychological issues for the rest of their lives. Amputation consequences from traumatic amputations (the inadvertent severing of some or all of a limb) in on-the-job accidents include: Chronic neuroma (amputation-related pain and/or discomfort), Inadequate wound protection and healing, Infection of the incision and the tissues around it, Stiffness as a result of an injury or rehabilitation concern non-secured scaffolding, inadequate machinery guards, faulty maintenance, inappropriate equipment training, falls, falling items, and dangerous work conditions are all causes of sympathetic dystrophy syndrome. In any of these scenarios, the explosive mix of heavy machinery and human mistake may swiftly result in a disastrous construction site amputation. Many construction workers who lose a leg will be unable to return to their occupations and may be forced to choose lower-paying labor [37].

3.11.2 Burns

Every year, many construction workers get burnt on the job. In 2009, 920 employees suffered heat burns on construction projects, according to the U.S. Bureau of Labor Statistics. While mild burns can sometimes be healed with easy home treatments, severe burns can be life-threatening or even deadly to construction workers or onlookers. When burn incidents occur on construction sites, it's critical to determine if sufficient safety protocols were in place at the time of the occurrence or whether the injuries were caused by someone else's negligence. Electrical burns (electrical shock and electrocution), toxic exposures, and explosions are all possible risks in work zones

(including gas lines, open fires, heavy machinery, overheated equipment, pipelines), chemicals that can cause significant burns to construction workers, cement, or hot water [29].

3.11.3 Eye Injuries, Vision Loss and Construction Accidents

The eye is a delicate component of the body that can be severely damaged by even slight irritants. When working on a construction site in New York City, there are a variety of physical and chemical threats that might harm your eyes or cause irreversible vision loss, affecting your life forever. According to the Centers for Disease Control and Prevention, 70 per cent of work-related eye injuries were caused by contact with equipment or an object, while 26 per cent were caused by exposure to harmful chemicals or fumes. Scrap, waste, and debris were responsible for 34 per cent of work-related eye injuries. Chemicals or chemical products accounted for 14 per cent, people, plants, animals, and minerals accounted for 9 per cent, and welding torches accounted for 6% [4].

3.11.4 Fracture Injuries and Construction Accidents

Broken bones and numerous fracture injuries are common in construction accidents. According to labor data, in 2009, 10,380 construction employees in the United States had fractures as a result of on-the-job incidents. This is a decrease from the 13,470 construction workers who shattered bones the previous year. Fracture Injuries - What Causes Them? Machine accidents, machinery accidents, falling items, equipment accidents, explosions, and malfunctioning power tools are all common causes of bone fractures. Even when all measures are taken, fracture injuries can occur on construction sites [7].

3.11.5 Paralysis and Construction Accidents

The inability to move a body component as a result of injury to its nerve supply is referred to as paralysis. These people were rendered paraplegic as a result of a workplace spinal cord injury. Other times, construction workers get injured on the job and become paralyzed as a result of someone's negligence. In such circumstances, injured workers may be able to file a claim against the liable party to assist recompense

them for their physical, emotional, and financial damages. Paralysis can be transitory and affect only a small area of the body, or it can be persistent and affect whole parts of the body. Then there's the mental anguish that comes with paralysis [35].

3.11.6 Shoulder Injuries and Construction Accidents

Shoulders are among the body's hardest-working joints, and construction workers rely on them every day to do their tasks. When a shoulder injury occurs on the job, it can result in a lengthy recovery period or perhaps the end of a career. Accidents involving the shoulders are among the most prevalent occupational injuries, according to the Bureau of Labor Statistics. According to the latest recent figures, about 87,000 employees were injured on the job in 2009. Shoulders can be harmed on the job site because of a violent hit or through overuse. If you were injured while working on a construction site and had a shoulder injury, you may be eligible for compensation [28].

3.12 Conclusion

3.12.1 Integration of “Safety and Quality Management”

The management of safety involves the utilization of approaches and processes towards the removing or minimizing of occurrences, mishaps and damages or injuries, as also the plant damage, damage to construction site equipment and adjoining belongings. However, the management of quality is working on the optimization of struggles and efforts to make sure that the needs and requirements must be met effectively, efficiently and on the primary attempt. In the project construction, the management of quality has now grown into a central point. Most of the stakeholders of this industry are anxious about the factor of safety of the projects, whereas the contractors of the construction industry are more anxious regarding the safety and protection of the employees [31]. A proper system of "quality management" can enable and simplify the success of the project and sustainability of the organization but neglecting the protection and culture of safety for the employees can outcome in accidents and mishaps at the site of construction and damage. The occupational damages and injuries due to the negligence of culture of safety will impact the employee's manpower productivity, which is why decreasing the possibility that the

work will be appropriately performed. [32] Stresses that the culture of safety will lead the project construction towards the attainment of quality of the project. Such as, it is stressful for a mason to place bricks and blocks on a straight path if one hand is required to suspend onto the framework. The incorporation of a "safety and quality management system" could minimize and eliminate the inconsistency and variability in the process of construction, for example, failure of components of the building, inefficiencies of employees and incidents or injuries [33]. Various investigations have demonstrated that the incorporation of both a "safety and quality management system" will enhance and improve the degree of productivity and work-related health and safety aspects. And this incorporation will also reduce the budget overruns [34]. The roles of "safety and quality management" are the same in various aspects; for example, the scope of the management of safety and quality is similar, the goal of both the elements is also the same, obstacles and hurdles in achieving safety and quality in a construction project is also same, the impact of failure and tough in enhancing program. All these resemblances between "safety and quality" roles and functions and their capabilities to co-exist in the similar surrounding are the evidence that they can be effortlessly combined to develop positive and fruitful impacts in the construction industry [35].

3.12.2 Features influencing “Safety and Quality Management”

It is important to find out the specific aspects that are significantly essential and important towards the effective and efficient execution of "safety and quality programs" to attain favorable and desired results. In every study conducted by [36], it is concluded that the elements and components of poor or reduced safety management in China are due to deficiency of training programs, lack of awareness of managers of projects, the unwillingness of resource input to protection and safety and irresponsible and reckless operational systems. Requirements of owners, requirements of the insurance company and work requirements were analyzed and recognized as standards for "safety management system" execution [37]. Research suggests that the accidents that occur at construction sites are mostly because of inappropriate and incomplete information or training, faults in taking decisions or judgements and inaccuracy and lack in the handling of machinery. These factors and causes of accidents can be

eradicated or minimized through the implementation of indicators of safety performance; these indicators include reviewing of management, the effectiveness of cost and time, communication, observations or audits, great protection culture or climate, stresses on short-range aims and worker participation or employee empowerment [38]. According to "The European Process safety Centre", the chief "safety management elements" can be laid down as safety and protection policy/arrangement, organization, practices, or approaches of management, controlling and reviewing and reviewing of management. The most common hurdles and barriers in the path to implementation of safety include a lower number of skilled workers, lack of the commitment of management, poor behavior of workers towards the construction activities, nature and type of the project or construction. [28]. List down the threats and intimidations to the execution of safety as a packed schedule of a construction project, lack in the competency of management, unsuitable and inappropriate planning of the project, extreme and unnecessary approval measures and procedures, unavailability and inaccessibility of trained labor, low coordination, and changes between the participants of the project. The criteria for "safety management" involve the requirements of the client, requirement of the insurance company, workers or labor needs and requirement and effectiveness of cost or budget [30]. The summary of the factors that can influence "safety management" in the project of the construction is presented in Table 3.2. To reduce these risks, the government should educate the workers about all health and safety laws and rules, proper training on how to use the advanced machinery and equipment should be provided and educate the workers about what measures are essential before using the machinery, the use of proper PPE's (personal protection equipment) Should be mandatory for every worker working on site. Reducing work at elevation will reduce falling from height. For this purpose, lay down roofs built on the ground and lifted into position so, in this way, workers don't have to stick to build them at an elevation [19]. Potential quality defects can lead to repairs under warranty, while hidden safety hazards can lead to delayed chronic health problems. A company's reputation may be tarnished by a poor quality or safety record, and it may be barred from submitting bids for some projects [77]. Design immovable ladders or staircases every time, when possible, especially in tall structures, it would remove the requirement for a portable ladder when accessing a roof, work stage or

higher level or heightened place for any work requirement. Consider eradicating the need and requirement for scaffolding or designing permanent anchor systems. Most risks are reduced if we consider the big three causes of fatal accidents, which are falls, scaffolds and ladders; design the projects in such a way that does not require fall protection, so this risk would be eliminated. Provide solid structures so that scaffolds can be avoided. Design the ladders in the building so that the portable ladders are not needed [39].

Table 3.2 “Summary of features influencing safety management in construction projects” [42].

Safety Factors	1	2	3	4	5	6	7	8	9	10	11
Management Commitment		x				x					x
Employee involvement/ altitude		x			x	x			x		x
Errors in judgement or carelessness	x		x								
Expertise knowledge or training	x		x			x				x	
Poor machineries	x										
Communication		x									x
Audits/ observations		x		x							x
Safety culture/ climate		x									x
Safety awareness of top management/ top managers			x							x	
Reluctance of input resources to safety			x								
Safety policy/ arrangement				x							
Type/ nature of construction						x					
Safety management/ practices/ procedures/ review				x						x	
Client involvement					x		x				
Insurance company requirement					x			x			
Cost-effective/ time											x
Tight project schedule										x	
Improper construction planning/ programs										x	
Variations											
Lack of coordination between project participants										x	
Employee empowerment											x
Emphases on short-term objectives											x

(1)Coble and Kibert (1994), (2) Loushine and Hoonakker (2002), (3) Tam et al (2004), (4) European process safety centre (1994), (5) Law et al (2006), (6) Smallwood (2000), (7) Pun and Hui (2002), (8) Harm-Ringdahl (2000), (9) Saksvik and Nytro (1996), (10) Husin et al (2008), (11) Hoonakker (2002).

Poor management and leadership skills, lack of understanding or expectations of the client, deficiency of empowerment of workers or labors, Nature of task and type of construction project are the most common factors and barriers that could impact the successful “quality management” [41]. The factors and elements that have the power to indicate the quality of the project are good teamwork, constant improvement, the commitment of management, effective communication, focus on the needs and requirements of the client, workers involvement and empowerment—the investigation by [28]. Highlights the threats to the implementation of effective "quality management", and these threats include tight and packed schedules of construction work activities, inappropriate planning of construction work, inadequate or imprecise

estimation of cost, low competency of the organization, variation, poor communication between participants, deficiency of skilled and trained employees and labors [42]. The major tools and tactics for good and efficient identification of tools have been recognized as good and skilled supervision, good connection and communication between participants, selection of efficient process of bidding, training, and quality performance check [43]. Changes are referred to as safety incidents and quality deviations. In fact, a deviation could be used to define an accident. If the goal of zero injuries at work is set, an injury is a deviation if it results in a failure to meet the requirements [73].

According to, the key elements that impact the performance of quality in the project of Construction include the process of planning, complexities in the design of the project, uniqueness or nature of the project, obtainability of resources and other required equipment and environment of the project. Another researcher thinks of problems of quality as "low-quality continuous improvement", the absence of rules and policies of quality and poor resources and equipment availability [18]. Table 3.3 summarizes the features that have the power to influence "quality management in construction projects".

