TALLINN UNIVERSITY OF TECHNOLOGY
School of Business and Governance
Department of Business Administration

Muhammad Rizwan

IMPACT OF PROJECT RISK ATTRIBUTES ON PROJECT SUCCESS

Master thesis

Programme International Business Administration

Supervisor: Piia Tint, PhD

Tallinn 2021

I hereby declare that I have compiled the thesis independently and all works, important standpoints and data by other authors have been properly referenced and the same paper has not been previously presented for grading.
The document length is 12,191 words from the introduction to the end of conclusion.

Muhammad Rizwan ……

(signature, date)

Student code: 0184541TVTM

Student e-mail address: mrizwan.taniq@gmail.com

Supervisor: Piia Tint, PhD:

The paper conforms to requirements in force

……

(signature, date)

Co-supervisor:

The paper conforms to requirements in force

……

(signature, date)

Chairman of the Defence Committee:

Permitted to the defence

……

(name, signature, date)

TABLE OF CONTENTS

ABSTRACT

Every project is more prone to risks, which vary based on the project's size and volume. But no construction projects are risk-free. Thus, the company must follow certain practices to recognize the risk, make a qualitative and quantitative assessment, handle such risks, monitor and control it through proper risk management. The fundamental goal of the study is to identify the risk attributes which influence construction projects in Pakistan. The objectives of the study are to determine the relationship between risk management attributes and project success.

Consequently, it focuses on how risk management attributes have an impact on project success. It also provides suitable suggestions to overcome the risk attributes and accelerate project success in the construction industry. The study gets assistance from network theory, and identifies the project risks, analyzes the risks, manages the risks, and risk response as risk management attributes and project success as the dependent variable. All the attributes are having a positive relationship with the success of the project. Consequently, identifying project risk has a 34% effect on the success of the project. Analyzing the risk has a 47.1% impact on the success of the project. Monitoring the project risk has a 45.2% impact on the success of the project. Lastly, risk response has a 25.4% impact on the success of the project

Keywords: Risk management attributes, project success, risk response

INTRODUCTION

The construction industry is the backbone of countries economic growth and development (Imran *et al.* 2019, 285). Generally, the industry is having strong backward and forward linkages with other sectors. Globally, the industry is the largest one, which contributes 10 trillion USD to construction activities.

Though the industry is getting a higher amount of investment, constraints present in the industry affect productivity. According to the new Mckinsey global institute production survey, poor management, improper execution of projects, lack of skilled personnel, improper risk management, inadequate design processes, underinvestment in skills development, research and development, and innovation.

Thus, the industry faces poor performance. However, the construction sector contributes a significant amount to the GDP of Pakistan. Presently, the industry is contributing 2.3% of the country's G.D.P. growth. It is offering numerous job prospects to people in developing and underdeveloped countries. Consequently, the industry is getting more amount to extend the construction projects in the country. Hence, the industry is experiencing rapid development in recent years. But at the same time, the projects in the country gets delayed which in turn create a negative impact on the country. Some of the impacts were low productivity, cost overrun, poor quality and disputes among stakeholders (Sohu *et al.* 2018, 2685). Consequently, in Pakistan, more than 90% of projects get delayed, affecting the country's project success (Sohu, Chandio 2019, 103).

Global studies have proved that the countries like Saudi Arabia projects get delayed to 75% (Alsuliman 2019, 801). Qatar projects delayed to 72% (Senouci *et al.* 2016, 368), Brazil has 82%. From the observation, it is clear that highest percentage of delays found in Pakistan. Thus, the researcher is keen on assessing why the construction projects get delay in Pakistan

Statement of problem

Every project is more prone to risks, which vary based on the project's size and volume. But no construction projects are risk-free. Out of wide risks, the study picks out the risks related to financial, environmental, and technical risks. Such threats affect the track record of the operation of the project. Thus, it affects the outcome of the project. Thus, the study focuses on assessing the how project risks attributes influence the success of the construction companies in Pakistan.

Thus, Construction projects have to bear various risks in terms of operational and quality, and financial aspects. Even completion of such risks project makes more time to resolve. To avoid such delays, the company must follow certain practices to recognize the risk, make a qualitative and quantitative assessment, handle such risks, monitor and control it through proper risk management (Ali *et al.* 2007). Risk identification is the first step in the risk management process. The personnel has to check whether the risk is under control or not. The second one is risk assessment, which refers to developing and recognizing the risk—understanding the risk by combining the consequences and their likelihood. Thirdly, risk response planning was made to create responses for identified risks. Responses are in the form of reducing the probability or diminish the impact of risk in the project. The last step is to control the risks through an effective risk response strategy (Pirwani *et al.* 2020; Nawaz *et al.* 2019). The study recognizes that risk management in construction projects is essential because it impacts the project's success. Thus, the researcher measures the aspects using the quantitative research method.

An in-depth analysis of related literature points out that no studies have been done to determine the association between risk management attributes and project success in Pakistan. A few studies made identify the risks, analyze them, and control risks that emerged in the construction sector. No reviews have been made to address the impact of risk management attributes on project success in Pakistan. The present study intends to address the gap. Thus, it is vital to assess the significant effect of risk management on construction project success in selected companies in Pakistan.

Research aim

The study aims to find out the risk attributes which influence construction projects in Pakistan

Research objectives

- To identify the relationship between risk management attributes and project success
- To find out the impact of risk management attributes on project success

- To provide suitable suggestions to overcome the risk attributes and to accelerate project success in the construction industry.

Research questions

- What are the risk management attributes?
- What are the attributes included to assess project success?
- What is the relationship between risk management attributes and project success?
- How much impact does risk management attributes have on project success in the construction industry?
- How to overcome the risk attributes to make the projects to be a success in the Construction industry?

The study addresses the above stated questions using network theory. Network theory is in the form of a generalized pattern. The approach has tools which use to analyze, model, and recognize the network theoretically. The theory can be applied across various disciplines. The theory initially lies in applying network theory indicators that relate to the project management field. Using the theory, tools are developed to assess the risk, find ways to overcome it and provide outcomes to narrow down the project's uncertainties. Risk assessment is an essential tool to know the present and future risks related to the construction project. Hence the study uses the theory to analyze the risks and how they interact with the construction projects. Such a project is exposed to various risks, which are quite tricky to manage. Thus, the present study uses the theory to identify the interrelated risks that ruin the construction project (Guo *et al.* 2020; Zou *et al.* 2016).

The study intends to assess the risk management attributes and how it relates to the project's success. It gets consistent support from network theory to describe the risk management process, identify the features, and assess it in the study. The theory helps the researchers determine the independent variables like identifying the risks, analyzing the risks, monitoring, and controlling the risks.

Also, the Guo *et al.* (2020) and Zou *et al.* (2016) studies are more to acquire the attributes in developing the framework for the research theme. Assessing the attributes can help construction

companies know the risk management attributes and their statistical percentage of their success. Besides, it helps the companies to finish the project within stipulated time and budget. The study paves the way to understand the importance of assessing the risks and how it will benefit society and organizations.

Chapter schemes

Chapter 1 depicts the theoretical background of the study. It includes risk management, financial risk, construction risk, environment risk, risk response, project success, project risk on project success from global perspective and Pakistan perspective.

Chapter 2 represents methods and empirical analysis. It contains research onion framework, target area and population, sampling, sampling technique, sample size, data collection, reliability and validity, ethics and statistical tools. Empirical analysis include demographic profile of respondents, descriptive statistics, association between project risk attributes and project success, impact of project risk attributes on project success, Anova to determine the risks (Construction, financial and environment risk) based on nature of construction projects. Also, summary of results and its discussion presented.

Chapter 3 presents the conclusion of the thesis.

1. THEORETICAL BACKGROUND OF THE STUDY

1.1. Risk Management

Risk represents a situation where document and experience exist together to get a possible outcome (Öztaş, Ökmen 2014, 229). Risks present in every project, and effective management of risk make the project a successful one (Szymański 2017, 174). Consequently, the construction sector has more complex risks, depending on complexity (Dey, Ogunlana 2004). The project manager needs to take care of the risks present in the project. Taking a proper and systematic technique with knowledge and experience induces to make the project effective and efficient (Serpella *et al.,* 2014). In the construction sector risk, the project's management is associated with the project's success and supports to accelerate the likelihood of acquiring success. Thus, risk management considers as an essential approach in the construction sector (Abazid, Harb 2018, 73). In order to identify the project risk, the study uses the below stated studies to evaluate it and find out the project risk attributes

(Lyons, Skitmore 2004) has pointed out that evaluating the construction industry's risk management techniques in Queensland. The authors derived the study using quantitative research in which survey techniques were executed. The study focuses on critical aspects like identifying the risk in terms of types, size, and risk tolerance. In the project, risk management usage in execution and planning stages is higher than at termination stages. The study pinpoints that identifying the risks and assessing risk is the most critical evaluation in risk management. It uses the risk response and risk documentation stages. Risk identification techniques state that brainstorming is the most effective method to identify the project's risks. Generally, the organization uses a risk response method to reduce the risks in the project. Using contingencies and contractual transfer helps to transfer the risk in the project. Risk analysis is usually made by project teams, specialists, and consultants. The study identifies that risk identification and risk evaluation is the most crucial step in risk management. Hence the researcher applies both the aspects in the study.

Chandra (2015) has shown that risks present in construction projects influence project success in the sector. The study intends to determine the various types of risks present in the projects and how they influence project success in the construction sector. Identifying the outcome for the study, the authors apply quantitative research in which questionnaire techniques are implemented. The study considers risks like natural risks, design risks, resource risks, financial risks, legal risks, and construction risks—project success measures in terms of costs, quality followed by time, and profit. With the structural equation model's help, the study provides information about the risk attributes and project success of construction projects. Financial and design risks harmed project success, whereas other risks positively impacted the project's success. The researcher derives that assessing the types of risks is another important factor that has a strong relationship with the project's success. Hence the attributes also are taken into account.

Obondi (2020) has pointed out that risk monitoring was low in construction projects, and hence it ruins the entire project to face failure. Therefore, the authors keen on aspects and investigate how risk monitoring and control have any association with project risk. The study executes based on quantitative research in which questionnaire techniques were adopted. Risk monitoring aspects assessed with the help of risk reassessment followed by risk audit, risk status meeting. With the use of statistical tools, it is clear that all the attributes are having a positive association with project success. Hence it concludes with the fact that giving special attention to all aspects can increase the success rate. Thus, the researcher recognizes that risk monitoring is one aspect of close association with project success. If it did not monitor correctly, then it will ruin the project. Therefore, the researcher gives importance to it.

Risk in the construction project refers to exposure to loss or gain, which influences the project in terms of cost, time, and quality. Construction project exposes to a wide range of risks. The emergence of risks raises because of the accumulation of a wide range of interrelated attributes. Chandra (2015) has pointed out that the construction industry comprises six risks: natural risks followed by design risk, resources and financial risks, legal risks, and construction risk. Urbański *et al.* (2019) has identified five risks that influence construction project success. It includes design risk followed by financial risk, technical, labour, and external risks. With help from two studies, the study considers the risks like financial, construction, and environmental risk, how the risks impact the organization's construction project success.

1.2. Financial Risk

It refers to the group of risk, which influences the construction organization in delivering the project outcome. Risks associated with financial aspects include lack of funds from the clients, inflation, and the subcontractor's financial default. Financial risks have a direct association with contractor cash flow. If there are any insolvencies, it will affect the effectiveness of decision-makers within the organization. Many studies focused on assessing the financial risks and their influence on construction organizations (Hlaing *et al.* 2008; Ke *et al.* 2011). The primary reason for the emergence of such risks is to act without following the consensus stated by consultants, contractors, and owners. Failure in such aspects leads to wind up the contractors' agreements with the organization, raising extra payments from the respective organization, and purposefully filing for bankruptcy. The action, in turn, leads to face many consequences and affects the company performance (Liu *et al*. 2015; Hlaing *et al.* 2008; Ke *et al.* 2011). Imran *et al.* (2019) has stated that design, financial, technical, and labour risk have a significant impact on Pakistan's construction project. (Qammaz, AlMaian 2020) have pointed out that inflation, insolvency and lack of clarity on payment of taxes ruin the construction sector's project success. Hence the study uses the attributes to measure the financial risks to integrate them with the project's success.

1.3. Construction Risk

Construction risks are more prone to safety and health issues, labour disputes, strikes, inadequate quality, and change-order negotiation. Construction risks are of two types. First, the risks consider as the most critical risks related to the above-stated attributes. The second risks are the least essential: acts of god, permits, ordinances, and regulations issues (Tang *et al.* 2007; Al-Bahar, Crandall 1990). From the observation, the study identifies that no reviews have been made directly to assess construction risks. Hence the researcher includes the aspects and measures whether there is any impact of risks on project success in the construction sector.

