

Causes and Effects of Delays in Large Construction Projects of Pakistan

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Abstract

The construction delay is a main problem in large construction industry of Pakistan. Large construction industry is very important for the development, economy and progress of Pakistan. In research methodology, we conducted a questionnaire survey to get data about the causes of delay and effects of delay. We asked the clients, contractors and constructions by questionnaire and we took interviews of labor to fill questionnaire about causes and effects of delay. To analyze the data, we applied a statistical formula to calculate the RIR value for importance of causes and effects. We used RIR values to rank the causes and effects. Then we discussed the sixteen important causes, five main effects of delay and related the effects with the main relating causes. Later, we described some main large construction projects in Pakistan and the delay affecting these projects. At the end, we suggested some solutions to counter delays by solving or

lessening the causes and effects of delays. By these solutions, the delays in Pakistan's large construction industry can be alleviated.

Keywords: Large construction projects, construction delay, causes of delay, effects of delay, Pakistan

Introduction

The construction industry is a very important sector for the development and economic growth of Pakistan, which is developing country. There are many construction projects completed, going on and many future ones. We are focusing on large construction projects in Pakistan. A large construction project is a project with a budget of more than 1 million US \$. In these construction projects, there are some problems faced such as delays in the completion or delivery of the project. The delay in completion of construction projects is a worldwide problem. In construction industry, construction delay refers to the time overrun in specified completion data or time overrun in the delivery of the construction project on which all parties agreed. Assaf SA. & Al-Hejji S. (2006).

For the client, construction delay refers to the loss of revenue, lack of productivity, dependency on existing facilities, lack of rentable facilities etc. For the contractor, construction delay refers to the higher costs, longer work duration, increased labor cost, higher material and equipment costs etc. Completion of construction projects on specified time or time agreed within parties indicates the work and construction efficiency. The delays in construction projects happen because of various factors or causes. These causes lead to the delay in construction completion, and this delay leads to some negative effects on the construction project.

In Pakistan, it is very rare case that large construction project is completed on the time specified or agreed upon. There are many large construction projects in Pakistan, which suffered delay or in some cases suffered suspension or abandonment. Some examples of large construction projects, which suffered delay or suffering delay, are: Reconstruction of Earthquake affected roads, reconstruction of Floods affected roads, China industrial cities in Punjab, Sindh, Khyber-Pakhtunkhwa and Baluchistan, Port tower complex by KPT, Motorways of Pakistan, National Highways of Pakistan, Kalabagh Dam etc.

Review of Previous Researches

In the review study of previous researches, we found out that the most common and frequent problem in large construction projects is the delay in project delivery or completion. Construction delay refers to the time overrun in completion or delivery of project beyond the data on which parties agreed or project completion data specified. Assaf SA. & Al-Hejji S. (2006). Whether the large construction projects are simple or complex, in Pakistan we mostly see the construction delays. It is difficult to analyze the delays, because there are many activities in the construction project. Shi J, Cheung S & Arditi D. (2001). Odeh AM, Battaineh HT. (2002). Kaming P, Olomolaiye P, Holt G & Harris F. (1997). Alaghbari W, Razali M, Kadir S & Ernawat G. (2007). Stressed on the early identification of construction delays and suggested some main solutions for avoiding delays.

Baldwin JR, Mathei JM, Rothbart H & Harris RB. (1971). Arditi D, Akan GT & Gurdamar S. (1985). Okpala DC, Aniekwu AN. (1988). Dlakwa MM, Culpin MF. (1990). Mansfield NR, Ugwu OO & Doran T. (1994). Semple C, Hartman FT & Jergeas G. (1994). Ogunlan S.O,

Promkuntong K & Jearkjirm V. (1996). Lo TY, Fung IWH & Tung KCF. (2006). Chan DWM, Kumaraswamy MM. (1996). Aibinu A, Odeyinka H. (2006). Cited many noteworthy causes of delays such as: weather conditions, shortages of resources, shortage of materials and equipment, financial difficulties faced by clients and contractors, poor contract management etc. Different authors and researchers have different perceptions about causes of delays. According to Chan & Kumaraswamy, in Hong Kong Construction industry, Chan DWM, Kumaraswamy MM. (1997) According to Mansfield, in Nigerian Construction industry. Aibinu AA, Jagboro GO. (2002), five main causes of delay are shown below in table 1.