Table 3.3 “Summary of features influencing quality management in construction projects” [42].

Quality Factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Management/ leadership skills	x																			
Interpretations of client /customer expectations	x																			
Worker empowerment/incentive	x			x								x					x	x		
Organization structure																	x			
Nature of construction	x																			
Continuous improvement								x				x								
Management commitment		x	x	x										x				x		
Communication		x																		
Client/customer focus		x																		
Employee involvement/ altitude		x		x																
Tight project schedule			x																	
Inaccurate or incomplete estimate			x																	
Variations			x																	
Planning/ scheduling process			x		x									x			x			
Coordination between project participants		x	x			x			x	x								x		
Expertise knowledge or training system			x	x		x													x	x
Tendering and bidding climate				x		x			x			x								
Emphases on short-term objectives				x																
Cost and time implementation				x																
Design complexity					x					x										
Quality policy						x	x													
Project supervision						x		x												
Auditing system												x		x						
Subcontractor's responsibility								x				x								
Nature uniqueness					x															x
Availability of resources					x		x								x					
Project environment					x															

(1) Loushine and Hoonakker (2002), (2) Hoonakker (2006), (3) Husin and Adnan (2008), (4) Hoonakker et al. (2003), (5) Chan and Tam (2000), (6) Arditi and Gunayalin (1998), (7) Joaquin et al (2008), (8) Wong and Fung (1999), (9) Jha and Iyer (2006), (10) Tang et al (2009), (11) Leonard (2008), (12) Pheng and Wei (1996), (13) Moody (2005), (15) Saraph et al (1989), (16) Samuels (1994), (17) Hiyassat (2000), (18) Marosszeczy et al (2002), (19) Yung and Yip (2010), (20) Mohammed and Abudullah (1999), (21) kanji and Wong (1998).

Table 3.4 Classification of accidents on construction site

Accident Type	Details	Causes	Prevention
Falls from high heights or scaffolding	Workers in the construction industry are frequently forced to operate at great heights, on scaffolding and ladders, in windows, and on rooftops [12]. When a person is	<ul style="list-style-type: none"> ➤ Roof edges that aren't protected, roof and floor apertures that aren't protected, structural steel and leading edges, and so on. ➤ Scaffolding that isn't up to code. 	<ul style="list-style-type: none"> ➤ Falls from a height of fewer than 3 meters (particularly ladders and scaffolding). ➤ In all building sites, there are codes and standards. The need for health and safety training for employees is emphasized.

	<p>hurt after falling or leaping from a ladder, scaffold, building, roof, or other elevated position or working area and landing with impact on the ground or surface below, it is referred to as a fall. These incidents account for 34% of all construction worker deaths on the job, according to the Bureau of Labor Statistics [19].</p>	<ul style="list-style-type: none"> ➤ Portable ladders that aren't safe. ➤ There was no provision for a secure scaffold removal mechanism. ➤ On the sloped floor, the tubular scaffold was not built horizontally and firmly. ➤ The steel plate beneath the tubular scaffold failed to keep the structure balanced and secure. ➤ The boatswain's chair's overall construction was dangerous. 	<ul style="list-style-type: none"> ➤ Ensure the different personnel with obligations under the Health and Safety Act, both in general and for specific locations. ➤ Employment Act 1992 is aware of their responsibilities and what they must do to accomplish them. ➤ Heightened awareness of the importance of assessing the structural integrity of permanent structures. ➤ Structures that are only in place for a short period of time knowledge of how to use and maintain safety equipment that prevents falls. ➤ Appropriate matting should be used when building a movable tubular scaffold on an inclined floor to maintain the scaffold level [37].
Slips and falls	<p>There are various risks on a construction site, from loose equipment and materials to uneven ground or holes that might cause a deadly slip, trip, or fall.</p>	<ul style="list-style-type: none"> ➤ Spills, whether liquid or solid. ➤ Rain or snow is blown through entrances by the wind. ➤ Switch from a moist to a dry surface. ➤ Surfaces that are dusty and sandy. ➤ Using footwear that has damp, 	<ul style="list-style-type: none"> ➤ Establish good housekeeping habits. ➤ Reduce the amount of time you spend on wet or slick surfaces. ➤ Avoid obstructing aisles and walkways with obstacles. ➤ The proper lighting should be created and maintained. ➤ Wear proper footwear .

		<p>muddy, greasy, or oily soles.</p> <ul style="list-style-type: none"> ➤ Wet or oily floors, loose flooring, carpets, or matting are all things to avoid. ➤ Walking surfaces that are uneven. ➤ Floor tiles and bricks that are missing or uneven and so on. 	<ul style="list-style-type: none"> ➤ Keep individual behavior under control.
Electrocutions	<p>Because building sites are always a work in progress, exposed wire, power lines, and incomplete electrical systems are common. Contacting them might result in electrocution or shock.</p> <ul style="list-style-type: none"> ➤ When Using a Hand Tool, There is a Risk of Electrocution . ➤ Electrocution when working on electrical equipment [28]. 	<ul style="list-style-type: none"> ➤ The workspace was wet and flooded. ➤ The Electric saw was not properly grounded. ➤ There was no residual current device installed in the power socket (commonly known as an earth leakage circuit breaker). ➤ From the electric saw, there was a leakage current. ➤ The power supply had not been turned off prior to the job being done. ➤ Some of the cables' insulations had been damaged [1]. 	<ul style="list-style-type: none"> ➤ Personal Protective Equipment (PPE) should be provided. ➤ Inspecting Tools and Cords ➤ Make sure you've received electrical safety training for the task you'll be conducting. ➤ Ensure that all machinery and power tools are grounded or double insulated. ➤ Before using any extension or power cords, inspect them for wear and tear. Before checking or repairing any power tool or machinery, unplug it. ➤ Maintain a safe distance of at least 10 feet from live overhead power wires. ➤ Metal items should be kept away from living electrical circuits and parts [7].

Struck by object	<p>Forcible contact or collision between the afflicted person and an object or piece of equipment causes struck-by injuries. Having said that, it's worth noting that struck-by dangers in construction might resemble caught-in or – between hazards [29].</p> <ul style="list-style-type: none"> ➤ Having been hit by a flying item ➤ Strike by a falling item ➤ Strike by a swinging item. 	<ul style="list-style-type: none"> ➤ The oil rig's catastrophic collapse of equipment. ➤ Employees working nearby may be struck by objects falling from the rig's superstructure, tank tops, building roofs, scaffolding, aerial lifts, cranes, and forklifts. 	<ul style="list-style-type: none"> ➤ Inspection of equipment connections, pressure gauge checks, correct lubrication, and the replacement of damaged chain and wire rope. ➤ Wear the proper personal protection equipment (PPE). ➤ Use proper toe boards, identify, and barricade the areas below work zones, and enforce the use of toe boards. ➤ Train new personnel on how to operate the drill rig and when to stand safely. ➤ Barricade the swing radius of cranes and excavators to keep personnel safe. ➤
Falling debris, materials or objects	<p>Falling equipment, building materials, or beams are typical on projects with numerous stores, striking employees below.</p> <ul style="list-style-type: none"> ➤ A metal bar that is falling from a great height. ➤ Bricks are falling from great heights. ➤ During the hoisting procedure, 	<ul style="list-style-type: none"> ➤ Because it was located near the window edge on a higher story, the metal bar was prone to falling. ➤ Someone at work may have unintentionally caused the metal bar to fall. ➤ There were no secure fenders/bracing s built on the building's external wall near the podium. 	<ul style="list-style-type: none"> ➤ Instead of a boatswain's chair, use a hanging operating platform. ➤ Before using the suspended working platform, inspect, examine, and test it. ➤ Make good use of the safety harness and independent lifeline. ➤ The materials are properly arranged and secured. ➤ The platform is completely enclosed. ➤ The hoist's structure has been securely gated. ➤ With the help of a signaler, the crane

	<p>metal pipes fell.</p> <ul style="list-style-type: none"> ➤ Panels of formwork are being knocked down. ➤ A precast concrete building unit topples over [2]. 	<ul style="list-style-type: none"> ➤ The concrete blocks were not properly piled or fastened in place. ➤ The hoist's platform was not equipped with any enclosures to prevent stray objects from dropping during the hoisting process. 	<p>operator should adopt a safe lifting route.</p> <ul style="list-style-type: none"> ➤ For lifting operations, employ a common set of hand signals or other efficient means of communication, such as walkie-talkies. ➤ Not exceeding the crane, lift, or hoist's lifting capacity [19].
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CHAPTER 4

RESEARCH IMPLEMENTATION AND RESULTS

4.1 Introduction

The chapter contains the results of the research. These results have been obtained through quantitative analysis. A questionnaire was distributed to 23 participants; these participants are associated with the construction industry of Afghanistan. The questionnaire comprised of two sections, the first section addressed the personal information of the participants, and the second section addressed the information related to the construction industry. The researcher has done regression analysis for the practical analysis of collected data. The chapter on results is divided into two main parts; the first part is the “descriptive analysis”, which represents the collected info and data through a questionnaire in a descriptive format. The second part of the chapter represents the “Inferential statistics”, which is composed of the two hypothesis.

4.2 Inferential Statistics

Hypothesis 1

The first hypothesis of the study addresses the quality of construction and the factors associated with it.

H₀; the quality of construction depends on, legislation, a timetable of curing and de-cluttering and a survey of a quality team.

H₁; the quality of construction does not depend on, legislation, timetable of curing and de-cluttering and survey of a quality team.

Hypothesis 2

The second hypothesis of the study addresses the safety in the construction industry.

H₀; safety in the construction industry depends on, site review meetings, the use of tools and tactics and safety assurance surveys.

H₁; safety in the construction industry does not depend on, site review meetings, the use of tools and tactics and safety assurance surveys.

4.3 Demographic Details

The questionnaire was distributed to 23 people associated with the construction industry on a criterion that they match basic requirements as respondents; a total of seventeen people participated in the questionnaire; the first section of the questionnaire addressed the demographic details of the participants; the results of the first section represent that all the participants were males. In addition, the results also showed that most participants, i.e., 82.4% of the participants belong to the urban areas of Afghanistan. However, only a few participants, i.e., 17.6% of the participants, are from the rural region of Afghanistan.

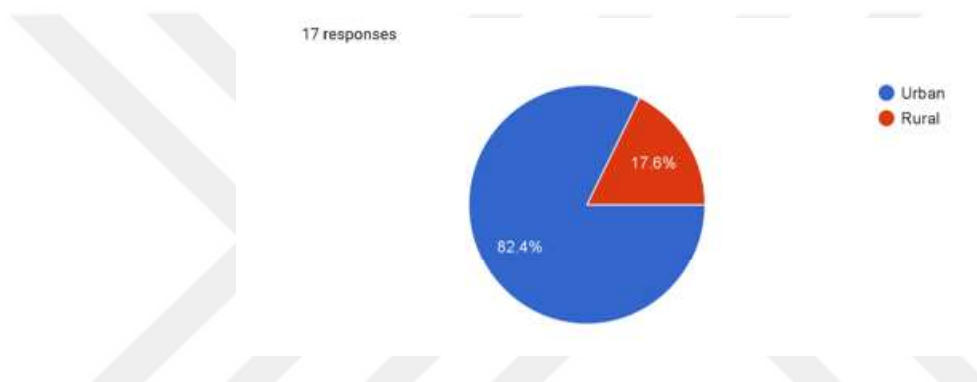


Figure 4.2 Area of residence

Moreover, the section also addressed the degree of education and whether the participants are directly linked with the construction industry or not. The results showed that 70.6% of the participants are graduates and 29.4% of the participants are post-graduates, showing that all the participants are from educated backgrounds and are able to understand the importance of safety and quality in the construction industry.