1.4. Environmental Risk

Environmental risks arise due to site pollution, dispersal of solvents or other materials, installing roofs, and improper storage of materials. Many projects had faced delays and poor performance

primarily because of environmental issues between political to ecological conditions. It is vital to avoid such risks to make the environment to be pollutant-free. Companies have to recognize the domain, formulate strategies based on the internal and external environment. Besides, any project's success relies on the formulation of strategy and executing it in the background (Ansah *et al.* 2016, 752).

1.5. Risk Response

Zhang (2016) stated in the study that getting quantitative support to measure the risks presented in the project. Generally, risk response analysis considers the risk as a separate one. Risks present in the project affect the execution of it to a great extent. Hence the authors have framed a model to identify the risks present in the project. With the model's help, the authors identify the expected risks that influence the managers to face losses. Besides, the model is useful in determining the appropriate risk response strategies. To identify the appropriate risk response strategies using the model, the authors rely on qualitative analysis. In qualitative research, the researcher uses the case study method. The case study method provides an outcome that the insufficient attention given to risk interdependence or even neglect creates the managers' problems. The action, in turn, accelerates the implementation cost of the project. The researcher derives out the neglecting it or giving less attention to influence the project in a significant way from the study. Hence the authors provide an insight that paying attention to risk response strategies diminishes the unnecessary costs incurred for the project.

1.6. Project Success

Project success refers to managing the project in a successful way, which helps to accomplish the tasks. Besides, the action will not stop failing to successful (Munns, Bjeirmi 1996, 81). However, Construction project success is the foremost important for the government or users or communities. Because modern projects face huge constraints, owning the clients and contractors finds it challenging to successfully deliver the project. More complexities in design and stakeholders' high involvement have affected the entire construction projects (Doloi 2009, 1245). The word project success has a different meaning for different jobs. Architects considering the project succeed in providing aesthetic performance, whereas contractors find success in profit from the project (Cooke-Davies 2002, 185). The construction project is

considered successful when it is completed on time. It should also be completed within the allocated budget and must satisfy the clients with the projects' quality. Success refers to getting a better outcome than expected. It may vary based on cost, followed by schedule, quality, and safety. Conventionally, project success measures with cost followed by time and safety (Turner, Cochrane 1993, 93). It has transformed to meet the user requirement, customer requirement and safeguard the project from environmental, safety, and quality risk.

Shrnhur *et al.* (1997) has pointed out that project success measuring using the statement like project efficiency, business success, and how the organization prepares it for the future. Project success can be viewed through two aspects, namely micro point and macro point. Micro points have attributes like time followed by cost, quality, and performance. However, macro points have assessed the aspects like time followed by satisfaction and utility and operation (Lim, Mohamed 1999, 243). Another study portrays that scope, time followed by cost, quality, HRM, communication, and integration management significantly impact project success (Ling *et al.* 2009, 59). Consequently, Hwang *et al.* (2014) have stated in the study that four attributes of quality followed by cost, schedule, and overall performance are the four crucial project success attributes. Zou *et al.* (2006) have focused on identifying the risks and measure the risk influence on project objectives.

Project objectives measures through time, cost, quality, and safety and environmental sustainability. Finally, the above-stated studies help identify the statistically significant success attributes: time, budget, and satisfaction (Wu *et al.* 2017; Krajangsri, Pongpeng 2017).

1.7. Project risk on project success: Global perspective

Abd El-Karim *et al.* (2017) pointed out that what are the variables influence cost and time. Also, it quantifies the risk assessment influence on cost and schedule. In a wide array of literature reviews, the authors identified the four primary attributes: site conditions, resources, project parties, and project factors. The study assesses the characteristics using quantitative research, consider survey as techniques. With the BRIAN model's help, the authors identified that changes in the legal framework, project goals, new technology, funds, and security requirements significantly impact project success.

(Pimchangthong, Boonjing, 2017) points out in the study that exploring the organization attributes influence IT project success. The study also identifies the risk attributes and assess how the attributes influence project success from the literature reviews, the risk management practices measured in terms of identifying the risks, analysing it, planning risk response, and monitoring the risk and controlling the success. IT project success is measured by process and product performance. The study uses quantitative research, uses survey techniques to measure the attributes. The statistical outcome makes it clear that differences in organization types influence IT project success in all aspects. Differences in organization size significantly affect project success in terms of product and process performance. Considering risk attributes identifying the risks, proper planning of risk response has the power to influence process performance and total aspects of project success. The study also finds that risk identification, risk response, was the most decisive influence on product performance, whereas risk analysis has an impact on product performance.

(Reed, Angolia 2020) has stated that how risk management practices influence virtual team projects. The study uses quantitative research in which survey techniques have been adopted. It uses attitude and behaviors with the help of the theory of reasoned action. The study provides an outcome that there was a strong association between risk management and successful development. Also, it finds that most respondents framed the risk management plan, followed the plan using well-trained project managers—the medium, in turn, influenced project organization culture and project success. The statistical test showed the results that project planning, project risk management have a strong association with success. Mediation analysis provides an outcome that risk management mediates the association between project planning and project success. However, organizational culture has no power to strengthen or weaken project risk management and project success.

Viswanathan *et al.* (2020) pointed out that the measurement of risk attributes on project success. Risk attributes include project planning, local participation, and contractor selection. The project success was assessed using features like cost performance, schedule, and firm performance. The study's nature is quantitative research, uses survey techniques, and evaluated the variables using SEM. Findings of the study state that risk mitigation attributes have the most influencing attributes on project success. The study concludes that risk mitigation attributes can accomplish project success and project management success.

Wu *et al*. (2017) represented identifying the factors that have a significant influence on project success. The study uses mixed methods to find out the risk factors which associate with project success. The study finds that risk attributes seen in designer, contractor, subcontractor, client and government have a significant impact on project success from the survey and qualitative analysis.

1.8. Project risk on project success: Pakistan perspective

Aftab *et al.* (2016) have stated that examining the construction sector's project success in Pakistan. In this study, the authors considered project management staff, project management leadership, and project management performance indicators as independent variables and project success as the dependent variable. The methods were determined based on quantitative research in which survey techniques were adopted. Correlation analysis pinpoints that all the variables are having a strong positive relationship with project success. Consequently, regression analysis highlights that all the attributes play a crucial role in determining project success in the construction sector. Hence, the researcher derives out that the project success factors from the study.

Imran *et al.* (2019) stated that the study gives more importance to risk attributes and project success in Pakistan's construction sector. The authors determine the risk attributes as design risk followed by technical risk, financial risk, labour risk, and external risk. All the risk attributes are considered as the independent variable. Project success is determined as the dependent variable. The partial least square modelling method provided a positive impact saw in selected risk attributes, namely design risk followed by financial and technical risk and labour risk. All others hurt project s, success in the construction sector in Pakistan. From the study, the researcher derives out the statistically significant attributes for the survey. It includes financial, technical, and labour risks. All the risks have been taken into account.

Semab *et al.* (2017) have focused on identifying the delay in construction projects in Pakistan. Besides, the study assesses whether there exists any relationship with the success of the project. The authors use quantitative research in which survey methods were adopted. Findings of the study highlight that project delays had a negative association with project success. Therefore, it

concludes that identifying the risks, monitoring correctly can not only reduce the delays. But also paves it to gain success in the market

Sohu *et al.* (2018) have shown that the attributes determine project success in Pakistan's construction sector. The authors also focused on assessing how the respondents gave ranks to the projects that apply the mean values. To evaluate the study, the authors applied quantitative research in which survey techniques were adopted. Statistical results state that an experienced project team management team, effective site management, and experienced team members play a crucial role in determining its success. Hence the study concludes that the quality projects completed within an appropriate time and budget are the primary attribute for the stakeholders to assess the organization's projects. The researcher gets the project success attributes like the quality of projects followed by cost and time taken into account from the study. However, there is no information regarding the statistical tools, and how the researcher determines the outcome is not defined in the study.

Tahir *et al.* (2019) have shown how the relationship exists between risk management and project success in Pakistan's construction industry. To determine the work's outcome, the authors fixed the extent of risk identification followed by the degree of risk assessment and aggressiveness of risk response as an independent variable, overall control of risk as a mediator, and project success as the dependent variable. Project success determines based upon schedule, followed by cost and quality. Statistical tools provide an outcome that risk identification has no relationship with project success of the sector. However, other variables have a strong positive relationship with the project success of the industry. From the study, the researcher derives out the quantitative methodology by using a questionnaire. A similar approach applies to the present study. Besides, the researcher uses both the dependent and independent variables from the survey. However, the researcher didn't consider the mediator variable to use in the study.

1.9. Theoretical framework

Both national (Pakistan) and international studies assist to find out the risk management attributes which is vital to assess the project risk management. The attributes identified from the above stated literature support is that identifying the project risk, analysing the project risk, monitoring the project risk and risk response. All the attributes consider as the independent

variable. However, the study measures the success of the project in terms of time, budget, and satisfaction.

2. METHODS AND EMPIRICAL ANALYSIS

2.1. Introduction

To address the research questions outlined above, the study reports how to carry out the methods and methodology in the present chapter. The study gets the opportunity to explore risk management and project success through the research onion framework. Using research onion is to use the interdependent layers and provide conclusive evaluation for the impact of risk management attributes on the project's success in the construction sector. All the layers of research onion illustrated along with the justification of using such layers in the study are stated in the below section.

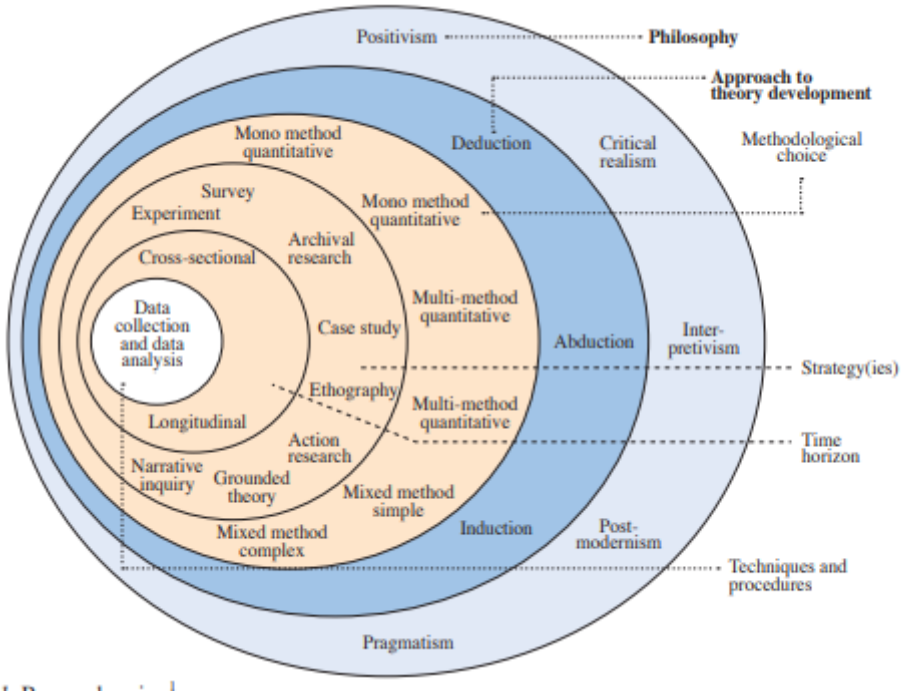

Figure 1. Research onion Framework
Source: Saunders *et al.* (2009)

2.2. Research onion framework

Research onion framework includes research philosophy, research approach, research strategy and time horizon

Research philosophy: The concept of research philosophy relies on the way the researcher thinks about the development of knowledge.

Justification of research philosophy: The positivism is backed up by (Biedenbach, Müller 2011) evidence, which supports the idea of risk management attributes and project success. Thus, the study uses the approach to get an appropriate outcome for the research questions raised above.

Research Approach: It defines how to use the theory to address the research questions at the beginning stage of raising research questions for the thesis. There are two types of approach; inductive and deductive approach.

