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TECHNOLOGY, ISLAMABAD



**Impact of Project Risk Management on
Project Quality with the Mediating Role
of Project Efficiency and Moderating
Role of Project Culture**

by

Sana Faiz

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degree of Master of Science

in the

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Department of Management Sciences**

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This thesis is dedicated to my parents who have always loved me and taught me to work hard on the tasks I aim to accomplish. This work is also dedicated to my husband who supported and encouraged me to face the challenges of my master's degree and last but not least I would like to dedicate this research to my daughter who was born the day I started my research work. She is my motivation and just because of her I was compelled to complete my research to set an example for her about the importance of work. I am indeed blessed to have them in my life...!



CERTIFICATE OF APPROVAL

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Abstract

Main purpose of project risk management is to identify and mitigate the threats that can affect the project but current study does not provide detailed insights on how project-based organizations respond to the challenges and risks that a project management team encounters in different projects. The main purpose of this research is to figure out impact in relationship of project risk management and quality of the project to provide with some suggestions so that people working in the project-based organizations get a clear concept of this relationship.

This research study explores those underlined factors that can be ascertained to contribute in improving project performance. Data was collected from 244 respondents working in various project-based organizations across Pakistan.

The study examined the impact of project risk management on project quality. The results of the study indicate that project risk management has significantly positive impact on project quality. The project risk management enhances the quality of the project. The mediating role of efficiency is also significantly positive between the relationship of project risk management and project quality. However, the results indicate that the project culture does not play the role of moderator on the relationship between project efficiency and project quality. The study significantly contributes to the area of research specifically in the domain of project management. The implications, limitations and future directions are discussed below.

Keywords: Project risk management, Project quality, Project efficiency, Project culture.

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Abbreviations

DV	Dependent Variable
H	Hypothesis
IV	Independent Variable
PC	Project Culture
PE	Project Efficiency
PMI	Project Management Institute
PRM	Project Risk Management

Chapter 1

Introduction

1.1 Background of the Study

Risk management of projects is not a thing from which the project manager is afraid of. The project manager is used to manage uncertainties such as the lack of key members in the project team and long-lead complexity ([Loosemore & Charles, 2006](#)). Risk management is among the organization's most critical departments and so many skilled people are involved with projects today because the accomplishment of good project depends on the risk management. Most of the problems surrounding time, cost, scope and quality exist in the construction industry. So, it is very important to determine these issues and figure out strategies to eliminate these risks to make the project successful. There is no literature review that addresses the issue of how risk management performance is effectively monitored and managed ([Serpell & Larissa, 2019](#)). The aim of this study is to review recent developments in the risk sector, with particular emphasis on the fundamental ideas and thinking that shape the standard risk research [Aven \(2016\)](#). Risk is everywhere, every part of our lives. Another such thing which is the industry of construction, where risk is a genuine feature. Good 'risk management' does not only mean risk reduction/mitigation, which is likely to be the most inexpensive option ([Szymański, 2017](#)). Lack of know-how on risk techniques and limited resources can also lead to poor project risk management.

A system for analyzing and monitoring the quality of projects needs to be developed with the main purpose of timely process redesign and improvement in order to achieve the objective of increasing efficiency and cost reduction, thus ensuring long-term business success (Perković & Milan, 2011). The project is defined as time and cost limited, which must achieve a certain result (the scope for achieving project goals) in line with quality requirements and standards (Perković & Milan, 2011). A lot of times, business have a great preferences to take the risk at the beginning of their business and so many people among them become bankrupted and ruin their money in the very first two years of their businesses (Aven, 2016). This research would start with the “project risk management” analysis and later the impact on the project quality. It would end with the assessment of different research phases to accomplish the objectives.

The risks of construction projects, if not properly handled, will result in the inability to attain the desired project goals by having increment in costs, delay in time, and reducing the quality and functionality problems of the amenities (Choudhry & Khurram, 2013). C. Wang and Hui-Yu (2003) found in the research which is later mentioned in the research of (Odimabo & Oduoza, 2013) that improper management of construction risk can impact the project efficiency, capability, project time, project quality and cost of construction. Risk management helps to maximize the probability of project outcomes by identifying/evaluating risks, offering certain risk prevention or elimination strategies and enhancing opportunities (Ward & Chris, 2003).

1.2 Gap Analysis

A research gap is described as a subject or region for which lacking or inadequate facts limits the capacity to attain a conclusion for a question. So many authors note that risk management practices, even broad and complex ones, are still rarely used in the daily routine of projects, thus characterizing a gap in the field (Zwikael & Sadeh, 2007). It has been studied so far in large companies and corporations, but in projects and project-based organizations, little emphasis has been focused

on risk management and project quality. Therefore, light on this aspect needs to be shed.

The research also focuses on the potential mediator and moderator when discussing this void. The study proposes that project efficiency mediates the relationship between project risk management and project quality. Whereas the role of a moderator is played by project culture. Such variables make the analysis unique in the domain of project management has yet to be discussed as its impact on the key factors. In order to know the means to instill imagination in every project, they should be studied.

In the Pakistani context, these variables were not studied altogether and the results would be very helpful in filling the contextual gap as well as gaining competitive advantage for Pakistani managers. This research study would make a major contribution to the present literature as well as the course of research will have a focus on project-based Pakistani organizations.

1.3 Problem Statement

The topic is primarily seen between management and productivity as you go through the literature on project risk management and project quality, both of which offer this topic a great deal of significance and is now one of the key subjects studied these days. As project risk management increases then it also increases the project quality showing direct connection. Literature has shown that quality of project is affected due to poor risk management. The Organizations ignore the risks which threaten quality of projects ([Choudhry & Khurram, 2013](#)).

In the construction industry risk management is done at the start of the project life cycle. As this field deals with many uncertainties so it is not sure when a risk can be encountered. So, risk management needs to be done through out the project life cycle. Common reasons for poor project risk management includes; limited resources like money and time and lack of know-how on risk techniques ([Hlaing & Ehrlich, 2008](#)).

Most of the studies related to these variables have been carried out in western societies and very little research is present in developing nations, as in the context of Pakistan. The main problem that occurs in projects in construction industry is when the team does not apply proper risk management techniques. There are so many organizations in which risks are ignored that could threaten the quality of project.

The risks related to cost, schedule and scope are very important to manage because these risks could also affect the efficiency of different projects. If scheduling and budgeting is not done properly or followed by the project team, then the efficiency of project will be affected which will later affect the project quality. Risk of cost, schedule and scope are not properly handled which effect the fulfillment of objectives of project (Serpell & Larissa, 2019). The mediating role of project efficiency linking project risk management and project quality is not much surveyed in Pakistani construction industry. Moreover, project culture has never been used so far as a moderator between efficiency of project and a project quality.

The identification of such mediating and moderating mechanisms for advancing the literature on risk management of the project and a project quality is critical step towards solving the highlighted problem. All these variables are discussed in the literature, but in a single conceptual model they are not modelled together. The present study is conducted to model these variables by investing how project risk management effects project quality with the mediating role of project efficiency and moderating role of project culture. This study fills the gap and also the study is conducted in a unique setting of Pakistan

1.4 Research Questions

Depending on this study's problem statement, the current research is aimed at seeking the answers to a few questions, as discussed below:

Research Question 1

Does project risk management affect the project quality?

Research Question 2

Does project efficiency mediate the relationship between project risk management and project quality?

Research Question 3

Does project culture moderates the relationship between project efficiency and project quality?

1.5 Research Objectives

In the light of above discussion, our research work seeks to explore the risk management within the projects of construction and its influence on the quality of the project. The ultimate goal of the study is to build and test the model and to see the link between project risk management and project efficiency and project quality.

Additionally, project culture is added as a moderator to the relationship discussed above. Project efficiency has been added as a mediator in this study to check the impact that if it mediates the relation or not. The specific objectives of the study are stated below:

Research Objective 1

To check the relationship between the project risk management and project quality.

Research Objective 2

To check the relationship between the project project risk management and project efficiency.

Research Objective 3

To check the relationship between project efficiency and a project quality.

Research Objective 4

To investigate the mediating role of project efficiency between project risk management and project quality.

Research Objective 5

To investigate the moderating association of project culture on the relation between project efficiency and project quality.

1.6 Significance of the Study

Project risk management is vital in different organizations as a business cannot successfully identify its future goals without it. If an organization sets targets without taking risks into considerations, they are likely to lose control if such of these risks are encountered. Risk may come from internal as well as from external sources. External risk includes political issues, exchange rates, interest rate and are not directly controlled by management. On the contrast, internal risks may include failure, violation or break of data. The implementation of quality management systems within the project results in decreased effort and costs, improved project performance efficiency, faster management of project process and change management through a combination of the project management and process management.

The current study does not only contain theoretical significance but also it is significant for project management domain by pointing out the very existence of a project risk management and underlying mechanisms that link the project risk management and its impact project quality. Its extensive analysis is very important as it is necessary to deal with common project risk management techniques in construction companies to prevent the risk its impact on projects. This study will determine that how strong comprehensive project culture supports the better efficiency outcomes of the project. Sufficient study is available on impact of a project culture on project efficiency and project quality. This is the gap which is still arguable in construction industry.

Concluding the thoughts on significance of study, it can be stated that our study highlights various indicators to improve existing project management policies and practices, hence making a positive contribution towards the existing system. It

provides a new dimension for an in-depth analysis that can help the project management sector of Pakistan in terms of creating a more supportive and success-oriented environment. Overall, study explores various gauges for upgrading successful project implementation and preventing unfavorable circumstances that may limit desired outcomes. Construction companies should implement project risk management because companies are typically threatened by diverse and complex risks and depend primarily on construction projects to earn revenues and profits (Xiaopeng & Sui, 2013).

1.7 Theoretical Support

A number of theoretical perspectives have been represented by various research scholars that are used globally to support the studies of diverse project risk management techniques, but utility theory includes all variables of the current study which it can cover. The theory is presented by (Aven, 2016) and it is explained further.

1.7.1 Utility Theory

The theory of utility based its assumptions on the desires of individuals. It is a concept postulated in economics to describe individual behavior based on the premise that individuals should accurately rate their choices according to their preferences. Utility theory is described as relative assessment of the potential outcomes of decisions by considering the preferences of the decision makers. Here we are concerned with the statistical indicator of the importance of the actual outcomes of the decisions made or the degree of the decision maker's satisfaction with the profit achieved. This is the domain of the utility theory (Kaplinski, 2013).

The same concept of utility theory is given by (Kaplinski, 2013). (Bonenberg & Oleg, 2018) mentioned that the predicted degree of utility theory and its estimated sale price are directly proportional to the system of criteria used to properly explain

them and the values and importance of those criteria. By observing the model, we can see how the Aven's theory of utility will play its role in the current study. Utility is an evaluation of choices over a certain combination of services and goods. This theory is an important supporting theory in economics and game theory of rational choice, since it signifies the satisfaction experienced by the consumer. A thing is considered good when it satisfies human desires. Our models fit on most of the components of this theory as we are discussing risk management, project quality, efficiency and culture of the project. The interaction of employee with the project and the management is the essence of this theory and also a key component of our study that the risk management done by project team effects the performance of the project and if the individual working in the project is aware of the work it can mitigate the chances of having risks. Also, if the senior management involved in the project has keeping a check on the project development while employee having follow the set rules can increase the chances of better project performance and the employees can have a better understanding of the project.

So, we can conclude that the theory perfectly fits on our model and can become the bases for explaining our results. The underpinning theory will help us find direction in the research to reach our objective to find the end result of research undertaken.

Chapter 2

Literature Review

The chapter contains a thoroughly reviewed extensive literature pertaining to risk management in projects, project quality, project efficiency and project culture to offer a sound theory of variable definitions and in-depth account of proposed relationships. To create this, we directed our search towards an abandoned number of publications and articles using keywords of, risk management, quality, project quality, project performance, efficiency, project efficiency, effectiveness or efficacy, organizational culture, project culture, and thereof.

The model suggests five hypotheses based on the relationship between the different variables under consideration. While the variables used in this study are as below:

2.1 Project Risk Management

[Mhetre and B \(2016\)](#) defined the risk management as; risk management is a procedure which includes risk recognition, qualitatively and quantitatively evaluation, responses with an acceptable risk handling system, and then monitoring the risks. Project risk management is an essential component of a process aiming to identify potential risk corresponded with the project and these risks are clarified ([Ehsan & Azam, 2010](#)).

