



Research Article

An Analysis of Delay Factors in Government Construction Projects in Southern Punjab, Pakistan: A Case Study of Metro Bus Service Project, Multan District

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Abstract: The study intended to document the different factors that were subjected to contribute to the delay in the metro bus construction project in Multan, Pakistan. In this regard, six major contributing factors have been highlighted to evaluate their impact on the project for being delayed and overrun time schedule. The work adopts the questionnaire-based survey as a means of data collection for the employees of the metro bus project Pakistan. The results show that out of six major delay factors, two have found a significant association with the metro bus project delay and four elements as insignificant. The factors that have found with a significant association are material and external issues, whereas, the client, contractor, consultant, and labor-related factors have been found as insignificant. The research recommends that project management should make effective contingency planning, experienced ways of acquiring the materials, acquire human capital from foreign markets, external factors, the release of funds on time and raw materials. The results of the study will be helpful for general practitioners consult the problems and recognize the factors associated with the project delays. The work will provide a base for the further research to incoming researchers, stakeholders, consultants and advance the assessment of mega projects in Pakistan as well as international level.

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Introduction

In road construction projects, delay factors are the specific problem that not only exists in the metro bus service project, Multan district, but also seems in the China, Pakistan Economic Corridor project as well as other constructional projects at the national

level. Construction projects are facing many problems related to the longer time-spaces, difficult tasks, issues related to environmental fairness, investment hindrances along with the support of local authorities (Wang, 2010). Delay in the construction project could be due to reduced efforts by project contractors and clients for not be able to put the tasks in effect for that

leads the project towards in time completion (Addo, 2015). A constructional project is a typical design usually faces many issues related to time and cost, due to the time urgency project always suffer the threat of being overrun time and due to this time threat, its cost schedule also disturbs. For instance, a special type of project which is regular working suspects to disturb in the abrupt and unforeseen environmental conditions. Moreover, an effective plan for construction relies heavily on the performance of clients, project owner's capabilities, design, contractors efficiencies and the suppliers of communication all the phases with effective coordination in a timely way. Any project that faces the disturbing plans has a string chanced to be delayed and exceed with respect to cost and time.

kilometers (Figure 1). The project was sponsored by the Government of Punjab and executed, operation and maintenance by the Multan development authority, government of Punjab (GoP, 1998).

A number of researchers have presented their views on different delay factors in mega construction projects, from which the famous are; Gardezi *et al.* (2014), Aslam *et al.* (2013). Among the international contributors, the well-known are, Elhanaish and Stevovic (2016), Shibi and Regi (2015), Ashwini and Rahul (2014), Aigbavboa *et al.* (2014), Rao and Culas (2014), Shehu *et al.* (2014), Fakunle *et al.* (2021) etc.

Materials and Methods

The specific objectives of the study are to explore the delay factors, impact and how to mitigate the delay factors in the metro bus project in Multan district, Pakistan. The different research tools used in the study are structural questionnaire, personal visits, personal interviews, discussion, maps, charts, graphs, observations, and statistical tests. According to research objectives, the research questionnaire consists of the five-point Likert scale options to respond against suitable options (Fassinger and Morrow, 2013). The study has been based on primary as well as secondary data. The primary data have collected from the field using questionnaire surveys and visits, whereas the secondary data about population, health, education, vehicles, etc from their respective organizations. The study has been based on independent as well as dependent variables. The client role in the metro bus construction project in the Multan district has tested as an independent variable. The dependent variables of the work have included the role of contractor construction materials, labor force, feasibility and external delay factors like environment, customers, vehicles, resources, performance, and population, etc.

The research mainly categorized into three basic designs that are the quantitative, qualitative and mixed-method (Ponterotto *et al.*, 2013). A comprehensive questionnaire consisting of 50 questions has designed for the purpose to understand the views of the locals as well as the metro bus project workers regarding the delay in the project. The collected responses have recorded in statistical software SPSS for analyzing the association of independent variables with the dependent variable. In SPSS, pilot testing has carried out for verifying the internal consistency of