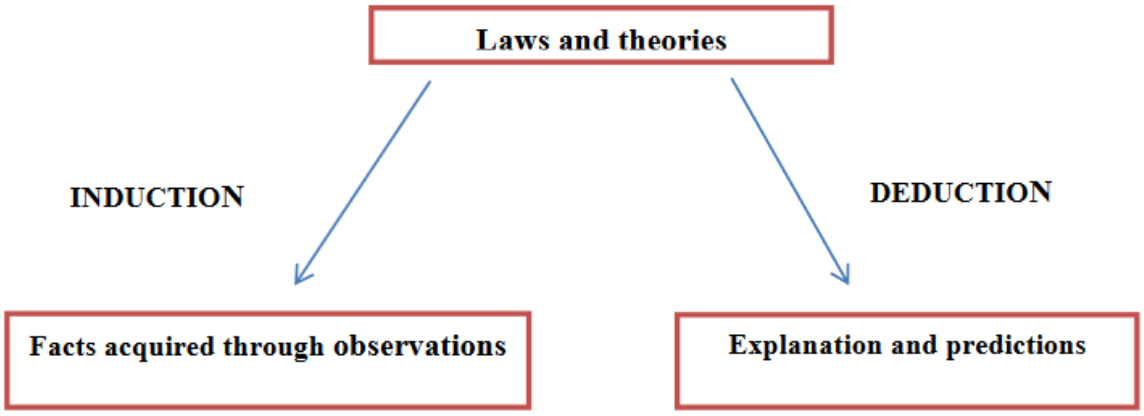

Figure 2. Research approach
Source: Saunders *et al.* (2009)

Justification: It is clear from the extensive evidence in the studies that De Azevedo *et al*. (2014) and Petrovic (2017) the deductive approach is the faster approach for resolving the research issues related to risk management and construction project success. Thus, the researcher adopts such an approach, identifies the attributes that support risk management and how it influences the project's success.

Research Strategy: It outlines the typical structure of how the researcher plans to address the research queries. The integral part of the research methodology is to choose the appropriate strategy based on research goals. The research strategy is three types; first is a quantitative method, the second is a qualitative method, and the third is a mixed method.

Justification: Quantitative method utilized as a research strategy in the method. Because the researcher uses techniques in endeavouring to optimize the neutrality followed by reliability and generalization of the outcome

Time horizon: It is the fifth layer in the research onion. These restrict the researcher to choose a cross-sectional study pattern for the study. Cross-sectional techniques help the researcher find out the scrutiny of a study group or smaller cluster that represents it in a given time. There is clear evidence supporting the cross-sectional approach is the best approach to resolve the research questions within the respective time limit (Saad *et al.* 2020).

2.3. Target area and population

The researcher conducts the study at Rawalpindi, Pakistan. The target population for the survey is construction companies in Pakistan. Ammar (2018) reported in the study that construction companies in Rawalpindi are more prone to risks, and hence the concept helped the researcher conduct the study in the same city. More recent work in this area centres around population as 250-300 construction firms presented at Pakistan (Rawalpindi) (Khan, Gul 2017, 900)

2.4. Sampling

It plays a crucial role in the research framework. It facilitates the researcher to investigate the small target group from the entire population. (Easterby-Smith, Thorpe 2002) Recently, a Malik *et al.* (2020) study reported that construction employees belong to Rawalpindi as a sample. Similarly, the study considers employees who are working in Rawalpindi, Pakistan, as samples

2.5. Sampling technique

It refers to how the researcher empowers the research by diminishing the amount of data gathered by bearing in mind small samples instead of taking the entire population (Saunders, Lewis 2012). There are different techniques, like probability sampling and non-probability sampling. A former represents a sample being picked out within the scope of researcher knowledge and equal for all the cases. Later describe samples pick out based on total population. Considering the suitability and benefits, the researcher selects the non-probability sampling that involves convenience sampling method

2.6. Sample size

The total population for the study is 300 construction companies, which include government and private organizations. The study fixes a confidence level of 95% and a confidence interval of 5%, and hence sample size is 120. Thus, the researcher approaches 120 companies in Rawalpindi and get proper survey responses from all the companies. The study approach the project manager of all the construction companies through web survey. The researcher have prepared the survey questions in Google form, sent to their respective email ID. With the help of survey, the researcher can measure the risk management attributes and its impact on success of project

2.7. Data collection

It is a measure of gathering information on respondents' opinions in an established way. Besides, it helps answer the research questions, fixes the hypothesis, and provide an outcome for the study. There are two types of data. One is qualitative, and the second is quantitative data. However, the study uses quantitative data to measure the aspects in mathematical form. Quantitative data collection is made in various ways. It consists of experiments, observations, surveys, interviews and questionnaires. Among various forms, the study picks out the questionnaire form, frame the questions relevant to the research in the google form and sent the form to the samples. The researcher had communication with the samples, induce them to participate in the survey. Finally, all the samples had recorded their opinion in the google form. Thus, the action saves a lot of time and money.

Generally, data classification is of two types, namely primary data and secondary data. Among the two data, the study picks out preliminary data and records the respondents' opinions for the first time. Even though sources are limited, primary data has more excellent reliability. Thus the researcher applies primary data that is commonly used in their study (Ghauri *et al.* 2020). Conversely, secondary data collected information such as background information and another author's opinion through journals, newspapers, or blogs

2.8. Reliability and Validity

Validity refers to how effective the inferences are drawn from the outcome of an assessment. However, reliability represents measuring the internal consistency of the items uses in the study. Both aspects have the power to increase transparency and diminish the biases present in quantitative research. Thus, the study assesses the factors using statistical tools. Reliability measures using Cronbach alpha, whereas validity using the kappa coefficient. The study gets opinions about the statements from the company officials using dichotomous questions. Subsequently, the researcher measures the opinion through the kappa coefficient. All the variables used in the study have an opinion between 0.80-0.90. Thus, the statement is having 64-81% agreement with the respective constructs. However, the Cronbach alpha for the construct is 0.890 above the standard limit (0.70) for 35 items. Thus, the items used in the study has a higher internal consistency

2.9. Ethical considerations

For research to succeed, the researchers must focus on the study's key participants' ethical values. The researcher received permission from the main interviewees who took part in the class during the data collection. No other workers have been injured and injured during data processing. (Hantrais, Mangen 2013) have reported that all the respondents must be given a choice to leave the procedure after registering their names for testing. Thus, the overall willingness of the respondents to carry out further research is gathered and invited.

Rossi *et al.* (2013), in comparison, claimed that the findings of the study could not be used for commercial purposes. The data gathered are vulnerable to the company, both for quantitative and

qualitative approaches. The researchers do not ask questions about the respondent's workers' details, such as the living room, salary, and more. The researcher does not urge the respondents to respond in line with their personal opinions, which helps collect results. In this report, the writer has adopted ethical considerations that indicate that the analysis has been performed correctly.

2.10. Statistical tools

The study measures the demographic profile of respondents using percentage analysis. Descriptive statistics uses to measure the Likert scale statement of variables. Pearson correlation uses to find out the connection between two variables. Consequently, simple linear regression applies to find out the impact of independent on the dependent attribute. Finally, one-way ANOVA uses to find out the differences in characteristics based on construction projects.

2.11. Data Analysis

This section outlines the specific statistical tools used in the research. Besides, it helps to provide a solution for the research questions raised in the above section.

The first part is to assess the demographic profile of respondents through percentage analysis. It includes age, work experience, and designation. Besides, the section also addresses how the methods used to identify project risk.

The second part is to measure the Likert scale questions of dependent and independent variables using descriptive statistics. The study uses mean and standard deviation to determine the accuracy of the variable's statement.

The third part is to evaluate the connection between the variables using correlation analysis.

The fourth part is to identify the effect of the independent variable on the dependent variable

The fifth part is to determine the differences in risk management attributes based on concerning construction projects.

2.11.1. Demographic profile of respondents

It represents tables and graphs and has several observations in the category and their respective percentages presented in the percentage column. The demographic profile of respondents includes age, work experience, and designation. Age is four categories: below 30 years, 30-35 years, 35-40 years, and above 40 years. Work experience classifies based on below two years, 2-4 years, 4-6 years, and above six years. Designation assesses based on the nature of the job. It includes the project manager, project engineer, site engineer, and team leader. The study also measures the currently working sector, namely apartment buildings, residential buildings, roads, and others. Others include commercial and industrial projects. The study assesses the methods to identify the risks, including brainstorming sessions, investing historical data on similar projects, and using industrial checklists, and others.

Table 1. Demographic profile of respondents

Particulars		Frequency	Percent
Age	Below 30 years	16	23.2
	30 to 35 years	14	20.3
	35 to 40 years	20	29.0
	Above 40 years	19	27.5
Work experience	Below two years	14	20.3
	2 to 4 years	16	23.2
	4 to 6 years	16	23.2
	Above six years	23	33.3
Designation	Project manager	13	18.8
	Project engineer	20	29.0
	Site engineer	15	21.7
	Team leader	21	30.4
Projects currently work in the organization	Apartment buildings	20	29.0
	Residential buildings	14	20.3
	Roads	18	26.1
	Others	17	24.6
Methods apply to identify the risks present in the project	Brainstorming sessions	17	24.6
	Investing historical data on similar projects	16	23.2
	Using industrial checklists	23	33.3
	Others	13	18.8
Total		69	100.0

Source: Author calculation

Age: The table indicates that 23.3% of participants are younger than 30 years, 20.3% are between 30 and 35 years old, 29% between 35 and 40 years old, and 27.5% over 40 years of age. It is also clear that the age categories with the most participants are between 35 and 40.

Work experience: 20.3% of the participants are less than two years of work experience, while 23.2% are between 2 and 6 years of experience, and 33.3% are more than six years of work experience. Thus, the study reveals that participants had more than six years of work experience with the highest preferences.

Designation: From the table above, 18.8% of the members are project managers, while 29% are project engineers, whereas 21.7% are site engineers, and 30.4% are team leaders. It then inferred that the team leader position is the maximum number of members preferred

Projects currently work in the organization: The table shows that 29% of the respondents are apartment buildings, 20.3% residential properties, 26.1% roads, and 24.6% others. So, there is a small bias towards roads; it can only be assumed that work in an organization tends to become the most involved in an apartment complex when it comes to projects.

Methods apply to identify the risks present in the project: From the table, 24.6% of respondents are brainstorming meetings, while 23.2% spend historical knowledge of related projects, accompanied by 33.3% using industrial checklists and 18.8% on other projects. It is also concluded that most respondents who have selected the techniques are used to identify the project's threats using industrial checklists.

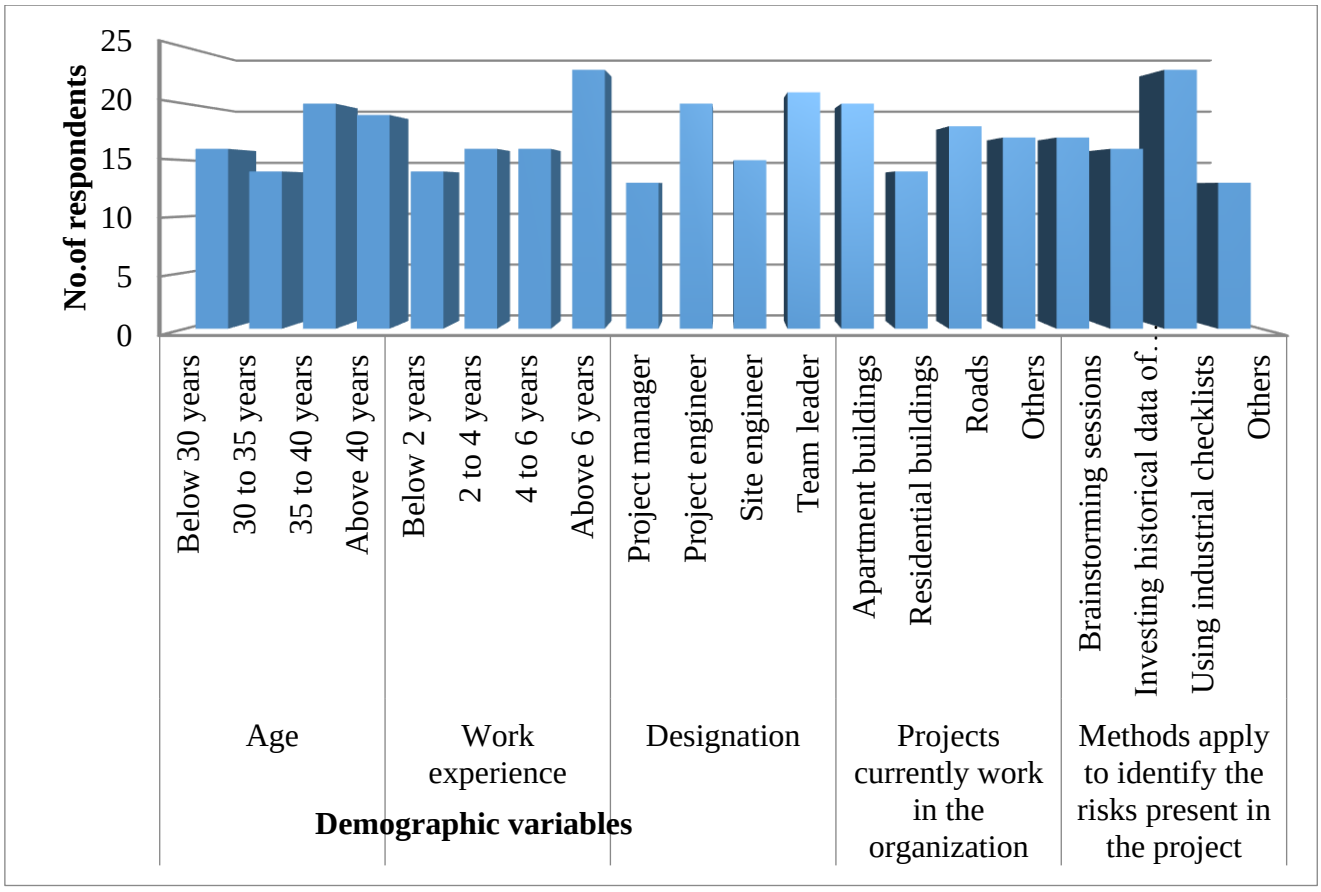

Figure 3. Demographic profile of respondents
Source: Own calculation

2.11.2. Descriptive statistics

Project risk: The researcher evaluates the risk in terms of three aspects: financial risks, construction risk, and environmental risk. Financial risk includes the statements like "lack of clarity on the allocation of responsibilities of payment for taxes," "lack of provisions for payments," and "lack of financial insolvency." A construction risk contains the statement like "non-availability of labour," "lack of soil and site conditions," "material shortages and no site safety." Environmental risks measures through the statements like "adverse weather condition," "pollution and safety rules," and "opposition from public in executing the project in the concerned area." Financial risks secure mean as 3.44 and standard deviation as 1.32. Construction risks have 2.78 as mean and 1.43 as standard deviation. Simultaneously, Environmental risks have a mean value of 2.85, and a standard deviation of 1.35 and Construction projects have higher financial risks than construction and environmental risks. The highest accuracy was seen in financial risks and the lowest accuracy in construction risks.

