

Important Causes of Delay in Construction Projects in Baghdad City

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Abstract: This study aimed to identify causes of delay in construction projects in Baghdad city, and specify the most important causes of delay in the construction project through a field survey of a questionnaire contained 58 causes of delay identified for this research, categorized in 10 groups of delay causes. The Field survey conducted included 78 engineers represent the project three participants (owner, contractor and consultant). The results show that 60 engineers responded, agree together that the most important cause of delay is (Mistakes and discrepancies in design documents) by relative importance index (RII) of 83.05%, followed by (Ineffective planning and scheduling of project by contractor). While design group of delay causes was ranked the highest instead of environmental group that was ranked the lowest group of delay causes.

Key words: Causes of delay, Construction projects, Baghdad city

INTRODUCTION

In recent years, Iraqi economy has improved largely, following the growth of oil sector, infrastructure development and the urbanization are booming. And complying with them, the weight (importance) of the construction industry in the national economy has been increasing. However, many problems have arising during the construction project implementation, delay is one of them.

Delay could be defined as the time over-run either beyond completion date specified in a contract, or beyond the date that the parties agreed up on for delivery of project.

A major criticism facing the Iraqi construction industry is the growing rate of delays in project delivery. Completing projects on time is an indicator of efficiency, but the construction process is subject to many variables and unpredictable factors, which result from many sources. These sources include the performance of parties, resources available, environmental conditions, involvement of the parties and contractual relations. However, it is rarely happen that a project is completed within the specified time.

For the owner, 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.

Objectives of the study:

The main objectives of this study include the following:

- Identifying the causes of delay in construction projects in Baghdad city in Iraq
- Test the importance of the causes of delay for each group of parties and from the all together.
- Studying the differences in perceptions of the three major parties in any constructions, namely, owners, contractors and consultants

Literature Review:

Fugar and Agyakwah-Baah (2010) investigates the causes of delay of building construction projects in Ghana to determine the most important according to the key project participants; clients, consultants, and contractors. Thirty-two possible causes of delay were identified. These delay factors were further categorized into nine major groups. The list of delay causes was subjected to a questionnaire survey for the identification of the most important causes of delay. The respondents generally agree that financial group factors ranked highest among the major factors causing delay in construction projects in Ghana.⁽⁴⁾

Assaf and AlHejji (2006) conducted a time performance survey of different types of construction projects in Eastern Province of Saudi Arabia to determine the causes of delay and their importance according to each project participant (owner, consultant, and contractor). They identified seventy three (73) causes of delay during the research. The most common cause of delay identified by all three parties was “change order.”⁽³⁾

Pourrostan and Ismail (2011) they aim in this paper to identify the main causes and consequences of delay in Iranian construction projects. A questionnaire survey was conducted to solicit the causes and consequences of delay from consultants and contractors’ viewpoint. This study identified 10 most important causes of delay from

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a list of 27 different causes of delay and 6 different effects of delay. The results showed delay can lead to many negative effects such as time and cost overrun, disputes, arbitration, total abandonment and litigation.⁽⁷⁾

Tumi *et al* (2009) aimed to identify the cause of delay in Libyan city of Zantan, where they classified the causes of delay in two categories of delays used in determining delay damages: 1-Inexcusable delays (Non-Excusable delay) and Excusable delays of both (Non-compensable delays and Compensable delays) also mentioned 43 factors cause delays distributed in to six board categories used in questionnaire survey targeted at some contractors, clients and consultants in some projects in Libya. To reach the important delay causes.⁽⁸⁾

Hoai *et al* (2008) studied delays and cost overruns that have been met in construction projects in Vietnam; this research has employed a questionnaire survey to elicit the causes of this situation by interviewing 87 Vietnamese construction experts. Twenty one causes of delay and cost overruns appropriate with building and industrial construction project were inferred and ranked with respect to frequency, severity and importance indices. Factor analysis technique was applied to categorize the causes, which yielded 7 factors: Slowness and Lack of constraint; Incompetence; Design; Market and Estimate; Financial capability; Government; and Worker.⁽⁵⁾

Aibinu and Jagboro (2002) identified by questionnaire evaluates and through empirical method assesses the effects of construction delays. The findings showed that time and cost overruns were frequent effects of delay. Delay had significant effect on completion cost and time of 61 building projects studied. Client-related delay is significant in Nigeria.⁽²⁾

Abdullah *et al* (2010) in this paper presents a survey study on significant causes of delay in MARA management procurement construction projects in Malaysia. The results analysis revealed that the significant delay causes were cash flow and financial difficulties faced by contractors, contractors' poor site management and ineffective planning and scheduling by contractors.⁽¹⁾

Research Methodology:

From existing literatures on the construction projects delay causes in different countries, it have been reviewed and from simple experience in projects and based on the preliminary investigation conducted to previous projects at the outset of this study, it was possible to identify certain factors effect of delay on project delivery. The fifty eight causes of delay were identified, categorized to ten major groups (sources).