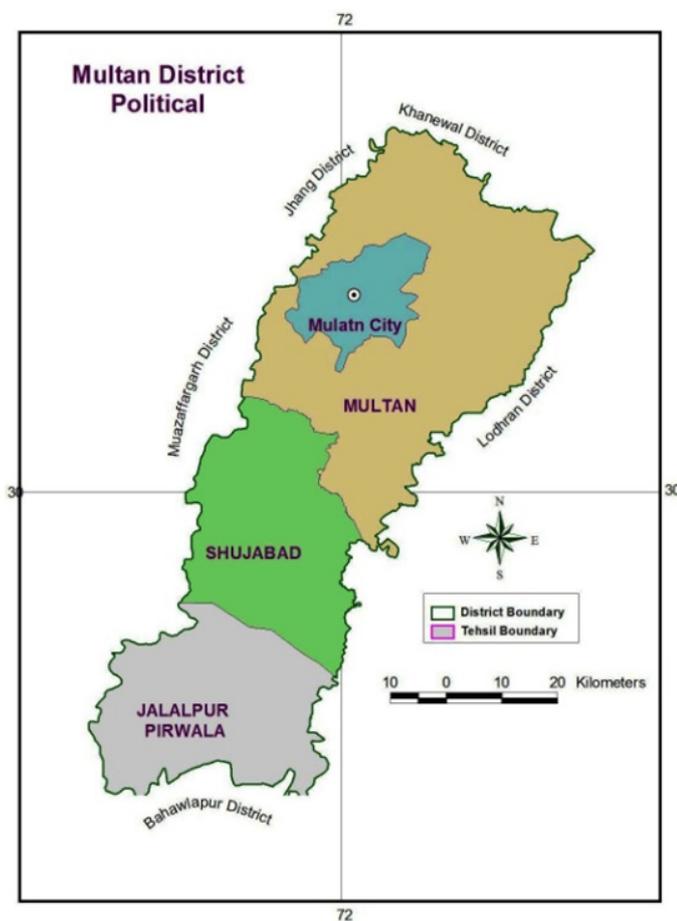


Figure 1: Location of the study area.

Multan city is situated among the 29°-22' to 30°-29' North-latitudes and 71°-03' to 72°-28' East-longitudes. The construction of the Multan metro project corridor located between Bahauddin Zakaria University to Kumharan Chowk passing through the major intersections of Northern bypass, Chungi No. 6, Chungi No. 09, Fish market, Daulat Gate, Chungi No. 14, BCG Chowk and Vehari Chowk. The approximate length of the metro route is 18.50

the data. After verifying, the reliability of the tool processed for this study, data have undergone other tests like correlation, frequency, averages, regression analysis, etc. the results gained from the analysis have interpreted and explained.

A test of frequency distribution has processed for quantifying the respondent's demographic information. The correlation test in SPSS has processed for knowing the relationship of research variables with each other. In order to quantify the impact of study independent variables on dependent variables, the regression test has processed. On the basis of output tables, the hypothesis have accepted or rejected. The reliability analysis has aimed to evaluate the internal consistency of the instrument being implemented for the study survey. The resulted value of reliability as Cron Bach's Alpha indicated toward the level of consistency of the scales. The formula used for the purpose is:

$$\alpha = N \cdot \bar{C} / \bar{v} + (N-1) \cdot \bar{C}$$

Whereas N is the number of questions, \bar{C} is the average inters question co-variance among the questions and \bar{v} is the average variance. In the regression model, a significant regression equation has been seen as (F (6, 194) = 2.55), Sig>.05). The results derived from the field survey as well as statistical analysis has compiled, associated and presented in the form of a research thesis.

Findings and discussions

The reliability of the field survey, its consistency, frequency distribution, correlation, analysis of variance using regression and to assess the association between different variables is stated as follows.

Reliability test

The Cron Bach's Alpha test has intended to run against each variable scale in the study and the results of all scalar values against each item processed for reliability (Abbasi et al., 2016). Referred to Table 1, primarily, the dependent scale of the contractor related delay factors, including five sub-factors, has resulted in the Cron Bach's Alpha value as 0.722 and declared as a reliable factor as it is significant at above 70% for internal consistency of the scale (Ponterotto et al., 2013). Client related factors, which is comprised of 11 items shows a value of 0.978, this scale also verifies the reliability standards. Consultant related

issues keep 8 items and resulted in value at 0.971, it is also a reliable value that proves internal consistency (Table 1). The delay factor keeps five questions and indicated a value of 0.706 that have been verified and declared as internally consistent. Labor-related factors keep 5 items and it results in value as 0.821 and certifies as a reliable one. External factors with five items resulted in value as 0.741 and accepted for internal consistency. The last scale of the dependent variables (six items) has resulted in a value of 0.966 and declared as reliable because it is significantly proved above than 70% value.

Table 1: Multan district, metro bus reliability test.

