

# Assessment of Critical Factors Responsible for Cost and Time Overruns in Pre Construction Planning Phase of Construction Projects

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## Abstract

In Pakistan, the construction industry has not a good reputation for the completion of its project within cost and time. The cost and time overruns in the preplanning phase of the construction project have become a major issue, and the contractors and management of the construction industry are working for analyzing the elements which are influencing the cost and time overruns of the construction projects. The major focus of the research study is to analyze the elements influencing Cost and time overruns in the existing construction Planning Phase of Construction Projects. Numbers of studies are reviewed on this particular topic, and it has been observed from all these studies that Poor site management, Labor force, Project complexity, and Construction material Shortage are major factors that can be the reason for the cost and time overruns of the projects of construction. The research analysis is conducted by using the combination of a different approach in which the exploratory research method is applied by using the theories and studies of the various authors; meanwhile, the quantitative research methods are applied by using the questionnaire. 200 questionnaires are distributed to the professionals of the construction company in Pakistan. Then the data is examined by using the SPSS (statistical packages for social sciences) for measuring the relationship of the variables and effect of the independent variable on the dependent variable. It has been evaluated that by one percent change Poor site management, Labor force, Project complexity, and Construction material Shortage, the cost and time overruns of the construction project will be changed 90%. It means that managing the project complexity and poor site management in a good way and the time cost overruns can be improved for the construction project. The example of the orange line train has been discussed to justify this study.

**Keywords:** Poor site management, Labor force, Project complexity, Construction material Shortage, cost and time overruns

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## 1. Introduction

One of the major the practitioners available by the construction industry to get the projected complete within time. The deadline is too important for any projects either it's related to the construction industry or any other industry. The deadline is one important thing that can enhance the goodwill of the company in front of the clients (Memon, et al., 2011). But the construction industry is the rule of the practitioners that the project must be completed within time according to the required quality and stipulated budgets. There are several strategies that are commonly using to identify the factors of the Cost and time overruns in the preplan construction projects for controlling and managing the projects (Aftab Hameed Memon, 2011). There are several projects of the numerous countries which are facing the issues related to the problems of the cost and time overrun, and all of these projects are required very serious attention to finding out the solutions in order to overcome all of these problems. The construction industry in the particular regions of the American society is also facing the problems of the cost and time overrun. Such types of problems and these issues can be solved out by adopting several strategies and steps. First of all and the most and most initial step for resolving such an issue is to understand and examine the causes for cost and time overrun for the construction industry. Therefore, there must be particular strategies to find out the factors that are affecting the cost and time overruns of the projects in the construction industry (Hemanta Doloi, 2012).

The construction industry is the most fragmented and complex industry among the industries of the world that are scheduled for particular, driven resources. The major criteria of the projects in the construction industry are the timely perfection of the projects. The success of any plan depends upon the timely completion of the projects (Ameh, et al., 2010). Cost and time overrun are referred to as particular delay away from building the plan baseline. With respect to managing the projects of construction in effective manners, the major goal is to reduce the time and cost of these projects. Therefore the delay of time frequently occurs in the entry stages of the construction projects and due to which the total duration of the construction projects can be increased easily. There are very rare projects in the Pakistani industry that can easily complete according to the particular deadline (Alinaitwe, et al., 2013). For several countries, there are significant impacts of building projects on the development and growth of this particular country. No doubt, the economic growth of Pakistan is depended upon

the manufacturing industry, but the construction industry has its own scope in this region. In most of the construction industries that major stakeholders are the supervision teams, developers, contractors and designers who play their own role to manage the projects in effective manners. They struggle to complete their projects with great success, and the success of these projects depends upon the cost and time of the projects. There are several factors in the market that can affect the cost and time overrun of the projects (Rahman, et al., 2013).

The demanding project is paralleled with the Malaysian construction industry, which performs the role of the epicenter of growth. However, it suggests a useful contribution to developing a nation, but the construction industry is connected with delays in project delivery. When the contract date is extended, the time overrun takes place to execute the program to extend to the targeted date for which parties were agreed (Endut, 2014). The ultimate objective of the research to recognize the importance of liability overruns the project. This prevails the significance of the level of the aspects which are affecting the results. The projects are facing cost and time overrun problem which is considered as the main issue in the construction problems. This is also considered as objective to make the economic growth in the industry. There are many other purposes of the research as;

- To evaluate the signification of the elements on the basis of the sector involved in the project in the public and private sectors.
- To examines the statistical data about the project in order to collect the information about the audience with the presence of the client and contractor.
- To develop the stage where the responses are based on a professional role in electrical and mechanical expertise working in the project management.
- To develop the industry internationally to compete with the projects that already exist in the market to filter the services and products in the industry.
- The research study is used to reduce the influence of the aspects of reducing the delay and cost overrun projects in possible ways.