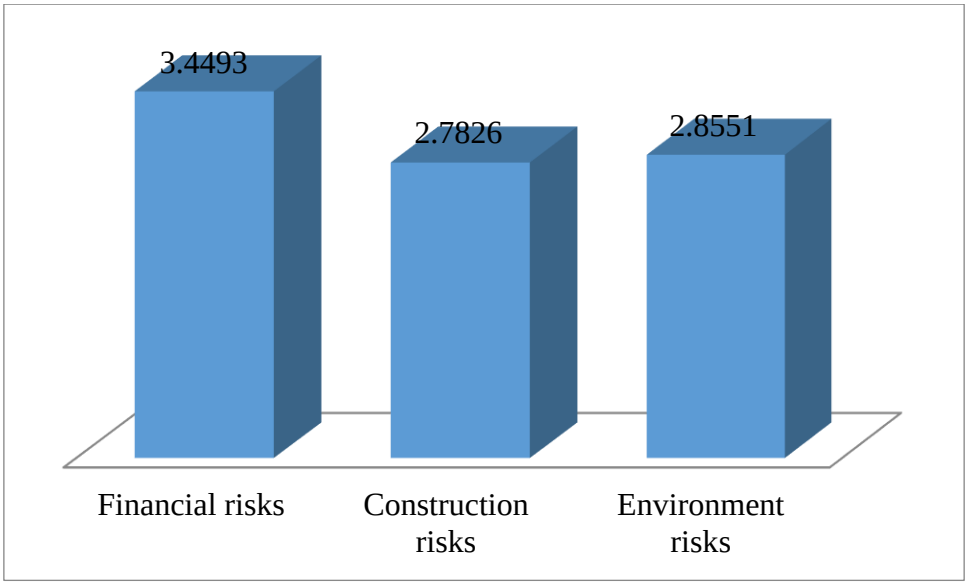

Figure 4. Descriptive statistics for rank the project risks do you face while constructing the projects
Source: Own calculation

Finanical Risk: Financial risks measures through the lack of clarity on allocating payment for taxes, lack of provisions of partial payment for projects, and lack of financial insolvency of stakeholders. The statement "lack clarity on the allocation of responsibilities of payment for taxes" was reported with 3.10 as the mean value and 1.42 as the standard deviation. The statement "lack provisions of partial payment for projects" was indicated with 3.14 as mean value and 1.30 as standard deviation. The statement "lack financial insolvency of stakeholders" was noted with a mean as 3.20 and standard deviation as 1.30. Financial risks were higher because of the lack of financial insolvency of stakeholders. The highest accuracy was due to the "lack of financial insolvency of stakeholders." However, the lowest accuracy was "lack of clarity on allocating responsibilities of payment for taxes."

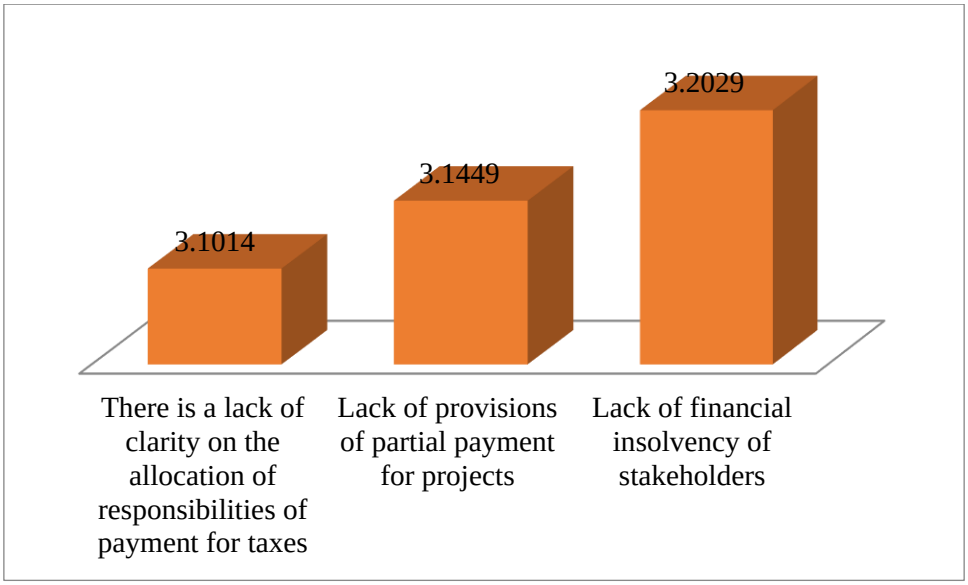

Figure 5. Descriptive statistics for financial risks
Source: Own calculatiom

Construction Risk: The construction risks of projects measures through the statements. The statements like “non-availability of labor,” “no proper soil and site conditions to execute the project,” “material shortages and quality,” and “ lack of site safety.” The non-availability of labour mean score is 2.98, and their standard deviation is 1.52. No proper soil and site conditions to execute the project was reported, with the mean score is 3.3, and their standard deviation is 1.38. Material shortages and quality were indicated with a mean score of 3.2 and a standard deviation of 1.43. There is no site safety noted, with a mean score of 2.92 and a standard deviation of 1.60. All the mean scores of construction risks ranged between 2.92-3.3. The highest construction risk was made due to a lack of proper soil and site conditions to execute the project. Others have the least effect on the project. The highest accuracy was due to no adequate soil and site conditions to manage the project, whereas the least accuracy was due to lack of site safety.

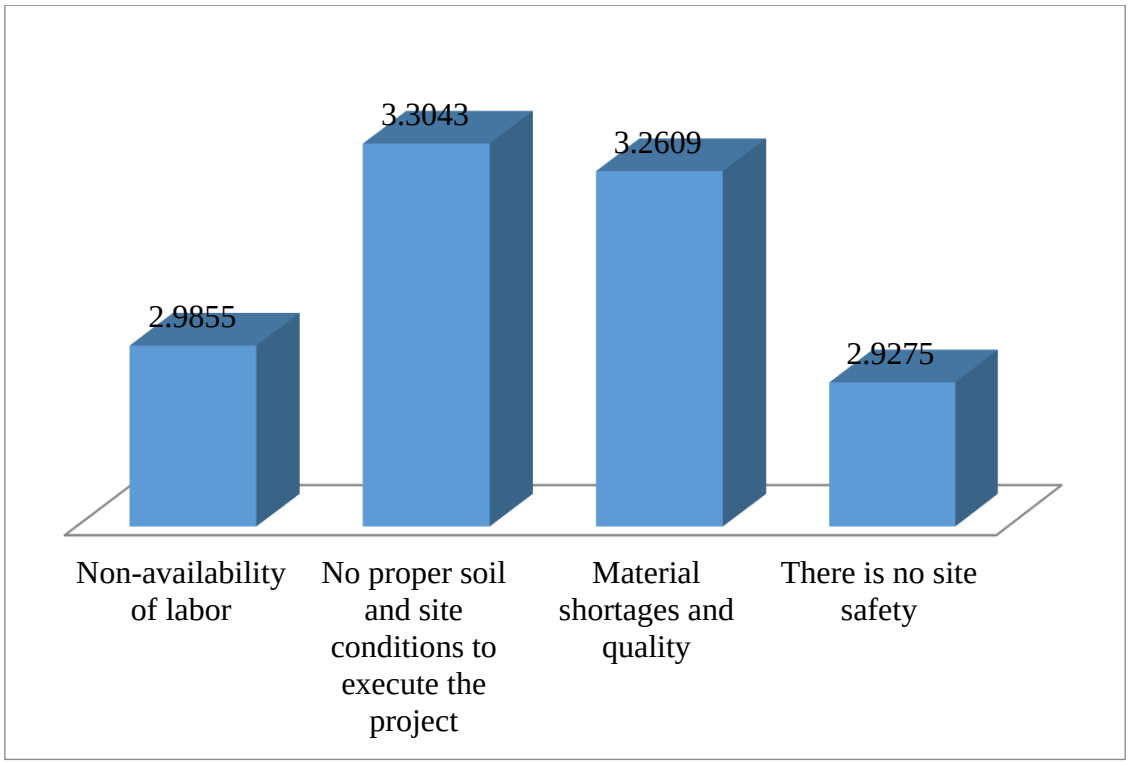

Figure 6. Descriptive statistics for financial risks
Source: Own calculation

Environmental risk: The study measures it with the help of various statements. Statements like "there are adverse weather conditions," "pollution and safety rules," and "opposition from the public to execute the project." Adverse weather conditions are indicated the mean score as 2.9 and their standard deviation as 1.49. Pollution and safety rules have their mean score as 3.10 and standard deviation as 1.38. There is opposition from the public to execute the project in the concerned area have the mean score as 2.71 and standard deviation as 1.44. All the values ranged between 2.7-3.1. The highest accuracy is presented in the statement "Pollution and safety rules," whereas the lowest accuracy is denoted with the statement "there is an adverse weather condition."

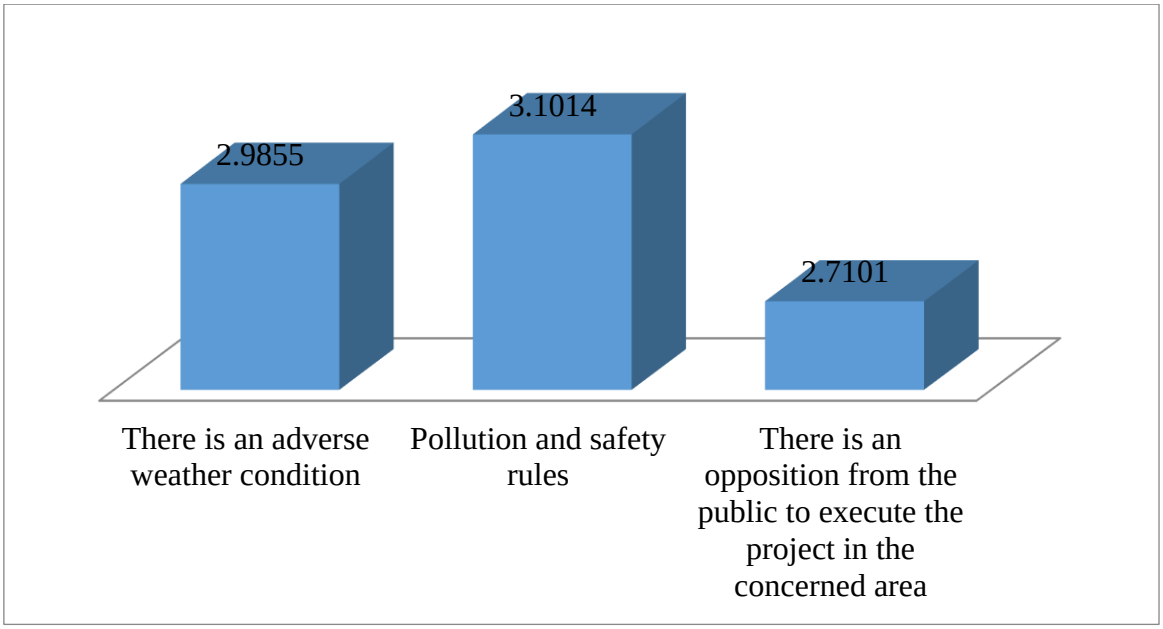

Figure 7. Descriptive statistics for environemntal risks
Source: Own calculation

Risk response: It measures using statements like “there is an action which has to be taken to deal with the risks,” “focuses on preventive action which prevents the risks,” “giving care to the risks through risk response.” The mean score for the statement “ there is an action which has to be taken to deal with the risks” is 2.92, and the standard deviation is 1.33. The statement “it focuses on preventive action that prevents the risks” has a mean score of 2.71 and a standard deviation of 1.466. The statement “giving care to the risks through risk response” has a mean score of 3.24 and a standard deviation of 1.31. The values are ranged between 2.7-3.2. The highest accuracy was with the statement “giving care to the risks through risk response,” whereas the lowest accuracy was with “focuses on preventive action which prevents the risks.”