S. No	Scale name	No of questions	Cron Bach's Alpha
1	Contractor factors	8	0.722
2	Client factors	11	0.978
3	Consultant factors	8	0.971
4	Material related	5	0.706
5	Labor Factors	5	0.821
6	External Factors	5	0.741
7	Project Delay	6	0.966

Source: Field Survey, 2017.

Factor analysis

The factor analysis has intended to run against each question of variable scale in the study and the results of all scalar values against each item processed for factor loading. Each question of different six variables like client related factors, consultant related factors, contractor related factors, labor related factors, material related and external related factors have declared as reliable factor as it has significantly above 50%.

Age structure of respondents

A total of 201 respondents has categorized into four age groups. The maximum responses have collected from the age group varies from 26 to 30 years old having responses, frequency of 80 that is 40 percent. The next major respondent's age group is of the most junior age category of lower than 25 years, having a frequency of 24 and 12 percent of the total shares. The respondents having age group from 31 to 35 are younger employees with a frequency of 60 that is 30 percent of the total responses. The respondents having an age group of 36 to 40 years and above have a frequency of 37 (19 percent). Generally, all age groups have been participating and responding with different capacities.

Gender of respondents

Among the 201 respondents, male employees have responded with a higher frequency of 172 that is 86 percent as compared to the women frequency of 29 that is 14 percent. The data have represented that both gender participation that has made effective opinion building as per objective persuasion. The minimum responses by women have due to culture, low literacy, and accessibility. However, the perception of both genders made the research more reliable and valid for analysis.

Profession of the respondents

Referred to Table 2, out of 201 effective responses, the category managers and supervisors has responded with frequencies of 18 and 42, respectively that are 09 and 21 percent. The excluding employees of the project comprises of project engineers (31%), admin officers (21%), logistic managers (17%), finance manager (13%), quantity surveyor (20%), program manager (15%) and others (24%). The combine response by all employees with respect to their level and objectives of the research makes it more reliable to reach the delay factor of the Metro Bus project (Table 2).

Table 2: Multan district, designation of the metro bus employees.

Factors	Fre- quency	Per- cent	Valid percent	Cumulative percent
Construction Manager	18	9.0	9.0	9.0
Project Engineer	31	15.4	15.4	24.4
Site Supervisor	42	20.9	20.9	45.3
Logistic Manager	17	8.5	8.5	53.7
Admin Officer	21	10.4	10.4	64.2
Finance Manager	13	6.5	6.5	70.6
Quantity Surveyor	20	10.0	10.0	80.6
Program Manager	15	7.5	7.5	88.1
Others	24	11.9	11.9	100.0

Source: Field Survey, 2017.

Working experience of respondents

It is evident that the working experience of 1-5 and 5-10 years workers are 40 and 72 by frequencies. These responses have added to the overall survey response with 20 and 36 percent, respectively. The response of working experience of 10-15 years is with a frequency of 60 which is 30 percent. The most experienced staff members have come up with a response frequency of 29 that has added the 14 percent effective response in this survey. The mixed response from different working, the experience, and staff members has made

the survey more effective because each individual has changed experience and working exposer with diverse expertise for serving in the metro bus construction project.

Literacy level of respondents

Most of the respondents at higher levels are well qualified and hired on merit and per government policy. Due to this survey, all of the respondents are divided into three categories. Referred to the Table 4, out of 201 respondents, it has found that most of the engineers and managers are graduate-level having a frequency rate of 80 (40 percent). Most of the respondents have their education level of master degree and above. The total individuals with master and above education are 99 that have been added in total response with 49 percent. Intermediate level education of respondents is with a frequency of 22 and their participation in the survey is 11 percent. It has shown that the education level of the respondents is valid per government policy and project requirement.

Correlation analysis

Correlation is measured, how variables are related to each other. Keeping in view the importance of correlation has been implemented to assess the relationship of variables with each other. The resulted value of the Pearson correlation explains, how strong these variables are interrelated with each other in accordance with the response of respondents (Table 3). The level of significance has been denoted by one tail or two tails, two levels refer to the highly significant results. It has shown that all of the variables have mutually related with a significant level of two-tailed. It has evidence that there are significant values of Pearson correlation between independent and dependent variables, but there is a very weak relationship between independent to dependent variables and affects the stability and completion of the project within time.