Risk management represents a strategy for avoiding losses and take advantage of available chances or rather potential chances originating from risks. The strategy

calls on the person doing a precise consideration and estimation of the situation and the scenarios possibly happening in the future (Schieg, 2006). Risk management is characterized as the method of detecting and evaluating risks and methods of reducing risk to an appropriate degree. The key objective of a project risk management is to recognize assess and mitigate the risk to project success (Serpella & Larissa, 2014). Project risk management is an important factor of the 'project management' as unmanaged risks which lead towards failure of a project. A traditional construction project may include all categories of risk, that contain contractual, financial, organizational, political and technical risks (Zhao & Weisheng, 2014).

2.2 Project Efficiency

The performance of project management is the standard indicator of project progress measured at the project's completion and based largely on, if the output of project is provided on time, with in cost and on purpose. This is project efficiency Turner and Rosenthal (2008).

Efficiency of projects has historically been used as a metric for assessing project progress, often correlated with compliance, time table, cost and agreed quality/specifications indicators (Mainga, 2017). Project efficiency is the difficult task to perform and at the same time a responsibility of non-managerial employees. Project efficiency is the effective transformation of inputs (activities) to outputs (Abbasnejad & Javad, 2017).

It is well acknowledged that projects must be carried out in productive manner. One of the main indicators of project performance should be called project efficiency. The value of productivity has increased as projects are increasingly being conducted in an atmosphere of multi project management (MPM), in which projects share resources among each other (Frinsdorf & Xia, 2014). The project efficiency on terms of the programs is defined as the ratio of total expenditure to the effects and performance evaluation due to their usefulness that address the

question of whether the data needs of information system users were achieved (Kaczorowska & Sabina, 2016).

2.3 Project Quality

Quality is a degree or standard to which the objectives or attributes of a project, product or service fulfil the requirements. If the project is meeting its time, cost and scope and satisfying the customer needs that simply means the quality of the project or product is good. Performance is a fascinating concept because for different people it can mean different things. As it refers to tangible products and intangible resources, the definition of performance is made even more complicated D. Lewis (2008). Researchers gave the following concepts for quality performance in construction projects: meeting consumer standards, minimize rework or defects, repeat company and time and budget competition (Hoonakker & Todd, 2010).

Basu (2014) says in his research, 'what the consumer wants is consistency as life long experience. Quality in projects is regulated mainly to a lip service and multiple documents with ticking boxes. Quality is one of an essential elements to build project success. The standard of construction projects along with a performance of a project, can be seen as, meeting project stakeholders' expectations (Ashokkumar, 2014). A quality management program is referred to as the project quality framework in the ISO 9001 quality management system; that deals with three key issues that are quality control, quality assurance and quality improvement (W. E. Lewis, 2017).

Hence project quality is the ability of the project to perform satisfactorily for the purpose it is made. The project will fail to meet the objectives even if it is too big but does not fulfil the purpose of the project. When the project is performing efficiently in all of its aspects than the quality of the project is improved because every client wants the project to be delivered within time and within the suggested budget.

2.4 Project Culture

Project Culture is a mixture of diverse cultures carrying contract parties. Specific elements of cultures forecast organizational outcomes in various circumstances, such as efficiency, innovative environment and employee or client satisfaction ([Andrew, 2013](#)). The culture of the project is the general attitude towards projects within the company. Most projects do not operate independently; they must operate within a work environment that should be complimentary to good project management requirements ([Stare, 2011](#)). To align organizational roles and also the objectives along with the individual participants, a project culture needs to be designed. Social, economic, political and procedural understandings that commonly accepted to reduce the organizational tension and improve communication & collaboration, and increase the efficiency at which project goals are accomplished ([Thomas & Denny, 2002](#)).

[Samaraweera and Sepani \(2012\)](#) defines project culture as the common interests, underlying assumptions and convictions help by the project participants that decide how they manage the project and how they relate to each other in the project atmosphere. The culture of the project is derived from organization. While senior management develops the organizational culture, project management office (PMO), project leadership and project teams can establish the culture of the project. Project culture has an impact on the processes of the budget and on relations between team members. It builds upon the actions and attitudes of project team leaders ([Vaidyanathan, 2016](#)).

2.5 Project Risk Management and Project Quality

[Perković and Milan \(2011\)](#) concluded from his research that management strategies eliminate task complexity, project system variability and improves repeatability and automation. In addition, organizational sophistication needs to be further established by setting up the agency to handle organizational changes. The various

construction actors need to realize this transition in a slow and often painful phase, and that more work is needed to improve the quality of the construction industry (Hoonakker & Todd, 2010).

Every year a substantial amount of the budget is spent on infrastructure and other construction projects. Since the projects output results do not meet the necessary requirements, defective construction takes place (Ashokkumar, 2014). The lack of quality contributed to non-compliance costs which can include internal and external costs which include rework costs. Also can be caused by project design failures or project inefficiency that lead to unsatisfied customer (Miguel & Ronaldo, 2019). Project managers often value the risk of a project due to its importance, difficulty and purposeful design specifics do not seem to be evaluate the linkage between the risk outcomes and the root causes characterized by the project quality aspects. So, we find several examples of projects finished in time and within the budget but they fail to meet end user expectations (Basu, 2014).

This paper provided a research effort aimed at addressing a subject that was not widely explored as suggested by the literature. With the aim of using these elements to assess efficiency, the study has tried to acquire a model which appropriately represents the features involved in the success of risk management in construction projects. The model represents a different approach in which it is specified that risk management a practice to be done at the end of the project and focused on the risks that have taken place (Serpell & Larissa, 2019). (Szymański, 2017) Risk management in a project is not limited to listing all the advantages and disadvantages or to placing a bad risk mark on each destructive and existing case. Management is a dynamic, long-lasting and far-reaching process that begins long before the investment and sometimes continues even after it has been completed. Managing risk wisely does not mean avoiding it, but recognizing it.

The following points should be considered (Iqbal et al., 2015) the value of risks from the viewpoint of key stake holders, their current management strategies, the existing state of risk management programs in organizations and obstacles to successful risk management. The analysis shows that the most important risk are economic and financial factors, supported by quality, and the industry generally

tries to prevent or transfer these risks. Project schedule, cost of project and project quality are recognized as the most common project aims which can be linked to project performance. So the influence of project risk management on the project schedule, project cost, and quality of the project is also neutral (Zhao & Weisheng, 2014). Common reasons for poor project risk management includes, but are not limited to, the dearth of information and expertise from contractors, limited resources like money and time and lack of know-how on risk techniques (Hlaing & Ehrlich, 2008). Moreover, risk management is considered the feature quality of decision. Whether a decision is good or bad is primarily determined by the quality of relevant data the decision maker obtains. Information is the principal source in the risk identification and analysis steps (Tang & Youmei, 2007).

H₁: Project risk management is associated positively with project quality.

2.6 Project Risk Management and Project Efficiency

Serpell and Larissa (2019) found out in his study; that critical analysis of the importance & benefits of evaluating PRM efficiency. It also provides a preliminary and groundbreaking approach for evaluating the quality of PRM by assessing the adequacy of responses to mitigate risks and assessing the consequential influences as measures of the success of these interventions at the completion of the project. The study concludes that risk identification in the Coastal Region has the greatest impact on the execution of NHA road construction projects. This research attributes the impact of threat recognition to risk assessment and collateral, plan requirements and managers setting up inspection (Kirira & N, 2019). This study showed that it only has a positive influence on one dimension of project performance-time although with small effects (1.8%). However, the lack of interest in cost-related theories and the other five conceptual metrics inevitably leads to

questions about how risk management in organizations is being applied ([Carvalho & Roque, 2015](#)).

[Ali \(2005\)](#) examined the usage of Project Risk Management in the preparation of cost estimates for construction projects and budgeting money and discovering that the approach of “Estimating using risk assessments” was superior to other conventional approaches.

Project Efficiency of the public infrastructure projects is achieved through cheap money attracting. It is also critical that projects be protected from facts of corruption to avoid fraud of the project funds and risk of harm ([Sepashvili & Eka, 2018](#)).

Economic and financial development handling construction investments as aimed at increasing or extending project efficiency; Evaluation continues here from the independent project to the quality of its project provided to internal and external clients; evaluation of the methods of projects resulting from value creation may be used here among others ([Kaczorowska & Sabina, 2016](#)).

Establishing Project Management Competencies is enabled by attempts to strengthen project managers capacity to identify the best operating practices and procedures to be implemented in a given environment, increase project efficiency as well as cost efficiencies and establish a greater view of what could go wrong when the project moves through its lifecycle (i.e., improved project risk management capabilities) ([Mainga, 2017](#)).

The method for measuring the project efficiency is based on the hierarchical classification framework for these variables. The program will consider the parameters of the financial flow and the characteristics of the corporate reputation emerging during the implementation of the project, as well as inflation, uncertainty, the environment of conflicts and the economic risks caused by them ([Sigal & Bakumenko, 2014](#)).

Project control calculate the efficiency (time & cost) of a project during its development and use the details gathered during the scheduling of baselines and

the phases of the risk management to track and upgrade the schedule, and take corrective steps when issues occur (Vanhoucke, 2012).

Projects rarely perform quite as perfect as planned. Systematic Risk Management aims to decrease project costs, to raise profits, to minimize project risks or flaws or deficiencies and to build new incentives for new projects (Rao & Chandra, 2013).

H₂: Project risk management is associated positively with project efficiency.

2.7 Project Efficiency and Project Quality

Assigning or positioning construction workers (experts) in close proximity to the design team and recommending development strategies that can enhance the project's construction efficiency during pre-construction will boost project profitability and raise the chance of project success (Farooqui & Sarosh, 2008).

Serpell and Larissa (2019) in his paper provided a research effort aimed at addressing a subject that was not widely explored as suggested by the literature. With the aim of using such factors to assess the efficiency, the study has tried to acquire a model that appropriately denotes the aspects involved in the success of risk management in construction projects.

In previous years, several administrations have advocated the use of Building Information Modeling (BIM) as a tool to support cooperation and increased project risk management and project efficiency. While BIM has been around for some time, recent advances in Information and Communication Technologies (ICT) have provided new encouragement to researchers and practitioners in construction to press for further adoption (Abanda & HM, 2015).

Farooqui and Sarosh (2008) mentioned in his research study that; At first, there was criticism from different industries as well as reluctance from local contractors because it was thought that local contractors lacked the requisite expertise (in terms of qualifications and equipment) and experience to perform such major construction work that demanded a high degree of project efficiency and project

quality in construction but then the contractors' physical capability grew and contractors have expanded their spending in recruiting workers and the procurement of heavy building equipment.

Factors which cause problems with quality in Pakistan are material costs increase, competition, distribution, product quality, lack of coordination and inadequate on-site monitoring (Abas & Ahmad, 2015). For the evaluation of Social Innovative and Investment Project's efficiency, both quantitative and quality indicators of the outcome of project implementation are used. The methodology proposed for productivity appraisal is based on the idea that the implementation of social innovation and expenditure programs contributes to an increase in the quality of human life and comfort of accommodation conditions, that is, growth of the ultimate quality social indicators: decrease in prevalence and death, increase of birth and life expectancy, quality of employment, community and sport (Glazkova, 2017).

Assigning the construction staff (experts) to or locating them in close range to the design team and suggesting construction methods that may improve the project's construction efficiency during initial planning of construction can improve the quality of the project as well as increase the likelihood of project success (Farooqui & Sarosh, 2008). Qiu and Susheng (2011) Suggested a solution to the government's license extension policy issue is to impose price limits and allow for a quality-dependent license extension. They have shown that such a BOT contract would encourage the right incentives and provide maximum Project Performance. The author added more about price controls which are well-known mechanisms which are primarily used under dominant conditions to improve efficiency. Zhang and Malik (2018) found out in his study that lack of communication and teamwork effects the Project Efficiency badly. To improve the Project Efficiency team collaboration and sharing the responsibilities together is very important.

Dvir and Thomas (2004) found in the study that quality of the project contributes a lot towards project efficiency. Williams and Eric (2015) said; It is seen that if the quality of project is good than the customer is satisfied. Dvir and Thomas (2004) also said that customer satisfaction is twice as important as project efficiency.

Project efficiency fails in an environment where multiple projects operate at the same time. The reason for this issue is that it is difficult to allocate resources efficiently to the selected projects (Frinsdorf & Xia, 2014). It was found in the research of (Uvarova & Lyudmila, 2017) that in road construction project the immediacy of the problem of improving the quality of the road construction is due to the need to increased demand for toll travel, which indeed increase efficiency of construction project. Parameters of efficiency not efficacy appear to dominate the project success literature. Effectiveness measurements are not measurable or as easy to understand as performance metrics, so often takes time to assess (e.g. during the process change or life cycle of a project) (Müller & Kam, 2012).

H₃: Project efficiency is positively associated with project quality.