Table 1. Causes of delay in construction industry

Main Causes of Delay in Construction Industry		
S.No	According to Chan & Kumar W, in Hong Kong	According to Mansfield, in Nigeria
1	Poor supervision and management	Finance and payments
2	Unpredictable site conditions	Poor handling of contract
3	Slow decisions	Shortages of materials and equipment
4	Variations by client	Inaccurate estimations
5	Variations of work	Fluctuations in prices

According to Chan and Kumaraswamy (1997), the most important causes of delay in Hong Kong construction industry are poor supervision and management, unpredictable site conditions, slow decisions, variations by client, and variations of work. According to Mansfield (2002), the most important causes of delay in Nigerian construction industry are finance and payments, poor handling of contract, shortages of materials and equipment, inaccurate estimations, and fluctuations in prices.

Odeyinka HA, Yusif A. (1997) categorized some main causes of delays in Nigerian construction projects are shown below in figure 1.

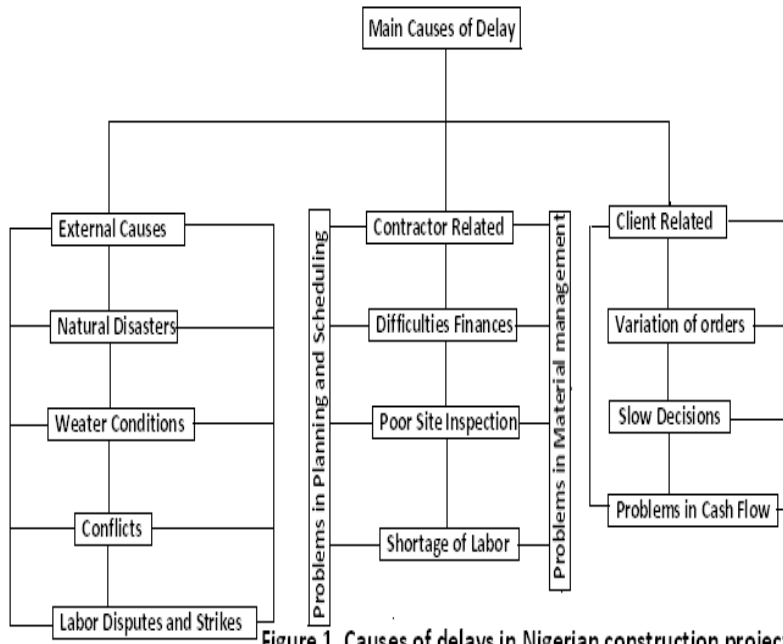


Figure 1. Causes of delays in Nigerian construction projects

According to Odeyinka HA and Yusif A (1997), the main client related causes of delay in Nigerian construction projects are variations of orders, slow decisions, and problems in cash flow. According to Odeyinka HA and Yusif A (1997), the main contractor related causes of delay in Nigerian construction projects are difficulties in finances, poor site inspection, shortage labor, problems in planning and scheduling, and problems in material management. According to Odeyinka HA and Yusif A (1997), the main external causes of delay in Nigerian construction projects are natural disasters, weather conditions, conflicts, and labor disputes and strikes.

Assaf SA, Alkhalil M & Al-Hazmi M. (1995) categorized some main causes of delays in Saudi large construction project, which are shown below in figure 2.

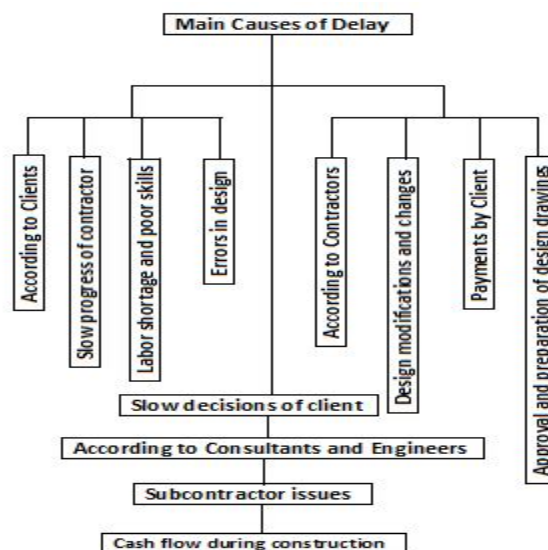


Figure 2. Causes of delays in Saudi large construction projects

According to Assaf SA, Alkhalil M & Al-Hazmi M. (1995), main causes of delay according to clients are slow progress of contractor, labor shortage and poor skills, and errors in design.