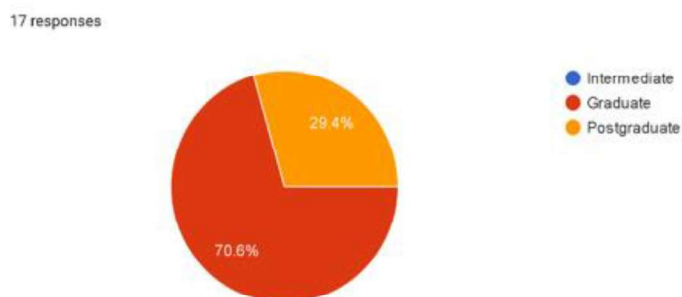


Figure 4.3 Degree of education

In addition, the question of this section asked the participants “do they consider themselves to be associated with the process of construction”, and the results of the question show that 100% of the participants considered themselves directly linked with the processes of construction, as shown in figure 4.4:



Figure 4.4 Link with the process of construction

4.4 Descriptive Statistics

The second section of the questionnaire comprises several questions related to the quality and safety of the construction industry in Afghanistan.

1. The first part of this section comprises the questions related to the “Essential Actions by the Construction Industry”.

Figure 4.5 shows the results of the first question of this part stated that “The industry of construction must set the quality of workmanship in all activities of construction” the participants were provided with five options, i.e., strongly disagree, disagree, neutral, agree, and strongly agree. The results of this question showed that 58.8% answered strongly agree to this question, 29.4% of participants answered agree, 5.9% of participants selected neutral, 0% of participants selected disagree, and 5.9% selected strongly disagree with this statement. These results show that most of the participants agreed with the fact that the construction industry should set the workmanship quality in all construction activities.

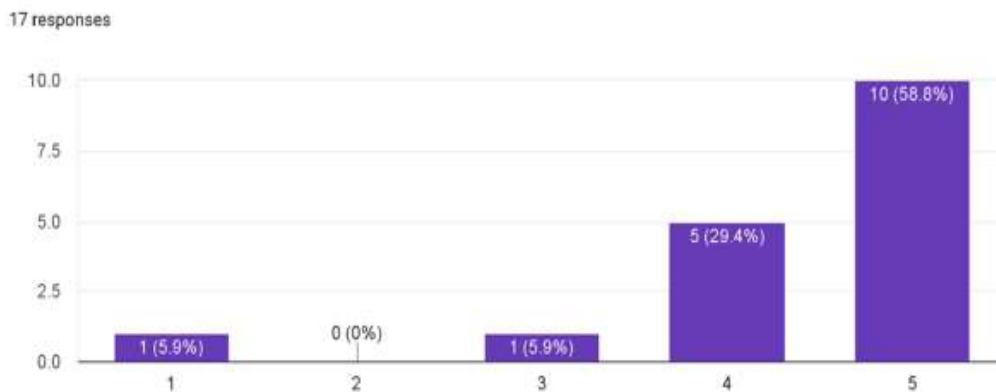


Figure 4.5 “The industry of construction must set the quality of workmanship in all the activities of construction”.

Figure 4.6 shows the results of the second question of this section stated that “The industry of construction must set procedures to control the quality”. The results of this question showed that 88.2% of the participants answered strongly agreed with this question, and 11.8% of the participants answered that they agreed. These results show that most of the participants agreed with the fact that the construction industry should set definite approaches to control the quality of construction projects.

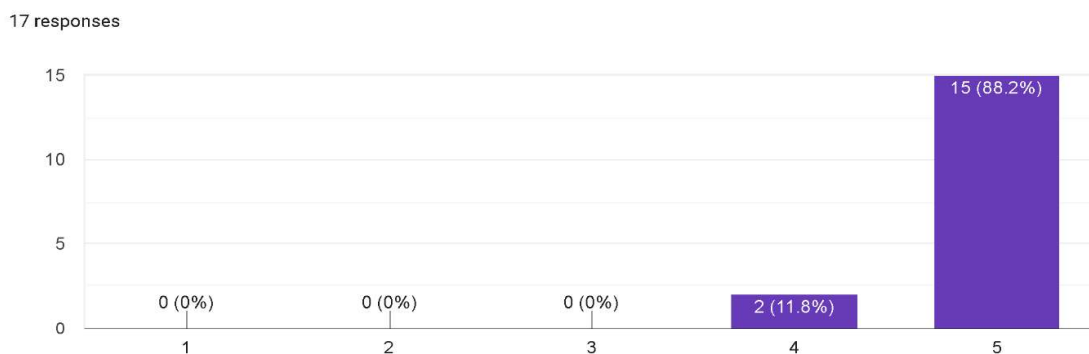


Figure 4.6 “The industry of construction must set procedures to control the quality”

Figure 4.7 shows the results of the third question of this section, and the question stated that "The industry of construction must set the recommended curing and decluttering timetables". The results of this question showed that 64.7% of the participants answered strongly agree to this question, 23.5% of the participants answered agree, 5.9% of the participants chose neutral, 5.9% of the participants selected disagree, and

0% selected strongly disagree to this statement. These results show that most of the participants agreed with the fact that the construction industry should set timetables for decluttering and curing.

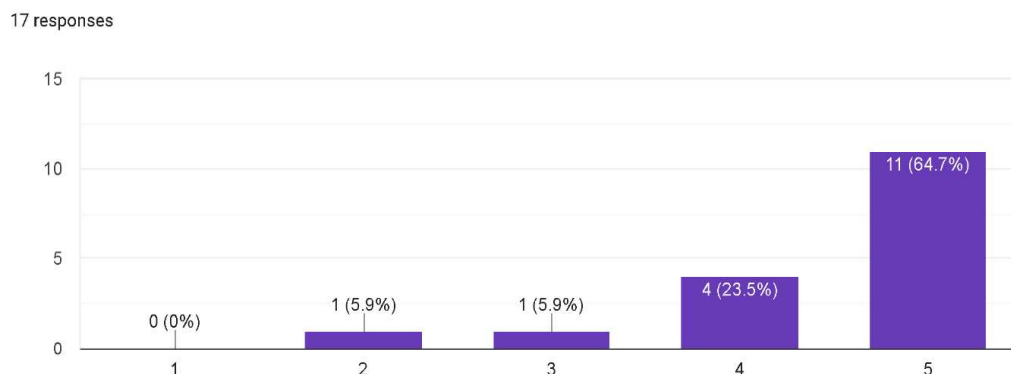


Figure 4.7 “The industry of construction must set the recommended curing and decluttering timetables”

Figure 4.8 shows the results of the fourth question of this section; the question stated that “The industry of construction must establish quality control laboratories at the site”. The results of this question represent that 52.9% of the participants answered strongly agree to this question, 23.5% of the participants answered agree, 17.6% participants chose neutral, 5.9% participants selected disagree, and 0% selected strongly disagree to this statement. These results show that most of the participants are in favor of the fact that the construction industry should establish laboratories for quality control at the site of construction.

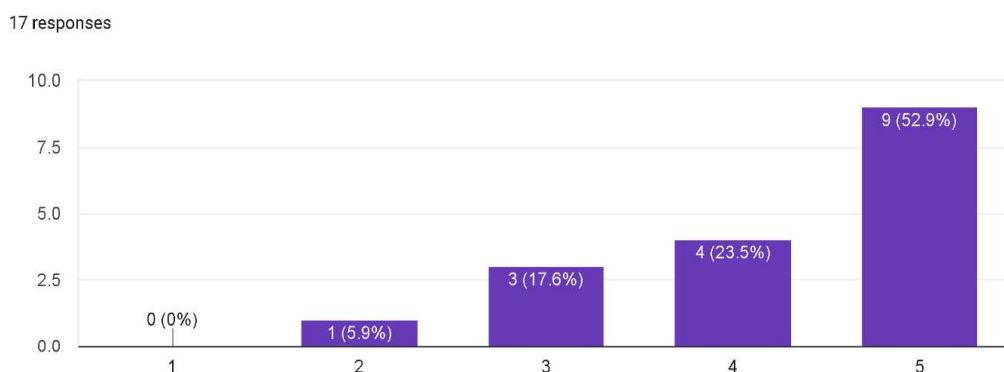


Figure 4.8 “The industry of construction must establish quality control laboratories at the site”

Figure 4.9 shows the results of the fifth question of this part; the question stated that “The industry of construction must conduct site review meetings with all workers and members of staff”. The results of this question represent that 64.7% answered strongly agree to this question, 17.6% participants answered agree, 11.8% participants chose neutral, 5.9% participants selected disagree, and 0% selected strongly disagree to this statement. These results show that most of the participants agreed with the fact that the construction industry should conduct regular meetings for site review with all the staff members and people associated with the process of construction.

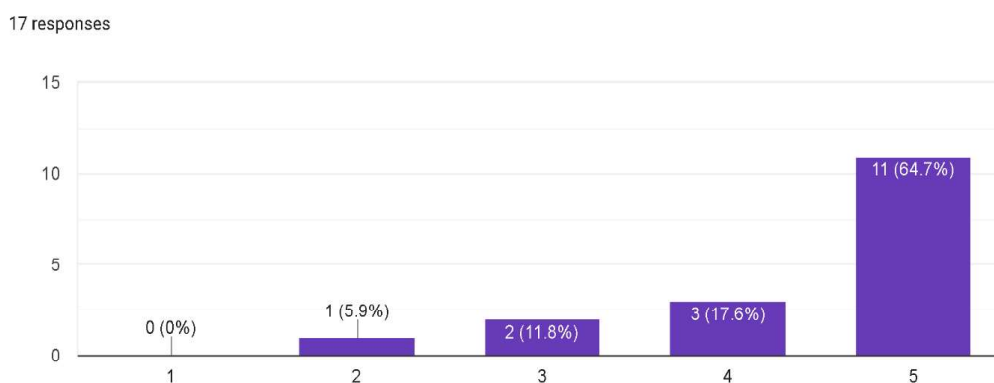


Figure 4.9 “The industry of construction must conduct site review meetings with all workers and members of staff”

2. The second part of this section comprises the questions related to the “Importance of Safety in Construction”.

Figure 4.10 shows the results of the first question of this part; the question stated that “The factor of safety is significant in the construction industry.” The results of this question show that 70.6% of the participants answered strongly agree to this question, 17.6% participants answered agree, 5.9% participants chose neutral, 5.9% participants selected disagree, and 0% selected strongly disagree to this statement. These results show that most of the participants agreed with the fact that the factor of safety is important in the industry of construction.