2.8 Mediating Role of Project Efficiency between Project Risk Management and Project Quality

As stated by Müller and Kam (2012) Efficiency of a project includes the things to be done to complete a project. Before beginning a project, construction managers have to check all the drawings, required services and utilization of these services. The project manager can minimize unnecessary expenses and increase efficiency of the project by carrying out a detailed review of the project before starting (CMI, 2008). Further mentioned in this study is to avoid inefficiency of the project by collecting the information at the beginning of the project so there is no issue of project delay. The principles were applied in a more developed manner in the field of quality management. In Quality Management, efficiency refers to doing things right, i.e. whatever is done, due to the available resources (high efficiency it is done in the most appropriate way (Sundqvist & Diana, 2014)).

The main aim of establishing the methods of risk management is to bring value to the construction project and improve the project efficiency during operation of the construction industry. Increased work has since been undertaken to examine risk

management pattern in the construction industry (Wood & CT, 2003). Operating according to schedule is highlighted because contractors (& subcontractors in the supply chain) are believed to be capable of forecasting and estimating all possible contingencies. The client project owner(s) will then pass all forms of risks to the contractors service providers and subcontractors (May et al., 2016). An approach to project delivery which integrates individuals, processes, business frameworks and practices to a procedure that exploits the abilities and understandings of all members in a collaborative way to diminish discarded and efficiency optimization through all design, manufacturing and construction phases (Sive, 2009).

All of the recent work concerns the management of very broad, complicated projects involving specific conclusions on the complexity of the project environment, project risk management, development, environments beneficial to collaborative learning and the situational contingent purpose of the project relation between project delivery partners and customer(s) (Walker & Anthony, 2015). “Conventional project management methodology assumes a stable and predictable project environment, defined and expected project requirements, emphasizes low-cost tenders, manageable and predicted risks, and structured and repetitive project activities” (Ghassemi & Burcin, 2011). The implications of these expectations are always schedule and cost overruns, unsatisfied quality requirements, inability to comply with them with unforeseen and emerging project uncertainties, risk-averse, short-term non - collaborative transactional relationship between the project customer(s) and contractors, which mostly turn into adversarial and judgmental (Azhar & U, 2014).

By applying risk management techniques, we say that it can be measured precisely the actual duration and expense of a project, as the estimated costs are taken into account. This happens more or less, thereby expanding the length of the project and increasing the cost (Coleman, 2001). The firms are trying to change, despite the lack of resources in construction companies, the efficiency and the performance of the labor and resources available. And without an understanding it is incredibly difficult to completely grasp the demand or supply of certain services to efficiently control the prices (Borkovskaya & Maxim, 2019).

Some risk factors can be measured from the analysis of financing risk factors by the Urban Infrastructure Projects while others are more difficult to quantitatively analyze. Fuzzy comprehensive evaluation method allows all involved parties to extend the related risk evaluation findings to all project stakeholders and to know how much project engagement provide conceptual basis for decision making (Chen & Tao, 2009). Because of the high frequency of cost and schedule overruns, project results in generally fail to meet satisfactory levels. Only a number of projects with high performance quality and owner satisfaction are completed under budget and on schedule (M. F. H. Ling Dulaimi & Jing, 2012).

Risk analysis evaluate the benefits and disadvantages of a project baseline schedule to provide details on the efficiency of the plan and the possible modifications that are certainly happening during project development (PMI, 2009). Unmitigated risks are one of the key causes of project breakdown according to (Royer, 2000). (Baker, 2005) has also demonstrated that there are many cases of project loss of time, cost and efficiency due to the absence of risk management techniques in project management. Knowledge of cost & quality has been shown on risk management in Nigerian construction industry. The reasons responsible for the application of risk management in Nigeria are administration and the mindset of the construction participants (Aminu, 2013).

S. P. W. S. Q. L. Ling Low and Hua (2009) Investigated the impact of PRM on timing of project, cost & quality of the projects. A scheduling, cost and quality of projects are recognized as the most common project goals which can be related to metrics of project success. Research carried out by (Bowen & Pearl, 2002) showed that majority of building was only two of such parameters, i.e. time and cost are used to obtain the proposal.

In every project a project risk management should plan for the management of risk. The contractor is given the authority of the project manager to manage the issues regarding the finances and resources.

Hallenge and Dov (2007) mentioned in the research study which was further argued by (Mir & H, 2014) that project efficiency (on-time/meeting schedule; on budget; on scope) should be calculated only as one of a set of five total project drivers of

quality (project efficiency; team satisfaction; customer impact; business success; future preparation) and thus more thorough look at project quality.

Weaver (2002) gave a comprehensive review of research on project management, which covers over 40 years of publications. During most of the 1960s, project management research focused on planning and scheduling according to their observations.

In the 1970s, automatic project management software developed a greater interest in costs and check schedule. The style continued through the 1980s, with new researches on costing of the life cycle and planning the risk management. A project is appeared be successful if the construction project is delivered on time, at the right price and in a good quality (T. Chan & YC, 2003).

Tabish and Neeraj (2012) found in a research study that the major issue which affects the project efficiency and project quality in construction industry is corruption. If we take the anticorruption strategies it will help to achieve the goals.

Raymond and François (2008) mentioned in a research study that improvements in efficiency of project is the managerial task and these includes proper project planning, budgeting, scheduling and monitor and control. This helps to improve the quality of the project. Mills (2001) found out that the construction industry has a bad reputation for risk management, several programs struggling to meet time limits and cost goals.

The study given by different researchers showed that the project risk management has a positive impact on the project efficiency and in the same way the project efficiency has a positive effect on the project quality.

The reason is when the risks related to cost, time and scope are handled properly it will improve the efficiency of the project. The same way when the project is efficiently performing in all of its aspects than the quality of the project is improved because every client wants the project to be delivered within time and within the suggested budget.

H₄: Project efficiency mediates the relationship between project risk management and project quality

2.9 Moderating Role of Project Culture between Project Efficiency and Project Quality

Research factor impacting quality performance of Hong Kong construction projects. The key considerations are customer support, successful project management, creating an efficient construction team and the culture in which the project is carried out (Chan & Tam, 2000). We explain SPC's evolution to direct users in the implementation of SPC and help them make it more appropriate for their socio-economic environment. In the meantime, four safeguard steps were suggested in terms of theory, organization, actions and philosophy to ensure the smooth implementation and continued optimization of SPC (L. H. N. D. Q. Z. Wang Bai & Tingting, 2019).

Practices, traditions and institutions in the construction industry are so completely different from manufacturing that practitioners can not see how such techniques can be adapted and make them create value for their customers (Thomas & Denny, 2002). The culture of the project is often recognized as an abstract set of rules with an effect on the project's self-organization that is when all the members of the team responsible for their own actions. When all project members agree on the project process, then the project culture is efficient.

The project manager should be overseeing the regular conferences and client relations. When employees are working in the same project every single of them has to understand the culture of the project. Sometimes there are team members who want to add their creativity to the project to bring innovation but they are bound due to the culture. The drawback of the project culture is that everyone needs to work with mutual collaboration and communication with others. But if there is cultural difference there can be communication gap.

It can be either due to language issues or it can be behavioral or thinking difference. Another thing is that every member of the team is from different culture so this cultural difference can cause issues which can lead towards project failure. The main aspects of culture are communication, negotiation and decision making which

are made with mutual collaboration otherwise it can cause wrong decisions which leads towards failure of project.

Cultural change must be prioritized on the list of effective tools to contribute to building projects' sustainability and progress'. This finding suggests that more effort is needed to make cultural aspects part of the procurement process for the company (Nguyen & Tsunemi, 2017).

In the research study of Teräväinen and Anton (2018) the culture of the construction project was seen to consist of two subcultures: white- and blue collar cultures. Two apparently similar profiles on culture, with apparently similar desires for cultural change, some important differences were found and analyzed in depth. Also (Teräväinen & Anton, 2018) focused Throughout their Organizational Culture research in the Finnish construction industry, they focused on organizational (company) level culture. The article draws on our interpretation of Culture at project level and how project culture influences the efficiency of a construction project.

Gregory and L (2009) found in his research study that organizational culture affects firm's effectiveness. Inherently maintained by many managers and researchers in management, although few scientific findings provided detailed evidence on the relationship.

Alas and Ann (2012) and (Ancarani & Daniela, 2009) mentioned in their study that the project culture is a mixture of different cultures practiced by multiple contractors. Various cultural factors forecast organizational outcomes in various contexts, such as productivity, environment for creativity and employee happiness or customer satisfaction.

Therefore, in order to achieve the desired culture in the project environment, the identification of the elements of the project culture , i.e. the basic speculations on which the project operates, and the principles which characterize individual organizations along with the project-based organization where they are united as a team (Dulaimi & Amjad, 2011) and (A. M. H. L. Ling Ang & Yu, 2007) mentioned in research study that in addition to the generic Project Management practices,

cultural factors also need to be investigated in multinational construction management. The understanding and management of cross-cultural factors is essential for the smooth implementation of projects.

Recognition and sensible management of cultural diversity allows improvements in efficiency of the projects and also increases the profitability of international projects (T. Chan & YC, 2003). M. F. H. Ling Dulaimi and Jing (2012); Dulaimi and Amjad (2011) also stated in research study that Project efficiency in the UAE usually struggle to reach acceptable standards because of the high degree of overruns in costs and schedules.

A multi-skilled team needs to be integrated to achieve project efficiency in Building Information Management by developing and sharing new ideas, tools and innovations (Hossain, 2020). For this reason different teams unified at one spot which involved both behavioral changes and process changes (Arayici & O'Reilly, 2011) so to achieve project efficiency it is important to understand the project culture. Sinclair and Carl (2009) Suggested in his study that the efficiency of hotel organizations can be enhanced by combining service-oriented activities with project management concepts. This is possible when staff of the organization working in a project understand the project culture and also provided with the flexible environment. Among other countries it is recommended that the relationship between culture and efficiency be analyzed among detail to increase the efficiency of the construction industry internationally (Teräväinen & Anton, 2018).

According to the contrast, the Global Position System and Geographical Information System integrated approach increased the construction efficiency by increasing the productive operating hour of the construction machinery and the construction time and thus the labor costs (Li & CW, 2005).

A good company environment guarantees the correct demonstration for the workers attitude, while an innovation friendly climate gives them room to rethink constantly engineer their job (Davidson, 2003).

One of the management problems is building a culture of support to ensure that anyone with responsibility for handling uncertainty is secure about raising, addressing and handling uncertainties (Karlsen, 2011). Accordingly, the authors

propose changing the construction project culture from the already dominant market culture to a clan culture. The writers also claim that a project culture should be organized to match the organization's objectives and goals with those of the individual member (Thomas & Denny, 2002; Zou & Vaughan, 2009). Adapt current organizational dimensions to suggest five dimensions for a project culture model: integrative, cooperative, goal-oriented, flexible, and people-oriented. Their research focuses on contract procurement relations in the Chinese construction industry, and results indicate that there are small to broad positive associations between all five dimensions of the project culture.

Construction project organization is managed by several people of varying experiences, creating different human activities and different project standards. Those persons involved, who come with complex behaviors or perceptions, thus have a major influence on project success (Tijhuis, 2012). It is also argued that cultural variances can create individual communication clashes, which decrease the efficiency of construction organizations to achieve project goals (Ankrah & Langford, 2005). Thus, it may perhaps be believed that culture plays an important role in project management success or failure. In project management practice, therefore, culture should be regarded as a critical factor for resolving conflicts, enhancing quality performance and promoting creativity (Nguyen & Tsunemi, 2017).

To boost the quality of construction project in Nigeria as well as in other developing countries, it is important to establish a culture of education and standard knowledge for all participants in the construction (Badihaveli & Vyas, 2019). A new framework has been developed in study of (Delgado-Hernandez & Elaine, 2008) to help build quality into the projects. It not only discussed the limitations of current methods but also fully integrated methods to improve manufacturing suited for construction projects. The resulting system covered quality management, quality of product and service, construction processes, staff, and strategies for developing their culture and quality.

Raouf (2004) Low quality and instability of different temporary structures system are listed as the main causes of construction accidents. The development of a

health and safety culture is undeniably one of the most critical aspects of the construction process, which could impact the organization's mission to attain project goals (Ogwueleka, 2011). The quality of the construction project and choosing the culture of project is very important to avoid the construction accidents (Husin & Kamaruzaman, 2008).

The passion and commitment of Project Quality and Project culture for motivating engineering workers is essential to enhance the quality of research and eventually improving project efficiency. Therefore, the project's success is largely determined by the quality and cultural actions of all participants (Peidong, 2018; Othman & Ayman, 2013) in his study gave the example of construction project of housing done by foreign consultant who did not understand the culture and principles of end user. So, the users made significant changes to meet their needs, such as privacy and the ability to build more rooms to their family sizes in the future. The above study showed that the project cultures has a positive influence on the project efficiency and project quality. The research given by different researchers showed that project culture strengthens the relationship between project efficiency and project quality.