According to Assaf SA, Alkhalil M & Al-Hazmi M. (1995), main causes of delay according to contractors are design modifications and changes, payments by clients, and approval and preparation of design drawing.

According to Assaf SA, Alkhalil M & Al-Hazmi M. (1995), main causes of delay according to consultants and engineers are slow decisions of client, subcontractor issues, and cash flow during construction.

Aibinu AA, Jagboro GO. (2002). Studied the effects of construction delays on completion or delivery of construction project in Nigerian large construction industry and mentioned them as: time overrun, cost overrun, dispute, arbitration and abandonment. In construction industry of Saudi Arabia, Assaf SA, Al-Hejji S. (2006). Found that approximately 70% of the large construction projects experienced time overruns.

Manavazhia MR, Adhikarib DK. (2002). Conducted a survey to for the investigation of the delay in the delivery of materials and equipment to the large construction sites and found important effect such as cost overruns in Nepal.

Research Methodology

A questionnaire was developed in order to assess the perceptions of different parties involved in the construction process in Pakistan's construction sector, for the evaluation of frequency of occurrence and importance of the identified causes. We divided the questionnaire into three parts. In first part, we requested the information and background of the respondents. In second part, we asked about the most frequent and important causes of construction delay. In third part, we asked about the most important and frequent effects of construction delay. First we discussed about the questionnaire with related people working in the construction industry for the confirmation of whether this questionnaire is enough for the gathering of required data. We got a positive response and then we did random sampling for the selection of respondents. We distributed a total of 150 questionnaires among the respondents from different backgrounds working on large construction projects. We distributed these to the people working in government departments related to construction projects, private clients, contractors and consultants. We also took interviews from the labor working on the field on different projects about the causes of construction delays. We distributed 30 questionnaires to the government employees related to construction, 30 questionnaires to the private clients, 40 questionnaires to the contractors, 30 questionnaires to the consultants and engineers, and then we took interviews of 20 labor persons working on construction projects to fill the remaining 20 questionnaires. We found that in previous studies, almost no one asked the labor and people working on the

construction site about the causes and effects of delay, but also taken into account their opinion on these delays.

Out of 150 questionnaires distributed, 100 (66.66%) were returned. There were 10 (33.33%) questionnaires from government departments related to construction, 15 (50%) from private clients, 35 (87.50%) from contractors, 20(66.66%) from consultants and engineers, and 20 (100%) we completed by taking interviews from labor. The table 2 as shown below shows the sector wise distribution and return of questionnaires.

Table 2. Sector wise questionnaire distribution

Questionnaires Distributed and Returned		
Sectors	Questionnaires distributed	Questionnaires Returned
Government Employees	30	10
Private Clients	30	15
Contractors	40	35
Consultants & Engineers	30	20
Labor Interviews	20	20

We applied a statistical formula to find out the relative importance of different causes of delays and effects in construction projects. We adopted a four-point scale ranging from 1 (not important) to 4 (very important) and then for each causes and effects. We transformed the ranged values into RIR by the formula as follows:

$$RIR = PR/I*TR$$

Where;

RIR = relative importance ratio (ranging from 0 to 1)

PR = percentage of respondents

I = importance

TR = total respondents

In the RIR value, zero is not inclusive. Lower the RIR value, more higher the cause/effect of delay.

We applied this methodology and formula for the importance of causes and effects of delay.

Delay in Large Construction Projects

Ogunlana SO, Promkuntong K. (1996). Conducted a study on the delays in construction industry of Thailand. They found out that the problems faced by construction industry in developing countries could be shortages or inadequacies in construction infrastructure (particularly supply of resources), caused by clients and consultants, and also caused by contractor's incompetence /inadequacies. The major problem faced by construction industry is the delay in the delivery or completion of the construction project. There are many causes of delay in construction industry, which leads to some effects of delay on the construction projects. These causes and effects of delay are explained as follows and their importance is calculated by the above research methodology and statistical formula.