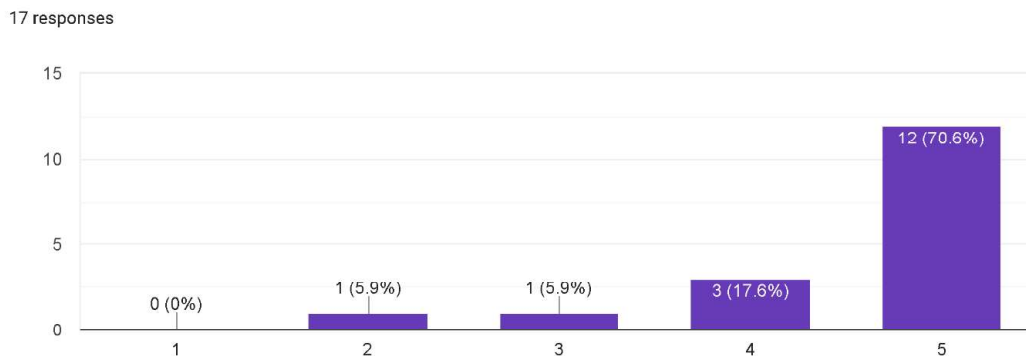


Figure 4.10 “The factor of safety is significant in the construction industry”

Figure 4.11 shows the results of the second question of this part; the question stated that “There are enough legislations available for construction safety.” The results of this question show that 47.1% answered strongly agree to this question, 29.4% participants answered agree, 11.8% participants chose neutral, 11.8% participants selected disagree, and 0% selected strongly disagree to this statement. These results show that there is mix opinion with majority of strongly agreed among the participants on whether there is enough legislation for safety in the construction industry or not.

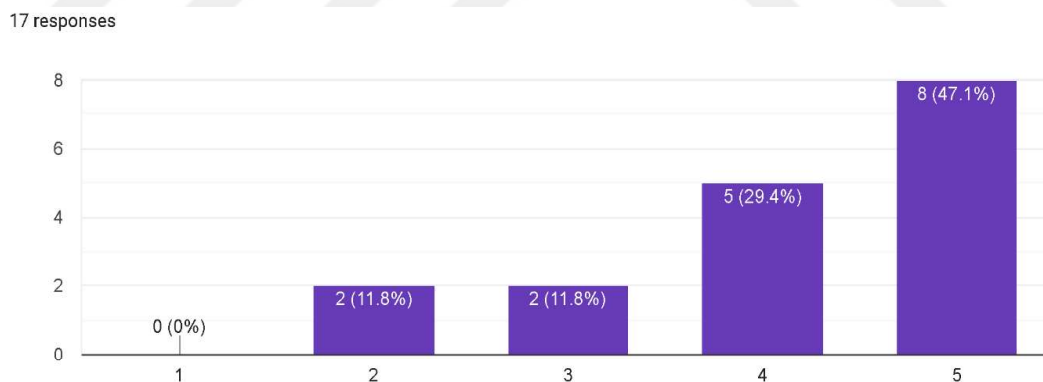


Figure 4.11 “There are enough legislations available for construction safety.”

3. The third part of this section comprises the questions related to the “Relationship between Safety and Quality of Construction Work in Construction Work”.

Figure 4.12 shows the results of the first question of this part; the question stated that “There is a strong relationship between safety and quality in the industry of

construction." The results of this question show that 41.2% of the participants answered strongly agree to this question, 23.5% participants answered agree, 23.5% participants chose neutral, 0% participants selected disagree, and 11.8% selected strongly disagree to this statement. These results show that there is a mixed opinion of the participants on whether there exists a significant relationship between quality and safety in the industry of construction or not.

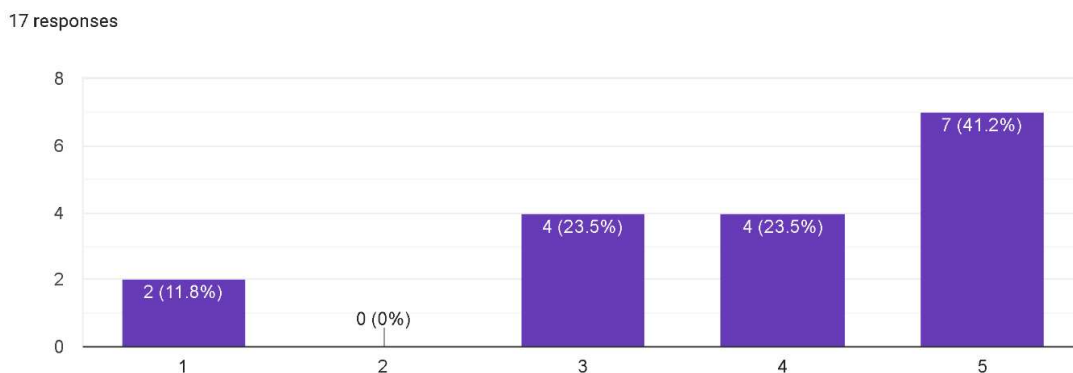


Figure 4.12 “There is a strong relationship between safety and quality in the industry of construction”.

Figure 4.13 shows the results of the second question of this part; the question stated that “Safety aspects impact the quality of the project.” The results of this question show that 47.1% of the participants answered strongly agree to this question, 29.4% participants answered agree, 11.8% participants chose neutral, 11.8% participants selected disagree, and 0% selected strongly disagree to this statement. These results show that the people strongly agreed with the fact that the aspects of safety have a significant impact on the quality of construction projects.

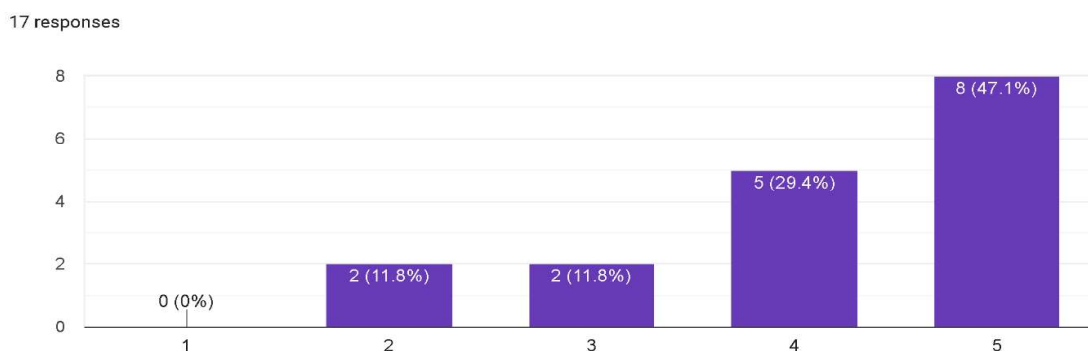


Figure 4.13 “Safety aspects impact the quality of the project.”

Figure 4.14 shows the results of the last question of this part; the question stated that “Quality aspects impact the safety of the project.” The results of this question show that 29.4% of the participants answered strongly agree to this question, 29.4% participants answered agree, 29.4% participants chose neutral, 11.8% participants selected disagree, and 0% selected strongly disagree to this statement. These results show that the people represented mixed opinions with the fact that the aspects of quality influence the safety of the construction projects.

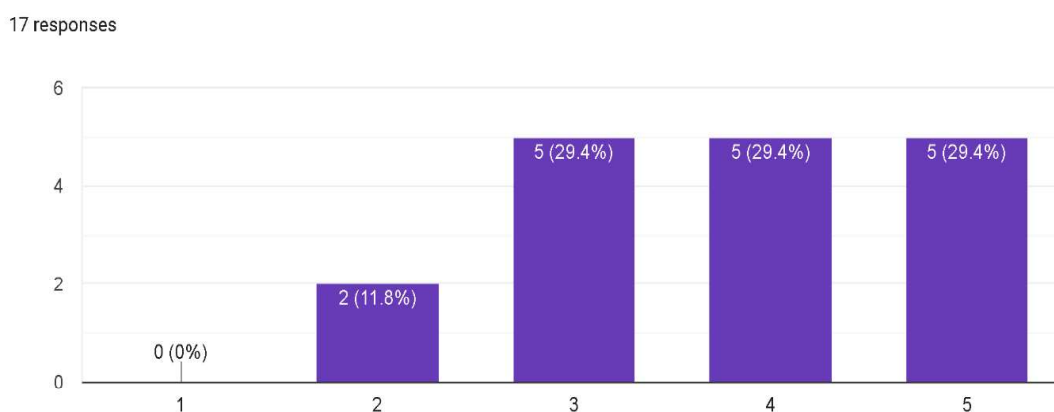


Figure 4.14 “Quality aspects impact the safety of the project”.

4. The third part of this section comprises the questions related to the “Safety Aspects at the Construction Site”

Figure 4.15 shows the results of the first question of this part; the question stated that “How are construction sites safe and secure for the people living near the site, say a 50m radius.” The results of this question show that 52.9% of the participants answered strongly agree to this question, 17.6% participants answered agree, 17.6% participants chose neutral, 5.9% participants selected disagree, and 5.9% selected strongly disagree to this statement. These results show that the people represented mix opinions with the fact that the sites of construction are secure and safe for the individuals living near the construction sites.

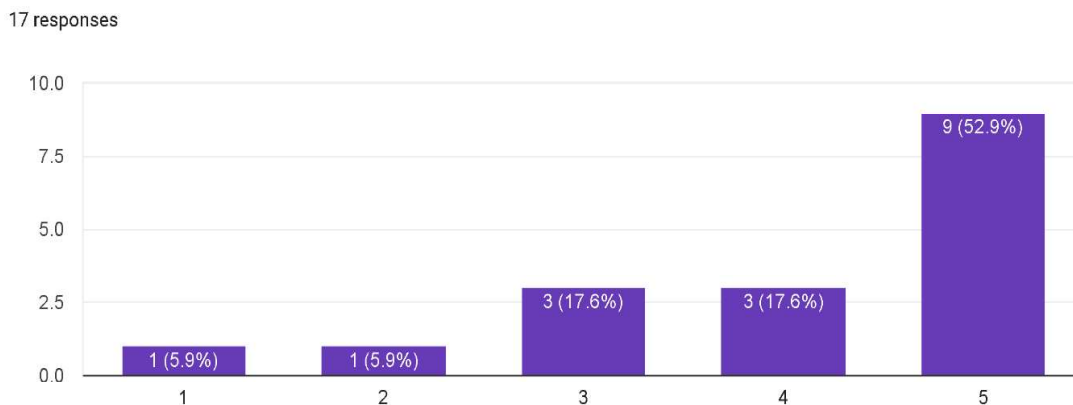


Figure 4.15 “Construction sites are safe and secure for the people living near the site.”

Figure 4.16 shows the results of the second question of this part; the question stated that “Construction sites are safe and secure for the people working on the project”. The results of this question show that 41.2% of the participants answered strongly agree to this question, 17.6% participants answered agree, 29.4% participants chose neutral, 11.8% participants selected disagree, and 0% selected strongly disagree to this statement. These results show that the people represented mix opinions with the fact that the sites of construction are secure and safe for the individuals working on the construction projects.