H₅: Project Culture moderates the relationship between Project Efficiency and Project Quality

2.10 Research Model

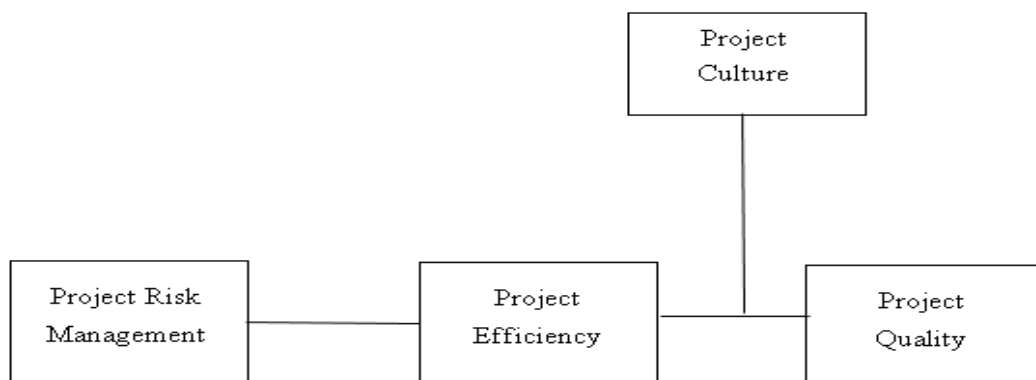


FIGURE 2.1: Research Model of Project Risk Management Impact on Project Quality through Project Efficiency: Moderation of Project Culture

2.11 Research Hypotheses

H₁: *According to hypothesis 1 There is a positive relationship between Project risk management and Project quality.*

H₂: *According to hypothesis 2 There is positive relationship between Project risk management and Project efficiency.*

H₃: *According to hypothesis 3 There is a positive relationship between Project Efficiency and Project quality.*

H₄: *According to hypothesis 4 Project efficiency mediates the relationship between Project risk management & Project quality.*

H₅: *According to hypothesis 5 Project culture moderates the relationship between Project efficiency & Project quality.*

Chapter 3

Research Methodology

The following chapter includes details of all the procedures and methods used in this research with the aim of obtaining consistent results. The discussion includes specifics regarding research design, population, sampling techniques, instrumentations, sampling characteristics, statistical tools, pilot testing and analysis of reliability of all the variables and items included in this research.

3.1 Research Design

3.1.1 Type of Study

This research study basically highlights the Impact of Project Risk Management on Project Quality. The sample of this study are the individuals who are working in project-based construction organizations.

This is a type of study where we will see that what is the effect of project risk management on project quality with project efficiency acting as a mediator and moderated effect of project culture was measured on the basis of self-report.

3.1.2 Descriptive Research Design

This is the descriptive research design as it helps to explore the context of a research problem and gain the appropriate knowledge to carry out further research.

In this method data is gathered through various organizations through surveys or case studies. Descriptive research is quantitative in nature as it uses the tools such as mean, median, standard deviation and frequencies. In this type of research different people respond to the questions in different ways or according to their preferences and experiences. This mainly focuses on the research problem and then to find out the solution that why that problem really exists.

3.1.3 Research Philosophy and Quantitative Research

This research follows the hypothetical deductive method of research that is based on the theory of determinism, in which previous work and current hypotheses were used to explain and justify our hypothesis, which would then be empirically tested to validate the proposed hypothesis. The expected description of the scientific method is the hypothetical deductive model or process. According to this approach, scientific analysis begins by framing a hypothesis in a way that could be falsified by a visible data test. A test running opposite to hypothesis predictions is considered as a falsification of the hypothesis. A test which is not opposite to the hypothesis confirms theory, then the descriptive value of competing theories is compared, by checking how strongly their predictions verify them. However, for reaching towards a wide population, quantitative methods are generally used and appreciated. The quantitative method has been used in this work to collect consistent data for the purposes of mutually associated variables and to demonstrate the essence of the relation between the variables that are used in this research.

3.1.4 Unit of Analysis

Conducting the Unit of analysis in any study is one of the most important components of research. In the following study, the unit of analysis may vary from people who belong to various groups, different organizations, different cultures etc. since our research study is observing the impact of project risk management on project risk with the mediator project efficiency and moderator project culture. As this study suggests that all these are human related factors so the employees working

in project-based organizations will be unit of analysis in our study. The workers who ultimately benefited from the projects were used as the unit of analysis to assess the performance of the projects.

3.1.5 Population and Sample

The research conducted focuses on the risk management of projects and the project quality in construction project achieved in Pakistan. Then the population under the current research covers project managers, project teams, project staff and all the subordinates of this sector. Data will be obtained from individuals working on projects in Islamabad and Rawalpindi from public and private organizations. The data will be gathered from people through a questionnaire.

The sample mainly consists of Islamabad and Rawalpindi projectized organizations. Almost 350 questionnaires will be distributed in all selected organizations. The sample will be from different types of project may that be domestic, big projects or small projects, projects from different domains so that we can get a generalized view of the impact of project risk management on the project quality. All of the projects are taken from civil and/or construction companies i.e. Frontier works organization (FWO), National Highway Authority (NHA), Defense Housing Authority (DHA), EarthLink, National Logistic Cell etc. It was difficult to include all the construction sector population. So only small samples from these sectors were taken. Quantitative research methods were used for the collection of data and samples were collected from the whole population. And convenient sampling was used in the context of non-probability sampling. Such sample size was used to gather data for the overall population representation. It is based on the selection of the randomly responds, when convenient sampling is used, so the author also did the same for this data set. The author selected those respondents who were readily available to fill the form so they could represent the whole population.

Quantitative research method was used because the data was collected through questionnaires and surveys. Some of the questionnaires were filled manually while some questionnaires were filled online.

3.1.6 Sampling Technique

Due to some constraints for example restricted time and resource shortages, it is usually impossible to obtain data from the entire population. Sampling is the data collection technique which is widely used. For this, they choose a specific group of people who are the true representatives of the entire population. In general, only Pakistani project-based organizations were targeted for the present study.

We used convenience sampling to collect data for impact Project risk management on Project quality with the mediator Project efficiency and moderator Project culture. The sample will be circulated in at least 350 questionnaires. In addition, each respondent must have information in first section Linked to demographic factors like gender, education, age, job and work experience. While we'll have questions pertaining to our variables in the second section. The distribution and selection of questionnaires was performed physically. One single participant of the questionnaire recorded all the data sample, and no other person played a part in it. The chances to get common method bias has been eliminated in such a manner that the questionnaire does not contain an aspect in which the respondent records his or her own results or so.

Since we used convenience sampling in our study. This is one of the techniques of non-probability sampling which is used in this analysis, in which data is gathered randomly and dependent on the feasibility of appropriate data collection.

3.2 Sample Characteristics

The demographics that are used in this research are; project managers and employee's age and information linked to their gender that is male or female and qualification which ranged between matric to PhD. For the current research the questionnaire was designed to be filled by project managers and all the employees working in project-based organization. The questionnaires were related to the project risk management, project quality, project efficiency and project culture.

Sample characteristic's details are elaborated as follows:

3.2.1 Gender

Gender is an important factor that remains at the forefront of the aim to maintain gender equality, is thus often viewed as an essential aspect of demographics, since it distinguishes between male & female in a given sample population. In this research, efforts were made to guarantee the right of gender equality, but it was also found that the number of male workers is slightly greater than that of female workers.

TABLE 3.1: Gender Distribution

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	87	35.7	35.7	37.5
Male	157	64.3	64.3	100.0
Total	244	100.0	100.0	

Table 3.1 represents the gender composition ration of the sample in which 64.3% were male and 35.7% were female. It can be seen that the total percentage of male respondents was high.

3.2.2 Age

Age is viewed as one of the demographics where the respondents may find it difficult of expose openly. So, scale/range was used to collect information about their age for the convenience of the respondents.

Table 3.2 reveals sample distribution according to age groups.

43.4% of respondents mentioned their age between the ranges of 21-30. 34.8% respondents mentioned their age between the ranges of 31 - 40 years, while 15.6% respondents who had an age between the ranges of 41-50 years and just 6.1% respondents were more than 51 years. In this study, most of the respondents lie in the ranges of 21-30 and 31 - 40 years of age.

TABLE 3.2: Age Distribution

Age	Frequency	Percent	Valid Percent	Cumulative Percent
21-30 years	106	43.4	43.4	43.4
31-40 years	85	34.8	34.8	78.3
41-50 years	38	15.6	15.6	93.9
50 and above	15	6.1	6.1	100.0
Total	244	100.0	100.0	

3.2.3 Qualification

Education is the key factor contributing to the development of the entire country and the fundamental need of time is always to succeed internationally. Qualification/Education is also another complex dimension after gender-based demographics. Education introduces many different and innovative paths for creativity and success in attempt to provide competitive advantage for all other countries around the world. Education possibly plays a major role in exhibiting innovation and advancement in project activities.

TABLE 3.3: Qualification Distribution

Qualification	Frequency	Percent	Valid Percent	Cumulative Percent
Matric	2	0.8	0.8	0.8
Intermediate	10	4.1	4.1	4.9
Bachelors	130	53.3	53.3	58.2
Masters	88	36.1	36.1	94.3
PHD	14	5.7	5.7	100.0
Total	244	100.0	100.0	

Table 3.3 characterizes the qualification of the respondents, 0.8% were Matric qualified, 4.1% were Intermediate qualified and 53.3% were Bachelors qualified, 36.1% were Masters qualified, 5.7% were Ph.D. qualified. The large number of responded were having a Bachelor's degree.

3.3 Instrumentation

The questionnaire is to be filled by each member individually. The questionnaire measures the Project Risk Management, Project Quality, Project Efficiency and Project Culture.

3.3.1 Measures

The given data was collected using questionnaires adopted from various authentic sources. In each project-based organization nearly 50-60 questionnaires are distributed and we visited each organization during questionnaire distribution time. For the quick response, we have circulated online questionnaires to websites of project-based organizations as well.

The data has been collected from different sources via the adopted questionnaires. The existence of the questionnaire items is such that all variables are i.e. Project Risk Management, Project Quality, Project Efficiency and Project Culture must be filled in by the various employees and their managers working in different Rawalpindi and Islamabad construction companies. All of the items included in the questionnaire would be answered to using a 5-points Likert-scale where 1 (strongly disagree) to 5 (strongly agree). Questionnaires may contain demographic factors including information about the respondent's Gender, their Age and their Qualification.

In total 350 questionnaires have been issued but only 247 have been received. Yet the total number of questionnaires that were used for data collection to show the findings was 244. The questionnaires rejected from 244 of the questionnaires were

those which did not have the full information or many of the questions were not filled out in the questionnaires, so they were not authentic for the study.

3.3.1.1 Project Risk Management

The questionnaire having five item project risk management is adapted by (Karimi & Anol, 2007). The items of the scale are Formal project management tools and techniques were employed for this project, The project's scope, size, and effort were estimated adequately, The implementation risks were adequately evaluated, classified, and prioritized, The implementation schedule was realistic, Project managers in charge of the project were highly capable and experienced. The answers are obtained by 5-point Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree).

3.3.1.2 Project Quality

The questionnaire having five item project quality is adopted by (Iacovou & Jeff, 2009). The items of the scale are In this organization projects are completed within budget and schedule, the projects the quality of the produced work is good, the work is done by interacting regularly with consultants, the projects have the ability to complete its goals. The answers are obtained by 5-point Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree).

3.3.1.3 Project Efficiency

The questionnaire having four item Project Efficiency is adopted by (Ravichandran & Arun, 2000). The items of the scale are Projects usually overrun budgeted costs, schedule overruns are common in most projects, backlog of development work is high and fixing bugs and other types of rework account for a significant proportion of systems development effort. The answers are obtained by 5-point Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree).

These are the reverse questions. Reverse questions are those questions which are used as an answer by a participant or the community to a direct query. Rather

than responding to the question, you return the exact question to the person asking it.

3.3.1.4 Project Culture

The questionnaire having thirteen item Project Culture is adopted by (Gold & H, 2001). The items of the scale are In this project; team members understand the importance of cooperation to project success, high levels of participation are expected in capturing and transferring knowledge, team members are encouraged to explore and experiment, training and learning are valued on job, members are valued for their individual expertise, members are encouraged to ask others for assistance when needed, members are encouraged to interact with other groups, members are encouraged to discuss their work with people in other teams, overall project vision is clearly stated, overall project objectives are clearly stated, benefits of sharing knowledge outweigh the costs, senior management clearly supports the role of knowledge in project success and In my organization the knowledge is shared with other organizations. The answers are obtained by 5-point Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree).

