

Causes of Delay in Construction Projects of Punjab-Pakistan: An Empirical Study

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Received: May 21 2013
Accepted: June 20 2013

ABSTRACT

The objective of the present study was to explore the causes of delay in construction projects. Effects of various delaying factors related to the contractor, client/owner, consultant, material, equipment, labor and general environment factors on delay in constructions projects have been measured. Data on the study variables has been collected through structured questionnaire from 37 construction firms located in Punjab province of Pakistan. Participants were approached personally to collect the data. Various statistical tools such as reliability test, factor analysis and regression have been applied for data analysis and inference. The results of the study reveal that the factors related to contractor, client, consultant, material and equipment have significant impact on delay in construction project whereas labor and general environment factors found to have no effects on delay. The findings of the study provide significant insights to construction industry so that they may formulate strategies in order to avoid delay and its consequences. The recommendations and limitations are also discussed in the conclusion part of the study.

KEYWORDS: Pakistan, Construction Industry, Contractor, Client, Consultant, Material, Equipment, Labor, Delay,

1. INTRODUCTION

Delay is the most critical factor in overall performance of any construction project because it increases the cost of the project. Completing project on time is beneficial for all the parties involved in the project like Consultant, Client and the Contractor. [1, 2]. Therefore it's necessary to identify the factors responsible for schedule delay in construction projects. Assaf and Al-Hejji define the delay as "the time overrun either beyond completion date specified in the contract, or beyond the date that the parties agreed upon for the delivery of the project"[3, pp. 666]. Zack Jr describes it as an "act or event which extends required time to perform or complete work of the contract manifests itself as additional delays of work" [4, pp. 565]. The concerns of late completion in construction projects are considered as global phenomenon[5]. Time is a constituent component of each and every plan that a company schedule to perform a task or a project. There is strong relationship between project scope, time and conditions. A single change in any of above mentioned areas affects the overall performance of the project [6]. Delay is considered as costly for owner as well as for construction firm. Where owner lose the potential revenue while utilizing the projects and higher cost for maintaining the contract, the contractor lose opportunities for future project due to engagement in current projects. General public also suffer due to delay in construction of roads, flyovers and buildings. Time and cost have strong relationship as the increase in time will tend to lead to the cost-overrun. Time is discussed as critical resources and it should be managed until the start of the project[7]. Delay and its consequences is considered as one of the supreme adverse factor in Pakistan construction industry [8].

Problem Statement

The construction projects and infrastructure development of Pakistan are considered as key indicator of its development and economic growth[8]. Many construction projects in Pakistan have been facing serious problems due to which construction projects cannot be completed in time [2]. Moreover, construction projects become more complex due to the entrance of new tools, equipment, technology and innovation. Haseeb, et al.[8]reported that it is very uncommon in Pakistan that construction project is completed without delay. The most adverse impact is it gives bad impression to foreign investors that ultimately lead to downward trend of national progress. Sweis, et al.[9] reported that delays often occur due to poor management of various factors related to contractor, client, consultants, material, labor and equipment of the projects. In addition, general conditions including weather, law & order situations and overall economic conditions becomes severe which causes delay in completion of projects. In order to fill the literature gap and to address the problem of construction industry of Pakistan, the present study is aimed at:

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- Measuring the effects of consultant, client/owner, contractor, material, equipment, labor and general environmental (Govt policies, political and legal environment and weather conditions) related factors in construction industry of Pakistan.

Moreover, the study will provide insights about the topic to various types of construction firms. It is also expected that the findings of the study will provide the significant understanding to the project managers so that they may formulate policies to overcome the issues which cause delay and to avoid the negative outcomes of delay in project completion.

2. LITERATURE REVIEW

As indicated by the various researches Frimpong and Oluwoye, [10] construction industry all over the world is facing delays in completion of their projects due to different reasons. Sanders and Eagles defined delay as “an event that causes extended time to complete all or part of a project” [11, pp. 3]. Various factors are found to be causing delay in completion of construction project. Ahmed, et al., [12] classified into two categories such as internal causes (client, contractor and consultant) and external causes which are beyond the control of the organization. Various scholars [e.g. 13, 14, 15] stressed the significance of proactive measures to identify the delays in construction projects and came up with key remedies to overcome the delays. Sweis, et al., [9] are of the view that delays occur in all types of construction projects whether small or large, simple and complex and reported that it is very difficult to analyze and classify the delays because there is a large number of activities involved in any construction project. In general many researchers have conducted their studies and identified a large number of causes which are involved in the construction project [e.g. 13, 16, 17-23]. Such causes include extreme weather, scarcity of resources, financial problems faced by public organizations and contractors, poor contract management, shortages of materials, and inadequate resources.