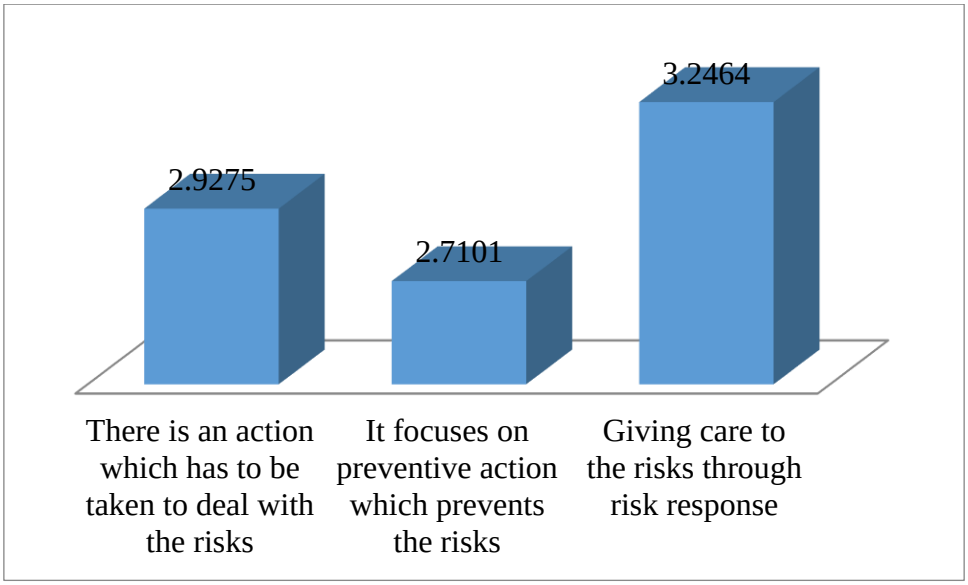

Figure 8. Descriptive statistics for risk response
Source: Own calculation

Risk management: The study measures risk management through the statements. Statements like "transfer risks to others," "use alternative contract strategies to manage the risks," redesign the project," and "use different methods for constructing the projects. All the risk management mean scores ranged from 2.7 to 3.2. The statement "I will transfer the risk to others in terms of bidding a high amount" has a mean score of 3.08 and a standard deviation of 1.47. Secondly, "I will use alternative contract strategies to manage the risks" with a mean score of 3.23 and a standard deviation of 1.30. Thirdly, "I will redesign the project" have a mean score of 2.76 and a standard deviation of 1.27. Finally, the statement "I will use different methods for constructing the projects" was 3.14 and the standard deviation as 1.23. The highest accuracy was with the statement "I will redesign the project," whereas the lowest accuracy denoted the statement "I will transfer the risk to others in terms of bidding a high amount."

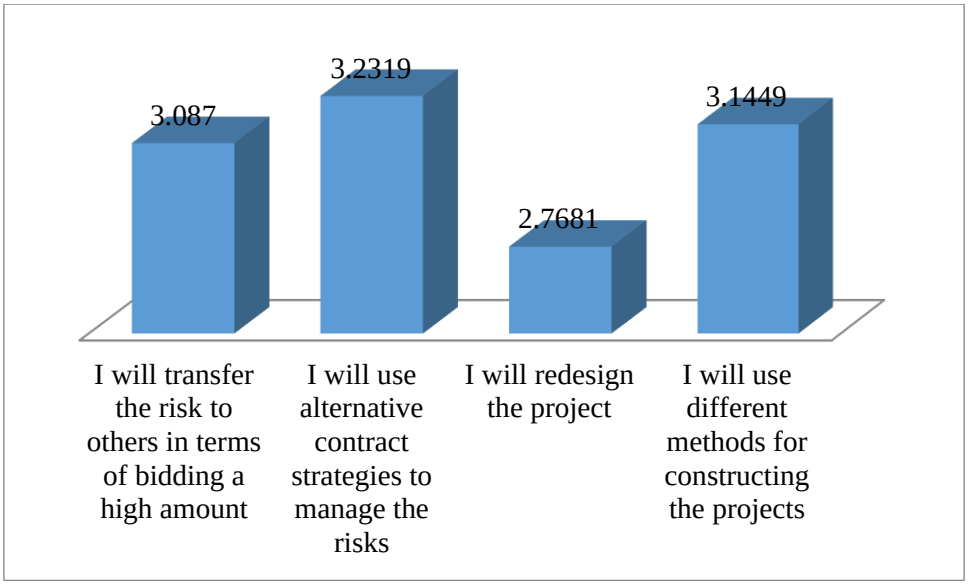

Figure 9. Descriptive statistics for manage the risks which emerge in construction projects
Source: Own calculation

Project success: The study measures the project success through statements like "efficiency of use of resources," on time," within the budget," "the project completes based on specified quality standards," "The absence of disputes between the parties helps to complete the project within the stipulated period," "health, safety, and environmental control," "quality of the project is satisfactory to all the stakeholders." All the statement denotes project success, and the values ranged between 2.8-3.2. The statement "There is an efficiency of use of the organization's resources" has said the mean score is 2.85 and the standard deviation is 1.49. Secondly, "The project completes on time" has secured a mean score of 2.92 and a standard deviation of 1.33. Thirdly, "project completion within a budget" has a mean score of 2.87 and a standard deviation of 1.48. Fourthly, "the project completes based on specified quality standards" secured with the mean score as 2.94 and their standard deviation as 1.49. Fifth, "the absence of disputes between the parties helps complete the project within the stipulated period" has 3.04 as the mean score and 1.39 as the standard deviation. Sixth, "health, safety, and environmental control" have the mean score as 3.24 and 1.36 as standard deviation. The highest accuracy was with the statement "the project completes on time" whereas the lowest accuracy with the statement" The project completes based on specified quality standards."

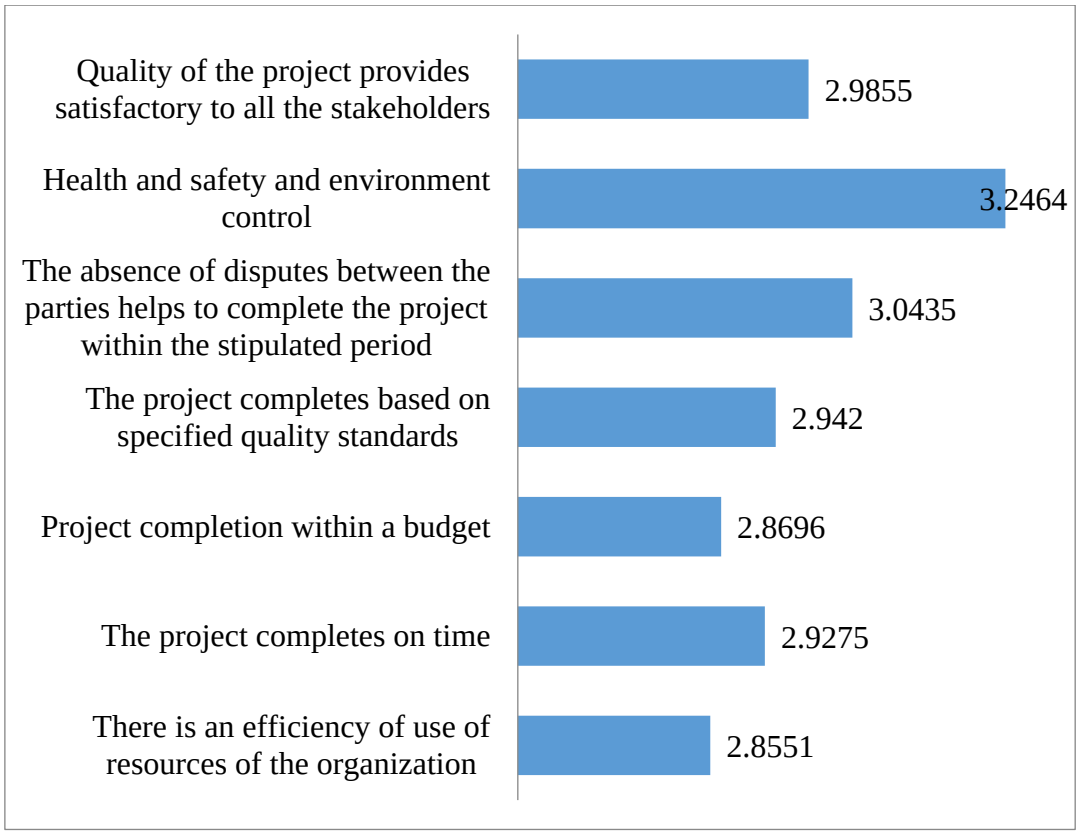

Figure 10. Descriptive statistics for project success
Source: Own calculation

2.11.3. Association between project risks attributes and project success

It uses to identify the association between two variables. The study fixes project success as a dependent variable, identifies the project risk, analyses the project risk, and monitors the project risk as an independent variable. The outcome of the analysis has been described in detail in the below table.

Table 2. Correlation showing the association between the probability of the project when conducting the tasks and project success

Particulars		Value	Sig
Project success	Identifying the project risk	0.638	0.000
	Analyzing the project risks	0.830	0.000
	Monitoring the project risk	0.932	0.000

Source: Author calculation

The table reveals that the correlation shows the association between risks and their relationship with the project's success.

H1: Identifying the project risk has a close association with the success of the construction project

The value of correlation uses to determine the connection between identifying the project risk and success of the construction projects. The value is 0.638; the p-value is less than a 5% level of significance. Thus, the value determined that identifying the project risk has a close association with the success of the construction project

H2: Analysing the project risk has a close association with the success of the construction project

Secondly, the correlation between analyzing the project risk and the success of construction projects measured. The value is 0.830, and the p-value is 0.000, it resulted in the conclusion that Analysing the project risk has a close association with the success of the construction project.

H3: Monitoring the project risk has a close association with the success of the construction project

Thirdly, the correlation between environmental risk and the success of construction projects presents in the above table. The value is 0.932, and the p-value is 0.002. Thus, it has been concluded that monitoring project risk has a close association with the construction project's success.

2.11.4. Impact of project risk attributes on project success

In this work, the researcher looks to improve the earlier correlation approach. Using simple linear regression analysis helps identify whether the variables have a linear relationship (Dependent and independent variable). Besides, It assists in measuring the significant effect of the independent variable on the dependent variable.

Identifying the project risks and its effect on project success: To address the research questions outlined above, the researcher uses simple regression analysis to identify the statistical effect of how identifying project risk affects the success of the construction projects. The study considers identifying project risk as an independent variable and project success as a dependent variable.

H1: Identifying the project risk affects the success of the construction project

Table 3. Identifying the project risk affects the success of the construction project

R	R^2	Adj R^2	Std. Error of the Estimate
.583[a]	.340	.312	.53544

The value of r is 0.583, which shows that identifying the project risk and project success has a linear relationship between them. R square value for both variables is 0.340, representing that identifying the project risk has a 34% effect on the construction project's success

Particulars	S.S.	df	M.S.	F	S
Regression	.053	1	.053	.185	.000[b]
Residual	19.209	67	.287		
Total	19.262	68			

From the ANOVA table, it is clear that f statistics is 0.185 and sig. is 0.000. Thus, it observes that identifying the project risks helps to predict the success of the construction project.