Causes of Delay

There are some major causes of delay. Assaf SA, Al-Hejji S. (2006), found out the most important cause, which is the change order (all participants agree to this). Some key causes (according to clients, contractors and consultants) are shown below in figure 3.

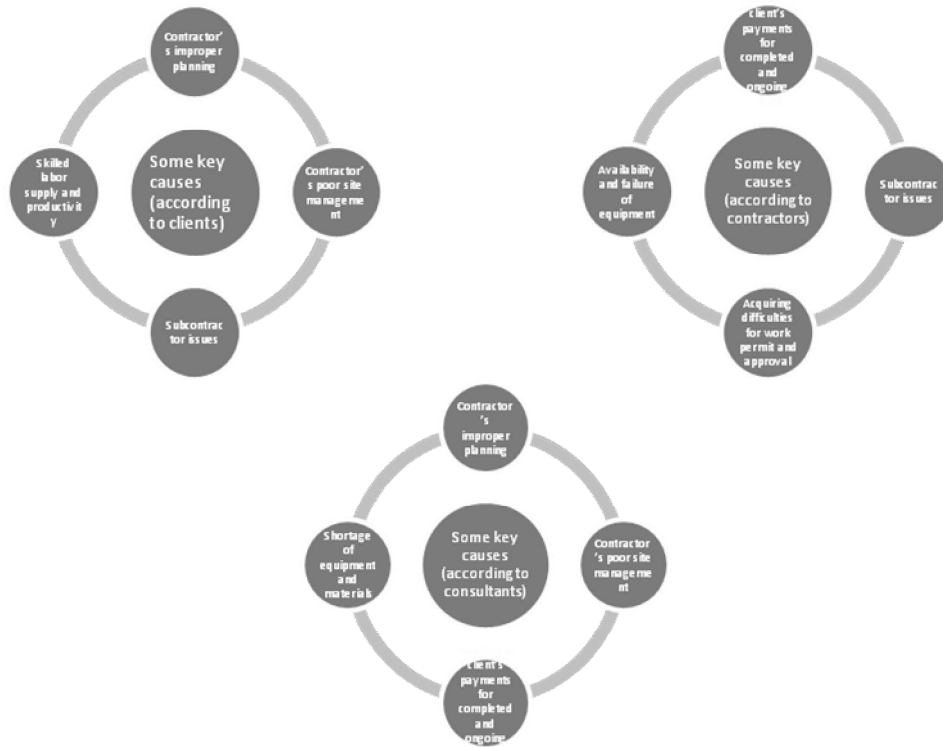


Figure 3

According to Assaf SA and Al-Hejji S (2006), the four key causes of delay according to clients are contractor's improper planning, contractor's poor site management, subcontractor issues, and skilled labor supply and productivity. According to Assaf SA and Al-Hejji S (2006), the four key causes of delay according to contractors are insufficient client's payments for completed and ongoing work, subcontractor issues, acquiring difficulties for work permit and approval, and availability and failure of equipment. According to Assaf SA and Al-Hejji S (2006), the four key causes of delay according to consultants are contractor's improper planning, contractor's poor

site management, insufficient client’s payments for completed and ongoing work, and shortage of equipment and materials.

The importance and ranking of delay causes resulted by our research methodology of questionnaire survey and applying of statistical formula is as follows in the tables below.

The importance and ranking of financial related delay causes is shown below in table 3.

Table 3. Importance and ranking of financial related delay causes

Importance and ranking of financial related delay causes by RIR value						
Delay causes	1	2	3	4	RIR	Ranking
Client’s financial problems	4	9	46	41	0.341	23
Client’s constraints	3	10	50	37	0.339	21
Contractor’s financial problems	6	14	55	25	0.376	37
Inadequate fund allocation	3	7	39	51	0.323	13
Monthly payment problems	5	11	61	23	0.366	35
Inflation	6	9	50	35	0.359	32
High interest rate	18	35	37	10	0.503	48
Delay in payments to supplier and subcontractor	2	6	31	61	0.306	4

The most important and highly ranked financial related delay causes in construction industry of Pakistan are delay in payments to supplier and subcontractors, inadequate fund allocation, client’s constraints, client’s financial problems, inflation, and monthly payment problems.

The importance and ranking of client related delay causes is shown below in table 4.