Amer [24] discussed the delay problems in the construction industry of Egypt. The study had identified the following chief reasons of time overrun in the construction industry of Egypt: inefficient contract management, impractical scheduling, a little financing by client, delay in payments, design amendments through construction, and non-availability of construction material materials like cement and steel. The issue had also been found as of equal importance in Arab countries. Assaf, et al., [25] conducted a study in construction industry of Saudi Arabia and reported critical causes of delay related to contractor, constructor and client in large building projects. They further classified the causes into nine divergent clusters like financing, materials, contract relationships, government relations, manpower, scheduling and control, equipment, and environment. Later on, El-Razek, et al., [1] used these causes and revise the lists of delay causes with respect to the Egyptian construction industry. They further emphasized the important role of consultants and payment by owner in reducing the delays in large construction projects.

Delays in construction industry have also been a matter of great concern in Pakistan. However, only two researches have been conducted for classifying the causes of delay in construction industry of Pakistan. Shaikh, et al., [2] introduced a theoretical framework by analyzing the previous studies highlighting the client, contractor, general and resource related problems are key factors causing delay in construction industry. In the same vein, Haseeb, et al., [8] concluded in their study that the most important and highly ranked causes are related to financial matters causing delays in Pakistani construction industry. They further elaborated and identified the delays like delay in payment to supplier, inadequate fund allocation, inflation and monthly payment problems. However, there is need to identify the client, contractor, consultant, material, equipment, labor related and general factors causing delay in project execution.

Contractor Related Factors Causing Delay in Project Execution

A number of studies by several researchers identified the contractor related delaying factors. According to Sambasivan and Soon, [5] improper planning by contractor, inefficient site management, and inadequate experience of the contractor are the major causes of delay. Financial problems of contractors, sub-contractor issues quality of contractor's work are the main causes of delay [26]. Similarly, Yaw Frimpong and Oluwoye [10] also proved that contractor related factors play an important role in delaying any construction project. While writing about contractor related delaying factors, Odeh and Battaineh [15] identified that the major issues related to contractors are the poor site management, sub-contractors, inadequate planning, approaches used for construction and insufficient experience of contractor. In the same line, Wei [27] reported that the difficulties in financing, clashes in sub-contractors schedule during execution of project, rework due to errors, deprived communication and organization, unsuccessful planning and scheduling of project, improper implementation of construction methods, insufficient contractor's work, inadequate sub-contractors work, frequent change of sub-contractors poor qualification of technical staff and site deployment are the important factors related to contractor. After reviewing the relevant literature, the following hypothesis has been developed to be tested in this study.

Hypothesis 1: Contractor related factors have significant effect on project completion.

Client Related Factors Causing Delay in Project Execution

There are many researchers who identified the client related delaying factors. For clients, construction delays are the loss of revenue, lacking in productivity, dependency on existing resources and the lack of rentable resources [8]. Through a study conducted by Mezher [28] in Lebanon, it is found that clients are more concerned in financial issues. Abdul-Rahman et al., [29] carried out a study in Malaysian construction projects. They have extended the concept given by Mezher [28] and proving the survey that financial problems as the main cause of delay in construction projects. Clients are focusing on the prime contractor ship to shift the risk of time along with other liquidated damages of schedule delay to the contractors [30]. A number of studies conducted in Saudi Arabia by [31-34] found the delay in payments or nonpayment to contractors by clients is the major cause of delay in construction projects of Saudi Arabia. Change orders by clients also play an important role in delaying any construction project [25]. According to Al-Hazmi [31] client approval is also the major cause of delay in the construction projects. Al-Khalil and Al-Ghafly [32] found that decision making by client is the major problem of delay in construction industry. The reason of slow decision making is low level of technical expertise of the client. In the light of above literature, the following hypothesis has been developed to be tested in this study:

Hypothesis 2: Client related factors have significant effect on project completion.