TABLE 3.4: Instruments.

Variables	Source	Items
Project Risk Management	(Karimi & Anol, 2007)	7
Project Quality	(Iacovou & Jeff, 2009)	5
Project Efficiency	(Ravichandran & Arun, 2000)	4
Project Culture	(Gold & H, 2001)	13

3.4 Statistical Analysis

Reliability and validity were tested at the very first stage of the scale by doing CFA (confirmatory factor analysis) by using AMOS and model was found

good fit because the significant values were CFI (comparative fit index), IFI, TLI (Tucker-Lewis index), and RMSEA (root mean square approximation error). Over alternative models, the measurement model provided excellent fit to data. The findings of these CFAs revealed that the relevance of the four-factor model had satisfactorily discriminate validity. In addition, all items significantly loaded onto their respective latent factors, with factor loads ranging from 0.58 to 0.99.

TABLE 3.5: Confirmatory Factor Analysis (CFA)

	Chi Square	Df	CMIN DF	IFI	TLI	CFI	RMSEA
Initial	852.6	273	14.085			1.00	0.232
Modified	1001.5	318	3.149	0.852	0.836	0.851	0.094

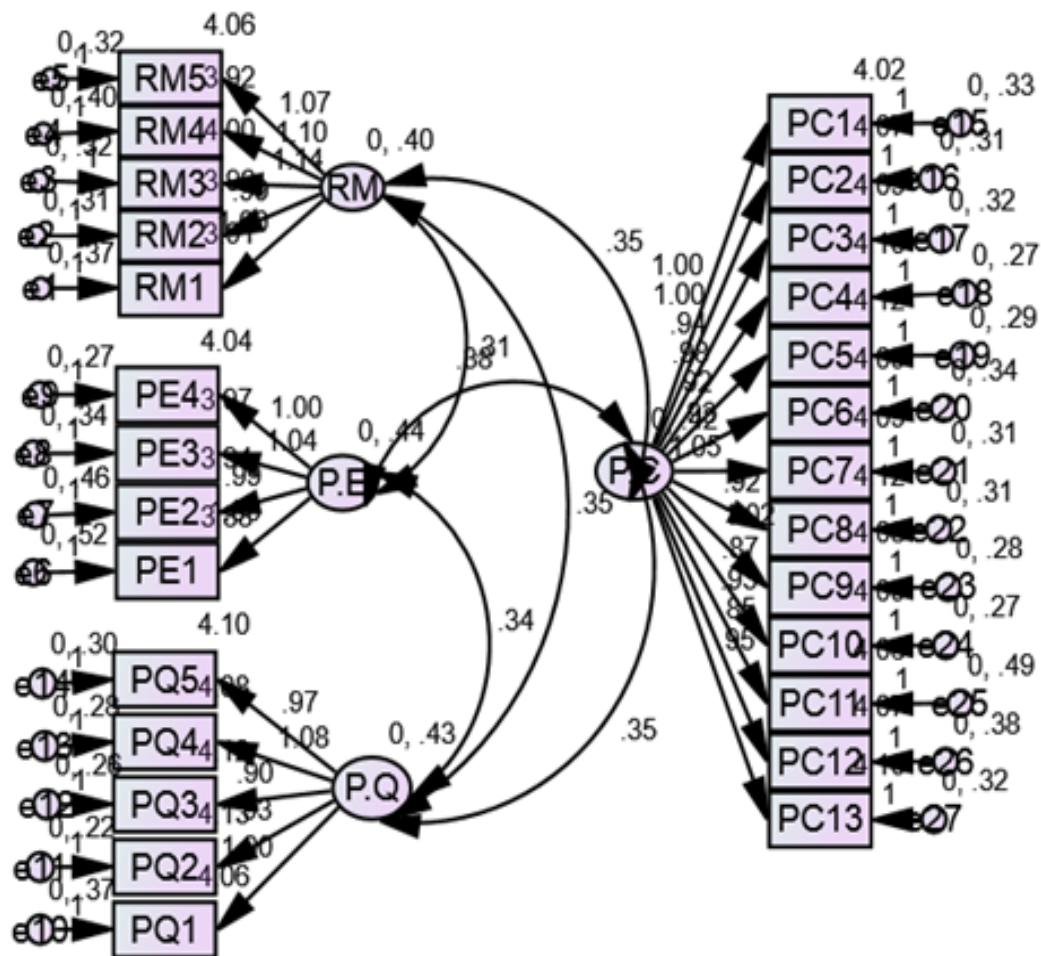


FIGURE 3.1: CFA Model

3.5 Pilot Testing

Pilot testing is a type of small study that is conducted to check the performance before the detailed research study in order to evaluate the cost, feasibility and duration of the research design.

When undertaking a pilot testing on a larger scale, it would have been a very cautious and effective strategy, as it avoided certain risks associated with losing time and resources. Therefore, to check whether the results are familiar, the pilot testing of approximately 30 questionnaires were undertaken in compliance with the proposed hypothesis or not. After the pilot testing it was concluded that there was no major issue with the variables and that the tests were fully correct for the pilot study.

3.6 Scales Reliability

Reliability is a function of how many reliable outcomes we can achieve on a particular element after repeated amount of a study. Scales Reliability is the ability of the scale that the measure would produce the same kind of results while running several times. The reliability test is conducted by the Cronbach Alpha method in the current study. By running this method, we can observe whether there is a connection between the variables and their reliability. It also has the ability to measure a single variable. The Cronbach alpha value which is considered to be significant ranges from 0-1 but in the case of Cronbach alpha in this range of 0-1 there are regions with acceptable and unacceptable Cronbach Alpha values. Usually 0.7 and greater value of Cronbach Alpha is considered to be acceptable value but, in some case, if the items to measure a variable are less than 10, we can use the range of 0.6 and greater as an acceptable range to carry on with our study. The greater the Cronbach alpha value greater the reliability of the used scale and the lower the Cronbach alpha value lower the reliability of the used scale would be. In Table 3.6 below, for the scales used the Cronbach alpha values are mentioned. It shows the Cronbach alpha of the scales used for data collection. The Cronbach

alpha values are above 0.7 for the variables under analysis. All items with 0.8 values show that these scales are highly reliable according to Pakistan context to be used in this study. The Cronbach alpha test the reliability of the questionnaire. It depends on the number of items in the variable and the Likert scale which has been used to gather data in survey. The greater the number of items in, the higher would be the reliability.

TABLE 3.6: Scales Reliability and Validity Analysis

Variables	Cronbach's Alpha	N of Items
Project Risk Management	0.867	5
Project Quality	0.876	5
Project Efficiency	0.822	4
Project Culture	0.938	13

Table 3.6 Displays findings of the Reliability and Validity Analysis after full data collection. Cronbach's Coefficient Alpha value of Project Risk Management was 0.867, Project Quality was 0.876, Project Efficiency was valued as 0.822, and Project Culture was 0.938. As we know that the length of the test affects the Cronbach alpha. The project Culture has the larger number of items and all the items are correlated which increased the value of alpha.

3.7 Data Analysis Techniques

After gathering data relevant to the study from 244 respondents, the data was then analyzed on version 20 of the SPSS software. When processing the data a variety of procedures are used, these procedures are as follows:

1. Firstly, just the questionnaires were selected for the analysis which were filled out appropriately.

2. Each questionnaire variable was coded, and each coded variable was used to analyze the data.
3. Frequency tables have been used to describe properties of the sample.
4. The descriptive statistics was performed using the numerical values.
5. Then Reliability of all variables has been verified by Cronbach coefficient alpha.
6. Confirmatory factor analysis has been used to explain the model of measurement.
7. Correlation analysis was performed to determine whether or not there is an acceptable association between the variables identified in this study.
8. A simple linear regression analysis of the Independent and Dependent Variable was conducted to determine the optimal relationship.
9. Preacher and Hayes Process have been used to perform mediation and moderation and assess the nature of mediator & moderator position between the Independent, Dependent and mediator variables.
10. The intended hypotheses were tested by correlation and by Preacher and Hayes method to check the rejection and acceptance of the proposed hypothesis.

Chapter 4

Results

4.1 Correlation Analysis

Analysis of the correlation is generally performed to determine the relation between the variables. The primary objective of conducting correlation analysis in this research work is to establish the relationship between project risk management and project quality, the mediating role of project efficiency and the moderating role of the project culture; to test the presented hypotheses.

Analysis of the correlation is performed in order to know about the nature of the variation between the two variables whether or not the variables vary at the same time. Basically, correlation analysis does not involve a relationship between two or more variables because it differs from the analysis of regression.

In correlation analysis, Pearson correlation analysis tells the intensity and essence of relationship through Pearson correlation range i.e. from -1 to +1. Hence, through magnitude value we can conclude the intensity of the relationship among two variables and that magnitude value can generalize by the distance of correlation from zero. If the correlation is far from zero that means the relation between the two variables is strong and on the contrary if it is close to zero then the relation is weak. But if the values are zero that straightly means that there exists no relationship between the understudied variables. Positive and negative sign depicts the nature of the relationship, if the sign is positive this means that the

increase in one variable causes the increase in the other variable and is considered to be a direct relationship and, in the same way, if the sign is negative, that means that the increase in one variable causes a decrease in the other variable and an indirect relationship.

The table below shows the mean, standard deviation and correlation between the variables under study. And the correlation values represent the existence and magnitude of the relation between the variables.

TABLE 4.1: Correlation Analysis

S.No	Variables	1	2	3	4
1	Project Risk Management	1			
2	Project Quality	0.743**	1		
3	Project Efficiency	0.621**	.65**	1	
4	Project Culture	0.762**	0.742**	0.767**	1

***Correlation is significant at the 0.01 level (2-tailed). N=244, * $P < 0.05$, ** $p < 0.01$, *** $p < .001$ (PRM = Project Risk Management; PQ= Project Quality; PE= Project Efficiency; PC= Project Culture)*

Table 4.1 shows the correlations for all of the theoretical variables. Project Risk Management was positively correlated with Project Quality ($r = 0.743$, $p < 0.01$) with Project Efficiency ($r = 0.621$; $p < 0.01$) and with Project Culture ($r = 0.762$); Project Quality with project efficiency ($r = 0.65$) and project culture ($r = 0.742$; $p < 0.01$); Project efficiency with Project culture ($r = 0.767$; $p < 0.01$);

4.2 Descriptive Statistics

Descriptive statistics cover the essential data information points. This contains the total number of respondents, each variable's minimum and maximum values, and the means and standard deviations for each variable. The mean values represent the average response while the standard deviation values reflect the variance of

the response from their means. All the variables understudied were measured at 5-point Likert scale. Descriptive statistics is the information summary of whole data because it highlights the significant statistic points. The given table presents some significant figures that are representing the whole data.

TABLE 4.2: Descriptive Statistics

	N	Minimum	Maximum	Mean	S.D
Risk Management	244	1.00	5.00	3.9697	.72252
Project Quality	244	1.00	5.00	4.0975	.68264
Project Efficiency	244	1.00	5.00	3.9559	.74145
Project Culture	244	1.00	5.00	4.0847	0.64066
Valid	244				

The descriptive statistic comprises basic particulars like the size of the population, minimum & maximum values, mean values and normal data deviations. Table 4.2 gave descriptive statistics of the present data. The table's first column gives details of the variables. Second, third, fourth and fifth columns respectively tell of sample size, lower most value, upper most value, mean and standard deviation.

Table 4.2 Exhibits that the sample size for all four factors was 244. All variables (Project Risk Management, Project Quality, Project Efficiency and Project Culture) were graded on a Likert scale of five scales, such as 1 showing "Strongly Disagree" and 5 showing "Strongly Agree". Mean values and the values of standard deviation demonstrate the nature of the responses. That is a respondents' observation concerning a specific variable. The mean value of the Project risk management (PRM) was 3.9697 whereas value of standard deviation was 0.72252. The mean value of Project (PQ) was 4.0975 whereas value of standard deviation was 0.68264. The mean value of Project efficiency (PE) was 3.9559 whereas value of standard deviation was 0.74145. Finally, the mean value of Project culture (PC) was 4.0847 whereas value of standard deviation was 0.61066.

4.3 Regression Analysis

A basic linear model of regression is run to investigate the relation between independent & dependent variable. Regression analysis shows the dependent variable uniqueness which varies with any of change in independent variable. We check that to what extent a variable is bringing unit change in another variable or whether this change is positive or negative. So, table below will describe the relation between independent and dependent variable through a simple regression change that how much change it is bringing and what is the nature of the impact.

Results of regression analysis are shown in the Table 4.3.