### 1.1 Research Questions

- How will the signification of the elements be evaluated on the basis of the sector involved in the project in the public and private sector?
- What is the procedure to examine the statistical data about the project in order to collect the information about the audience with the presence of the client and contractor?

## 2. Literature Review

According to Alinatiwe et al. (2013), the main focus of the conduction of the literature review to discover the effective strategies to resolve the existing problems of overrun of cost for the senior leadership or managers as well as to resolve the construction project delay issue due to time for the managers. So it is a critical global problem which is increasing day by day.

Researchers held a research study on construction projects and concluded that the payment progress method gets influence in the project when the client makes changes during the construction period. Scheduling and planning of projects by contractor supervision, financing issues, and poor site management will also enhance influence on the payment progress method. Some identified reason behind this issue is a delay in the delivery schedule and changes in the project schedule. When the client requires changes they stop running operations as a result of cost increases and delivery schedule face delay (Assaf & SadiqAl-Hejji, 2006).

According to Aljohani et al. (2017), the industries of the constructing of the project may have a poor reputation to complete their construction projects in the selected and agreed budget, so the delay in the project or construction occurs due to their reputation. The cost overrun is experienced normally by such kind of projects, and of these projects may nine out of ten. There can be various causes of cost overrun. So, several kinds of causes have also be determined by the constructors, and the researchers, as well as some researchers, have also identified the effects of those causes. The literature regarding the cost overrun in the project of construction is reviewed by the research article for the identification of the main potential causes in the different countries. (Aljohani, et al., 2017).

According to Haseeb et al. (2011), postponed the projects is the fact, but it is the issue. The issues of delaying in construction projects occur mostly in the industry of construction of Pakistan. The occurrence of delays may be critically expensive as mentioned in the study. Furthermore, the delays in the construction projects are always measured so much expensive for the involving parties, or the clients or the stakeholders that are related to the particular construction projects, as well as the delays, are very often. So, the claims, clash in the expected results, a total dissertation will be resulted by the delays in often as well as will be complicated for the feasibility while the delays in the construction projects show the growth for the sector of the construction.

Haseeb et al. (2011) stated that it conducts an appraisal on the time of the project of the construction performance to analyze the causes of delay. The major goal of conduction the literature is to identify all the factors regarding the delay and to determine or measure the effects on the completion of the project of the construction successfully. In simple words, the researchers have conducted all the research to determine what factors and causes

can take part in the delay in a construction project as well as for the determination of the effects that how much they can be. In Pakistan, due to natural disasters such as flood or earth quack or rainy seasons can make a late in the construction project (Haseeb, et al., 2011). Noulmanee et al 1999, investigated various causes and influencing factors regarding the delay in construction projects. Research findings suggest that insufficient resources, poor management of project plans, unclear design, and poor communication system are the key reasons behind the delay in the construction project (Noulmanee, et al., 1999).

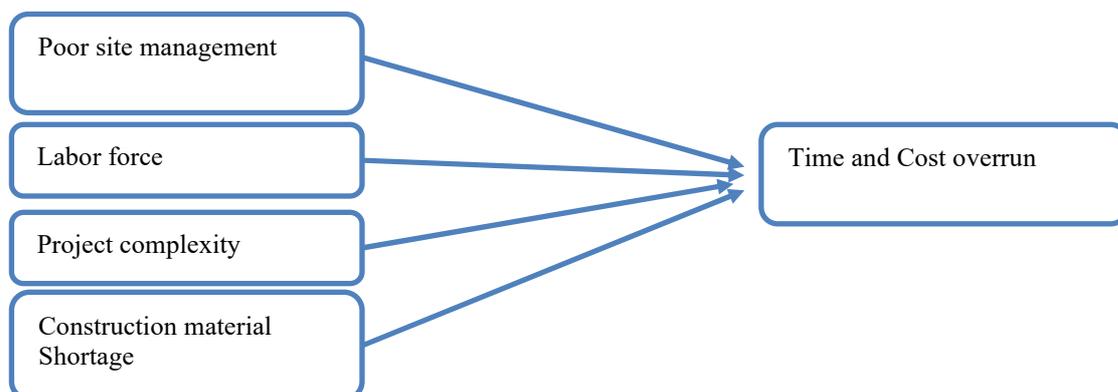
As stated by Hussain et al. (2017) that the industry of construction is one of the key areas that provide the facilitation to the justifiable social as well as the economic development in the area. Many developed and underdeveloped nations adopt mechanisms of the development of the community or culture in the running time. It focuses on the quality of life as well as the economic growth for the enhancement along with the local community of social welfare. The rural perception of the public of the residents on the project of construction on delays is reviewed by the research article as well as the main purpose of the study is to explore the societal and economic challenges opposing by the residents of any region of Pakistan but especially in the rural areas. The proposed study has examined influencing factors of the socio-economic on the basis of 73% valid responses of rural residents (Hussain, et al., 2017).