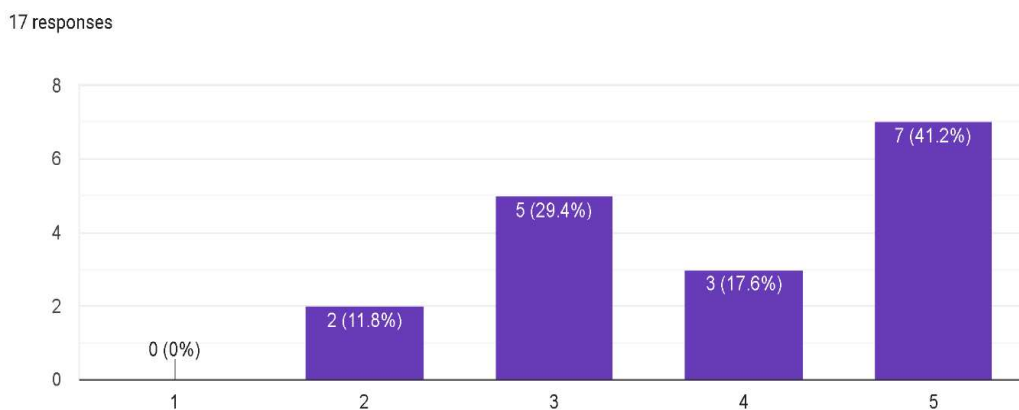


Figure 4.16 “Construction sites are safe and secure for the people working on the project”

Figure 4.17 shows the results of the third question of this part; the question stated that “Workers at a construction site are mostly following all the safety measures that are set by international authorities”. The results of this question show that 47.1% of the

participants answered strongly agree to this question, 11.8% participants answered agree, 17.6% participants chose neutral, 23.5% participants selected disagree, and 0% selected strongly disagree to this statement. These results show that the people represented mix opinions with the fact that the labor and the workers at the construction sites appropriately follow all the measures of safety assurance.

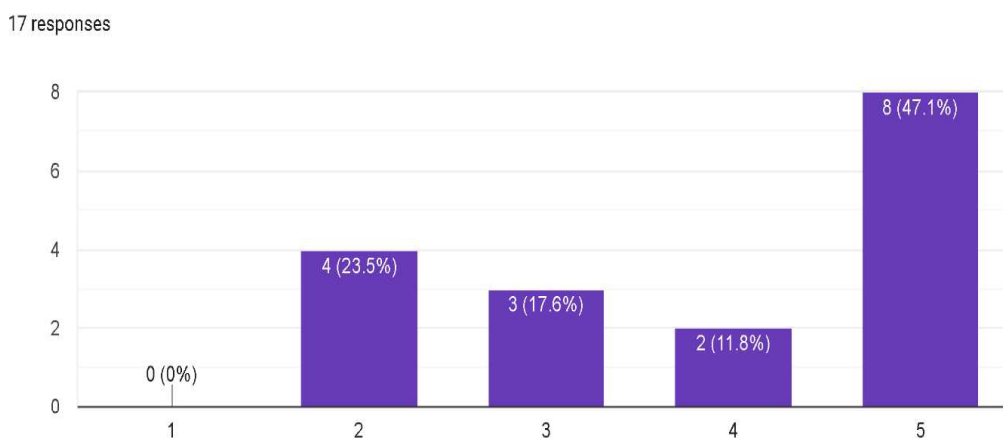


Figure 4.17 “Workers at a construction site are mostly following all the safety measures”

Figure 4.18 shows the results of the fourth question of this part; the question stated that “Workers at a construction site are provided with safety equipment”. The results of this question show that 58.8% of the participants answered strongly agree to this question, 11.8% participants answered agree, 23.5% participants chose neutral, 5.9% participants selected disagree, and 0% selected strongly disagree to this statement. These results show that the people represented mixed opinions with the fact that the labor and the workers at the construction sites are provided with all the required safety equipment.

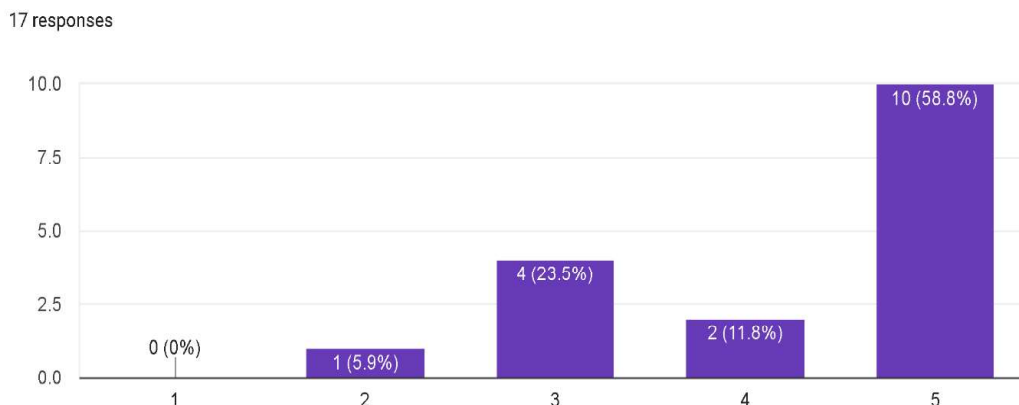


Figure 4.18 “Workers at a construction site are provided with safety equipment”

Figure 4.19 shows the results of the last question of this part; the question stated that “The surveys of safety teams are essential at construction sites”. The results of this question show that 64.7% answered strongly agree to this question, 23.5% participants answered agree, 11.8% participants chose neutral, 0% participants selected disagree, and 0% selected strongly disagree to this statement. These results show that the people agree with the statement that “safety team surveys” are important for the construction projects.

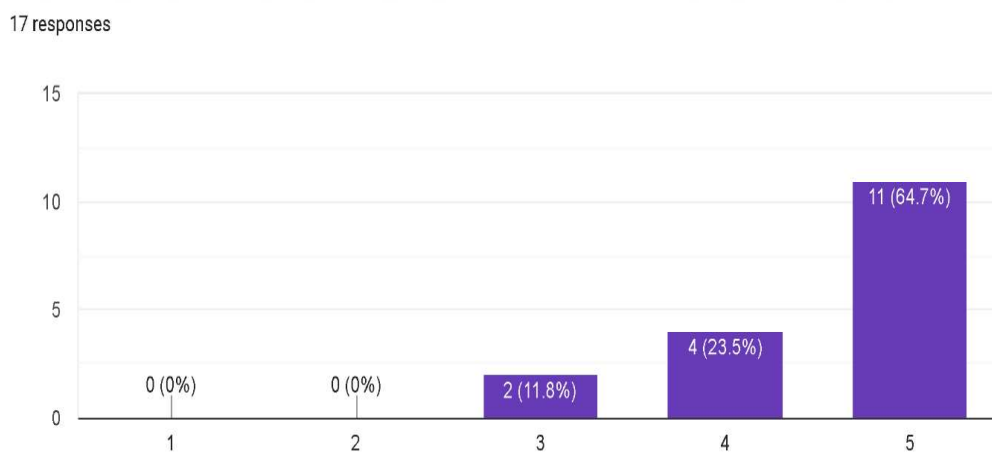


Figure 4.19 “The surveys of safety teams are essential at construction sites”

5. The second part of this section comprises the questions related to the “Quality Aspects at the Construction Site”.

Figure 4.20 shows the results of the first question of this part; the question stated that “The quality of construction projects in Afghanistan is satisfactory”. The results of this

question show that 17.6% of the participants answered strongly agree to this question, 23.5% participants answered agree, 35.3% participants chose neutral, 17.6% participants selected disagree, and 5.9% selected strongly disagree to this statement. These results show that the people represented mix opinions with the fact that the quality of the construction projects in Afghanistan is satisfactory.



Figure 4.20 “The quality of construction projects in Afghanistan is satisfactory”

Figure 4.21 shows the results of the second question of this part; the question stated that “Quality is the most important factor in every construction project”. The results of this question show that 70.6% of the participants answered strongly agree to this question, 29.4% participants answered agree, 0% participants chose neutral, 0% participants selected disagree, and 0% selected strongly disagree with this statement. These results show that the people strongly agreed with the fact that the factor of quality plays the most significant role in the projects of construction.

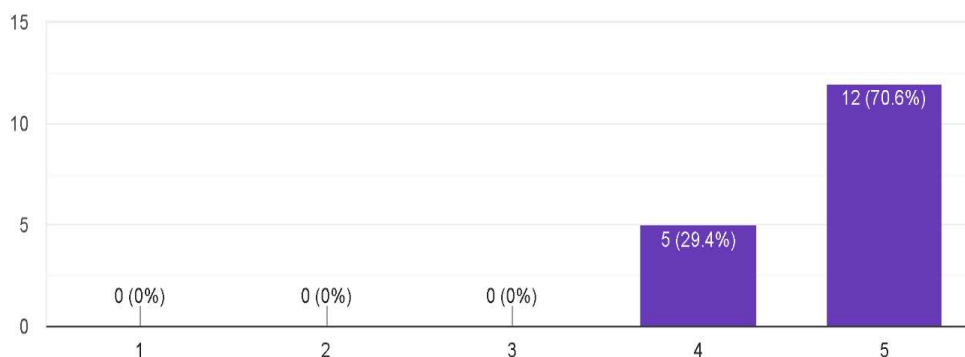


Figure 4.21 “Quality is the most important factor in every construction project”

Figure 4.22 shows the results of the third question of this part; the question stated that “Workers at a construction site follow all the quality measures.” The results of this question show that 47.1% of the participants answered strongly agree to this question, 17.6% participants answered agree, 17.6% participants chose neutral, 11.8% participants selected disagree, and 5.9% selected strongly disagree with this statement. These results show that the people represented mix opinions with the fact that the staff and workers at the sites of construction projects follow all the measures of quality.

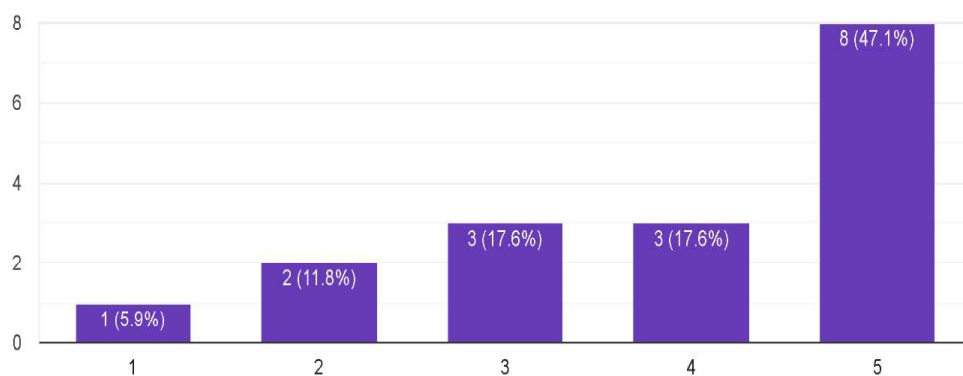


Figure 4.22 “Workers at a construction site follow all the quality measures”

Figure 4.23 shows the results of the fourth question of this part; the question stated that “Assurance of quality is the responsibility of contractor.” The results of this question show that 35.3% of the participants answered strongly agree to this question, 17.6% participants answered agree, 11.8% participants chose neutral, 11.8% participants selected disagree, and 23.5% selected strongly disagree with this statement. These results show that the people represented highly mixed opinions on the fact that quality assurance is the contractor’s responsibility.