TABLE 4.3: Regression Analysis' Outcome

Predictor			β	R^2	$AdjR^2$	ΔR^2	p
Project Risk Management	→	Project Quality	0.702	0.552	0.551	0.552	0.00
Project Risk Management	→	Project Efficiency	0.638	0.386	0.383	0.386	0.00
Project Efficiency	→	Project Quality	0.612	0.442	0.439	0.442	0.00

H₁: There is a positive relationship between Project Risk Management and project Quality.

In accordance to Hypothesis 1 the Project risk management is positively affecting Project Quality. The relationship is positive i.e. increase in project risk management will increase the quality of the projects and decrease in project risk management will decrease the quality of project.

The results demonstrate, ($\beta = 0.702$, $p = 0.000$) that β value is positive so it is positively affecting and the value of ΔR^2 is 0.552 which means that project risk management brings a positive change of 55% in project quality. These results show

that Hypothesis 1 is accepted which is positive impact of project risk management on project quality.

In the present study, X denotes the variable that is Project risk management and Y denotes the variable Project quality. The input variable is called X and the outcome variable is called Y.

Unmediated model is in pictorial form:

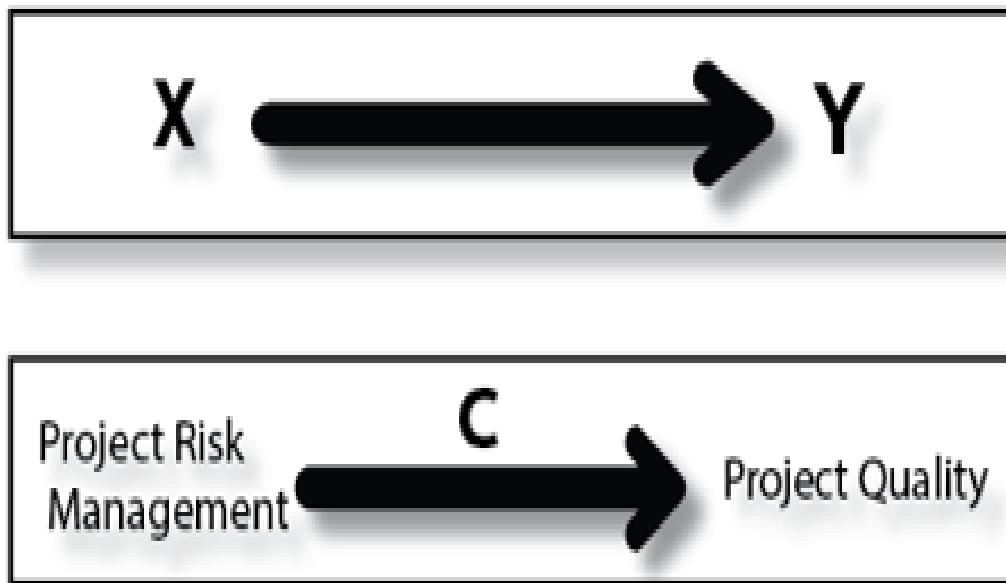


FIGURE 4.1: Unmediated Model

H₂: There is a positive relationship between Project Risk Management and Project Efficiency.

In accordance to Hypothesis 2 the Project risk management is positively affecting Project efficiency. The relationship is positive i.e. increase in project risk management will increase the efficiency of the projects and decrease in project risk management will decrease the efficiency of project.

The results demonstrate, ($\beta = 0.638$, $p = 0.000$) that β value is positive so it is positively affecting and the value of ΔR^2 is 0.386 which means that project risk management brings a positive change of 38% in project efficiency. These results show that Hypothesis 2 is accepted which is positive impact of project risk management on project efficiency.

H₃: There is a positive relationship between Project Efficiency and Project Quality.

In accordance to Hypothesis 3 the Project efficiency is positively affecting Project quality. The relationship is positive i.e. increase in project efficiency will increase the quality of the projects and decrease in project efficiency will decrease the quality of project.

The results demonstrate, ($\beta = 0.612$, $p = 0.000$) that β value is positive so it is positively affecting and the value of ΔR^2 is 0.442 which means that project risk efficiency brings a positive change of 44% in project quality. These results show that Hypothesis 3 is accepted which is positive impact of project risk management on project efficiency.

The correlation analysis was performed in the study to analyze the existence of the relationship between the variables, but simple relying on the correlation analysis is not sufficient because it simply shows the existence of the relationship between variables through inadequate support and does not tell about the casual relationship between the variables. Thus, regression analysis is done to verify that one attribute relies on another. Study of regression basically demonstrates the degree under which one variable depends on the other one, i.e. independent variable on which it is regressed. Methods of (Preacher & F, 2004) were used in this study for both the analysis of mediation and moderation regression analysis. In (Preacher & F, 2004) process; Model 1 for moderation and Model 4 for mediation are used; both mediation and moderation are conducted separately.

4.4 Mediation Analysis Results

Mediation analysis quantifies the quantity to which a variable participates with inside the transmittance of alternate from a purpose to its effect. Project efficiency assumed in Hypothesis 4 plays a mediating role between project risk management and project quality. To test the mediation of H₄ we used model 4 of PROCESS macro through SPSS by Hayes and Scharkow (2013).

In which we checked different paths a, b, c and c' respectively. According to Preacher and Hayes process there are total three effects that have to be ascertained: total effect, direct effect and indirect effect.

TABLE 4.4: Mediation Analysis

DV	Effect of (a path)	Effect of (b path)	Direct Effect of IV on DV (c path)	Total Effect of IV on DV (c path)	Bootstrapping For Indirect LL 95% CI	Results Effect UL 95% CI
Project Quality	0.5083**	0.3042**	0.5083**	0.7022**	0.0980	0.2870

*N = 244, * p < .05; **p < .01; ***p < .00 Un-standardized regression coefficient reported. Bootstrap sample size was 5000. Confidence Interval = 95N = 244, Control variables were, Gender, Age and Qualification, * p < .05; **p < .01; ***p < .001 LLCI = Lower Limit Confidence Interval; ULCI = Upper Limit Confidence Interval. Following is the explanation of every path.*

4.4.1 Total Effect

Total effect demonstrates the effect of IV project risk management and DV project quality. The total effect of project risk management on project quality is 0.7022 with the significance of $p = 0.000$. It indicates that approximately 70% variance occur in project quality due to project risk management. The lower limit of bootstrap is 0.6222 while the upper limit is 0.7823, without having any zero between both limits. Hence, H_1 is accepted that project risk management is positively affiliated with project quality.

4.4.2 Direct Effect

Direct effect identifies the effect of IV which is project risk management on DV which is project quality in the presence of mediator Project Efficiency. In the presence of mediator direct effect is 0.5083 with the significant p-value of 0.000.

It demonstrates that project risk management covers 50% variation of project quality in the presence of Project Efficiency. The lower limit of bootstrap is

0.4139 while the upper limit is 0.6026, without having any zero between both limits, which clarifies that the results are significant.

4.4.3 Indirect Effect

Indirect effect identifies that mediation exists between IV and DV i.e. Efficiency of the project mediates the relation between project risk management and project quality. The bootstrap values are predicting the significant results because there is no zero existing between lower limit i.e. 0.0980 and upper limit i.e. 0.2870.

Therefore, the results are supporting the H_4 which states that Project efficiency mediates the relationship between Project risk management and Project quality. So, this hypothesis is accepted.

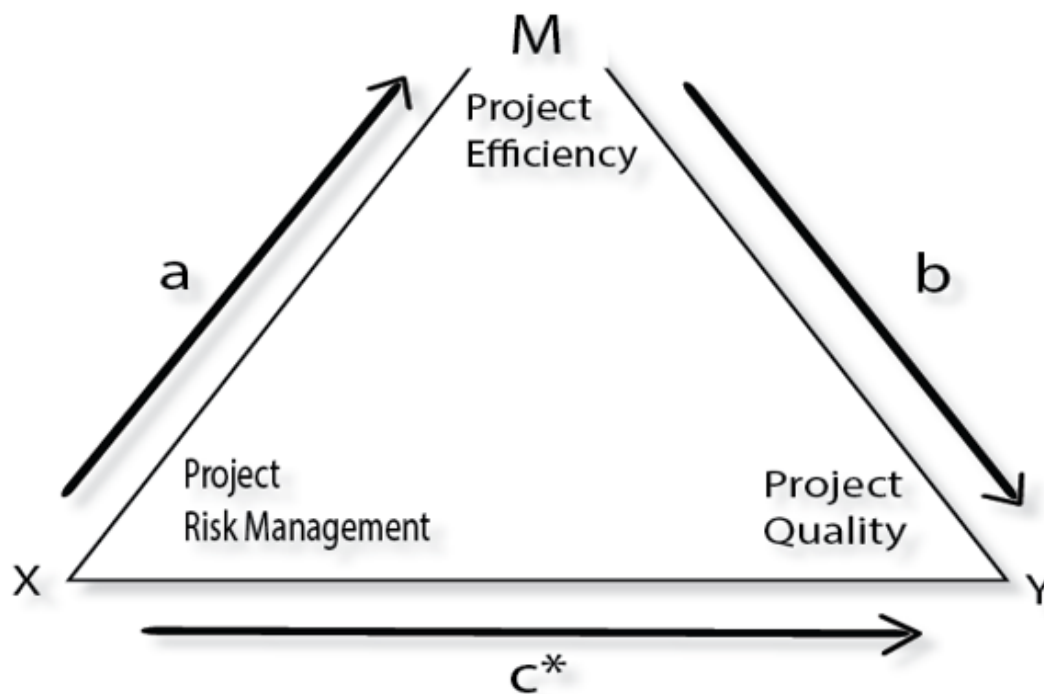


FIGURE 4.2: Mediated Model

The following table demonstrates the indirect impact of project risk management on the quality of the projects. Path coefficients a , b , and c^* are shown in figure. Where $a = 0.5083$, $b = 0.3042$, $c^* = 0.5083$.

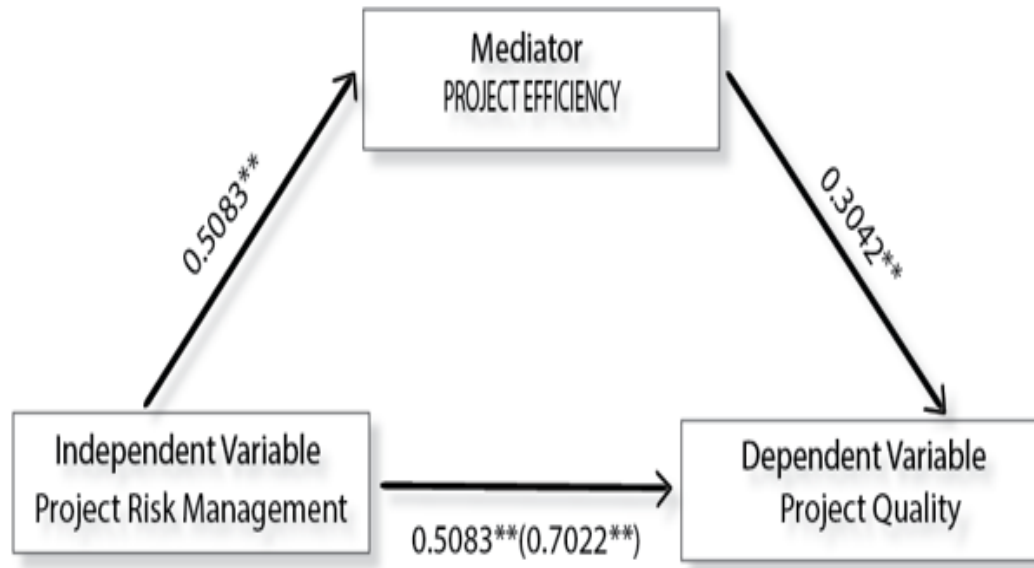


FIGURE 4.3: Coefficients of Mediated Model

4.5 Moderation Analysis Results

In order to test the hypothesis H₅ which says that; project culture moderates the relationship between project efficiency and project quality, we used model 1 of PROCESS macro through SPSS [Hayes and Scharkow \(2013\)](#).

Following is the explanation of every path:

TABLE 4.5: Moderation Analysis

variable	β	se	t	p	LL 95% CI	UL 95% CI
Constant	4.1062	0.0311	132.04	0.0000	4.0449	4.1674
Project Efficiency	.2155	0.0605	3.5627	.0004	.0963	.3346
Project Culture	.5849	.0728	8.0331	.0000	.4415	.7284
Project Quality						
Interaction	-0.0238	0.0328	-0.7246	0.4696	-0.0884	0.0409

*N=244, ** p < .01*

According to the Hypothesis 5, in the current study the more project culture the project efficiency increases positively resulting in more project quality and it moderates the project efficiency and project quality for this study. From table

4.5, it can be seen that the zero is present in the 95% confidence level between the upper and lower limits of -0.0884 and 0.0409 of the interaction terms which moderates on the relation between Project Efficiency and Project quality.