Consultant Related Factors Causing Delay in Project Execution

There are few number of studies have been conducted regarding the consultants in past. However, it is seen now that there are many projects which are different from the previous projects, requiring some technicalities from the consultants but they are not able to deal successfully because of their experience and delay in review of design documents [35]. Moreover contractors and clients often claim that there is less number of employees in the consultancy firms which is responsible for delay. Assaf and Al-Hejji [3] reported that the main causes of delay from the consultant's point of view are inadequate planning of contractors, contractor's poor site management, client's payment of completed work and less availability of equipment and materials.

According to Haseeb et al., [8] the drawing changes, inefficiency of consultants, preparation and approval of drawings, wrong site investigation, contract management, and slow response and inspection are the major problems arose by the consultants in the construction industry of Pakistan. Wong and Vimonsatit [36] concluded through a study that consultants should be provided with the certain knowledge regarding the site condition and methods of construction before designing. On the basis of mentioned above discussion, the following hypothesis has been proposed:

Hypothesis 3: Consultant related factors have significant effect on project completion.

Material Related Factors Causing Delay in Project Execution

Material is also a critical factor in the construction industry. There are many researches which have been done to identify the material related delaying factors in the construction industry. Delivery of the material is the most critical factor for delaying any construction project [37]. According to Sambasivan and Soon [5] quality of material and scarcity in material during the execution of projects are the main material related factors which are responsible for delaying a project. Koushki and Kartam [38] concluded that selection of material is the main contributor of delay in construction industry. According to Sweis, et al., [9] the main causes for delay are the shortage of materials and late delivery of material. Aibinu and Jagboro, [39] identified that the management problems in managing materials are the main contributor of the project delay. Thus the following hypothesis has been proposed:

Hypothesis 4: Shortage of material increases the chances of delay in project completion.

Equipment Related Factors Causing Delay in Project Execution

Equipment related factors are one of the many delaying factors that cause suspension of construction project [9]. Assaf, et al., [25] conducted a study regarding the Saudi construction industry and concluded that equipment failures, scarcity of equipment, unskilled equipment operators, little output and efficiency of equipment and absence of high-technology mechanical equipment. Shree [40] reported that the increasing cost for renting construction equipment also play a big role for delaying any construction project. Short supply of construction equipment can result is serious constraint for successfully completing a project on time. The major factors relate to equipment which may result in schedule delay of any project are the equipment failures, scarcity of material, little skills of equipment operators, low productivity and efficiency of equipment and lack of high technology mechanical equipment are material related factors which are responsible for delay in construction projects [27]. Thus, based on the above literature, it is hypothesized that:

Hypothesis 5: Non-availability of latest equipment increases the chances of delay in project completion.

Labor Related Factors Causing Delay in Project Execution

Labor shortage is one of the major problems which the construction industry of the world is facing now a days [41]. There are many reasons for this problem [42]. According to Trendle, [43] due to increase in the demand for labor, shortage of skilled labor occurs. According to Sweis, et al., [9] less availability of skilled, semi-skilled and unskilled labor also cause delay in the construction projects. In the same line Sambasivan and Soon,[5] concluded that the in the list of delaying factors, Malaysian labor supply is at the 7th number out twenty eight. This shows that Labor related delaying factors are also very important in delaying a construction project. Wei [27] reported that people working directly on construction projects, play an important role for on time completion of any project. Assaf and Al-Hejji, [3] reported that shortage of labor, unskilled labor, foreign labor, low productivity level of labors and personal conflicts among labors lead to delay in construction projects. After reviewing the relevant literature, the following hypothesis has been proposed to be tested in this study:

Hypothesis 6: Poor skilled labor increases the chances of delay in project completion.