Table 4. Importance and ranking of client related delay causes

Importance and ranking of client related delay causes by RIR value						
Delay causes	1	2	3	4	RIR	Ranking
Finance and Payments	1	8	33	48	0.280	1
Interference of Client	6	8	51	35	0.358	31
Slow decision making	3	4	48	45	0.323	13
Unrealistic contract duration and requirements	6	10	65	19	0.374	36
Non-capable client’s representative	14	19	53	14	0.447	47
Change in specifications	5	16	45	34	0.365	34

The most important and highly ranked client related delay causes in construction industry of Pakistan are finance and payments, slow decision making, interference of client, change in specifications, unrealistic contract duration and requirements, and non-capable client's representative.

The importance and ranking of contractor related delay causes is shown below in table 5.

Table 5. Importance and ranking of contractor related delay causes

Importance and ranking of contractor related delay causes by RIR value						
Delay causes	1	2	3	4	RIR	Ranking
Delays caused by subcontractor	1	8	40	51	0.311	7
Poor site management	2	4	37	57	0.306	4
Inappropriate construction methods	1	10	65	24	0.336	19
Improper planning	4	7	51	38	0.340	22
Errors during construction	2	9	45	46	0.330	17
Inadequate contractor's experience	8	21	42	29	0.398	40
Inaccurate time estimation	2	5	38	45	0.284	2
Inaccurate cost estimation	1	4	56	39	0.314	9
Incompetent project team	6	13	47	43	0.389	39
Old technology	1	3	56	38	0.306	4

The most important and highly ranked contractor related delay causes in construction industry of Pakistan are inaccurate time estimation, old technology, and poor site management, delays caused by subcontractor, inaccurate cost estimation, and errors during construction.

The importance and ranking of consultant related delay causes is shown below in table 6.

Table 6. Importance and ranking of consultant related delay causes

Importance and ranking of consultant related delay causes by RIR value						
Delay causes	1	2	3	4	RIR	Ranking
Contract management	1	3	57	49	0.338	20
Preparation and approval of drawings	2	11	39	48	0.325	15
Incomplete drawings	4	9	54	33	0.348	27
Changes in drawings	1	5	49	45	0.311	7
Quality assurance	9	8	51	32	0.380	38
Inaccurate site investigation	5	4	47	44	0.336	19
Inadequate consultant experience	3	7	41	49	0.324	14
Slow response and inspection	2	13	49	36	0.338	20

The most important and highly ranked consultant related delay causes in construction industry of Pakistan are changes in drawings, inadequate consultant experience, preparation and approval of drawings, inaccurate site investigation, contract management, and slow response and inspection.

The importance and ranking of material related delay causes is shown below in table 7.

Table 7. Importance and ranking of material related delay causes

Importance and ranking of material related delay causes by RIR value						
Delay causes	1	2	3	4	RIR	Ranking
Quality of material	1	5	55	34	0.303	3
Shortage of material	3	4	33	60	0.310	6
Supply of material	5	10	46	39	0.351	28
Late delivery	7	9	43	41	0.361	33
Rise in material prices	5	14	54	27	0.361	33
Inadequate material	8	22	41	29	0.399	41

The most important and highly ranked material related delay causes in construction industry of Pakistan are quality of material, shortage of material, supply of material, late delivery, rise in material prices, and inadequate material.

The importance and ranking of labor related delay causes is shown below in table 8.

Table 8. Importance and ranking of labor related delay causes

Importance and ranking of labor related delay causes by RIR value						
Delay causes	1	2	3	4	RIR	Ranking
Labor supply	12	17	59	12	0.431	46
Labor productivity	5	10	37	48	0.343	24
Shortage of Skilled Labor	2	18	43	37	0.346	26
Slow working of Labor	4	12	61	23	0.361	33
Labor injuries	10	22	53	15	0.424	45
Labor Strikes	7	11	56	26	0.376	37
Non-attendance	8	17	54	21	0.398	40

The most important and highly ranked labor related delay causes in construction industry of Pakistan are labor productivity, shortage of skilled labor, slow working of labor, labor strikes, non-attendance, and labor injuries.

The importance and ranking of equipment related delay causes is shown below in table 9.