The value of R2-Change is .0009 but the value of p is 0.4694 which means there is no moderation in this case. These results show that Hypothesis 5 is rejected which states that Project Culture moderates the relationship between project efficiency and project quality so that it strengthens the relationship.

4.6 Summary of Accepted/Rejected Hypothesis

After conducting the analysis, we have the results which will help us to accept and reject the hypothesis based on the results. The acceptance and rejection of the results is based upon the final results of correlation and regression analysis conducted on the relationships between the variables under consideration in this study. This section summarizes the results and show us which of the hypothesis we will accept and which are going to be rejected in the study. The results are summarized in the following Table 4.6

TABLE 4.6: Hypotheses Summarized Results.

Hypothesis	Statements	Results
H_1	There is a positive association between Project Risk Management and Project Quality	Accepted
H_2	There is a positive association between Project Risk Management and Project Efficiency	Accepted
H_3	There is a positive association between Project Efficiency and Project Quality	Accepted
H_4	Project Efficiency mediates the relationship between project Risk Management and Project Quality	Accepted
H_5	Project Culture moderates the relationship between Project Efficiency and project Quality	Rejected

The summarized results show that the Hypothesis 1, Hypothesis 2, Hypothesis 3 and Hypothesis 4 are accepted on the basis of the results from the analysis and Hypothesis 5 is rejected on the same bases. The results from the analysis are found to be true and are accepted as valid on the bases of accurate data analysis. These results represent the acceptance and rejection of the hypothesis in the context of Pakistan.

On the basis of our findings, we can infer that project risk management is positively linked to project quality, project risk management is positively linked to project efficiency, project efficiency is positively linked to project quality and project efficiency mediates the relationship between project risk management and project quality. Project Culture's position in moderating the relationship between Project Efficiency and Project Quality is considered insignificant.

Chapter 5

Discussion and Conclusion

This chapter contains descriptions of the hypothesis relationship and also their reasons of acceptance and rejection, and also addresses the study's theoretical implications, practical implications, strengths and weaknesses and future directions for research.

5.1 Discussion

The study's goal was to examine the effect of project risk management on project quality in this relationship project Efficiency was taken as a mediator while the project culture was taken as a moderator providing us a moderated mediation process.

The analysis was conducted on the data collected from different individuals which are working in various project-based companies in the Pakistan. This type of studies conducted in the context of Pakistan is very rare.

We aimed to test our three hypotheses: Project risk management & project quality are directly related whereas Project efficiency mediates the relation between project risk management and project quality. We tested these hypotheses from the data collected from 244 respondents. The results section summarizes the hypothesis results. The present research has accomplished much of the aim of this report, which is the direct impact of project risk management on project quality,

the impact of project efficiency in completing the project in its timeframe given. Impact of the practice of project culture on the construction.

The research findings show that the project has a positive effect on project quality from project risk management which means that project risk management increases the project quality. A positive relationship exists between project risk management and project efficiency, which also has a positive association with project quality.

So, it is accepted that H_1 , H_2 , H_3 and H_4 develop a relationship between project risk management and project quality through project efficiency mediator. This means that project risk management greatly improves project efficiency and, as a result, strengthens and develops the project quality.

The research instilled element as moderator of the project culture. In Pakistan's contextual settings, the data analysis on the variable proves that project culture negatively influences the relationship between project efficiency and project quality. It was found that the position of project culture is negligible and has an adverse impact on the relationship between project efficiency and project quality.

5.1.1 Hypothesis 1: Project Risk Management will Positively Significantly Affect Project Quality

In Hypothesis 1, it was proposed that there is a positive relationship between project risk management and project quality so by Checking the research model with Pakistan in consideration. Project risk management is positively related to the quality of the project, which is accurate according to the theory suggested.

The research performed demonstrates us that there is support for the significant effects of the hypothesis. The results showed that project risk management has a significant influence on project quality and helps it to boost if the risk management is carried out correctly. It is widely seen that the more the risk management the more is the quality of a project and vice versa. In the background of Pakistan, project risk management is directly related to project quality. This analysis is in line with the study performed by various researchers in this area. According to the

study conducted by (Szymański, 2017) risk is everywhere, every part of our lives. Another such thing is the building industry, where risk is an intrinsic feature. Good risk management does not mean risk reduction, which tends to be the cheapest option. A system for analyzing and monitoring the quality of projects needs to be developed and the strategies for monitoring the quality of project should be included in the project. Main purpose of timely process redesign and improvement in order to achieve the objective of increasing efficiency and cost reduction, thus ensuring long-term business success (Perković & Milan, 2011).

The main considerations in the construction sector include the use of risk management strategies to mitigate the risks that are critical to the progress of the project. It occurs many times when the project manager is not aware which risk management strategy will be implemented to prevent or monitor a specific risk. This happens due to the fact that the work is assigned to the contractor and sub-contractors, in order to complete the high level projects but without taking in consideration the factors which can affect the execution of the project such as accessibility of resources and supplies when needed, also the lack of funds and check and balance by the corporate body, which also effects the efficiency of the project. The findings give developers, project managers the chance that supervisors and other main team leaders will keep track of their activities of ongoing and future projects, taking into account the risk management techniques identified in the research study (Choudhry & Khurram, 2013).

It can be observed that our results are simultaneous with the studies conducted in the different part of the world that risk management of the project is important for mitigating the risk of poor project quality or else the poor project risk management will affect the quality of the project and it is one of the major issues that impact the project. To make the quality of the project good and to get successful outcomes we need to use the proper and accurate risk management and take effective measures in all the phases of the project development. Risks are everywhere and occurs in almost all the projects but to avoid such situation which leads the project towards failure risk management measures should be taken on time and risks should be prioritized in order to resolve the critical risks first. The schedule for this process

should be made and followed strictly by the project managers and team members as well.

Risk management has a significant influence on project budgets, delivery time, efficiency, project quality, health and safety, and environmental sustainability (Akinbile & Agboola, 2018). The considerations should be handled by the project organization as early as possible, because the distance, cost considerations and consistency is found to be mainly administrative activities which should be until tendering or construction to complete in the design process. Hence, the project manager needs to consider and change dealing separately with the influence of each aspect (Larsen & Ditlev, 2016). New technology will be introduced by the contractor; and develop effective risk management team and a quality management team (Abas & Ahmad, 2015).

5.1.2 Hypothesis 2: Project Risk Management will Positively Significantly Affect the Project Efficiency

The second hypothesis concludes that the project efficiency makes the significantly positive relationship with project risk management. This theory was also accepted from the research carried out and from the study. This project's mediator's and independent variable effect is considered to be significant, and is based on our assumptions. This result is consistent with the analysis performed by numerous scholars across the globe and across specific project domains. Classifying and defining a significant number of existing risks in the construction industries and environment, we can conclude that the industry has a highly complex framework which can influence the final outcome in the context of building design, development of the product, renovation of the premises (Borkovskaya & Maxim, 2019). Projects usually present challenges for managers and team members. Keeping a project on schedule and delivering a positive outcome can be difficult. When issues occur, it helps to consider how projects can be held efficient and successful. The new version of risk management can provide various advantages to an organization by doing reductions on costs. It also ensures proper delivery of project according

to schedule and leads to timely project realization (Rao & Chandra, 2013). In so many researches the efficiency of project is measured through cost and schedule of the project. So, delivering the project on time and within the suggested budget is good for the project team as well as organization. We used a combined Project Efficiency measure (i.e., percentage of projects finished on time, projects completed within budget and projects finished on settled specification) instead of representing three separate measures (i.e., One percentage of the time, another percentage of the budget and the third percentage of the accepted requirements that have already been met) (Mainga, 2017). The high work backlog also effects the efficiency of the project. A backlog is a priority list of tasks which organizations should concentrate on within the context of a project management strategy. This is based on the project's specifications and roadmap. Relevant tasks are usually placed at the top of the list in the backlog to let the team know which projects they need to perform first. When taking an investment decision, one should concentrate on step-by - step assessment to effectively minimize all kinds of costs associated with the pre-investment period of the project life cycle and speed up the process of effective project execution (Sigal & Bakumenko, 2014).

It is clear that cost is the specific measure by which the impact of risk is measured and the dominant view of this study is that risk management gives greater trust in the project budget and helps in particular to create a more reliable and practical level of contingency funds (Wood & CT, 2003). Project control calculate the efficiency (time & cost) of a project during its development and use the details gathered during the scheduling of baselines and the phases of the risk management to track and upgrade the schedule, and take corrective steps when issues occur (Vanhoucke, 2012). Before the project begins to save the potential design collaborators the project manager will bring in the effort. The budget is then to be generated and submitted for approval to the company leaders. The details of the budget are then given to team members before the project begins. The schedule needs to be included in the project charter that is often an event/activity calendar and work schedules. It is important to set the schedule at project start. In fact, break down the due date timetable into smaller tasks.

5.1.3 Hypothesis 3: Project Efficiency will Positively Significantly Affect the Project Quality

The third hypothesis concludes that the project efficiency makes the significantly positive relationship with project quality. This theory was also accepted from the research carried out and from the study. There are several approaches that can be applied to improve both project efficiency and project quality by helping the companies to perform efficiently and profitably, while at the same time maintaining a project quality so that the project team will be confident and the consumers will be pleased. At the beginning of the project, the opinions of customers, contractors and consultants regarding customer expectations of time, cost and quality are not uniform. Clients agree that their standards for time, cost and quality are realistic, while managers and consultants usually don't think so (Bowen & Pearl, 2002). The only factor that will influence the project quality is the time, cost and scope of the project which is called project efficiency in other words. When the project is not meeting the budget that has been set or if the project is not delivered on time, or if the project is not meeting the scope that is defined in the start of the project, it will impact the quality of the project. The customer would not be happy with this behavior of project team. So it is necessary to follow the time, scope and schedule of the project which is given by the client to make the project successful and quality of the project good. Good material results in high quality performance, while the production schedule prevents shortages and reduces the lead time of construction projects (Abas & Ahmad, 2015).

A review of the efficiency indicators will be conducted as part of the project management process for projects which are still ongoing. Since efficiency can be enhanced at any point of the project lifecycle, the variables of project efficiency should be checked (and put into action if necessary) as soon as possible (Frinsdorf & Xia, 2014). Until starting a project, construction managers need to review all the plans, necessary resources, and cost of those resources. The classification of events, however, requires the study of hundreds of various considerations, including financial, economic, investor and regulatory issues. In fact, construction projects

may be lagging behind due to the weather effect on a construction site, which needs to be addressed when setting deadlines (CMI, 2008). So, by analyzing all the steps at the very start of the project, a project manager can reduce the extra expenses and improve the efficiency of the project.

It can be noted that our findings agree with studies carried out in various parts of the world that risk management is necessary to reduce the risk of poorer project quality or in other words poor project risk management affects the quality of the project, which is one of the key causes of this phenomenon.

5.1.4 Hypothesis 4: Project Efficiency Mediates the Relationship between Project Risk Management and Project Quality

The second hypothesis concludes the relationship between project risk management and project quality is mediated by the project efficiency. This hypothesis was also accepted from the results and analysis conducted. This mediating effect of project is found to be significant and is according to our assumptions. This result is consistent with the study conducted by different researchers around the globe and in different project domains.

In accordance with the above, we find it necessary, firstly, to correct organizational practices in the field of project information and, secondly, to develop existing standards and quality criteria for design and construction materials and to place estimates of performance and costs in accordance with applicable requirements in current planning and construction methods. Thirdly, mandatory identification of standard metrics to assess the performance of public contracts and, fourthly, effective oversight of a range of improvements in the working documents including revisions to the project documents (Uvarova & Lyudmila, 2017). The following tasks are included in project risk management; planning, organization, risk monitoring, risk identification and training, development of risk response, and control (Loosemore & Charles, 2006). So, if a team follow these tasks properly then there is a less chance of risk encounter. In every project a risk management should plan

for the management of risk. They should be aware of type of risks which can occur in the project and a team and project manager should have knowledge about how to identify those risks. A project manager and a team should more importantly take care of the risks related to cost, schedule and scope which can affect the efficiency of the project. Project managers should have proper knowledge that which strategies should be taken to avoid certain risk and how to control it. Training should be given to the team for risk management so that the quality of the project is improved. Unqualified contractors, incorrect statements, inappropriate information and specifications of working design, delays in decision-making at various stages of the project and delays in payment are some of the factors that affect the construction industry from rising at a faster rate. These kinds of issues have evolved to such an extent that it is completely necessary for the government to take decisive steps to increase the construction industry's efficiency (Farooqui & Sarosh, 2008).