Particulars	USC		SC	t	s
	b	std. error	b		
(Constant)	2.917	.163		17.847	.000
Identifying the project risk	.026	.061	.583	.431	.000

Source: Author calculation

Identifying the project risk secures beta value as 0.583 and t as 0.431, and sig as 0.000. Thus, the study found that one unit of changes in identifying project risk has changed from 0.026 unit changes in project success. The regression equation for the variable is

Project success=2.917+0.026(identifying the project risk)

Analysing the project risk and its effect on the success of the construction project: Simple linear regression is used to identify the how analysing the project risk affects the success of the construction project. The study adopts the project risk as an independent attribute and its success as a dependent attribute

H2: Analysing the project risk affects the success of the construction project

Table 4. Analysing the project risk and its effect on the success of the construction project

R	R^2	Adj R^2	Std. Error of the Estimate
0.686	0.471	.005	.53357

The R-value for both variables is 0.686, representing that the project risk analysis has a linear association with the project's success. The value of r square is 0.471, indicating that the project risk study has a 47.1% impact on project success

Particulars	S.S.	df	M.S.	F	S
Regression	.187	1	.187	.656	.000[b]
Residual	19.075	67	.285		
Total	19.262	68			

The study finds f statsitics as 0.656 and sig as 0.000 with the ANOVA table's help. Thus, it concludes that analyzing the project risk helps to predict the success of the construction project. The data fit to predict the success of the project

Particulars	USC		SC	t	s
	b	std. error	b		
(Constant)	2.865	.158		18.180	.000
Analyzing the project risk	.037	.046	0.686	.810	.000

Source: Author calculation

The coefficient table observes that the beta value is 0.686, the t value is 0.810, and the significance is 0.000. Therefore, it infers that analyzing project risk affects the success of the project. The regression equation for the variable is

Project success =2.865+0.037(Analysing the project risk)

Monitoring the project risk and its effect on the success of the construction project: The purpose of the section is to measure how monitoring the project risk affects its success. The study observes that monitoring the project risk is considered independent, and project success as a dependent variable.

H3: Monitoring the project risk affects the success of the construction project

Table 5. Monitoring the project risk affects the success of the construction project

R	R^2	Adj R^2	Std. Error of the Estimate
.672[a]	.452	.414	.52858

The value of r is 0.672, which indicates that the variables (monitoring the project risk and project success) have a linear relationship with them. The value of r square is 0.452, representing that the project risk monitoring has a 45.2% effect on the project's success

Particulars	S.S.	df	M.S.	F	S
Regression	.542	1	.542	1.939	.000[b]
Residual	18.720	67	.279		
Total	19.262	68			

From the table, the study observes that the f statistics is 1.939, sig as 0.000, which is lesser than the 5% level of significance. Thus, it has been concluded that monitoring the project risk fits to predict the project's success

Particulars	USC		SC	t	s
	b	std. error	b		
(Constant)	2.806	.141		19.846	.000
Monitoring the project risk	.060	.043	.672	1.393	.000

Source: Author calculation

The coefficient table shows the beta value as 0.672, and the t value as 1.393 and the P-value is 0.000. Thus, it is clear that single unit changes in monitoring the project risk, 0.060-unit changes in project success. The regression equation is

Project success = 2.806+0.060(monitoring the project risk)

Risk response and its effect on the success of the construction project: The section measures the risk response and its effect on the success of the construction project. The study considers the risk response as an independent variable and project success as a dependent variable.

H4: Risk response affects the success of the construction project

Table 6. Risk response and its effect on the success of the construction project

R	R^2	Adj R^2	Std. Error of the Estimate
.504	.254	.225	.53616

Risk response and project success secure r value as 0.504, which depicts that the variable has a linear association among them. The r square value is 0.254, which represents that risk response has a 25.4% impact on the construction project's success

Particulars	S.S.	df	M.S.	F	S
Regression	.001	1	.001	1.205	.000[b]
Residual	19.260	67	.287		
Total	19.262	68			

From the Anova table, the study observes that the f statistics is 1.205 and sig as 0.000, which is lesser than 5% level of significance. Thus, it signifies that the risk response helps to predict the success of the construction project.

Particulars	USC		SC	t	s
	b	std. error	b		
(Constant)	2.964	.262		11.329	.000
Risk response	.006	.086	.504	.070	.000

Source: Author calculation

The coefficient table shows the beta value as 0.504, and t value as 0.070 and the significance as 0.000. Thus, it is clear that one unit of changes in risk response makes a 0.006 unit of changes in project success. The regression equation is Project success=2.964+0.006(risk response)

2.11.5. One-way ANOVA

It uses to compare the mean of two more groups. The primary purpose is to determine the differences between class means (Jiryaei *et al.,* 2013).

Financial risk based on construction project: The study measures projects from various perspectives. Construction projects related to apartment buildings, residential buildings, roads, and others. Other categories represent it as commercial and industrial projects. A detailed analysis of one-way ANOVA for the management of risks is directed in the below section. (Appendix)

In this study, the researcher assesses that the significant difference between financial risk and construction projects.

The first statement is, “There is a lack of clarity on the allocation of responsibilities of payment for taxes,” which indicates that the highest mean value in others is 3.41 and the least in apartment buildings. Thus, the others have an increased lack of clarity on allocating payment for taxes than other construction projects, namely apartment building, residential building, and roads.

The second statement is, “Lack of provisions of partial payment for projects.” It clarifies that the highest mean value in apartment buildings is 3.35, and the least is a residential building. Hence, the apartment building project has an increased risk of partial payment provisions than another project.

The third statement is, “Lack of financial insolvency of stakeholders,” which shows the most significant mean value is residential building (3.36) and the lesser one is others. Therefore, it is inferred that the residential building has a high risk of stakeholders’ financial insolvency than others.

Finally, it concludes that the One-way ANOVA shows that the F-value is 1.856 and the P-value is 0.000. It then evident that the financial risk has a substantial difference with the construction projects

Construction risk based on construction project: The researcher found in this study that the construction risk has a significant difference with the construction project.

The first statement is “Non-availability of labor.” which indicates that the most considerable mean value in a residential building (3.29) and the least is others. Therefore, it concludes that the residential building has a high Non-availability of labor than other construction projects.

The second statement is, “No proper soil and site conditions to execute the project.” shows that the highest mean value is 3.5 for residential building and the fewer ones are others. The residential building has no proper soil and site conditions to execute the project than other projects.

The third statement is, “Material shortages and quality,” which has the enormous mean value is apartment building (3.45), and the least is others. Hence it concludes that the apartment building has a shortage of material than another construction project.

The fourth statement is, “There is no site safety,” shows that the highest mean value is roads (3.17) and the least is others. It thus concludes that the road has no site safety than other construction projects.

Hence it is then inferred that the one-way ANOVA indicates the F-value is 2.225, and the P-value is 0.000, which shows a significant difference between the variables

Environmental risk based on construction project: In this study, the researcher assesses a significant difference between environmental risk and construction projects.

The first statement is, “There is an adverse weather condition,” which shows the highest mean value is roads (3.39) and the least is 2.64 in others. It then concludes that the roads have an increased risk of adverse weather conditions than other construction projects.

The second statement is, “Pollution and safety rules,” has the highest mean value is apartment building (3.45) and the least in others. Therefore, it is evident that the apartment building has a high safety and pollution rules than others.

The third statement is, “There is opposition from the public to execute the project in the concerned area,” which indicates that the highest mean value is others (2.88) and the least is roads. Thus, the others have opposition from the public to execute the project in the concerned area.

Finally, it is inferred that the One-way ANOVA shows the F-value is 1.1785 and the p-value is 0.000. Hence it is concluded that there is a significant difference between the variables

Analyzing the project risk based on construction project: The study assesses the project risk has a significant difference with construction projects.

The first statement is “The risks likelihood of the projects always assessed,” which shows that the highest mean value in others (3.82) and the least is the residential building. Therefore, it concludes that the other has an increased risk of the projects always assessed.

The second statement is, “Risk impact always assessed,” shows that the highest mean value is 3.78 for residential building and the fewer roads. Hence it concludes that the residential building has a high impact always assessed other projects.

The third statement is, “Evaluation of Probability and impact matrix done to know the priority and importance for identified project risks,” which has the enormous mean value is others (3.47), and the least is a residential building. Hence, it concludes that the others have a high impact matrix to know the identified project’s priority and importance.

The fourth statement is, “Risk exposure estimated well in advance,” which shows that the highest mean value is roads (3.17) and the least is a residential building. It thus concludes that the road has a high-risk exposure estimated well in advance than another project.

Hence it is then inferred that the F-value is 2.238 and the P-value is 0.000, which shows a significant difference between the variables

Managing the risk based on construction project: The study assesses the project risk has a significant difference with construction projects.

The first statement is, “I will transfer the risk to others in terms of bidding a high amount,” which has the most considerable mean value is 3.4 for an apartment building, and the least is roads. It then concludes that the respondents will transfer the risk to others to bidding a high amount in an apartment building than the other construction project.

The second statement is, “I will use alternative contract strategies to manage the risks,” indicates that the highest mean value is 3.65 for an apartment building, and the less is others. Thus, the respondents use alternative contract strategies to manage the risks in the apartment building than others.

The third statement is, “I will redesign the project,” which has an enormous mean value is roads (3.00), and the least is an apartment building. Therefore, it is evident that the respondents will redesign the project on roads.

The fourth statement is, “I will use different methods for constructing the projects,” which shows that the highest mean value is residential building (3.71) and the least is roads. It thus concludes that the respondents use different methods for constructing the project’s residential building than another project.

Finally, the one-way ANOVA indicates that the F-value is 1.953, and the p-value is 0.000, which shows a significant difference between the variables.

2.12. Result

The percentage analysis found that most of the participants were between 35 and 40 years. The respondents are having more than six years of work experience, which is sufficient to get an appropriate outcome of the study. Most of the respondents are occupying the position of a team leader in the respective organization. The highest number of companies are currently in the apartment building projects. Consequently, construction companies assess the risks using "industrial checklist" methods to identify the project's risk.

The descriptive statistics reveal that the data were reported by the mean and standard deviation in this survey. Construction project risks assess in terms of three aspects. Environment risk, financial risk, and construction risks. Out of three risks, the construction project has the highest financial risks than others. Financial risks were high due to the "lack of financial insolvency of stakeholders." Construction risks were high was due to no proper soil and site conditions to execute the project, whereas the least accuracy was due to lack of site safety. Environmental risks in the construction project are high due to pollution and safety rules. Project risks measures "the project completes on time."

However, a correlation exists between the risks and their relationship with the success of the project. Identifying the project risk has a close association with the success of the construction project (0.638). Analyzing the project risk has a close association with the success of the construction project. (0.830). Monitoring the project risk has a close association with the success of the construction project. (0.932)

Simple linear regression shows that the project risks and its effect on project success. Identifying project risk has a 34% effect on the success of the construction project. Analyzing the project risk has 47.1% the success of the construction project. Monitoring the project risk has a 45.2% effect on the success of the project. Risk response has a 25.4% impact on the success of the construction project.

One-way ANOVA reveals that the significant difference between the risk-based and construction project. The financial risk was high in roads and other sectors. The primary reason for the emergence of risk is the lack of clarity on allocating payment responsibilities for taxes. However, the lack of clarity risks was lower in the apartment and residential building projects. Lack of partial payment provisions for projects was high in apartments, roads, and other projects; however, significantly less in a residential building project. Lack of stakeholders' financial insolvency was increased in an apartment building project, residential building project, and roads. Finally, it concludes that the financial risk has a substantial difference with the construction projects. Construction risks were high in residential building projects than others. Non-availability of labour and No proper soil and site conditions to execute the project is high in residential buildings. Consequently, material shortage and quality are high in the apartment and residential building. Thus, the outcome states the construction risks vary based on the nature of construction projects Environmental risks were high in the residential building project. The statement "There is an adverse weather condition" is high inroads than others. Pollution and safety rules are high in apartment buildings and residential buildings. Finally, the outcome states that environmental risks vary based on construction projects.

2.13. Discussion

Risk varies based on the nature of the project and may change based on the project life cycle (Smith *et al.* 2006). The Management of risks is a proactive decision process. It focuses on accepting the risk and instantly reduces the threats and accelerates the opportunities present in the project. Construction companies are focused on profits in minimizing the risk and uncertainty present in the project. The stages of risk management start from the identification of risk to control the risks. A detailed explanation of the risk management process stated below

What are the risk management attributes?

Construction companies in Pakistan assess the risks through the industrial checklist method. It is quite a surprise to find fewer tools like brainstorming, expert judgment, and the Delphi technique (Ali *et al.* 2007). Risk management is a proactive approach, and hence the below-stated attributes are used to assess the risks present in the project. To evaluate risk management attributes as identifying the risk, analyzing the risk, monitoring the risk, and risk response. The observation

of the variables agrees with risk management attributes similar to that investigated in this study (Banaitiene, Banaitis 2012, 429).

What are the attributes included to assess project success?

Another study portrays that scope, time followed by cost, quality, HRM, communication, and integration management significantly impact project success (Ling *et al.* 2009, 59). Consequently, Hwang *et al.* (2014) has stated in the study that four attributes of quality, followed by cost, schedule, and overall performance, are the four crucial project success attributes. Zou *et al.* (2006) have focused on identifying the risks and measure the risk influence on project objectives. Thus, the consistent literature support, helps to derive project success attributes for the study: time, cost, efficiency, health and safety environment control, and quality.

What is the relationship between risk management attributes and project success?