General Environmental Factors Causing Delay in Project Execution

External factors play an important role in delaying any construction project in Nigeria[5]. Further, they define the external factors as weather changes, change in rules and regulations, problem with neighbors and unforeseen site conditions. Haseeb, et al., [8] reported that in Pakistan's construction industry, the most important and highly ranked factors are natural disasters, unexpected site conditions, organizational changes, changes in rules and regulations, conflicts and problems with neighbors. In the same line Assaf and Al-Hejji, [3] reported that the main external factors which are responsible delay in Saudi construction industry are weather condition, regulatory changes problem with neighbors unforeseen site condition. Wei [27] reported that there are eight external factors which cause delay in construction project.

According to him the most important external factors are effects of subsurface and ground conditions (e.g. soil, high water table, etc.), obtaining licenses from municipality, effect of weather conditions on construction activities, traffic control and restriction at job site, accident during construction, modifications in government guidelines and rules, providing services from utilities (such as water, electricity, telephone, etc.) and final audit and certification. Thus it is hypothesized that:

Hypothesis 7: General environmental conditions (e.g. Govt rules, regulations and policies, political stability and weather conditions) have significant effect on project completion.

Moreover, the following regression model has been developed to be tested in this study.

$$\text{Delay} = \beta_0 + \beta_1 \text{Contractor} + \beta_2 \text{Client} + \beta_3 \text{Consultant} + \beta_4 \text{Material} + \beta_5 \text{Equipment} + \beta_6 \text{Labor} + \beta_7 \text{General} + \epsilon$$

3. RESEARCH DESIGN

Population, Sample and Sampling Technique

Target population for this study is construction firms based in Punjab province of Pakistan. List of construction companies obtained from the website of Pakistan Engineering Council (PEC). According to the list, there are 141 companies working in construction sector in Pakistan Punjab. The scope of these companies ranges from construction of household & commercial buildings to road, underpass, fly-over and working both in public and private sectors. Systematic random sampling technique has been used to choose the firms for data collection purpose. Out of total companies, 47 companies (33%) selected. Thus, every 3rd firm from the list has been selected to collect the information about the contractor, client, consultant, material, equipment, labor and general factors causing delay in project completion. After selecting the firms, questionnaire has been served to each key position holder like operation manager, procurement manager, marketing manager, HR manager etc. Approximately, there are 10 key positions in construction organization from which data will be collected. Total 470 questionnaires were administered and out of which, 172 questionnaire completed in all respect has been used for data analysis.

Measurement and Instrumentation:

Twelve, nine and six items adopted from the measurement scale developed by Al-Khalil and Al-Ghafly, [32] to measure contractor, owner and consultant related respectively causes of delay in construction projects. To measure the material, equipment, labor and general environmental including weather and governmental issues causing delay in construction projects, six, five, four and eight item scales respectively used developed by [27]. All of these items measured on five point Likert-type scale i.e. Rarely(1); Never (2); Occasionally (3); Mostly (4); Always (5). Two items scale developed by K.S. Wei, [27] used to measure the delay in construction projects. First item is about the number of projects delayed and measured on five point Likert-type scale i.e. 1 = 0 Project; 2 = 1 to 5 projects; 3 = 6 to 10 projects; 4 = 10 to 15 projects and 5 = More than 15 projects. The second item is about percentage of project delay from estimated project duration and will be measured on five point Likert-type scale i.e. 1 = 0%; 2 = 0% 1 to 10%; 3 = 11% to 20%; 4 = 21% to 30%; 5 = More than 30%.

Moreover, information about respondent like gender, age, education, project management education, work experience, and information about organization like sector, nature of project, project being established and presently being carried out and availability of latest tools and equipment collected to generate the finding according to the project situation. In addition, information about demographics including size of organization (number of employees), about sector (i.e. public or private) in which firm is serving, number of department in firms and age of the organization will be collected.

Data Collection Procedure:

To collect the data, a well structure questionnaire was designed incorporating the stated above measurement scale. Firstly, project managers were approached personally and briefed about the objectives, methods and fruitfulness of the study. After getting approval from project managers, questionnaire served personally to employees holding key positions like operation manager, HR manager, marketing manager and procurement manager.