Moreover, a survey was conducted by Ramabodu and Verster (2010), to study a variety of factors for cost and time consumption. The result of the survey gave different results, which gave a variety of expected or unexpected factors, which were the main cause of the delay in construction projects and the effect on the cost in the sense of cost overrun. As the studies describe that time and cost are the direct proportion, but the manpower and cost are inversely proportional to each other. For example, if workers' quantity increased, the productivity will also be increased as well as time consumption will below. However, on the other hand, if the quantity of the workers will be increased, the cost will also be increased, but time consumption will be low, and the chances of delay will be minimized. But the delay is still here because of the cost overrun (Ramabodu & Verster, 2010).

As stated by Shah (2016), the researcher has discovered the most influencing factors that affect the construction projects as well as the cause of delay and cost overrun to overcome this kind of issue effectively. There are many influencing factors are identified such as deficiency of knowledge, reduction of experience, lack of equipment, lack of manpower, lack of material or any kind of raw material which is required the completion of the project, mismanagement in the materials, costs, time, assigning tasks to the workers as well as the lack of interest to complete the construction project in the given time. However, many researchers have studied cost overrun as a major issue in the construction project. According to Chan (2004), cost overruns factors are categorized as factors beyond the control of management, factors under owner's control, and factors under consultant's control (Chan, et al., 2004). The other reasons are also enlightened which can take part in the delay of construction projects and cause for the cost overrun. The other critical factors are as follows; any governmental legislation, any political or religious actions or pressure, or any other factors can disturb the productivity and cause for delay or cause for the cost overrun (Shah, 2016).

### 3. Methodology

This section of the research study discusses the materials and methods that are used in this particular study for analyzing the data in effective manners. This part of the research study explores the details about the methods that are used for research purposes. It includes the methods that are required to explore the factors that are affecting the time and cost overrun of the construction projects. This chapter discussed the research methodology, a research design that is contained in the (Research approach, Research philosophy, Research methods, and types of data and instruments of the study). This part of the research study also includes sampling and population. The tools for data analysis are a mandatory part of this research study. All of these above-given points are explored in this paper in an effective manner with an expectation that this research methodology will provide us with the preferred outputs (Larsen, et al., 2015)



The research study is conducted by using the Positivism paradigm because this is the approach that is used for explaining describing the strategies of the social studies which rely on particular scientific evidence. It includes statics and various experiments in order to reveal the true nature of the hypothesis. In this study, the scientific and static approach is used to measure the effectiveness of the several factors that affection on time and cost overruns of the construction projects. The particular statics will be conducted by using the software of the static to obtain the specific outcomes of the hypothesis (Memon, et al., 2010). This paradigm is based upon the idea that is required to gaining a better understanding of the particular topic as it includes the observations and critical analysis for examining the various factors that are affecting the time and cost overrun of the construction project in the Pakistani construction industry. Under this philosophy, true knowledge is explored according to the senses of experiences (Ali & Kamaruzzaman, 2010).

The deductive approach is leading towards the development of the hypothesis that is based on the existing theories. Than research strategies are designed in this approach for testing the hypothesis. In common words, it is also known as the reasoning study from the specific to general (Yehiel Rosenfeld, 2013).