The nature of the relationship between the variable is positive, and the variables are statistically significant. Voetsch *et al.* (2004) reported a positive relationship, and the observation also agree with the present study

How much impact does risk management attributes have on project success in the construction industry?

Consequently, risk management attributes had a linear relationship with the success of the project. Attributes like analyzing the risk and monitoring risks had a high impact on the construction project's success. However, identifying the risks and risk response is having the least impact on the project's success.

How to overcome the risk attributes to make the projects to be a success in the Construction industry?

The risk attributes vary based on the nature of projects. The study assesses the nature of projects like apartment buildings, residential buildings, roads, and others. Risks may vary based on the nature of projects. The study assesses the risks using three attributes: environment risk, construction risk, and financial risks. Ansah *et al.* (2016); Tang *et al.* (2007); Al-Bahar, Crandall (1990); and Imran *et al.* (2019) demonstrated that risks were significant which have an impact on the success of the project. Thus, the risks have been taken into account. It is quite a surprise to find that residential buildings have high construction and environmental risks. It happens due to a lack of proper risk management (Bowen *et al.* 1999). The results were compared with the

previously reported findings that improper decision leads to create disputes in the construction project (Prakash *et al.* 2017)

In Pakistan, financial risk considers as the primary risk which emerges due to lack of financial insolvency and lack of partial payment for the projects. Such risks affect all kinds of projects. It was high on roads and other sectors, and the outcome contrasts with the previous studies that roads and other sectors have a low risk (Choudhry, Iqbal 2013, 42). The primary reason for getting varied results is that the survey uses fewer samples compared to previous studies. Appointing skilled personnel who have made effective risk response strategies helps to overcome the above-stated constraints and make the construction project to be effective in the market. Overall, the study fails to address how the risk response strategies vary based on risk and type of projects.

CONCLUSION

The fundamental goal of the study is to identify the risk attributes which influence construction projects in Pakistan. The study gets assistance from network theory, and identifies the project risks, analyzes the risks, manages the risks, and risk response as risk management attributes and project success as the dependent variable.

The study objective is to identify the relationship between risk management attributes and project success. With the help of correlation analysis the study finds that all the risk management attributes have a strong relationship with the construction project's success.

Second objective is to find out the impact of risk management attributes on project success. Regression analysis provides an outcome that identifying project risk has a 34% effect on the success of the project. Analyzing the risk has a 47.1% impact on the success of the project. Monitoring the project risk has a 45.2% impact on the success of the project. Lastly, risk response has a 25.4% impact on the success of the project.

Third objective is to provide suitable suggestions to overcome the risk attributes and accelerate project success in the construction industry. To achieve the outcome, the study provides the implications that the construction companies have to follow the implications of identifying the risks through brainstorming; past historical data helps to know the impact of risks on the project. It is also vital to follow the risk management process, discuss the risks with appropriate team members, and take necessary action to pave the way to make the project successful in the environment.

The implication of the findings in terms of risk management attributes are described
The study observes that classifying the risks based on the nature of projects guide to know how the project suffers due to risks

Construction risks: One of the essential construction risks is the non-availability of labor. Construction companies face such issues, especially apartment building projects, road projects, and other commercial projects. The non-availability of labor is a crucial risk that can reduce the sustainability of the business in Pakistan. Thus, it is vital to overcome such constraints by inducing such employees to take part in vocational training and provide proper education.
The second constraint is the lack of proper soil and site conditions to execute the residential building project in the residential area. The companies should get appropriate documents from the clients and check the document if there is any information regarding the stoppage of work until the higher officials' decision in the respective document. If any technical problems are encountered in the respective site, dropping the project can help them retain the company image in public eyes.

The third constraint is material delivery delays that emerge due to a lack of finance, government regulations, and contractual relations. Such discrepancies influence the material delivery delay, which in turn leads to disrupts and claims. Hence it is advisable to follow JIT to overcome the problems present in the project.

Environment risks: Construction works performed in an outdoor environment. Adverse weather conditions like cold, ice, severe heat likely to affect the construction works. Employees have to put more effort into performing tasks in such a situation. Hence, it is essential to take precautions like performing the job faster, improve cost control and process, to appoint a skilled workforce, and do effective planning to finish within the respective time and budget.

Financial risks: Construction project faces due to lack of stakeholders' financial insolvency and lack of provision of partial payment for the projects. The best way to overcome the constraints is that explaining such a situation with the companies, resolving the issues through contracts or arbitrage can avoid the emergence of risks in the construction project.

The study identifies the emergence of risks in three attributes. It is vital for the construction companies to find out presence of risks, conduct expert judgement, brain storming sessions to identify it. Analyzing such risks through skilled personnel well in advance can resolve such risks in future. Risks are high in apartment buildings and roads projects. Thus, the companies have to appoint skilled personnel to investigate the risks properly. Managing the risks through contracts or mediation helps to overcome the risks present in the project.

The present study focuses on assessing risk management attributes and their impact on the project's success. The survey of attributes is reserved to a limited extent. Further work investigates how the combination of the risk management process and soft skills plays a crucial role in determining the project's success. Other work is foreseen also includes an extensive study on considering many respondents from Rawalpindi and Karachi. It conducts comparative research on how the risk management attributes vary based on construction companies residing in the above-stated cities. Besides, the assessment of attributes still uncovered, and hence it is advisable to do more investigation using the structural equation model

The researcher executes the study using a quantitative method. The population of the study is vast. But the study uses a less sample from the large population. If the study extends the size to be large, then there is a chance of generalization of outcome may happen

Due to COVID-19 situation, the researcher finds it challenging to get prior support from construction companies to survey the project. But consistent support from the team leaders and supervisors working in the respective organization guides us to get constant help to execute the study. The researcher finds it complex to get an opinion from the highest number of respondents. Thus, the time limit induces the researchers to restrict the size to be meagre.

LIST OF REFERENCES

Abazid, M., Harb, H. (2018). An overview of risk management in the construction projects. *Academic Research International*, 9(2), 73-79.

Abd El-Karim, M.S.B.A., Mosa El Nawawy, O.A., Abdel-Alim, A.M. (2017). Identification and assessment of risk factors affecting construction projects. *H.B.R.C. journal*, 13(2), 202-216.

Aftab, J., Sarwar, H., Sarwar, H., Amin, S. (2016). Influence of project management performance indicators on project success in construction industry of Punjab, Pakistan. *International Research Journal of Management Sciences*, 4(9), 511-520.

Al-Bahar, J.F., Crandall, K.C. (1990). Systematic risk management approach for construction projects. *Journal of construction engineering and management*, *116*(3), 533-546.

Ali, T.H., Stewart, R.A., Qureshi, S. (2007). Evaluating risk management practices in the pakistani construction industry: The current state of play. In *Proceedings of the Fourth International Conference on Construction in the 21st Century: Accelerating Innovation in Engineering, Management and Technology*.

Alsuliman, J.A. (2019). Causes of delay in Saudi public construction projects. *Alexandria Engineering Journal*, 58(2), 801-808.

Ammar, A.A. (2018). Issues Contractor's Face in The Construction Industry of slamabad and Rawalpindi (Pakistan). *(Doctoral dissertation, INTI INTERNATIONAL UNIVERSITY).*

Ansah, R.H., Sorooshian, S., Mustafa, S.B., Duvvuru, G. (2016). Assessment of environmental risks in construction projects: a case of Malaysia. In *Proceedings of the 2016 International Conference on Industrial Engineering and Operations Management Detroit, Michigan, U.S.A.*, 25. 752-763.

Banaitiene, N., Banaitis, A. (2012). Risk management in construction projects. *Risk Management–Current Issues and Challenges. In N. Banaitiene (Ed.), Risk Management–Current Issues and Challenges*, 429-448.

Basden, A. (2019). *Foundations and Practice of Research: Adventures with Dooyeweerd's Philosophy*. Routledge.

Biedenbach, T., Müller, R. (2011). Paradigms in project management research: examples from 15 years of IRNOP conferences. *International journal of managing projects in business*.

Bowen, P.A., Pearl, R.G., Edwards, P.J. (1999). Client briefing processes and procurement method selection: a South African study. *Engineering, Construction and Architectural Management*.

Chandra, H.P. (2015). Structural equation model for investigating risk factors affecting project success in Surabaya. *Procedia Engineering*, 125(3), 53-59.

Choudhry, R.M., Iqbal, K. (2013). Identification of risk management system in construction industry in Pakistan. *Journal of Management in Engineering*, *29*(1), 42-49.

Collins, H. (2018). Creative research: the theory and practice of research for the creative industries. *Bloomsbury Publishing*.

Cooke-Davies, T. (2002). The "real" success factors on projects. *International journal of project management*, *20*(3), 185-190.

De Azevedo, R.C., Ensslin, L., Jungles, A.E. (2014). A review of risk management in construction: opportunities for improvement. *Modern Economy*, *5*(04), 367.

Dey, P.K., Ogunlana, S.O. (2004). Selection and application of risk management tools and techniques for build-operate-transfer projects. *Industrial Management & Data Systems*.

Doloi, H. (2009). Analysis of pre-qualification criteria in contractor selection and their impacts on project success. *Construction Management and Economics*, *27*(12), 1245-1263.

Easterby-Smith, M.T., Thorpe, R., Lowe, A. (2002). *Management research: An introduction*, *2*, 342.

Ghauri, P., Grønhaug, K., Strange, R. (2020). *Research methods in business studies*. Cambridge University Press.

Guo, S., Zhou, X., Tang, B., Gong, P. (2020). Exploring the behavioral risk chains of accidents using complex network theory in the construction industry. *Physica A: Statistical Mechanics and its Applications*, *560*, 125012.

Hantrais, L., Mangen, S. eds. (2013). *Cross-national research methodology and practice*. Routledge.

Hlaing, N.N., Singh, D., Tiong, R.L.K., Ehrlich, M. (2008). Perceptions of Singapore construction contractors on construction risk identification. *Journal of Financial Management of Property and Construction*.

Hwang, B.G., Zhao, X., Toh, L.P. (2014). Risk management in small construction projects in Singapore: Status, barriers and impact. *International journal of project management*, *32*(1), 116-124.

Imran, M., Khaliq, M., Hye, A., Ekareesakul, K. (2019). Influence of risk factors on construction firm project success in Pakistan. *Decision Science Letters*, *8*(3), 285-294.

Jiryaei, A., Parchami, A., Mashinchi, M. (2013). One-way ANOVA and least squares method based on fuzzy random variables. *Turkish Journal of Fuzzy Systems*, *4*(1), 18-33

Ke, Y., Wang, S., Chan, A.P., Cheung, E. (2011). Understanding the risks in China's PPP projects: ranking of their probability and consequence. *Engineering, Construction and Architectural Management*.

Khan, R.A., Gul, W. (2017). Empirical study of critical risk factors causing delays in construction projects. In *2017 9th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (I.D.A.A.C.S.)*, 2, 900-906.

Krajangsri, T., Pongpeng, J. (2017). Effect of sustainable infrastructure assessments on construction project success using structural equation modelling. *Journal of Management in Engineering*, *33*(3), 04016056.

Lim, C.S., Mohamed, M.Z. (1999). Criteria of project success: an exploratory re-examination. *International journal of project management*, *17*(4), 243-248.

Ling, F.Y.Y., Low, S.P., Wang, S.Q., Lim, H.H. (2009). Key project management practices affecting Singaporean firms' project performance in China. *International Journal of Project Management*, *27*(1), 59-71.

Liu, J., Liang, J., Yuan, X., Zeng, G., Yuan, Y., Wu, H., Li, X. (2015). An integrated model for assessing heavy metal exposure risk to migratory birds in wetland ecosystem: A case study in Dongting Lake Wetland, China. *Chemosphere*, *135*, 14-19.

Lyons, T., Skitmore, M. (2004). Project risk management in the Queensland engineering construction industry: a survey. International journal of project management, 22(1), 51-61.

Malik, M.F., Khan, R.A., Khan, M.M., Humayon, A.A. (2020). Role of sustainability and project complexity in achieving project success. *City University Research Journal*, *10*(1).

Munns, A.K., Bjeirmi, B.F. (1996). The role of project management in achieving project success. *International journal of project management*, *14*(2), 81-87.

Nawaz, A., Waqar, A., Shah, S.A.R., Sajid, M., Khalid, M.I. (2019). An innovative framework for risk management in construction projects in developing countries: Evidence from Pakistan. *Risks*, *7*(1), 24.

Obondi, K.C. (2020). The Relationship Between Project Risk Monitoring, Control Practices, and Project Success in Construction Projects (Doctoral dissertation, Northcentral University).

Öztaş, A., Ökmen, Ö. (2004). Risk analysis in fixed-price design–build construction projects. Building and environment, 39(2), 229-237.

Petrovic, D. (2017). Risk management in construction projects: A knowledge management perspective from Swedish contractors.