4. RESULT AND DISCUSSION

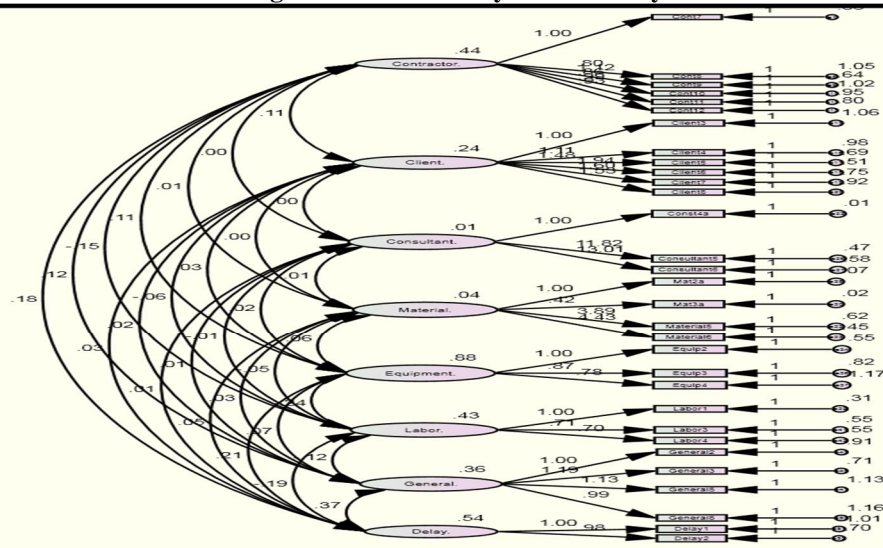
Validity and Reliability Testing

As shown in Figure 1, Confirmatory Factor Analysis (CFA) through AMOS software has been used to check the validity of the scales used in the current research. CFA has been widely used in previous studies [44-46] to check the validity of the measurement scales. Different statistical indicators have been used to check the model fitness of CFA. CFA model is proved to be good fit after removing the item statements with low factor loading (<0.40), non-normal item statement and those item statements whose residual has high covariance with other item statements. In the present CFA, value of CMIN/DF is 1.35 that report a good model fit. The value of TLI for the evaluated CFA model is 0.87 that indicate good model fitness. CFI for the current CFA model is 0.88 for this model. The value of RMSEA for this model is 0.45 and its P-Close value is 0.78 that shows good model fitness as recommended by [47]. Value of GFI is 0.84 which also shows a good model fitness of CFA. Keeping in view the stated-above model fitness ratios, it can be reported safely that CFA model is good fit and can be used for validity testing of the measurement scales. The fitness indicators for CFA model is given in **Table 1**.

Table 1 Validity and Reliability Test

Variable	Item Statement	Factor Loading	Cronbach Alpha
Contractor Related Factors	"Improper construction methods implement"	.577	0.74
	"Delays in sub-contractors work"	.462	
	"Inadequate contractor's work"	.681	
	"Frequent change of sub-contractors"	.490	
	"Poor qualification of the contractor's technical staff"	.560	
	"Delays in site mobilization"	.569	
Client Related Factors	"Change orders by owner during construction"	.427	0.84
	"Late in revising and approving design documents"	.477	
	"Delay in approving shop drawing and sample materials"	.657	
	"Poor communication and coordination"	.477	
	"Slowness in decision making process"	.657	
	"Conflicts between joint-ownership of the project"	.798	
Consultant Related Factors	"Mistakes and discrepancies in design documents"	.541	0.70
	"Delays in producing design documents"	.777	
	"Unclear and inadequate details in drawings"	.774	
Material Related Factors	"Changes in material types during construction"	.596	0.81
	"Delay in material delivery"	.568	
	"Delay in manufacturing special building materials"	.708	
	"Late procurement of materials"	.802	
	"Shortage of equipment"	.785	
	"Low level of equipment-operator's skill"	.671	
	"Low productivity and efficiency of equipment"	.561	
Labor Related Factors	"Shortage of labors"	.763	0.78
	"Low productivity level of labors"	.530	
	"Personal conflicts among labors"	.763	
General Factors	"Delay in obtaining permits from municipality"	.531	0.72
	"Weather effect on construction activities"	.644	
	"Accident during construction"	.536	
	"Delay in performing final inspection and certification"	.480	
Delay	"How many projects did not complete in time so far?"	.577	0.55
	"How much delay (in percentage) has been occurred in all delayed projects?"	.462	