#### 4. Data Collection Methods

This section of the research study discusses the materials and methods that are used in this particular study for analyzing the data in effective manners. This part of the research study explores the details about the methods that are used for research purposes. It includes the methods that are required to explore the factors that are influencing the cost and time overruns of the construction projects. This chapter discussed the research methodology, a research design that is contained in the (Research approach, Research philosophy, Research methods, and types of data and instruments of the study). This part of the research study also includes sampling and population. The tools for data analysis are a mandatory part of this research study. All of these above-given points are explores in this paper in an effective manner with an expectation that this research methodology will provide us with the preferred outputs. In the quantitative research, method data is collected by using the questionnaire which was design by analyzing several studies on this particular topic. This questionnaire is used to measuring factors that are affecting the time and cost overruns. The questionnaire is used as an instrument because it's cheaper and easier ways to collect the data as well as it has required less time and consider the as effective and efficient source to conducting answers to the question. In the qualitative research, method data is collected by using the Interviews because it is considered an efficient way to getting the answer about the specific question and this source is also used to gaining the good ideas related to the services and products. This source is also useful for availing of the general ideas related to the factors by which the preplanning phase of the construction project is affected. The questionnaire is designed by considering the five-point liker ranging scales from strongly disagree to strongly agree. It contains the two parts, and the first parts explain the demographic profile of the respondents and another part of the questionnaire is explains the construct that is used in this study.

In this research study, the population is the professionals of the 5 famous construction companies in Pakistan. The sample is a subset of the population. The simple random sampling method has been employed in this study to get accurate data. In the quantitative research method, the sampling size consists of the 200respondents for collecting the data. The entire respondent would be professionals of these constructions who are engaged in performing their duties as part of their companies at least for months. During the last 6 months and the sampling frame is the same for both research methods. The simple random sampling technique is used in this research method. The data is collected by using personal contact and email. The questionnaire has been sent out to the mangers of the company and then personally visited construction companies after taking appointments from the mangers of the various organizations. To visiting all of this company the authority/ reference letter has been provided by the university along with confidentiality statements.

The data is analyzed by using the SPSS for the quantitative research method. This software is also used to analyzing and interpreting the data which is generated from the administrated questionnaire. This software is used for minimizing data manipulation chances. SPSS is a specific software which is used for generating charts, graph, and tables. It is also used to describing presenting and exploring the relationships and trends for the numeric data. After applying this software the data can be summarized in the main data types, tables and graphs and this research are also involved in the nominal, ordinal, interval and ratios. In the research work, quantitative data is analyzed through the use of statistical testing techniques. The correlation coefficient is used to calculate the importance index, severity index and the difference between the ranks. While descriptive analysis is also taken to represents demographic information about samples e.g. gender and age. Moreover, research will also use the coefficient testing technique to test the variance and significance of the relationship between dependent and independent variables. Additionally, qualitative analysis is taken in this research work to represent important findings of construction projects in Pakistan.

A few of the important ethical concerns are discussed in the research study. The research paper has various roles for conducting this work. The research study must be carried out by following the few points as;

- The data of the customers must be confidential

- Nobody will be distracting due to this study
- Authority letter permission letter is necessary for collecting the data.
- The role of the adroit must be well defined.

Every respondent who have to participate in this research he must be agreeing for the following;

- To ensure that research is conducted by ethical means.
- The participant doesn't be less than 18 years old.
- The answers to the question don't be bias
- It doesn't include the international harm for the project.
- Withdraw is free for the participant at any time

The impact of the researcher's potential on participant and informed consent are the biggest parts of the ethical consideration for conducting the research study. For collecting data from primary resources researcher must be collected, the data most relevant to the aims and objectives of the research study. In the construction industry, the participant will value the time of each other, and the concepts of sustainability will be kept in mind.

#### 4.1. Descriptive analysis

Data has been analyzed by using the SPSS software. This software is used for analyzing the data because it reduces the chances of data manipulation. The risk of the mistakes and missing data can be minimizing by using this software. There are two types of analysis are conducted by using the software for both parts of the questioner. The first part is related to the descriptive analysis that is conducted for the demographic profile of the respondents. Another one is the inferential analysis that is conducted to measure the linearity and co linearity of the dependent variables with independent variables. The descriptive analysis provides the data for the demographics of the variables which impact the study that describes what his education was and how old he or she is. There are four major questions that are analyzed in this analysis, and these are; age, gender, education level, and designation of the professionals of the construction company who are the participants of this study. The first question is about the ages of the respondents.