Regression analysis

The regression model of delay factors has shown the combined effect of all variables towards the project delay. The multiple regressions show that there is R-square value of 7%, indicating that the variance of change (delay factors) can cause delaying the project at the metro bus project. This change has been shown as highly significant to highlight the resulting impacts of 6 different determinants of delay to predict the targeted project delay. In the regression model,

Table 3: Correlation analysis of the people responses.

Variables		Contractor	Client	Consultant	Material	Labor	External	Project delay
Contractor	Pearson correlation	1						
	Sig. (2-tailed)							
	N	201						
Client	Pearson correlation	0.368**	1					
	Sig. (2-tailed)	0.000						
	N	201	201					
Consultant	Pearson correlation	0.379**	0.992**	1				
	Sig. (2-tailed)	0.000	0.000					
	N	201	201	201				
Material	Pearson correlation	0.688**	0.364**	0.379**	1			
	Sig. (2-tailed)	0.000	0.000	0.000				
	N	201	201	201	201			
Labor	Pearson correlation	0.558**	0.224**	0.223**	0.615**	1		
	Sig. (2-tailed)	0.000	0.001	0.001	0.000			
	N	201	201	201	201	201		
External	Pearson correlation	0.244**	0.138	0.117	0.276**	0.489**	1	
	Sig. (2-tailed)	0.000	0.051	0.098	0.000	0.000		
	N	201	201	201	201	201	201	
Project Delay	Pearson correlation	0.025	-0.075	-0.070	0.121	0.064	-0.145*	1
	Sig. (2-tailed)	0.725	0.291	0.324	0.086	0.364	0.040	
	N	201	201	201	201	201	201	201

Source: Field Survey, 2017. *: Correlation is significant at the 0.05 level (2-tailed). **: Correlation is significant at the 0.01 level (2-tailed). Pearson Correlation; This number measures the strength and direction of the linear relationship between the two variables ranging from +1 to -1 and 0 shows no correlation at all. Significance (2-tailed); it is the P-value associated with the correlation. N; it is the number of respondents used in the correlation.

a significant regression equation has been seen as (F (6, 194) = 2.55), Sig>0.05). The overall model p-value has been highlighted as 0.000. Whereas, the separate change of beta values against each factor of delay has noted for material related factors. There is a change in beta valued 0.221, t-value resulting in 2.091 and the significance level shown in the model 0.038. The impact of external factors has been found significant with all values in the regression model. Change of beta value as -0.229 with a significance level of 0.005 shows that external factors are significantly related to delays, but in the opposite direction to other variables, exhibit that client factors are different with respect to other determinants. On the other hand, all other factors have found that there is an insignificant effect of contractor, client, and contractor and labor factors delaying the project (Table 4). As per the above discussion and analysis of data in SPSS, it is evident that there are two major factors, that is, material related and external related issues/factors have responsible for the delay in metro bus project Multan and the remaining factors have minor impact on project delay.

Table 4: Regression analysis of the people responses.

Variables	R	F square value	Beta	T value	Sig	Hypothesis
Contractor	0.073	2.55	-0.092	-0.918	0.360	Rejected
Client			0.078	0.135	0.893	Rejected
Consultant			-0.196	-0.335	0.738	Rejected
Material			0.221	2.091	0.038	Accepted
Labor			0.118	1.184	0.238	Rejected
External			-0.229	-2.834	0.005	Accepted

Source: Field Survey, 2017

People opinion about delay factor

Demographic characteristics: The first question asks about the project completed within the allocated budget. About the numbers of 49% and 23% of the respondent have selected to disagree and strongly disagreed respectively that the project has not been completed within the allocated budget, whereas 17% and 8% agreed and strongly agreed, while the 2% of the respondents remained neutral. The second question is regarding the completion of the projected within the estimated time. In response to the question,

about 44% and 13% have voted for disagreeing and strongly disagreed respectively that is the project has not been completed within the estimated time, but 20% and 8% have marked to agree and strongly agreed whereas, the 14% have remained neutral. The third question has formal and informal training programs during the course of the project. The survey results show that 35% and 17% of respondents have voted for disagreed and strongly disagreed that formal and informal training have not implemented in this project, whereas 20% and 11% of people agree and strongly agreed, respectively and almost 17% have not mentioned their opinion. The fourth question has enough research and developed procedures in the project. The answer is yes, as per field survey as 48% and 29% of people marked to agree and strongly agree, respectively, but 13% and 2% of respondents to disagree and strongly disagreed respectively and 7% of people's feedback has neutral.