Figure 1 Confirmatory Factor Analysis



Common Method Variance and Multi-collinearity

In order to test the potential effects of Common Method Variance as suggested by [48] Harman's test of one factor through Exploratory Factor Analysis (EFA) using SPSS was applied. Using varimax rotation in EFA, it is reported that variance of all item statements toward one factor is 27.69%. The value indicates that there is no problem of common method variance in the data. Multicollinearity has also been checked through Variance Inflation Factor (VIF). The highest value of VIF is 4.90 which is not greater than the cut-off value of 5 recommended by Neter, Wasserman, & Kutner, [49] or 10 recommended by Chatterjee, [50] thus it is reported that there is no problem of multicollinearity in this data.

Hypotheses Testing

Multiple linear regression has been applied to test the hypothesis. The objective was to find out relation between delaying factors in construction projects and project delay, individual readiness for change and organization performance. To predict the relation between variables involved in mediation, Regression is the widely used statistical technique as recommended by [51].

Table 2 Multiple Linear Regression Model

Model		Un-standardized Coefficients		T	Sig.	Collinearity Statistics	
		B	Std. Error			Tolerance	VIF
1	(Constant)	-.919	.846	-1.087	.279		
	Contractor Related Factors	.364	.163	2.234	.027	.298	3.360
	Client Related Factors	.285	.156	1.828	.069	.204	4.901
	Consultant Related Factors	.246	.082	2.980	.003	.581	1.722
	Material Related Factors	.224	.077	2.892	.004	.626	1.596
	Equipment Related Factors	.192	.085	2.268	.025	.483	2.071
	Labor Related Factors	.198	.136	1.451	.149	.373	2.679
	General Factors	-.073	.156	-.465	.642	.215	4.656
Adjusted R ² = 0.42, F-test value = 18.47, F-test significance = 0.00.							

Dependent Variable: Delay in Construction Projects

Regression Equation:

$$\text{Delay} = \beta_0 - 0.919 + \beta_1 0.364^{**} + \beta_2 0.285^{*} + \beta_3 0.246^{***} + \beta_4 0.224^{***} + \beta_5 0.192^{**} + \beta_6 0.198 + \beta_7 - 0.073 + \epsilon$$

***: Significant at 99% level

**: Significant at 95% level

*: Significant at 90% level

First hypothesis tests the relationship between “Contractor Related Factors” and “Delay” of construction projects. The regression results are shown in summarized in **Table 2**. It is observed that Contractor Related Factors are positively affecting the Delay in completion of construction projects. Furthermore, the β value of the relationship is 0.36 and significant at 95% level of confidence. It is reported that one unit change in “Contractor Related Factors” cause 36% increase in “Delay” in the completion of construction projects. P value for “Contractor Related Factors” is 0.05 which indicates a positive relationship between the dependent and predictor variable. Hence the hypothesis 1 is accepted. It depicts that difficulties in financing, rework due to errors, poor communication and coordination, ineffective planning and scheduling of project, improper implementation of construction methods, inadequate contractor’s work explain significant variance in delaying a construction project.

The second hypothesis indicates the relationship between “Client Related Factors” and “Delay” in project completion. The regression model was tested and the results came to be significant ($p=0.10$). The β value for the relationship is 0.29 specifying moderately positive relationship between the two. Hence, it is concluded that results of the current study support the proposed hypothesis “2” and it is proved that the “Client Related Factors” like late payments, furnishing and delivering site to the contractors, change orders, late in revising and approving designs, approving shop and sample material, poor communication and coordination, slowness in decision making process, conflicts between joint-ownership and suspension of work are responsible for delay in construction projects of Punjab Pakistan.

The third hypothesis tests the relationship between “Consultant Related Factors” and “Delay” in construction projects. The relationship turns out to be significantly positive ($p=0.01$) for the sample firms included in this thesis. The β value for relationship stands at 0.25, representing moderate strength for effect of predictor variable on dependent variable. The regression weight denotes that Consultant Related Factors account for 24% variation in causing delay in construction projects. Based on these statistical values ($p=0.01$, $\beta=0.24$) the hypothesis 3 is accepted. The change comes from rapid change in scope of project causing rework and rescheduling, hence delay in project completion.