| Age                      | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------------------------|-----------|---------|---------------|--------------------|
| Valid Less than 25 years | 38        | 18.1    | 19.0          | 19.0               |
| 25-35 years              | 127       | 60.5    | 63.5          | 82.5               |
| 35-45 years              | 23        | 11.0    | 11.5          | 94.0               |
| 45 years plus            | 3         | 1.4     | 1.5           | 95.5               |
| 55 years plus            | 9         | 4.3     | 4.5           | 100.0              |
| Total                    | 200       | 95.2    | 100.0         |                    |
| Missing System           | 10        | 4.8     |               |                    |
| Total                    | 210       | 100.0   |               |                    |

#### 4.2. Data reliability & validity

| Construct                      | Valid No | Item in each F.V | Chronbach's Alpha |
|--------------------------------|----------|------------------|-------------------|
| Poor site management           | 200      | 4                | 0.748             |
| Labor force                    | 200      | 4                | .861              |
| Project complexity             | 200      | 4                | .627              |
| Construction material Shortage | 200      | 4                | .805              |
| Time and Cost overrun          | 200      | 4                | .718              |

##### 4.2.1. Data Interpretation

The data reliability is analyzed by the user test of the Cronbach's Alpha. Questions for each variable can be analyzed by using the test, and this test is implementing for evaluating the reliability and validity of the data. This research study is conducted by using the three main scales variables from which four are the independent, and one is the dependent, Time and Cost overrun is taken as the independent variable in this research study, and the Cronbach alpha values for this variable are .718 respectively.

The value of the Cronbach alpha for the Construction material Shortage is .805. These values show that the data is reliable for all variables because the value of the Chronbach alpha is greater than .7 for all variables. The value of the Cronbach alpha for the Project complexity is .627. These values show that the data is reliable for all variables because the value of the Chronbach alpha is less than .7 for all variables. The value of the Cronbach alpha for the Labor force is .861. These values show that the data is reliable for all variables because the value of the Chronbach alpha is greater than .7 for all variables. The value of the Cronbach alpha for Poor site management is .748. These values show that the data is reliable for all variables because the value of the Chronbach alpha is greater than .7 for all variables

#### 4.2.2. Data Correlation Correlations

|                                |   | Poor site management  | Labor force           | Project complexity    | Construction material Shortage | Time and Cost overrun |
|--------------------------------|---|-----------------------|-----------------------|-----------------------|--------------------------------|-----------------------|
| Poor site management           | Pearson Correlation<br>Sig. (2-tailed)<br>N | 1<br>.000<br>200      | .795**<br>.000<br>200 | .777**<br>.000<br>200 | .899**<br>.000<br>200          | .625**<br>.000<br>200 |
| Labor force                    | Pearson Correlation<br>Sig. (2-tailed)<br>N | .795**<br>.000<br>200 | 1<br>.000<br>200      | .680**<br>.000<br>200 | .852**<br>.000<br>200          | .777**<br>.000<br>200 |
| Project complexity             | Pearson Correlation<br>Sig. (2-tailed)<br>N | .777**<br>.000<br>200 | .680**<br>.000<br>200 | 1<br>.000<br>200      | .646**<br>.000<br>200          | .870**<br>.000<br>200 |
| Construction material Shortage | Pearson Correlation<br>Sig. (2-tailed)<br>N | .899**<br>.000<br>200 | .852**<br>.000<br>200 | .646**<br>.000<br>200 | 1<br>.000<br>200               | .622**<br>.000<br>200 |
| Time and Cost overrun          | Pearson Correlation<br>Sig. (2-tailed)<br>N | .625**<br>.000<br>200 | .777**<br>.000<br>200 | .870**<br>.000<br>200 | .622**<br>.000<br>200          | 1<br>.000<br>200      |

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The correlation analysis shows the relationship of the variable either these variables have a relationship with each other. Thus, the Pearson correlation statistic is calculated 0.625\*\* for Time and Cost overrun which means the relationship between effective Time and Cost overrun and several other variables is good and satisfactory. The Pearson correlation for the Labor force is .795 which means the relationship of the Labor force and Time and Cost overrun is quite good and it also shows the Labor force is .795 percent correlated with the Time and Cost overrun. The correlation value of the Project complexity is .777 which shows the good relationship of the variables. The significant level for all variables is 0.89 and 1.00 respectively which shows these all variables have a significant positive relationship with each other. Because the correlation is significant at the 0.01 level and the values of significant correlation for all variable is less than 0.01 which shows these all variables have a positive significant relationship with the other variables.