Responses to contractor factor

The fifth question has the inadequate contractor experience. About 26% and 17% of the respondents have highlighted to strongly agreed and agreed, respectively, whereas 14% and 32% to strongly disagree and disagreed and 11% remained neutral. The second issue has inaccurate time estimating of the project. About 38% and 22% of the respondents have voted for agreed and strongly agreed, respectively, that time estimation of contractor has immoral, whereas 18% and 10% to disagree and strongly disagreed respectively with the statement. The third question has belonged to the first two questions that are about poor site management and supervision. As per field survey, 25 % and 22% people showed willingness for agreeing and strongly agreed, respectively, but 16% and 18% people strongly disagreed and disagreed and the 18% people's feedback has neutral. The fourth one has improper project planning and scheduling. About 32% and 27% respondents strongly disagreed and disagreed to this issue that there has proper project planning and scheduling, whereas 19% and 16% people has agreed and strongly agreed with this opinion and 4% was neutral. The last question has about the unreliable sub-contractor issue in the project. About 6% and 16% feedback of respondents have strongly agreed and agreed, respectively, that the subcontractor has unreliable, which caused delay in the project, but 30% and 31% people strongly disagreed and disagreed with this opinion and 16% was neutral.

Responses to client

To evaluate the client factor as a base in the delay of the metro bus project Multan, the tenth question has asked about the lack of client experience in relevant projects. About 35% selected to strongly disagree and 49% of the respondents disagree, that is there has enough client experience in relevant projects, whereas 10% agree and 6% strongly agree. The eleventh question has asked regarding the lack of capable representation in Metro Bus project Multan. Almost, 31% of the respondents have voted for strongly disagree and 55% to disagree respectively. However, 7% of the participants have disagreed and 6% strongly disagreed with the statement. The twelfth question has about being deficient in communication and coordination between the client, stakeholders, and workers and subcontractors. Generally, 42% of the respondents have selected to strongly disagree and 43% to disagree. However, about 14% of the people marked to strongly agree and strongly agree. The thirteenth question has asked about the sluggish decision making by the client regarding different phases of the project. About, 57% and 28% of respondents have marked to disagree and strongly disagree respectively, whereas 7% and 9% of people have to agree and strongly agree. The fourteenth question has about the improper project feasibility study and site location. About 52% and 34% feedback of respondents have selected to disagree and strongly disagree respectively, and there has no issue with the feasibility survey of the project, but 14% of people have marked to strongly agreed and agreed to the stated opinion respectively.

Responses to consultative factor

The fifteenth question is regarding the inadequate consultant experience. About 35% and 49% of the respondents strongly disagreed and disagreed with the statement, whereas 10% and 6% showed strongly agreed and agreed. The sixteenth question is regarding the revision and delay in project designing and implementation. About, 35% and 51% of the respondents have highlighted to strongly disagree and disagreed options that there has no delay and revision in design drawings. However, 9% and 4% selected to agree and strongly agree respectively, and 2% of people's feedback has neutral. The seventeenth question has about the slow response and weak inspection of the project. As per field survey, 59% and 27% of the respondents have shown strongly disagreed and disagreed, respectively but 9% and 5%

of people strongly agreed and agreed, respectively with the statement. The eighteenth question is regarding the delay in project implementation. About, 54% and 31% of the respondents have disagreed and strongly disagree, respectively, whereas 3% and 12% have agreed and strongly agreed with the statement.

Responses to material factor

The nineteenth question has asked about the non-availability of raw material on a local basis and its distance from the construction site. About, 36% and 13% of the respondents have marked to strongly agree and agree, respectively, and 28% and 21% of the participants have strongly disagreed and 3% have neutral about this issue. The twentieth question is regarding the delay in raw material supply by suppliers. Almost, 40% and 15% of respondents have agreed and strongly agreed respectively. Furthermore, 24% and 20% of the people have marked to disagree and strongly disagreed with this opinion. The twenty-first question has related to the previous two questions regarding material availability and supply as well as the late delivery of construction materials. As per field survey, 30% and 42% of people have marked to agree and strongly agree, respectively, while 12% and 11% surveyed people have selected to strongly disagree and disagree, respectively and the 5% people's feedback has remained neutral. The twenty-second question has the non-realistic procurement strategy of the Metro Bus project, Multan district. About, 41% and 11% of respondents have marked to agree and strongly agree with this, whereas 24% and 20% of people has disagreed and strongly disagreed and 4% have neutral. The participants have further judged for the low quality of raw material in the twenty-third question, about 46% and 24% feedback of respondents have strongly agreed and agreed that the quality of raw materials have poor due to which it was rejected by the client and then again supplied by suppliers, which has caused delays in the project but 15% and 4% people strongly disagreed and disagreed with this opinion and 11% has neutral.