Pimchangthong, D., Boonjing, V. (2017). Effects of risk management practices on I.T. project success. *Management and production engineering review*, 8.

Pirwani, W., Asim, M., Manzoor, M.S. (2020). Analysis of Vulnerability Rates in Construction Projects due to Lack of Risk Management in Pakistan.

Prakash, A.A., Manikanta, D.K.N., Prabhu, S.M. (2017). Risk Assessment Of Residential Buildings In Indian Construction Industry By Application Of Fuzzy.

Qammaz, A.S.B., AlMaian, R.Y. (2020). A critical success factors model for effective implementation of risk management process in the construction projects. *Journal of Engineering Research*, *8*(3).

Reed, A.H., Angolia, M.G. (2020). Risk management usage and impact on information systems project success. In Start-Ups and S.M.E.s: Concepts, Methodologies, Tools, and Applications (1065-1084). I.G.I. Global.

Saad, A., Zahid, S.M., Muhammad, U.B. (2020). Role of awareness in strengthening the relationship between stakeholder management and project success in the construction industry of Pakistan. *International Journal of Construction Management*, 1-10.

Saunders, M., Lewis, P., Thornhill, A. (2009). *Research methods for business students*. Pearson education.

Saunders, M.N., Lewis, P. (2012). *Doing research in business & management: An essential guide to planning your project*. Pearson.

Semab, S., Khan, A., Shah, F.A. (2017). Study on delaying factors affecting the success of construction projects in Pakistan; Role of project intervention as moderator. *Journal of Administrative and Business Sciences*, 2(2).

Senouci, A., Ismail, A., Eldin, N. (2016). Time delay and cost overrun in Qatari public construction projects. *Procedia engine*ering, 164, 368-375.

Serpella, A.F., Ferrada, X., Howard, R., Rubio, L. (2014). Risk management in construction projects: a knowledge-based approach. *Procedia-Social and Behavioral Sciences*, 119(2014), 653-662.

Shrnhur, A.J., Levy, O., Dvir, D. (1997). Mapping the dimensions of project success. *Project management journal*, *28*(2), 5-13.

Smith, N.J., Merna, T., Jobling, P. (2006). Managing risk in Construction Projects Oxford: Blackwell.

Sohu, S., Chandio, A.F. (2019). Identification of causes and minimization of delays in highway projects of Pakistan. *Mehran University Research Journal of Engineering and Technology*, *38*(1), 103-112.

Sohu, S., Jhatial, A.A., Ullah, K., Lakhiar, M.T., Shahzaib, J. (2018). Determining the critical success factors for highway construction projects in Pakistan. *Engineering, Technology & Applied Science Research*, 8(2), 2685-2688.

Szymański, P. (2017). Risk management in construction projects. *Procedia Engineering*, 208, 174-182.

Tahir, O., Tahir, I., Shujaat, S. (2019). Effects of Risk Management Practices on Project Success in the Construction Industry of Pakistan.

Tang, W., Qiang, M., Duffield, C.F., Young, D.M., Lu, Y. (2007). Risk management in the Chinese construction industry. *Journal of construction engineering and management*, *133*(12), 944-956.

Turner, J.R., Cochrane, R.A. (1993). Goals-and-methods matrix: coping with projects with ill defined goals and/or methods of achieving them. *International Journal of project management*, *11*(2), 93-102.

Urbański, M., Haque, A.U., Oino, I. (2019). The moderating role of risk management in project planning and project success: evidence from construction businesses of Pakistan and the U.K. *Engineering Management in Production and Services*, *11*(1), 23-35.

Viswanathan, S.K., Tripathi, K.K., Jha, K.N. (2020). Influence of risk mitigation measures on international construction project success criteria–a survey of Indian experiences. Construction Management and Economics, 38(3), 207-222.

Voetsch, R.J., Cioffi, D.F., Anbari, F.T. (2004). Project risk management practices and their association with reported project success. In *Proceedings of 6th IRNOP Project Research Conference, Turku, Finland*. 680-97.

Wu, G., Liu, C., Zhao, X., Zuo, J. (2017). Investigating the relationship between communication-conflict interaction and project success among construction project teams. *International Journal of Project Management*, *35*(8), 1466-1482.

Wu, Z., Nisar, T., Kapletia, D., Prabhakar, G. (2017). Risk factors for project success in the Chinese construction industry. *Journal of manufacturing technology management.*

Zhang, Y. (2016). Selecting risk response strategies considering project risk interdependence. *International Journal of Project Management*, 34(5), 819-830.

Zou, P.X., Zhang, G., Wang, J.Y. (2006). Identifying key risks in construction projects: life cycle and stakeholder perspectives. In *Pacific Rim Real Estate Society Conference*.

Zou, Y., Liu, S., Xu, B.B., Zhou, J. (2016). Risk Management of the Submarine Pipeline Project Based on Network Theory

APPENDICES

Appendix 1. Questionnaire

1. Name of the organization …….

2. Age ……

3. Work experience …….

4. Designation

a. Project manager

b. Project engineer

c. Site engineer

d. Team leader

5. Which of the following projects do you currently work in the organization?

a. Apartment buildings

b. Residential buildings

c. Roads

d. Others

Risk identification

6. Which of the following methods do you apply to identify the risks present in the project?

a. Brainstorming sessions

b. Investigating historical data of similar projects

c. Using industrial checklists

d. Others

7. How do you rank the project risks do you face while constructing the projects? (5-Strongly agree to 1-Strongly disagree)

Particulars	5	4	3	2	1
Financial risks					
Construction risks					
Environment risks					

8. Please indicate whether you agree or disagree with each of the following statements of financial risks? (5-Strongly agree to 1-Strongly disagree)

Particulars	5	4	3	2	1
There is a lack of clarity on the allocation of responsibilities of payment for taxes					
Lack of provisions of partial payment for projects					
Lack of financial insolvency of stakeholders					

9. Please indicate whether you agree or disagree with each of the following statements of Construction risks? (5-Strongly agree to 1-Strongly disagree)

Particulars	5	4	3	2	1
Non-availability of labor					
No proper soil and site conditions to execute the project					
Material shortages and quality					
There is no site safety					

10. Please indicate whether you agree or disagree with each of the following statements of Environment risks? (5-Strongly agree to 1-Strongly disagree)

Particulars	5	4	3	2	1
There is an adverse weather condition					
Pollution and safety rules					
There is an opposition from the public to execute the project in the concerned area					

Analyzing the project risk

11. The risks likelihood of the projects always assessed

a. Strongly agree
b. Agree
c. Neutral
d. Disagree
e. Strongly disagree

12. Risk impact assessed always

a. Strongly agree
b. Agree
c. Neutral
d. Disagree
e. Strongly disagree

13. Evaluation of Probability and impact matrix done to know the priority and importance for identified project risks

a. Strongly agree
b. Agree
c. Neutral
d. Disagree
e. Strongly disagree

14. Risk exposure estimated well in advance

a. Strongly agree
b. Agree
c. Neutral
d. Disagree
e. Strongly disagree

Monitoring the project risk

15. The organization reclassify some of the dangers after it turned out to be disastrous

a. Strongly agree
b. Agree
c. Neutral
d. Disagree
e. Strongly disagree

16. The team members who involved in the project makes a plan for new risks before they occur

a. Strongly agree
b. Agree
c. Neutral
d. Disagree
e. Strongly disagree

17. Please indicate whether you agree or disagree with each of the following statements of Risk response? (5-Strongly agree to 1-Strongly disagree)

Particulars	5	4	3	2	1
There is an action which has to be taken to deal with the risks					
It focuses on preventive action which prevents the risks					
Giving care to the risks through risk response					

18. Which of the risk response methods do you use to deal with risks?

a. Risk avoidance
b. Risk transfer
c. Risk reduction
d. Risk share
e. Risk acceptance

19. How do you manage the risks which emerge in construction projects? (5-Strongly agree to 1-Strongly disagree)

Particulars	5	4	3	2	1
I will transfer the risk to others in terms of bidding a high amount					
I will use alternative contract strategies to manage the risks					
I will redesign the project					
I will use different methods for constructing the projects					

20. Please indicate whether you agree or disagree with each of the following statements of Project success? (5-Strongly agree to 1-Strongly disagree)

Particulars	5	4	3	2	1
There is an efficiency of use of resources of the organization					
The project completes on time					
Project completion within a budget					
The project completes based on specified quality standards					
The absence of disputes between the parties helps to complete the project within the stipulated period					

Health and safety and environment control					
Quality of the project provides satisfactory to all the stakeholders					

Appendix 2. ANOVA result

Table 7. One-way ANOVA to determine the financial risk based on construction project

Particulars	Apartment buildings		Residential buildings		Roads		Others		f	sig
	mean	sd	mean	sd	mean	sd	mean	sd		
There is a lack of clarity on the allocation of responsibilities of payment for taxes	2.80	1.36	2.86	1.23	3.33	1.61	3.41	1.46	1.856	.000
Lack of provisions of partial payment for projects	3.35	1.23	2.93	1.49	3.06	1.35	3.18	1.29		
Lack of financial insolvency of stakeholders	3.35	1.39	3.36	1.34	3.22	1.35	2.88	1.17		

Source: Author calculation

Table 8. One-way ANOVA to determine the construction risk based on construction project

Particulars	Apartment buildings		Residential buildings		Roads		Others		f	sig
	mean	sd	mean	sd	mean	sd	mean	sd		
Non-availability of labor	2.95	1.57	3.29	1.54	2.89	1.41	2.88	1.69	2.225	.000
No proper	3.45	1.36	3.50	1.45	3.39	1.33	2.88	1.45		

soil and site conditions to execute the project										
Material shortages and quality	3.45	1.39	3.36	1.50	3.28	1.49	2.94	1.43		
There is no site safety	2.90	1.74	2.93	1.82	3.17	1.50	2.71	1.45		

Source: Author calculation

Table 9. One-way ANOVA to determine the environmental risk based on construction project

Particulars	Apartment buildings		Residential buildings		Roads		Others		f	sig
	mean	sd	mean	sd	mean	sd	mean	sd		
There is an adverse weather condition	2.85	1.53	3.07	1.21	3.39	1.54	2.65	1.66	1.785	.000
Pollution and safety rules	3.45	1.19	3.36	1.22	3.06	1.51	2.53	1.50		
There is opposition from the public to execute the project in the concerned area	2.85	1.50	2.57	1.70	2.50	1.20	2.88	1.50		

Source: Author calculation

Table 10. One-way ANOVA to determine the analysing the project risk based on construction project

Particulars	Apartment buildings		Residential buildings		Roads		Others		f	sig
	mean	sd	mean	sd	mean	sd	mean	sd		
The risks likelihood of the projects always assessed	3.00	1.26	2.57	1.65	3.17	1.47	3.82	1.19	2.238	.000

Risk impact assessed always	3.25	1.52	3.79	1.53	2.94	1.47	3.00	1.46		
Evaluation of Probability and impact matrix done to know the priority and importance for identified project risks	3.15	1.39	2.93	1.21	3.44	1.38	3.47	1.33		
Risk exposure estimated well in advance	3.15	1.50	2.71	1.38	3.17	1.54	2.76	1.35		

Source: Author calculation

Table 11. One-way ANOVA to determine the manage the risk based on construction project

Particulars	Apartment buildings		Residential buildings		Roads		Others		f	sig
	mean	sd	mean	sd	mean	sd	mean	sd		
I will transfer the risk to others in terms of bidding a high amount	3.40	1.47	3.14	1.46	2.61	1.58	3.18	1.38	1.953	.000
I will use alternative contract strategies to manage the risks	3.65	1.35	3.07	1.14	3.28	1.41	2.82	1.24		

I will redesign the project	2.60	1.27	2.79	1.12	3.00	1.46	2.71	1.26		
I will use different methods for constructing the projects	2.90	1.07	3.71	1.54	2.67	1.14	3.47	1.07		

Source: Author calculation

Appendix 3. Non-exclusive licence

A non-exclusive licence for reproduction and for granting public access to the graduation thesis[1]

I Muhammad Rizwan

1. Give Tallinn University of Technology a permission (non-exclusive licence) to use free of charge my creation

IMPACT OF PROJECT RISK ATTRIBUTES ON PROJECT SUCCESS

supervised by: Professor Piia Tint

1.1. to reproduce with the purpose of keeping and publishing electronically, including for the purpose of supplementing the digital collection of TalTech library until the copyright expires;

1.2. to make available to the public through the web environment of Tallinn University of Technology, including through the digital collection of TalTech library until the copyright expires.

2. I am aware that the author will also retain the rights provided in Section 1.

3. I confirm that by granting the non-exclusive licence no infringement is committed to the third persons' intellectual property rights or to the rights arising from the personal data protection act and other legislation.

---

[1] *The non-exclusive licence is not valid during the access restriction period with the exception of the right of the university to reproduce the graduation thesis only for the purposes of preservation.*