#### Coefficients

| Model |                                | Un standardized Coefficients |            | Standardized Coefficients | t       | Sig. |
|-------|--------------------------------|------------------------------|------------|---------------------------|---------|------|
|       |                                | B                            | Std. Error | Beta                      |         |      |
| 1     | (Constant)                     | .188                         | .105       |                           | 1.792   | .075 |
|       | Poor site management           | .611                         | .058       | -.669                     | -10.591 | .000 |
|       | Labor force                    | .506                         | .042       | .544                      | 12.040  | .000 |
|       | Project complexity             | .913                         | .038       | .909                      | 23.927  | .000 |
|       | Construction material Shortage | .150                         | .055       | .172                      | 2.736   | .007 |

a. Dependent Variable: Time and Cost overrun

### Model Summary

| Model | R                 | R Square | Adjusted R Square | Std. The error of the Estimate |
|-------|-------------------|----------|-------------------|--------------------------------|
| 1     | .950 <sup>a</sup> | .903     | .901              | .18072                         |

a. Predictors: (Constant), Construction material shortage, Project complexity, Labor force, Poor site management

### 4.3. Qualitative Analysis

According to the qualitative analysis, the data has been analyzed by using the real based example of the project of the Orange Line train. The orange line train which is one the largest project of the country has been delayed. It has been failed to compete with its given time and according to its deadline in the year 2017. Therefore due to its particular delays, the cost of the project is increased. Due to the delay in this project, the residents also remained affected. For the project of the orange line train, the estimated budget was set out or formally launched the RS 164 billion in 2015. This project was proved as the criticism for its civil society and it also needs the appreciation according to its circles in initiating stages of the project. There are several people who thought the cause of the time cost overruns of the project of the Orange Line train is the political instability but the most accurate truth is that this project is facing the time and cost overruns but due to the shortage of construction materials and the poor site management. As the kit has been stated in the literature review by several studies the major reason for the time overruns is the cost overruns and the cost runs are occur in the construction project due to the complexity of the project. As, Orange Line train is contained on they several complexities particularly the disturbance of the roads, personal property of the people. There were several points of the Orange Line train that are passing from the residential areas and to clear it is too tough. Due to these all complexities the cost of the project was rapidly increased because for acquiring the place of the houses of people it is necessary to provide them accurate alternate. The increase in the cost of these projects are discussed in the Appendix in the video (Dunya news tv, 2017).

### 5. Conclusion

It has been analyzed in several studies that the project of the construction around the world has a record of very poor performance in order to be completed within time, quality objective and cost. In this study, the factors are analyzed, which are influencing the preplanning phase projects of the construction. The factors are also analyzed that are affecting the cost and time overruns of the construction projects. There are several tests that are employed to ascertain the factors which are contributed immensely in order in late completion of plans. The significant element of the research are observed in this study by analyzing the literature of the several authors on this particular topic, and these factor are; Poor site management, Labor force, Project complexity, and deficiency of the material. The linear regression is also applied to measure the effects of variables. It has been measured that the value if the adjusted R square is 0.901 it means due to the 1 percent change in independent variables, the dependent variable will be changing 90%. In the construction projects, cost and time overrun problems are quite critical for the successful completion of the carried out project. In the research study, coefficient testing studied how construction project has a direct relationship with its complexity, labor force, resources shortage, and poor management system. Additionally, the qualitative analysis concluded that political instability caused to influence time cost overruns in the largest construction project of Pakistan known as the Orange line train project. Moreover, the findings of the research study shed light on the need for proper communication systems, reduces in complexities, and effective development of project schedules with the flexibility to adjust possible delays to complete a construction project successfully.

#### 5.1. Limitations

Although this research will be carefully conducted, Researchers are still aware of its limitations and shortcomings. This research is conducted only in Pakistan. The data is collected only from the employees of the construction companies. For this research, only 200 questionnaires are distributed or send out to the participants of the research. There is a specification of time for this research. The research is conducted through a mixed-method and deductive approach. The qualitative research method is just used to observing the theories of several authors. The research study is limited to the construction companies and projects of Pakistan, and it will be helpful for the betterment in the construction companies.

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**Conflicts of Interest:** The authors declare no conflict of interest

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