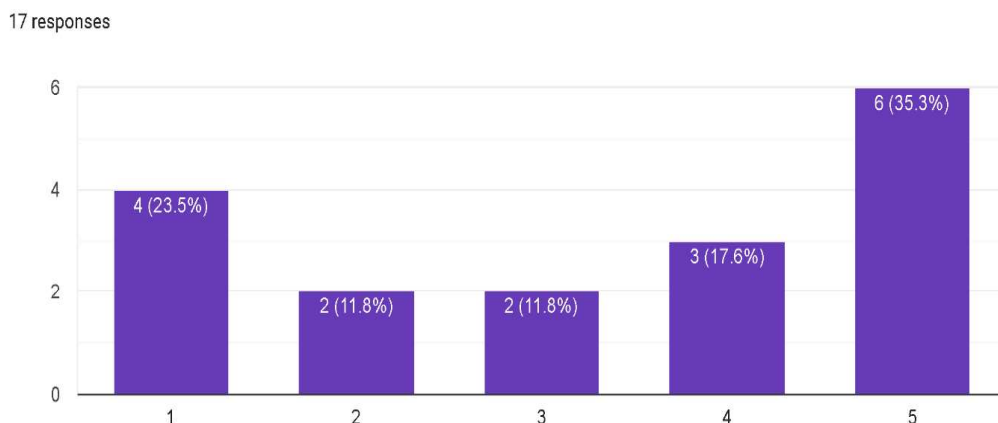


Figure 4.23 "Assurance of quality is the responsibility of contractor"

Figure 4.24 shows the results of the last question of this part; the question stated that “The surveys of quality teams are essential at construction sites for the assurance of safety”. The results of this question show that 52.9% of the participants answered strongly agree to this question, 23.5% participants answered agree, 17.6% participants chose neutral, 5.9% participants selected disagree, and 0% selected strongly disagree with this statement. These results show that most of the people agreed with the statement and think that survey of quality team plays an essential role in the assurance of safety at the construction sites.

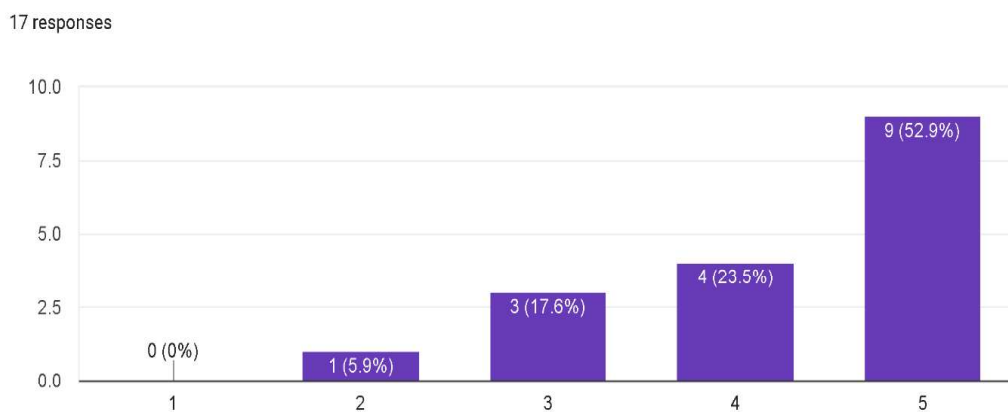


Figure 4.24 “The surveys of quality teams are essential at construction sites for the assurance of safety”

6. The second part of this section comprises the questions related to the “Technologies and Processes Used in Construction Projects”.

Figure 4.25 shows the results of the first question of this part; the question stated that “At present time, the construction industry is using advanced technology such as design gadgets and computerized machines”. The results of this question show that 23.5% of the participants answered strongly agree to this question, 35.3% participants answered agree, 29.4% participants chose neutral, 11.8% participants selected disagree, and 0% selected strongly disagree with this statement. These results show that people have highly mixed opinion regarding the fact that currently the industry of construction is utilizing advanced technology in the processes of construction.

17 responses

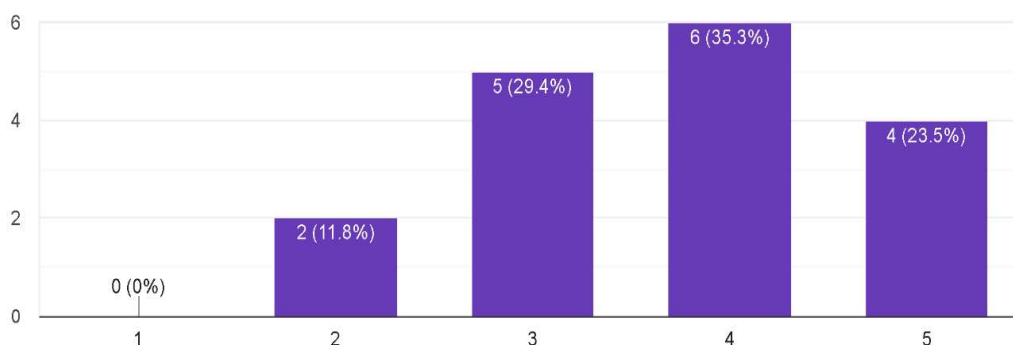


Figure 4.25 “At present time, the construction industry is using advanced technology”

Figure 4.26 shows the results of the second question of this part; the question stated that “Tools and tactics used in construction projects are safe and reliable.” The results of this question show that 47.1% of the participants answered strongly agree to this question, 29.4% participants answered agree, 17.6% participants chose neutral, 5.9% participants selected disagree, and 0% selected strongly disagree with this statement. These results show that people have mixed opinion regarding the fact that tactics and tools commonly used in the industry of construction are safe and reliable.

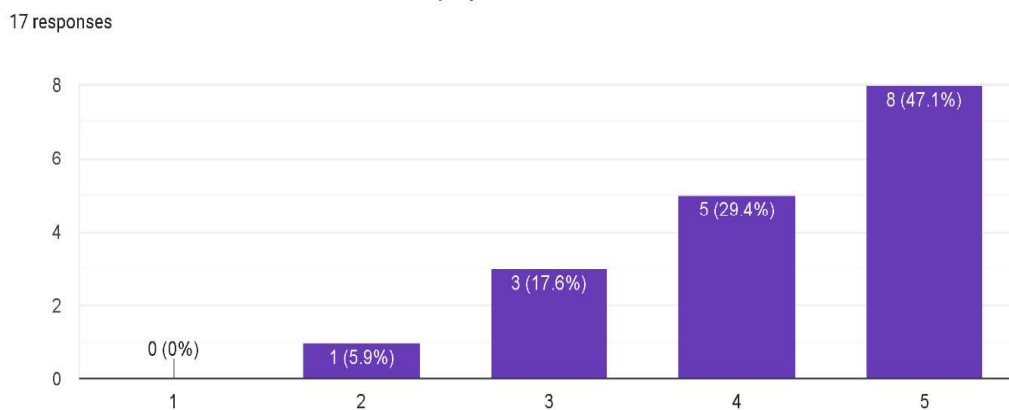


Figure 4.26 "Tools and tactics used in construction projects are safe and reliable"

Figure 4.27 shows the results of the last question of this part; the question stated that "The construction industry is using innovative approaches in current projects". The results of this question show that 17.6% of the participants answered strongly agree to this question, 47.1% participants answered agree, 29.4% participants chose neutral, 5.9% participants selected disagree, and 0% selected strongly disagree with this statement. These results show that majority of people have strong opinions regarding the usage of innovative approaches in the industry of construction.

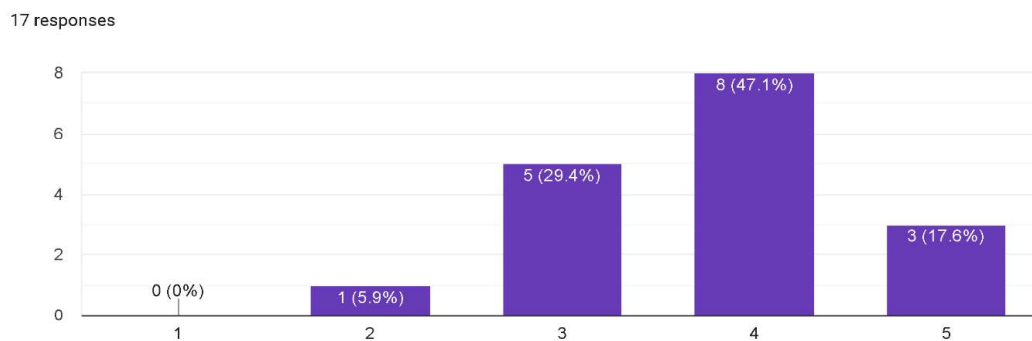


Figure 4.27 "The construction industry is using innovative approaches in current projects"

4.5 Regression Analysis

Table 4.5 Regression analysis of hypothesis 1

	<i>Coeffi cients</i>	<i>Standar d Error</i>	<i>t Stat</i>	<i>P- valu e</i>
Intercept	1.0863 8	0.905812	1.19 9343	0.25 1798
There are enough legislations available for construction quality.	0.4264 52	0.213561	1.99 6864	0.06 7217
The industry of construction must set the recommended curing and decluttering timetables	0.1962 72	0.243567	0.80 5824	0.43 4838
The surveys of quality teams are essential at construction sites for the assurance of safety.	0.1554 12	0.215847	0.72 0012	0.48 4263

Regression analysis is considered a set of statistical methods that helps in forming a relationship between different independent and dependent variables of a research study. This analysis plays an essential role in attaining the aim of this research as it supports determining the impact of quality factors in the construction industry. It has been analyzed from the results of regression analysis that the quality factors of the construction industry have a positive relationship with the legislation available for construction quality. The regression analysis signifies that the p-value of this independent variable is greater than 0.05, which shows that legislations have a strongly positive impact on the quality of construction. Moreover, it has also been determined from the results of regression analysis that there is a positively strong relationship between the quality of construction and curing and de-cluttering timetables. The p-value of this independent variable is 0.43, which signifies that curing and de-cluttering timetables portray an imperative role in improving the quality of the construction industry. Arranging every task in accordance with the deadline helps in the completion of construction projects in a timely manner. The results of this analysis identify that there is a significant impact of curing and de-cluttering timetables on enhancing the quality of the construction industry. In addition to this, there is also a positively strong relationship between the quality of the construction industry and surveys of quality

teams. It is important for the quality teams to conduct a survey on the construction site as it would help them in assuring the safety of the construction project. It also helps in improving the quality of construction projects as quality teams can point out the issue or concerns in the construction project so that labors can resolve that issue in a timely manner. Therefore, the null hypothesis should not be rejected, which signifies that the quality of construction depends on legislation, the timetable of curing and de-cluttering and a survey of a quality team.