Multiple linear regression revealed that factors related to the material are found to have positive significant effects on delay in construction projects in Pakistan. The beta coefficient for this relationship is 0.22 and it is significant on 99% level of confidence. It is reported that one unit change in material related factors cause 22% increase in delay in completion of construction project which indicates that hypothesis 4 has been accepted. The findings report that shortage of construction raw material, problem in the supply and poor quality of material, delay in material delivery and late procurement of material are found to be one of the major causes of delay in construction industry. Construction firms which face such problems related to the construction material face higher level of delay in completion and handing over the projects to client.

The fifth hypothesis of the study measures the effects of equipment related factors on delay in construction projects. Multiple linear regression model reveals the coefficient at 0.19 for this relationship significant at 95% confidence level. It is found that equipment related factors cause significant variance in delay of construction projects. Thus it is reported that breakdown and shortage of equipment, poorly skilled operators of equipment, old equipment and lack of high tech mechanical equipment increase the construction delay significantly which leads to the acceptance of hypothesis 5.

The sixth hypothesis of study investigates the relationship between “Labor Related Factors” and “Delay” in project completion. The analysis reports that the relationship is not significant, i.e. there is no impact of Labor Related Factors on project delay. The β value stands at 0.20; however the affect is not significant which leads to the rejection of the hypothesis 6. This relationship stands for the sample of companies selected for current study; however previous studies identify significant relationship between the variables. Although earlier research assigns Labor Related Factors to be significantly related with project delays, none of these studies calculate regression weights for the impact of Labor Related Factors on project delay.

The seventh hypothesis studies the relationship between “General Factors” and “Delay”. Multiple linear regression results for this hypothesis indicate an insignificant relationship between the dependent and independent variable. β value stands at -0.07 representing that General Factors explain no variance in construction delays in sampled firms in Pakistan which reveal the rejection of hypothesis 7.

5. Conclusion

The objective of the present study was to explore the causes of delay in construction projects. Factors related to the contractor, client/owner, consultant, material, equipment, labor and general environment factors on delay in constructions projects have been measured. Data on the study variables has been collected through structured questionnaire from 37 construction firms located in Punjab province of Pakistan. Participants were approached personally to collect the data. Various statistical tools such as reliability test, factor analysis, common method variance, normality test, and correlation, computation of means and standard deviations and Linear Regression have been applied for data analysis and inference. According to best of my knowledge, this study is pioneering in the area of construction project management as neither any international research nor Pakistani one applied such data analysis techniques previously to measure causes of delay in construction projects.

The objective of the study is to explore the possible causes of delay in construction industry located in Punjab province of Pakistan which is achieved successfully. The results of the study reveal that the factors related to contractors, client, consultant, material and equipment have significant impact on delay in construction projects. However, labor related and general factors do not explain significant variance in project delay. Moreover, the study provides following recommendation for construction firms in order to overcome delay in construction projects.

First of all financial issues should be given considerable importance in order to overcome the delay. Firm should design an effective mechanism for making timely payment from client to contractor and from contractor to sub-contractor, suppliers and staff. Construction firms should also take care of their relationship with client in term of on-time project financing, design, suspension of project. Construction companies should select consultant carefully and have good relationship with them. There should be quality control mechanism for material being used in construction projects. Construction firm should have sufficient material in hand and ensure the smooth supply throughout the project construction phase. As the study noted significant impact of equipment related factors on project execution, construction firms should invest heavily to own the latest machinery, tools and techniques instead of acquiring them on rent.

There are some limitations of the study. First, data has been collected at a time when government of Punjab emphasized heavily on construction projects such as road and flyovers. In this regime, construction industry is facilitated by the government and produced higher output as compare to the previous era. Thus, the respondents may view previous three to four years only while responding to the questionnaire instead of whole career of a firm. Secondly, the data has been collected only Punjab province of Pakistan. Thirdly, the present research considered seven delaying factors while different researchers have used several other factors; so this study can be extended further by either adding more variables into the current model or by using different variables. Fourth, the same model can be applied to collect the data from other provinces of Pakistan or other countries to evaluate the causes of delay in construction projects keeping in view the country environment

ACKNOWLEDGMENT

The authors declare that they have no conflicts of interest in the research.

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