Table 9. Importance and ranking of equipment related delay causes

Importance and ranking of equipment related delay causes by RIR value						
Delay causes	1	2	3	4	RIR	Ranking
Improper equipment	3	6	30	61	0.313	8
Inadequate quantity of equipment	3	10	56	31	0.344	25
Shortage of equipment parts	5	9	52	34	0.353	31
Equipment failure	6	9	41	44	0.351	28
Slow equipment movement	10	18	49	23	0.411	44
Allocation problems	3	16	35	46	0.341	23
Improper old equipment	7	8	38	47	0.354	30

The most important and highly ranked equipment related delay causes in construction industry of Pakistan are improper equipment, allocation problems, and inadequate quantity of equipment, equipment failure, improper old equipment, and shortage of equipment parts.

The importance and ranking of contract related delay causes is shown below in table 10.

Table 10. Importance and ranking of contract related delay causes

Importance and ranking of contract related delay causes by RIR value						
Delay causes	1	2	3	4	RIR	Ranking
Change orders	3	2	45	50	0.315	10
Mistakes in contract document	1	28	56	15	0.374	36
Incomplete documents	4	9	62	25	0.354	30
Contract modifications	2	12	41	45	0.329	16
Major disputes and negotiations	6	11	38	45	0.354	30
Lack of communication between parties	9	24	38	29	0.409	43
Improper organizational structure	10	21	30	39	0.403	42

The most important and highly ranked contract related delay causes in construction industry of Pakistan are change orders, contract modifications, incomplete documents, major disputes and negotiations, mistakes in contract document, and improper organizational structure.

The importance and ranking of external delay causes is shown below in table 11.

Table 11. Importance and ranking of external delay causes

Importance and ranking of external delay causes by RIR value						
Delay causes	1	2	3	4	RIR	Ranking
Weather conditions	5	12	53	29	0.359	32

Natural disasters	1	5	43	51	0.306	4
Regulatory changes	2	8	40	50	0.318	12
Problem with neighbors	2	13	45	40	0.335	18
Unforeseen site conditions	1	8	37	54	0.308	5
Organizational changes	1	8	46	45	0.316	11
Slow site clearance	8	17	44	31	0.389	39
Conflicts	4	9	46	41	0.341	23
Geological and geographical conditions	5	10	38	47	0.344	25

The most important and highly ranked external delay causes in construction industry of Pakistan are natural disasters, unforeseen site conditions, organizational changes, regulatory changes, problem with neighbors, and conflicts.

Pakistan large construction projects, after the analysis of data, 16 important causes of delays based on the RIR and ranking are as follows:

Finance and payments (RIR=0.280) refers to the slow and late payments by the clients. Inaccurate time estimation (RIR=0.284) refers to the incorrect time estimated for the completion or delivery of project. Quality of material (RIR=0.303) refers to the poor quality of materials used in construction projects. Delay in payments to supplier and subcontractor (RIR=0.306) refers to the late payments to suppliers of materials and subcontractors working on the construction project. Poor site management (RIR=0.306) refers to the poor management of site by the contractors. Old technology (RIR=0.306) refers to the utilization of old techniques and methods for construction. Natural disasters (RIR=0.306) refers to the delays and stoppage of work on construction projects due to the severity of natural disasters like floods and earthquake. Unforeseen site conditions (RIR=0.308) refers to the difference in conditions in the design and the real site scene. Shortage of material (RIR=0.310) refers to the shortage due to less supply of materials. Delays caused by subcontractors (RIR=0.311) refers to the slow progress of

subcontractors for their work in the project. Changes in drawings (RIR=0.311) refers to the changes in design and drawings demanded by clients and contractors. Improper equipment (RIR=0.313) refers to the usage of old equipments and machinery or the usage of equipment not suitable for the work on construction project. Inaccurate cost estimation (RIR=0.314) refers to the wrong and inaccurate estimates of cost of the project. Change orders (RIR=0.315) refers to the change of orders and changes about design or working process. Organizational changes (RIR=0.316) refers to the changes in changes in organizations and management, particularly for clients (particularly government and public construction works). Regulatory changes (RIR=0.318) refers to the changes in rules and regulations relating to construction projects.

There are many more causes, but we discussed the main and more important causes. These causes lead to the effects on the construction projects.

Effects of Delay

The causes lead to the effects on large construction industry. After causes, we did the analysis of data regarding effects of delay on large construction industry in Pakistan. We calculated the RIR and then ranking based on RIR values for the effects of delay.

The importance and ranking of delay effects is shown below in table 12.