Responses to labor factor

In twenty-fourth question has related to labor factors and shortage of skilled labors on the local basis. About, 26% and 50% of the respondents have marked to strongly disagree and disagree, respectively, whereas 12% and 8% to strongly agree and agree, respectively with this opinion about this issue and 4% has neutral. The twenty-fifth question has about the

low wages and incentives of laborers. Almost, 24% and 48% of the respondents have strongly disagreed and disagreed, respectively, that there has no issue of low wages or incentives of laborers, whereas 14% and 13% agree and strongly agree, respectively with this opinion. The twenty-sixth question is regarding the coordination among the workforce of the project. As per field survey, 16% and 27% of the respondents have marked to strongly disagree and disagree, respectively, but 26% and 32% of people strongly agreed and agreed respectively with this opinion. The people further asked about the slow labor strikes and laziness. About 46% and 24% of respondents have disagreed and strongly disagreed, respectively to this issue, whereas 13% and 14% of people has agreed and strongly agreed with this opinion and 2% have neutral. The last one question of the section is about low labor performance. About 28% and 27% feedback of respondents have agreed and strongly agreed, respectively, but 23% and 22% people strongly disagreed and disagreed with this opinion, respectively.

Responses to external factor

The twenty-ninth question has about the external factors, unforeseen environment conditions (weather, seepage, wind, local resistance, etc.) of the Metro Bus project, Multan. About 37% and 12% of the respondents have strongly agreed and agreed, respectively, whereas 21% and 28% have strongly disagreed and disagreed and 2% was neutral about this issue. In the thirtieth question, the respondents have asked about the inflation rate and price fluctuation during the project period. Almost, 41% and 15% of respondents have agreed and strongly agreed, respectively. Moreover, 23% and 20% of people have disagreed and strongly disagreed with this opinion. The thirty-first question belongs to the previous two questions that have regarding weather conditions. As per field survey, 30% and 44% of people agreed and strongly agreed with the statement, but 12% and 10% of people have strongly disagreed and disagreed, respectively, whereas the 4% of people's feedback has neutral. The thirty-second question has about the hazard and disaster factors in the area. About, 42% and 10% respondents agreed and strongly agreed to this issue that it has a serious issue at the site in the shape of heatstroke, heavy raining, and a bomb blast in the new bus stand area, etc, whereas 23% and 20% people has disagreed and strongly disagreed and 4% has neutral about this issue. The thirty-third question has the non-availability of project utilities on a local

basis. About 47% and 24% feedback of respondents strongly agreed and agreed, respectively, but 15% and 4% of people have strongly disagreed and disagreed with this opinion and 10% has neutral.

Responses to project delays

The thirty-fourth question has about the ineffective delay penalties by the client. Almost, 35% and 49% of the respondents have strongly disagreed and disagreed respectively, whereas 10% and 6% have marked to strongly agree and agree respectively to the statement. The thirty-fifth question has about the government policy for the projects delayed by the contractors. About, 35% and 51% of the respondents have strongly disagreed and disagreed respectively that there has no delay by the contractors, whereas 9% and 4% have agreed and strongly agreed and 2% people feedback have neutral. The thirty-sixth question has about the legal disputes between various parties involved in the Metro Bus project. As per field survey, 59% and 27% of the respondents have strongly disagreed and disagreed respectively, but 9% and 5% people have strongly agreed and agreed respectively with this point.

Responses to feasibility

The thirty-seventh question is regarding the feasibility of the project. About, 46% and 40% of the respondents have strongly disagreed and disagreed respectively, whereas 9% and 5% have strongly agreed and agreed respectively with the statement. The thirty-eight question has the outcome of the project and its benefit of the locals. About 44% and 41% of the respondents have strongly disagreed and disagreed respectively that there will be no facilitation at all to the locals, whereas 7% and 8% have agreed and strongly agreed to the subject matter.

Responses to infrastructure

The thirty-ninth question has regarding the infrastructure of the project, particularly the architectural drawings made by the consultant implemented without any change. About 49% and 35% of the respondents have strongly disagreed and disagreed, respectively, that there has revised again and again of architectural drawings, whereas 9% and 7% strongly agreed and agreed, respectively with the issue. The fortieth question has about the project process, especially the effective methodologies and guidelines for the working environment. About, 23% and 55% of the respondents have strongly disagreed and disagreed

respectively that there has no effective methodologies and guidelines for working, whereas 15% and 5% have agreed and strongly agreed, respectively and 2% have a neutral opinion.