Furthermore, the regression analysis of the second hypothesis represents that the dependent variable of safety in the construction industry has a positive relationship with the independent variable of site review meetings. The p-value of this independent variable is 0.46, which shows that it has a positive impact on the safety of construction project. It has been analyzed from this analysis that the construction industry should conduct site review meetings with all the workers and staff members who are involved in the construction project to ensure the safety of construction project. In relation to this, the independent variable of tools and tactics used in construction projects also has a positive impact on the safety of construction projects. It has been determined from the p-value of 0.108 that there is a strong relationship between these two variables. It represents that when safe and secure tools and tactics have been used in the construction project, it would enhance the overall safety of the construction project in an effective manner. However, it has been evaluated from the results of this regression analysis that the independent variable of the safety assurance survey has a p-value of 0.04. It signifies that there is an insignificant impact of this variable on the dependent variable of the safety of the construction project. The results show that arranging the surveys of the quality team on the construction site would not help in improving the safety of the project in any manner. Therefore, the results of regression analysis show that the null hypothesis should be rejected, which specifies that safety in the construction industry does not depend on on-site review meetings, the use of tools and tactics and the safety assurance survey.

Table 4.6 Regression analysis of hypothesis 2

	<i>Coeffi cients</i>	<i>Standar d Error</i>	<i>t Stat</i>	<i>P- valu e</i>
Intercept	0.9298 4	1.49531 4	0.62 1836	0.54 4802
The industry of construction must conduct Site review meetings with all workers and members of staff.	- 0.1892 1	- 0.24930 1	- 0.75 897	- 0.46 1411
Tools and tactics used in construction projects are safe and reliable.	0.4243 41	0.24600 3	1.72 4943	0.10 8215
The surveys of quality teams are essential at construction sites for the assurance of safety.	0.5313 25	0.23572 4	2.25 4008	0.04 2095

CHAPTER 5

DISCUSSION

5.1 Discussion of the Results

The findings of the efforts of this research are arranged based on six themes of the questionnaire; these themes have been linked to the safety and quality of the construction industry of Afghanistan. The construction industry is a vast area of practice which offers diverse services and projects. The standardized practice of the construction industry is ensured by its safety and quality protocols. From the findings of the following study based on a descriptive questionnaire, it has been analyzed that the first findings emphasized that the construction industry is required to take essential actions to support this industry in ensuring safety and quality factors.

5.2 Theme 1

The first finding of the study emphasizes the fact that the construction industry must set the quality of workmanship in all construction activities.

The results show that the people of Afghanistan associated with the construction industry think that there must be a definite workmanship quality in all the activities involved in a construction process. Individuals involved in this industry think that there is a need for definite procedures to control the quality of the projects.

There are numerous difficult jobs involved in creating structures. The design stage, approval stage, monitoring stage, and construction stage need a skilled team. One of the biggest challenges the workforce has while learning and implementing the appropriate construction methods and techniques after the quality control assurance for building projects is poor workmanship. Public sector owners are under growing pressure in the current construction climate to enhance project performance, complete projects more quickly, and lower the cost of managing their construction programs. The construction industry, which employs a substantial workforce, attracts a range of

resources and budgets, and provides a sizable number of job opportunities, is particularly important to Afghanistan's economy.

Every nation's economy depends heavily on the construction sector, which is also frequently cited as a major driver of economic expansion, especially in emerging nations. There has been a considerable increase in construction activity in Afghanistan recently. The rate of urbanization has boosted construction activity, which has resulted in a growing demand for both residential and commercial building space. The construction business offers job opportunities to trained, sub, and unskilled individuals due to its somewhat labor-intensive nature. Amongst the most often utilized construction materials is concrete.

Cement, water, coarse and fine aggregate, and mineral admixtures are some of their constituents. The quality of the concrete is significantly influenced by both the quality of the materials used and the quality of the labor utilized. 90% of building catastrophes are attributable to issues that arise during the design and construction phases, according to a prior study by the "Building Research Establishment (BRE)". Numerous things can contribute to recurring mistakes, such as poor communication, inaccurate information, the inability to authenticate information, a lack of check-and-balance mechanisms, a lack of technical skill, and inadequate feedback. Human mistake is the main cause of problems in building projects. It implies that human error was caused by subpar building construction. One problem with this situation is that building endeavors typically result in bad craftsmanship. The tenants of the building will suffer, and the resident's quality of life will deteriorate.

Today, construction is one of Afghanistan's biggest labor-intensive businesses, employing a sizable workforce of unskilled laborers. Due to these and other reasons, new concrete loses quality during the mixing, casting, vibrating, and curing processes. The components may have several flaws because of the subpar craftsmanship quality. There are several established fundamental causes for poor craftsmanship. Some of these on-site management-related problems include poor supervision, a lack of training, unskilled or inexperienced workers, a lack of appropriate tools and equipment, a lack of enthusiasm among employees, a lack of clarity in the specifications, and, to a lesser extent, subcontracting.

The number of quality management components directly affects the level of craftsmanship. Contrary to the other criteria, poor job site supervision has been found to be the primary cause of inferior workmanship. Poor workmanship is one of the key reasons for building flaws and failure problems. The ones with the most defects or issues because of poor construction are high-rise buildings. In their replies to survey questions, senior client officers, project managers, and resident engineers from the contractor and consultant sides all cited poor quality as a key contributing cause to the use of inferior materials. Low quality also led to project cost overruns for all parties involved in project management.

Increased workers' pay and hiring decisions based on competence were found to be two of the most crucial variables in improving workmanship quality on-site, with respective relevance ratings of 85% and 70%. With 85% and 75% of respondents agreeing, respectively, that proper inspection and control are essential, as is training and educating staff. Moreover, the results also suggest that there must be quality control laboratories at the sites of construction so that these laboratories and the experts working there will be able to keep control of the factors of quality.

Inspect each stage of the building process as part of the overall construction project management of your project. Check the effectiveness of the quality control methods or the caliber of the materials utilized. These labs will ensure the overall quality of construction work. They will also be able to mention any misconduct or use of inappropriate, unsafe, and unreliable material or technique on time. In addition to this, the study findings also suggest that essential actions by the construction industry must also contain the arrangement of sit review meetings with all the staff members and project managers; these meetings impact the quality of construction and enhances the safety factors of the project. These meetings provide the workers with the opportunity to discuss problems regarding the safety and quality of the project.

5.3 Theme 2

The second finding of the study highlights the significance of safety and quality in the construction industry.

The results of the second theme show that people think safety and its elements play an important role in the “construction industry”. The elements that make building more complicated provide the construction sector with new difficulties on a global scale. These difficulties prolong the construction process, which may increase costs and delay projects. Most of the problems the construction industry is now experiencing still need to be fixed, particularly in developing nations like Afghanistan. Compared to other nations, Afghanistan's construction industry has difficulties. The nation with the biggest construction delays is Afghanistan.

Afghanistan's construction industry was mostly dormant for a while due to several civil wars, but with the involvement of international organizations in the nation, there was a resurgence. Therefore, it's crucial to eliminate the intellectual and technical barriers between Afghanistan and the contemporary world. Afghanistan's construction industry faced several extremely challenging issues, including a shortage of skilled laborers, machine operators, and other building materials. There is a critical demand for construction projects around the nation.

The absence of technical resources has an impact on a wide variety of construction projects, including those that are residential, public, commercial, and other types. Along with the refugees who have returned home, the nation also has many homeless people. Even the government has no buildings, especially in remote districts. All of these factors indicate that the building industry has much potential. Despite this, the difficulties this company encounters will lead to conflict. Construction ranks third in importance behind mining and agriculture, making it a crucial sector for the nation. It, therefore, has a significant impact on the national economy and raises Afghan workers' employment prospects.

Construction "quality and safety" comparisons show some glaring similarities between these management tenets. Several elements are shared by programs designed to increase performance in terms of quality and safety. Safety is occasionally seen as a

component of overall "quality management (TQM)". Afghanistan has a more developed and established quality practice than the situation there now. Examples of control techniques include the adoption of quality management and the creation of a dedicated body to oversee activities related to the issue of quality management.

When the term "safety management" is used, it should be understood to also relate to the management of environmental variables and occupational health. The term is used to save time and be concise. The objective is safety management, which is how the problem is advanced.

Furthermore, there is no doubt that safety and quality are interconnected with each other; there is a strong bond between both factors. Taking care of the quality factors and adhering to the legislation linked with the quality of the project eventually impacts the safety factors of the project and vice versa. Results of the findings showed that safety elements influence quality; previous research also emphasized this fact.

5.4 Theme 3

The third finding of the research emphasizes on the relationship between the quality and safety of construction work in the industry of construction.

The third theme of the finding emphasizes the relationship between quality and safety; the results obtained through this theme highlight that there is a strong relationship between these two elements in the construction industry. Quality and safety are factors that must be considered throughout the whole process, including design, estimating, contract negotiations, and construction, for a work to be successfully completed. All parties involved, including subcontractors, must contribute to the endeavor since both quality and safety require ongoing attention and care. Keeping things safe and high-quality means minimizing obstacles to a job's quick completion. Usually, human error or unfavorable conditions are to blame for the disruptions in both cases.

This system combines quality control and safety function. Doing something correctly the first time can apply to both the procedure (safety) and the result (quality). In other words, quality and safety standards contradict Murphy's Law, the maxim that whatever may go wrong will. Failure detection needs to be planned beforehand. Before implementation, a risk analysis should be done to identify any potential problems or

the possibility that the aim would fail. Delays in problem discovery might lead to delays in work plans and financial losses.

A recently discovered uneventful incident that causes major injury can have similar fast affect. Poor performance in showing quality work can have direct impact and become apparent afterward. Morale and ethical code, costing time and finance, suspended work, an investigative team is on board and management handles the issue. The defects detected in quality leads repairing warranty concerns in the department, on the other hand, chronic health problems can occur because of concealed hazards. This may levy a heavy cost on company's reputation because of low performance and poor tracking record. Quality and safety issues often lead to the same types of disruptions, increasing direct and indirect costs. Failures also lead to reduced productivity and low morale.

Managers face great difficulty in maintaining quality and safety because of the diversity and complexity of contributing factors. It may seem that many of the issues in both areas are related. These problems include a variety of human variables such as distraction, apathy, and substance abuse, as well as substandard design, management, equipment and working conditions.

Fortunately, a quality or safety program can effectively solve many of these issues. Finding and verifying the program's financial advantage is another difficulty. Even though a non-event cannot be measured, statistical data can be gathered to provide sufficient direction to establish the appropriate level of effort.

5.5 Theme 4

The fourth finding of the study emphasizes the aspects of safety at construction sites.

The fourth finding of the study emphasized the different elements of safety at the sites of construction. The results highlighted that most of the people who live in the nearby areas of the construction sites feel safe. However, some people think that it is not safe for them to live near construction sites as there are several risks involved in this.