A questionnaire was organized in the form of an importance scale. Respondents were asked to indicate by ticking a column the relative importance of each of the causes of construction delay.

Field survey has been adopted to collect data; stratified sample technique was used to distribute the designed questionnaire to the three principal construction parties (owner, consultant and contractor) where these three parties represented completely by their engineers in this research.

Also agreement on the ranking of the importance of the causes of delay between each two groups of parties was tested.

Questionnaire Design:

Data were gathered through a questionnaire. The questionnaire is divided into two main parts. Part one is related to personal information for respondents like (name, specialist, experience years,.....) and the part two contain the list of 58 identified causes of delay in construction project, these causes are categorized in ten groups according to source of delay, classified groups are project, design, owner, contractor, consultant, workforce, equipment, materials, environment and external, where table (1) explains the 58 causes as listed in the questionnaire.

For each cause/group the participant was asked the importance degree in causing delay in the project duration according to five scale importance index (5 to 1 point scale: Extremely=5, Great=4, Medium=3, Little=2, Very little=1)

Table 1: Delay causes as listed in the questionnaire

Group	Seq.	Cause of Delay	Importance index in causing delay				
			Very Little	Little	Medium	Great	Extremely
project	1	Original contract duration is too short					
	2	Inadequate definition of substantial completion					
	3	Ineffective delay penalties					
	4	Type of construction contract (Turnkey, Construction only,....)					
	5	Type of project bidding and award (Negotiation, Lowest bidder,....)					
Design	6	Mistakes and discrepancies in design documents					
	7	Delays in producing design documents					
	8	Unclear and inadequate details in drawings					
	9	Insufficient data collection and survey before design					
	10	Inadequate design-team experience					
Owner	11	Complexity of project design					
	12	Delay in progress Payments by owner					
	13	Delay to deliver the site to contractor					
	14	Change orders by owner during construction					
	15	Delay in approving shop drawings and sample materials					
	16	Poor communication and coordination by owner and other parties					
	17	Low speed of decision making					
	18	Suspension of work by owner					
Contractor	19	Difficulties in financing project by contractor					
	20	Rework due to errors during construction					
	21	Poor site management and supervision by contractor					
	22	Poor communication and coordination by contractor and other parties					
	23	Ineffective planning and scheduling of project by contractor					
	24	Obsolete or unsuitable construction methods					
	25	Frequent change of sub-contractors because of their inefficient work					
	26	Poor qualification of the contractor's technical staff					
Consultant	27	Delay in performing inspection and testing by consultant					
	28	Delay in approving major changes in the scope of work by consultant					
	29	Inflexibility (rigidity) of consultant					
	30	Late in reviewing and approving design documents by consultant					
	31	Poor communication/ coordination between consultant and other parties					
	32	Inadequate experience of consultant					
Material	33	Shortage of materials on site or market					
	34	Late delivery of materials					
	35	Changes in material types and specifications during construction					
	36	Damage of sorted materials while they are needed urgently					
	37	Late in selection of finishing materials due to availability of many types in market					
Work force	38	Shortage of labors					
	39	Unqualified workforce					
	40	Low productivity of labors					
	41	Personal conflicts among labors					
	42	Difficulties of skilled workforce to work in different sites because of security conditions					
Equip-ment	43	Equipment failure or breakdown					
	44	Low level of equipment-operator's skill					
	45	Low productivity and efficiency of equipment					
Environm-ental	46	Shortage of equipment					
	47	Effects of subsurface conditions (e.g. soil, high water table, etc.)					
	48	Hot weather effect on construction activities					
	49	Rain effect on construction activities					
	50	Effect of dust storms that fall out repeatedly in					