Table 12. Importance and ranking of delay effects

Importance and ranking of delay effects by RIR value						
	1	2	3	4	5	6
Effects	N. Imp	LImportant	Important	V. Important	RIR	Ranking
Time overrun	0	4	33	63	0.288	1
Cost overrun	1	4	38	57	0.299	2
Disputes	5	22	41	32	0.376	5
Negotiations and court cases	4	17	48	31	0.363	4

Abandonment	2	13	47	38	0.336	3
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The most important delay effects in construction industry of Pakistan are time overrun, cost overrun, abandonment, negotiations and court cases, and disputes.

In Pakistan's large construction projects, the analysis of data from the questionnaire survey, five important effects of delay based on RIR values and ranking are as follows.

Time overrun (RIR=0.288) refers to the late completion or late delivery, from the time specified or agreed by all parties, of construction project. The main causes for the time overrun are financial problems, late payments for the completed work and ongoing work, change orders, organizational changes etc. Cost overrun (RIR=0.299) refers to the increased costs of labor, working force, materials and equipment etc. The main causes for the cost overrun are change orders, mistakes in the contract, changes in drawings etc. Abandonment (RIR=0.336) refers to the total abandonment of the construction project stopping every work or suspending the project for long time. The main causes for abandonment are organizational changes, regulatory changes, finances and payments, natural disasters etc. In Pakistan many large construction projects are temporarily or permanently abandoned due to financial crisis, natural disasters, organizational changes etc. Negotiations and court cases (RIR=0.363) refers to the negotiations and going to court to solve the problems and it takes a long time to solve the problems, in court cases the time duration for these last for many years. The main causes of negotiations and court cases are late or no payments for completed work or ongoing work, change orders etc. Disputes (RIR=0.376) refer to the small problems in between different parties in the construction project. The main causes for disputes are slow or late payments for completed or ongoing work, client interference,

neighbor issues, change in requirements, distribution of work, less communication within parties, subcontractor issues etc. There are also some more effects, but we discussed the main major effects of delay in large construction projects.

Relationship between Causes and Effects

There are both direct and indirect relationship between causes and effects of delays in large construction projects. Manavazhia MR, Adhikarib DK. (2002), linked the material-related causes with the effects of cost overruns and time overruns in construction projects in Nepal. In large construction projects in Saudi Arabia, Assaf SA, Al-Hejji S. (2006) linked the contractor and labor related causes with the time overruns. In Jordon, Odeh AM, Battaineh HT. (2002), linked the contract related causes with the disputes and negotiations among the parties involved in construction projects.

The finance-related and material-related causes are linked with time overrun and cost overrun. The finance-related and labor-related causes are linked with disputes, negotiations and court cases. The finance-related, parties relationship related, external and natural causes are linked with abandonment and time overrun.

Large Construction Projects in Pakistan

We found that around 80% construction projects in Pakistan faced delays, and only 20% of construction projects were completed within scheduled time duration and estimated cost. The large construction project of Port Tower Complex by KPT is a 1,947 ft (593 m) tall skyscraper approved for construction in Karachi, Pakistan. Investment needed for this project is around 2 billion US \$. It was planned and approved during the reign of President Pervez Musharraf. But

later due to changes in government and organizational changes, this project is in delay. Port Tower. (2010), Port Trust Projects. (2010).

Kalabagh Dam is hydroelectric project, which is approved and planned by Government of Pakistan. Its construction site is on river Indus at Kalabagh in Mianwali district of Punjab. Many times work started on this project, but soon stopped due to some political and organizational causes. Prime Minister Yousaf Raza Gilani after the 2010 floods stated that if Kalabagh Dam was built, there would have been less destruction and devastation. Kalabagh Dam project. (2008), Gwadar Port project. (2008). At the coast shore of Arabian Sea near the entrance of Persian Gulf, Gwadar deep-sea port is located. It is in Baluchistan province of Pakistan and it is important seaport of Pakistan after Karachi. It was constructed and some parts in construction with heavy investment from china. The construction work on this project started in 1993, but due to political and organizational problems this project faced delay and still there are some parts of this project under construction or needed to be constructed.