Some risks associated with building sites cannot be eliminated. Poor conduct and negligence, whether deliberate or not, are to blame for far too many construction-related issues. The best strategy to ensure that the hazards connected with this type of

activity are reduced is to cultivate a culture of good behavior and good habits. On most construction sites, chemicals are a significant source of risk. On construction sites, chemicals serve a variety of vital purposes, but they can also be quite hazardous. To ensure the safe handling of chemicals, there are numerous processes and procedures around accurate documentation and tracking.

Despite being surrounded by other construction sites and people going about their daily lives, construction sites can appear to exist and run in their own world. On building sites, maintaining other stakeholders' "happiness" is a never-ending struggle and a long-term danger. The goal of initiatives like noise monitoring is to avoid difficulties with the public and other stakeholders.

It would be impossible to emphasize the importance of the construction industry to society. A large part of the world's population depends on the construction industry, as it employs hundreds of millions of people. Additionally, society depends on construction projects to build and maintain the places we live and the infrastructure that allows us to move around. Over the years, the construction industry has controlled and reduced many internal and external hazards, but there are still many more to deal with soon.

The relationship between technology and the construction industry has always been an appreciated one. Technology has increased productivity and made new forms of construction possible, but it has also disrupted the market and caused certain businesses to lose money. In the construction industry, technology continues to present risks and opportunities. Many of the processes that construction firms have relied on for years could be destroyed soon by some major industry-wide applications of technology, while others could improve the way projects are planned and executed. Once again, it will be a double-edged sword and a source of risk for those who do not manage it properly.

According to "OSHA Statistics," 95,000 workers are injured each year globally while using forklifts. At least 100 of these injuries are fatal. Only skilled personnel should use forklifts, as they are reliable but dangerous machines. They often work near other employees, which raises the likelihood of damage. Because forklifts cannot be

replaced, occupational safety experts strive to reduce accidents through strict regulation.

The various forklift laws are listed here. (1) Lifting Operations and Lifting Equipment Regulations (LOLER) (1998) (2) Provision and Use of Work Equipment Regulations (PUWER) (1998) (3) Health and Safety at Work Act (1974) (4) Management of Health and Safety at Work Regulations (1999). Forklifts can only be used by certified personnel, require maintenance, and cannot be modified without permission. Always wear your seat belt, drive carefully in slick areas, and avoid moving heavy objects overhead.

Construction workers face more frequent and dangerous safety hazards on the job than most other employees. Construction sites are filled with dangerous machinery, environments, hazards, and substances that can lead to serious to fatal accidents if not watched carefully. The official OSHA website lists 4,836 fatalities in 2015 as one of those numbers. Of those, 937 were unique to the construction industry.

Safety measures in the construction industry rely heavily on OSHA and private occupational safety experts. They use previously collected data and reports, as well as current observations, to develop, modify and enforce construction safety laws continually. Occupational safety professionals also work to eliminate construction-related risks completely. They can reduce the risk of injury or environmental damage by using safer machinery, chemicals, and tools.

They not only reduce and eliminate workplace safety worries but also educate the public about construction safety. The official "OSHA" website has more about typical construction hazards, their potential effects, and safety precautions.

It has also been identified that most people working at the construction sites think that all the safety measures have not been followed, and the workers involved in the construction process show negligence and carelessness towards handling the equipment and performing construction activities.

On construction sites, there are risks that can result in the death or injury of workers, damage, or loss of property, or both. In Afghanistan, the average construction worker has little concern for their personal safety, and they work on the site with no regard for safety. They are ultimately at risk because of the work they do. On Afghan construction

sites, employees engage in risky behaviors, such as working barefoot, using bamboo for scaffolding, and mixing concrete with their bare hands without protection. Since barrows are not provided on construction sites, some untrained laborers carry bags of cement with their bare heads.

Despite the availability of wheelbarrows, in many cases, these inexperienced laborers choose to carry them on their heads. The construction industry in many wealthy countries does not consider these activities to be the norm as a matter of routine. If Afghanistan had a "Construction Industry Training Board (CITB)", construction workers throughout Afghanistan would be trained and counselled, which they are not. Accidents happen; they are not only inescapable occurrences. Every accident has an improbable cause, according to history. Different results have been drawn from numerous research that has been conducted on the issue. When an accident happens, it is the duty of the staff members in charge of the scene to identify the cause and suggest practical solutions. For a variety of causes, accidents can happen on building construction sites. Risky behavior and a hazardous atmosphere are two things that might lead to accidents involving construction site personnel. It is the responsibility of the construction worker to refrain from unsafe behaviors such as utilizing damaged equipment or disobeying site warning signs. Most construction sites have risky conditions like inadequate lighting and ventilation.

5.6 Theme 5

The fifth finding of the study emphasizes the aspects of quality at the construction sites.

The fifth theme of the questionnaire is related to the quality aspects of the construction industry in Afghanistan. Results of the findings suggest that most people show neutral opinions on the fact that whether they are satisfied with the quality of the projects or not. There are number of elements which ensures the quality of the construction project, and these elements may include the use of technology, the skills of labor and the staff working on the project, the material used in the process of construction, approaches and so on.

Rework must be avoided, and tasks must be done "right" the first time. The goal of job optimization is to put in as little effort as possible. To achieve this goal, the overall

cost of quality is minimized, as described below. Quality is not something that happens by accident. Even if everyone involved in the construction has the best intentions, systems must be in place to ensure that the work is done properly due to human factors such as haste and ignorance, management choices such as sequence and worker composition, and "uncontrollable" events such as contractor incompetence and inclement weather.

This aspect falls under the umbrella of quality control. In addition, the owner and occasionally the public need confirmation that the items ordered have been delivered. This confidence-giving is often referred to as quality assurance. Although the definitions of "quality control" and "quality assurance" are sometimes unclear in their application in the construction industry, both are included in quality management. Generally, dedicated individuals and/or equipment are required to accomplish quality assurance and/or quality control. The hierarchy of quality efforts includes the creation of generic documents, specific quality programs, and some contractually required quality programs.

To implement the quality program, specific quality tasks such as material testing, submission documentation verification, equipment recalibration and overall work inspection are required. Another action that falls under the category of quality is employee training. Quality requires a wide range of different expenditures. People think that workers and laborers working at the construction sites do not follow the measures of quality and due to which number of accidents happen. These findings suggest that there should be quality program implementation in the construction industry of Afghanistan.

Formal written systems for achieving quality are called quality plans. They often contain a policy statement that indicates support from upper management. It will include a thorough and systematic breakdown of control and assurance procedures, including material testing, plan checking, submission document review, and supplier evaluation. The aspects of the quality program will fall under process control. Program performance refers to a technique for figuring out whether a program is profitable or successful. This can be done using the techniques outlined in the next section to measure owner satisfaction or financial results.

5.7 Theme 6

The last finding of the study highlights the processes and technologies approaches utilized in the projects of the construction industry.

The last part of the findings emphasizes the approaches and technologies used in construction projects in Afghanistan. Most of the participants think that the current technologies used in this industry are not satisfactory. The world is moving towards technological advancement. However, the construction industry of Afghanistan is lacking when it comes to the usage of technology. People are still using old methods for the processes involved in the construction process.

Many work streams are being supported by digital tools like “BIM (Building Information Modelling)”, which also allows for remote site access. Both make it possible for endeavors to go on after they may have otherwise stopped. Adverse consequences of “risk management strategies” included significant project delays, difficulty in getting supplies in a timely manner, lower production rates, material price hikes, and other issues. Among the new opportunities were the ability to employ competent workers, the building of homes, occupations requiring transportation, and initiatives to quickly build medical facilities. Forming a task force team to investigate the spread of the pandemic and make advice, arguing that construction enterprises should be acknowledged as crucial to avoid delays, and using government aid programs are all examples of actions used to handle additional project risks. The efforts made to lessen the effects of material supply delays and associated difficulties were another area that was recognized. One of the panelists noted that certain companies who were actively following the pandemic's development could put material supply orders before things got complicated for deliveries. There were shortages of goods on the market. Other subcontractors were able to handle these problems by locating substitute suppliers and nearby vendors that could make on-time deliveries of supplies. Moreover, the findings of this part also suggest that the tools and approaches currently utilized by the industry are safe. However, previous research also stresses the fact that the tools and technologies are not entirely reliable and can cause severe damage to human life. Lastly, the findings highlighted that when it comes to utilizing innovative approaches and techniques, the construction industry of Afghanistan is lacking

severely. Contractors and engineers are using old technologies; there is no innovation in the new projects of construction. It is common knowledge that the resource management, risk management, and logistical problems plaguing the construction sector usually result in design flaws, project delivery delays, cost overruns, and legal complications.



CHAPTER 6

RECOMMENDATIONS AND CONCLUSION

6.1 Recommendations

In Afghanistan, construction quality management procedures regulate quality on the construction site. In essence, it ensures the legality and safety of each project component. Inspections are performed both internally and externally. The results of the research literature are consistent with the commonality of safety and quality management methods. The outcome indicators for safety and quality are equally the same.

To enhance the safety and quality aspects of the construction sector, the government of Afghanistan has to reconsider the current policies and regulations of construction and should implement appropriate modifications to them.

6.1.1 Safety Concerns

- To address any safety concerns, such as tools lying around or damaged equipment, the job site should be inspected before and after each workday. In addition, during the day, the job site should be inspected to identify any possible risks and to keep a close eye on personnel to ensure that they are completing their work safely. Hold a quick safety meeting before the start of each day's work to discuss the duties that need to be completed and the safety precautions that need to be taken. Verify any good practices used the previous day and address any issues or concerns.
- The people who benefit most from a safety-conscious culture are the employees. Insightful companies require employees to lead safety meetings, participate in safety walks on the job site, and help with task hazard assessments and pre-task preparation.
- Another recommendation is to reduce soft tissue injuries, which are a frequent problem in the construction industry. A structured training program that

includes material handling, using machinery or other mechanical advantages to move materials, and limiting the weight employees can lift and carry would be worth implementing.

- Create remedial action plans based on employee recommendations. To ensure and maintain quality that the strategy is properly implemented and enforced, ensure that all employees are aware of the strategy. Create an accident response team of several workers with basic first aid training for each job site. They must be aware of what to do in the event of an injury to eliminate any risks that already exist and to give the injured worker first aid. If your employees are actively involved in developing and improving your safety culture, they will feel invested and more inclined to take safety seriously. In addition, individuals are more likely to voice their concerns if they feel their ideas are valued.

6.1.2 Quality Concerns

- To do the job, construction workers must also be emotionally and physically prepared. A worker's ability to maintain focus and make safe judgments in and out of the workplace can be compromised by substance abuse, opiate use or fatigue. This is a key factor for fleet drivers to consider, and they should be aware of any company rules regarding substance use and distracted driving. Drivers' fatigue levels should also be checked regularly. The easiest way to help business reinforce its safety culture is to train its employees properly. It demonstrates to your employees your dedication to their health.
- Training should not be conducted only once. To help enforce proper practices, regular safety training should be implemented. With ongoing training, your employees will learn faster and keep safety at the forefront of their minds. Establish a safety committee with worker representatives from all organizational levels. During the pre-construction phase of any project, they should be involved in evaluating and revising the company's safety program, creating a job-site-specific safety plan, and assisting in identifying potential risks and safety issues.