Responses about monitoring

The forty-first question has about the availability of the well-planned monitoring system by a contractor or the client of the metro bus project, Multan. About 16% and 27% of the respondents have strongly disagreed and disagreed, respectively, that there has no well-planned monitoring system by a contractor or the client to look after the site properly and timely decision; whereas 22% and 20% strongly agreed and agreed, respectively with the statement and 15% people's feedback have neutral. The forty-second question is regarding the reservation made by the respective employees during the monitoring of the project. About, 20% and 14% of the respondents have strongly disagreed and disagreed, respectively, whereas 13% and 33% agreed and strongly agreed respectively and 19% of people's feedback has neutral. The forty-third question is regarding the non-observation of the contractor on the project process made by the client. As per field survey, 27% and 23% of the respondents have strongly disagreed and disagreed, respectively, that there has the strong observation of contractor on the project process made by the client, but 2% and 24% people have strongly agreed and agreed respectively with this point and 23% was neutral.

Responses about evaluation

Regarding the evaluation factors of the metro bus project, Multan, the forty-fourth question has asked about an effective evaluation system for all phases of the project. About, 57% and 26% of the respondents have strongly disagreed and disagreed respectively, that there has not an effective system for the evaluation system of all phases of the project, whereas 11% and 7% have strongly agreed and agreed respectively. The forty-fifth question has the low interest of stakeholders to evaluate the project. About 37% and 46% of the respondents have strongly disagreed and disagreed, respectively that there has a high interest of all stakeholders to evaluate the project, but 7% and 9% have agreed and strongly agreed, respectively. The forty-sixth question has related to the project stakeholder ownership their responsibilities during the course of work. As per survey record, 43% and 41% of the respondents have strongly disagreed and disagreed, respectively, that project stakeholders are

not owning their responsibilities due to which project delayed, but 12% and 4% of people strongly agreed and agreed, respectively.

Responses about policy

The forty-seventh question has asked about the policy factors of the metro bus project, Multan particularly the weak policy of the client to execute the project. About, 42% and 43% of the respondents have strongly disagreed and disagreed, respectively, that there has a strong policy of the client to execute the project, while the 6% and 9% of the respondents have strongly agreed and agreed, respectively to the option. The forty-eight question has regarding the project management team and continuous revision of evaluation policy. About, 54% and 31% of the respondents have strongly disagreed and disagreed, respectively that there has no issue in the revision of evaluation policy, but 7% and 9% of people agreed and strongly agreed, respectively with this option. The forty-ninth question has about the decrease in the pressure of general transport. As per field survey record, 23% and 55% of the respondents have strongly disagreed and disagreed, respectively, that there will no effect on the vehicle's pressure of the general transport, but 15% and 5% of people have strongly agreed and agreed, respectively and 2% has neutral opinion.

Conclusions and Recommendations

The reliability test has shown the confirmation of all scales as internally consistent for further work. All scales have been tested for reliability per variable and found consistent except the material and external factors. A test of frequency distribution has processed for knowing the characteristics of personal information of the respondents that clearly presented the picture of distributed response as per respondent's age, gender, qualification, designation. In the results against correlation analysis, variables have found with a significant and non-significant relationship. Generally, the independent variable (Client) has found a significant relationship with other dependent variables, but it has seen that there is an insignificant relationship between predicted and predicting variables. The regression analysis has shown that there has a significant association between two important variables that is material and external factors delaying the construction project of the metro bus project, while other factors under study have found with non-significant association with a

delay the metro bus project, Multan. The findings of the research have supported by previous researchers for only two significant factors that are material and external factors for delaying the project, the results of other factors are opposite with the findings of previous researchers. There is a significant association between the client's factors and delay of project Client related issues have been found as an insignificant by the project being delayed, but the change in beta value by the results presented show that there is a difference of client-related factors with respect to other factors, although, the role and importance of client factors have been acknowledged. There is a significant association between external factors and the delay of the project. The study for assessing the delay factors of metro, construction, Multan shows that external factors and material supply are highly associated with project delay.