Motorways of Pakistan is a large construction project started by Prime Minister of Pakistan Nawaz Sharif and first motorway of South Asia 367 km 6 lane M2 (Islamabad - Lahore) is operational from 1997. Motorways project includes construction of a international-standard motorways network throughout Pakistan. After M2, 154 km 6 lane M1 (Islamabad - Peshawar) and 54 km 4 lane M3 (Pindi Bhattian – Faisalabad) became operational but faced delay in completion of construction. But this large construction project faced delay, because just 3 motorways are operational and some others are under construction or needed to be constructed. The delay in this motorways project is due government changes, organizational changes, financial problems, design changes and some more.

The Karakorum Highway is 1300 km (806 km in Pakistan, 494 km in China) is the highest highway of the world. It connects Pakistan with china at altitude of 4,693 m through Khunjerab pass. It was constructed with many difficulties because of the high mountainous region and problems of land sliding and rock sliding delayed the work and delaying the rework on this construction project. The upgrading of this highway like doubling the width and making to more durable and workable is facing delay.

There are also many other large construction projects in Pakistan faced or facing delays in construction due to many causes leading to many effects on construction industry and Pakistan.

Conclusion

We conducted this research for the construction delays in Pakistan's large construction industry. We developed questionnaire to get the data about the causes and effects of delay. We analyzed the data by a statistical formula to calculate to relative importance index (RIR). Based on the RIR value, we ranked the causes and effects of delay. Lesser the RIR value, more important is the cause or effect. We discussed the 16 important causes of delay, which are: Finance and payments, Inaccurate time estimation, Quality of material, Delay in payments to supplier and subcontractor, Poor site management, Old technology, Natural disasters, Unforeseen site conditions, Shortage of material, Delays caused by subcontractors, Changes in drawings, Improper equipment, Inaccurate cost estimation, Change orders, Organizational changes and Regulatory changes. Then we discussed the 5 main effects of delay, which are: Time overrun, Cost overrun, Abandonment, Negotiations and court cases and Disputes. We also related these

effects with the causes relating to these effects. Most of the large construction projects faced or are facing delays. Some main large construction projects in Pakistan faced or facing delay are: Port Tower Complex, Kalabagh Dam, Gwadar Deep-sea Port, Motorways of Pakistan and Karakorum Highway. These delays are very common in Pakistan's large construction industry. We mentioned the main causes and effects of delays and relationship between them. This study can be used to lessen the delays in large construction industry of Pakistan by dealing with the main causes and reducing the effects.

Recommendations

These delays are badly affecting the large construction industry and it is needed to find a solution for countering the delays. The solution to avoid and counter delays is to avoid and lessen the causes related with delays, and in result there will be lesser effects of delays on large construction industry.

It is suggested to deal with the causes and find a solution so that these causes not happen or happen very less. The financial problems should be avoided, by making the payments on time. The client should make timely payments to the contractor and contractor should make the timely payments to the subcontractors, suppliers and labor. It is suggested that the time and cost estimation of the project should be accurate. The material should not face the shortage situation and the materials quality should be checked properly so that less errors and problems happen. The subcontractors should complete their work on time and the suppliers should supply the materials on time. The site should be managed properly and there should be proper equipment for the construction. The new technology and techniques should be preferred and there should be

skilled workers and labor working on the construction project. All changes should be done before the start of construction, because change orders and design changes during the construction should be avoided. The site conditions should be studied in detail before the start of construction and there should be consideration about the disaster, geographical and soil conditions. It is suggested that during the construction stage, the organizational changes and regulatory changes should be avoided or so they should not affect the progress of construction.

The effects should be lessened by dealing with causes leading to the effects. Time overrun and Cost overrun are most common effects, which can be solved or lessened by dealing with the causes leading to time overruns and cost overruns. If the construction project is started, then it should be completed and the case of abandonment should not be considered. The disputes, negotiations and court cases should be solved on time and it is preferred that they should not happen and if they happen then the timely solution should be done. By studying the relationship between effects and causes, we can counter the delays by dealing with causes leading to effects.

In Pakistan, many large construction projects faced delays and the country's economy and progress is affected because of the delays. These large construction projects contribute to country's development and progress. If there is delay in the completion of these crucial large construction projects, then the country's economy is affected because of loss of investment on the project and the development and progress is affected because these crucial large construction project leads to the development of the Pakistan. It is suggested that proper actions should be taken in Pakistan to solve and lessen the delays in completion of large construction projects in Pakistan.

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