The most important role the contractor must undertake is the hiring of a professional project manager. Project management experience, business skills and project management awareness are needed by a project manager to manage the project effectively. The contractor or the senior management should give the required authority to the project manager regarding finances and resources. The manager should be aware what his responsibilities are and what the senior managements expect him to do. Afterwards the project manager is responsible to gather a team which is competent and are dedicated to plan, execute, contracts, and procure to complete the project in the given constraints and conditions.

5.1.5 Hypothesis 5: Project Culture Moderates the Relationship between Project Efficiency and Project Quality

Due to negligible p value the fourth hypothesis was rejected, which makes the null hypothesis accepted. The Project Culture moderates the relation between project efficiency and project quality according to hypothesis 5. The Culture of

the project moderates the relationship but it was rejected on the basis of the results from regression analysis. Results showed that project Culture do not moderate the relationship. Project efficiency is not significantly affected by project culture. This suggests that project culture in the sense of Pakistan won't impact project efficiency and project quality relationship. Or so we can say that having a project culture or no project culture will not have an effect on enhancing the capabilities of the employees or the project manager.

Projects with the highest levels of quality and customer service tend to describe their project culture better than projects at the weaker level. This is in line with the research discoveries that a highly organized culture encourages better quality and efficiency of the project (Teräväinen & Anton, 2018). A combination of human resources, project management and External conditions impact project execution. The nine knowledge areas of project management practice are essential to enhancing project chances of success (M. F. H. Ling Dulaimi & Jing, 2012).

This finding is contradictory to what was observed in the studies done by other researchers including to have strong culture for projects that are large scale, the management can set up a PMO to oversee the projects health. The office will set up rules and standards to make sure that large scale projects managed according to the set standards. There can be a variety of factors that didn't support our hypothesis. One explanation for this negligible relationship as indicated by previous research may be project employee understanding of current project culture. The culture of the project includes open collaboration, encouragement and partnership, the exchange of information, the assessment of individual experience, common values and ideas in accordance with project goals, over a defined period of time (Marrewijk, 2007). Nevertheless, there is a strong difference between creating and introducing (or adopting) a specific culture of the project and how a project employee perceives the culture of the project (Aronson, 2015). Literature shows that corporate culture is a complex interplay between disruptive leadership and follower behavior that chiefly forecasts how subordinates view and respond both emotionally and physically to their toxic leadership Maseko (2017). Based on the following evidence, The theory was that project culture reduces the relationship

between project efficiency and project quality, as workers are considered to be less influenced by the harmful or detrimental consequences of project efficiency in the midst of supportive or high-project culture (Brewer & Faye, 2002) such that positive relation between project efficiency and project quality weakens. However, by looking at the statistically insignificant results, hypothesis is not accepted accordingly depicting that project culture do not act as a potential moderator between project efficiency and project quality in the organizations of Pakistan.

This finding is opposed to other studies is may be due to the change of context of the research because the other studies were conducted outside Pakistan. It is seen in many cases that in Pakistan's context the studies show different results from the studied from outside Pakistan. This is due to the fact that employee in Pakistan has a different type of personality and acts differently from the employee working outside Pakistan. Literature study suggested that there are four different factors which perform as input to projects which are organizational, managerial, technical and human that were affecting the project activates efficiency. However, these are only the assumptions and we need to explore it further for providing concrete evidence to our claims.

So, we conclude that the project efficiency is positively associated with project quality, project risk management is linked positively to project efficiency, project efficiency is related positively to project quality, project efficiency mediates the relationship between project risk management and project quality and ultimately the project culture does not moderate the project efficiency and project quality relationship.

The underpinning theory of (Aven, 2016) supports the accepted hypothesis and elaborates the concept of utility theory in risk management field. This reflects the satisfaction that the customer feels. A positive is something that fulfills human needs. While the profit, satisfaction or happiness of a good or service cannot be explicitly calculated, economists instead have built methods of describing and evaluating value in terms of economic choices that can be calculated. Aversion or tendency to risk-taking is major factor in decision-making that is to say in the

planning and execution of construction projects. Hence, the attitude towards risk-taking is important in the evaluation of options and at the same time, suggests the need to take the decision-maker's personality attributes into account.

5.2 Practical and Theoretical Contribution

The study has both theoretical and practical implication in the context of Pakistan. Based on theoretical perspective, this study contributes in literature for the insight in project risk management, project quality, project efficiency and project culture.

The present research has contributed to project management literature within the area of project risk management. This contribution to discovering the effect of project risk management on project quality is very significant, as there is little literature on this in Pakistan.

This research reviewed the influence of project risk management on the efficiency of a project by evaluating the role of project efficiency as mediator. The results of this study are relevant for project management researchers and practitioners.

This research highlights the value of project risk management for a country in the context of projects in Pakistan. The results will help new researchers explore numerous facets of project management in the field of risk management and quality, where the little work has been done in Pakistan. This study recommends the project managers and the senior management working in the project to plan the project properly to mitigate the negative effects of project risks. The application of appropriate project risk management practices must be used in project-based organizations of Pakistan. The workforce must be trained and educated about their roles and responsibilities and how to handle the risk and which risk management techniques should be used. The organization should adopt better and efficient approaches to manage the project so that they can be aware of all the roles and responsibilities that are expected from them.

Furthermore, one of the modules of the project which is the project culture moderates the project efficiency and the project quality relationship insignificantly.

This suggests that when researching projects in the sense of Pakistan culture does not play a significant role, either the working conduct of the project team and project managers is not affected by senior management oversight or the project team is not very serious about embracing the project culture. It is necessary for all the members of the team whoever joins the project which is under process, every team member should understand the traditions and norms of the project and they should accept that culture of the project. Project managers are responsible for guiding the team to follow the project principles and to communicate well with the other team members as necessary. If only one team leader does not obey the project culture, this may destroy the whole environment and also impact the project results.

Risk management is considered to be the most vital part of a project, so the individuals involved in risk management team must be competent enough to properly plan for all the risks of the project and mitigate those risks properly to make the project successful and improving the quality of the project.

5.3 Limitations

In respect to the data collected by the questionnaires, any of these findings need to be reconsidered because there was such a wide number of participants chosen in such a small sample, it is important to address the variation of the results. But this is of some importance as the research, as it identifies several challenges of the existing model of project risk management and project quality.

Both risk management and project quality are well-established literature fields, and as there have been no innovative discoveries in any of these field so this section should be seen as up-to - date and essential. But the main objective of this study is to focus on the relationship between project risk management and project quality, and for this reason, the most basic elements of both risk management and project quality were evaluated to identify the relation. This was important because literature of risk management and quality is not much known. In order

to say something specific about the risk management and quality of project there need to be more data available.

Even though this study used the opportunity to examine the impact of project risk management on project quality, certain limitations exist due to which the results should be interpreted. Regardless of the contribution the limitation must be noted. This study can only be run in projectized organization due to the fact that most of the projects are taken in projectized organization under the constraints of time, cost and scope.

5.4 Future Direction

The findings of the research carried out helped identify the actions to be taken for long-term improvement of the construction industry in Pakistan. The root causes of the industry's poor performance have been identified, leading to the conclusion that there is a huge need to apply the knowledge, tools, skills and techniques of professional construction project management, which cannot be achieved until coordinated speedy efforts to educate industry, project team and owners are applied.

The conclusion of this study is provided in the following section. The result may have been different if only the aspects of the section below were taken into consideration. This section would address activities that may have been made feasible if there were just time limits, any areas that require more investigation and a review on the results of this study.

Looking back on the literature review provided at the start of this research and understanding the outcomes of the data gathered, the section on literature will be revised to best match the rest of the study. The literature would either have helped validate the conclusions, or provided a subject discussion. There is also a trade-off between where to approach the issue for the conclusion of the literature review and when to depend entirely on the analysis of the results.

More research needs to be conducted to determine whether it is effective or not to generalize the application of the risk management and quality of projects in other fields. This can only be achieved by the process of trial and error. I propose that a related study on the risk management and quality of the project in the field of project management should be carried out before a new conceptual description is implemented. This is highly advised to further explore and evaluate as the other functions in the project management team expect. Even if the current functional description is unable to fulfill the project requirements, the resources put into the modification would be adding value to its products.

A further study could assess the impact of following the findings from the literature study regarding the areas where both risk management and quality could learn from one and other, and implementation would be very interesting. By having this approach, the link between risk and quality can potentially be highlighted.

For future studies the scope of the research can include the organization form all over Pakistan to get a wider view of the situation of the projects. The studies should focus now on exploratory studies to find the causes of risks and how much they effect the projects in the context of Pakistan. Project risk management is one thing the focus should be now on how project risk management plays its role to generate more factors or issues that can result in project quality. All of the studies have on the quality of the project show that there are different causes depending on the context of the project which affect the quality of the project. The causes and the group that are causing the poor quality of the project are specific with respect to region, country, and location and specific to the kind of project as well. In the domain of project, no cause can be taken for granted on the basis that they are most or least effective.

5.5 Conclusion

This work was intended to analyze the effects of project risk management on project efficiency with the mediating role of project efficiency and project culture moderating role. Conclusion is that moderation of the culture of the project is

not important. In the context of organizations working in Pakistan it does not moderate the relationship of project efficiency and project quality.

It has also been found that the relationship between project risk management and project quality is mediated by project efficiency. In fact, it has been observed that project risk management improves project quality.

This work underlines the value of project risk reduction and how it can impact project efficiency in the Pakistan context. The project efficiency is the basis for knowing the project environment and the attitude of the employees or a project manager in which they work and how it affects project risk management and the relationship between project quality. The organizations and project owners must devise ways to ensure project successful and risk-free delivery by taking proper risk management measures, making project risk management a vital part of the project while and ensuring proper risk management that resolves the critical issues of the project which can cause the project failure. The set plans of the risk management will help the individuals to know what they should do to eliminate or mitigate the risks. This way they will be able to execute the project successfully and properly.

The organization need to focus their efforts in the risk management of the project properly and to train their employee so that they may know what is to be done and when it is to be done when they face some risk in the project to ensure the quality of the project. Most of the organization do not implement properly the risk management strategies which may fail the project or at the very least push the project in the category of troubled projects. The context is very important in the sense that with changing context we have different levels of employee dedication to their roles and responsibilities and the trend to manage the project in the right and proper way.

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Appendix-A

Survey Questionnaire

Section-1: Risk Management

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

1	Formal project management tools and techniques were employed for this	1	2	3	4	5
2	The project's scope, size, and effort were estimated adequately.	1	2	3	4	5
3	The implementation risks were adequately evaluated, classified, and prioritized.	1	2	3	4	5
4	The implementation schedule was realistic.	1	2	3	4	5
5	Project managers in charge of the project were highly capable and experienced.	1	2	3	4	5

Section-2: Project Efficiency

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

1	Projects usually overrun budgeted costs.	1	2	3	4	5
2	Schedule overruns are common in most projects.	1	2	3	4	5
3	Backlog of development work is high.	1	2	3	4	5
4	Fixing bugs and other types of rework account for a	1	2	3	4	5

	significant proportion of systems development effort.					
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Section-3: Project Culture

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

1	In this project team members understand the importance of cooperation to project success	1	2	3	4	5
2	In this project high levels of participation are expected in capturing and transferring knowledge	1	2	3	4	5
3	In this project team members are encouraged to explore and experiment	1	2	3	4	5
4	In this project on the job training and learning are valued	1	2	3	4	5
5	In this project members are valued for their individual expertise	1	2	3	4	5
6	In this project members are encouraged to ask others for assistance when needed	1	2	3	4	5
7	In this project members are encouraged to interact with other groups	1	2	3	4	5
8	In this project members are encouraged to discuss their work with people in other teams	1	2	3	4	5
9	In this project overall project vision is clearly stated	1	2	3	4	5
10	In this project overall project objectives are clearly stated	1	2	3	4	5
11	In my organization the knowledge is shared with other organizations (e.g. partners, trade groups)	1	2	3	4	5
12	In this project the benefits of sharing knowledge outweigh the costs	1	2	3	4	5
13	In this project senior management clearly supports the role of knowledge in project success	1	2	3	4	5

Section-4: Project Quality

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

1	In this organization projects are completed within budget	1	2	3	4	5
2	In this organization projects are completed within schedule	1	2	3	4	5
3	In this organization the quality of the produced work is good	1	2	3	4	5
4	In this organization projects have the ability to complete its goals	1	2	3	4	5
5	In this organization work is done by interacting regularly with consultants	1	2	3	4	5