During public opinion, it has observed that there has a lack of formal and informal training in the project, serious issue about contractor experience and his coordination with subcontractors, the time estimation of completion of different phases of the project by the contractor has immoral, a poor site management and supervision at different stages of the project. The study recommends that project management should make effective contingency planning to meet the unforeseen factors that caused the project for being delayed. It should select the experienced ways for acquiring the materials, human capital from foreign markets, consideration of the external factors and release of funds on time, accessibility to raw materials. Further research has required for assessing the role of other factors like specifying legal issues, governmental supports and local community support for supporting in time completions, monitoring and evaluation, the easiest way of raw material supply, the role of construction workers and their coordination, training programs for mega project workers, consultants, and contractors.

Novelty Statement

The novelty of this study lies in its comprehensive documentation of six major contributing factors to the delay in the Multan metro bus construction project, with a notable focus on material and external issues. The research findings underscore the significance of effective contingency planning, strategic material acquisition, and accessing international human

capital to mitigate delays, offering valuable insights for project management and serving as a foundation for future research and assessments of mega projects both in Pakistan and at an international level.

Author's Contribution

Saleem, M. designed the study and wrote the manuscript. S. Khan supervised the study, collected data, provided essential feedback, and contributed to manuscript writing. S. Khan and M. Hasan verified the results, and both authors read and approved the final version of the manuscript.

Conflict of interest

The authors have declared no conflict of interest.

References

- Abbasi, S.A., S. Sohu and M.A. Memon. 2016. Causes of delay in highway projects in Pakistan. Proc. 8th Int. Civil Eng. Cong., Karachi, pp. 35-40.
- Addo, J.N.T., 2015. Delay and its effects on the delivery of construction project Ghana. Afr. J. Appl. Res., 1(1): 236-241.
- Aigbavboa, C.O., W.D. Thwala and Mukuka. 2014. Construction project delays in Lusaka, Zambia: Causes and effects. J. Econ. Behav. Stud., 6: 848-857. <https://doi.org/10.22610/jeps.v6i11.544>
- Ashwini, A.S. and R.S. Patil. 2014. Identification of critical construction delay factors. Int. J. Latest Trends Eng. Technol., 3: 258-260.
- Aslam, M.S., Y. Rahsid and S.U. Haq. 2013. Causes of delay in construction projects of Punjab, Pakistan: An empirical study. J. Basic Appl. Sci. Res., 3(10): 87-96.
- Elhaniash, F.E.A. and S. Stevovic. 2016. Towards factors affecting delays in construction projects: A case of Libya. Int. J. Appl. Res., 2: 1078-1081.
- Fakunle, F.F., A.A. Fashina, M.A. Omar and A.A. Sheikh. 2021. Exploring the significant factors that influence delays in construction projects in Hargeisa. Elsevier Ltd; Heliyon, 7: 1-10. <https://doi.org/10.1016/j.heliyon.2021.e06826>
- Fassinger, R. and L.S. Morrow. 2013. Toward Best practices in quantitative, qualitative, and mixed-method research: A social justice perspective. J. Soc. Action Couns. Psychol., 5: 69-85. <https://doi.org/10.33043/JSACP.5.2.69-83>
- Gardezi, S.S.S., I.A. Manarvi and S.J.S. Gardezi. 2014. Time extension factors in construction industry of Pakistan, fourth international symposium on infrastructure engineering in developing countries, IEDC 2013. Proc. Eng., 77: 196-204. <https://doi.org/10.1016/j.proeng.2014.07.022>
- GoP, 1998. Population census report of Multan District, Population Census Organization, Government of Pakistan, Islamabad. 300 pages.
- Ponterotto, J.G., J. Mathew and B. Roughly. 2013. The value of mixed methods designs to social justice research in counseling and psychology. J. Soc. Action Counsel. Psychol., 5(2): 42-68. <https://doi.org/10.33043/JSACP.5.2.42-68>
- Rao, P.B. and J.C. Culas. 2014. Causes of delays in construction projects. Int. J. Curr. Res., 6: 7219-7222.
- Shehu, H., I.R. Endut and A. Akintoye. 2014. Factors contributing to project time and hence cost overrun in the Malaysian construction industry. J. Financ. Manage. Prop. Const., 19(1): 55-75. <https://doi.org/10.1108/JFMPC-04-2013-0009>
- Shibi, V. and V. Regi. 2015. Analysis of delays in construction projects. Int. J. Eng. Res. Gen. Sci., 3: 108-112.
- Wang, F., 2010. China's exporters fret over labor shortage, My Sinchew. Online. <http://www.mysin Chew.com/node/3615>