		Baghdad recently					
External	51	Delay in obtaining permits from municipality					
	52	Unavailability of utilities in site (such as water, electricity, telephone, etc.)					
	53	Effect of social and cultural factors					
	54	Traffic control and restriction at job site					
	55	Accident during construction					
	56	Changes in government regulations and laws					
	57	Effects of roads and streets closing due to security conditions					
	58	Public holidays					

Data Analysis:

The collected data through the questionnaire survey of the 58 causes of delay were analyzed using relative importance index (RII) technique from (Lim and Alum)⁽⁶⁾, the aim of the analysis was to establish the relative importance of the various causes identified as responsible for construction delay, The score for each cause is calculated by summing up the scores given to it by the respondents. The relative importance index (RII) was calculated using the following formula (Lim and Alum)⁽⁶⁾

$$RII = \left[\frac{(5N5+4N4+3N3+2N2+N1)}{5(N5+N4+N3+N2+N1)} \right] * 100 \tag{1}$$

Where:

- N1= No. of Respondents answered (very little)
- N2= No. of Respondents answered (little)
- N3= No. of Respondents answered (medium)
- N4= No. of Respondents answered (great)
- N5= No. of Respondents answered (extremely)

Characteristics Of Respondents:

Face-to-face is preferred to distribute the questionnaire also official post and E-mail used; respondents are promoted to raise the response rate. A total of 78 questionnaires are delivered to construction professional engineers involved in large and medium projects located in Baghdad city.

The response rate from the (Owner, Contractor and consultants) are 74.193%, 78.571% and 78.947% respectively as illustrated in table (2) below:

Table 2: Percentage of questionnaire distributed and responses received

Respondents	Questionnaires distributed	Responses returned	Percentage of responses (%)
Owner	28	22	78.571
Contractor	31	23	74.193
Consultant	19	15	78.947
Total	78	60	76.92

Regarding number of years experience involved in construction, 6.67% of respondents have less than 5 years, 16.67% of those have between 5 to 10 years, 38.33% from respondents have experience between 11 to 20 years, and 38.33% remained of those have more than 20 years experience.

Regarding on graduation degree of highest education, 15% of respondents have Ph.D in engineering, 15% also of those have M.Sc Degree in engineering and the remained have B.Sc in engineering, where these respondents involved in building, sewage networks and lines, water networks and bridge and tunnel and road projects in Baghdad city.

Research Findings And Results:

The perspective of (owner, contractor and consultant) of the 58 delay causes analyzed based on the relative importance index. The results are shown in table (3) and (4) below. The relative importance index and ranks of delay causes by all the respondents are presented in table (3). Table (4) explains the relative importance index and ranks of groups of delay causes by all respondents.

Table 3: Relative importance index and rank of delay causes according to (Owner, Contractor and Consultant)

Delay Causes	Overall		Owner		Contractor		Consultant		Group
	RII %	Rank	RII %	Rank	RII %	Rank	RII %	Rank	
Mistakes and discrepancies in design documents	83.05	1	84.54	4	80.9	1	84	2	Design
Ineffective planning and scheduling of project by contractor	80.33	2	80.9	9	76.52	10	85.33	1	Contractor
Poor site management and supervision by contractor	80	3	80.9	9	78.26	5	81.42	3	Contractor
Poor qualification of the contractor's technical staff	79.64	4	88	1	79.13	4	68.57	17	Contractor
Unclear and inadequate details in drawings	78.96	5	80.95	8	80.9	1	73.33	9	Design
Inadequate design-team experience	78.94	6	82.85	5	80.9	1	70	14	Design
Insufficient data collection and survey before design	78.27	7	85.71	3	72.27	19	76	6	Design
Difficulties in financing project by contractor	77.58	8	80	11	77.27	7	74.66	8	Contractor
Obsolete or unsuitable construction methods	76.55	9	87.27	2	69.52	30	70.66	13	Contractor
Unqualified workforce	75.66	10	76.36	16	73.91	16	77.33	5	Work Force
Low speed of decision making	75.25	11	77.14	15	75.65	13	72	11	Owner
Delay in progress Payments by owner	74.91	12	76.19	18	75.65	13	72	11	Owner
Delays in producing design documents	74.73	13	79.04	13	77.27	7	64.28	24	Design
Delay in approving major changes in the scope of work by consultant	74.57	14	80	11	77.39	6	62.66	27	Consultant
Frequent change of sub-contractors because of their inefficient work	73.79	15	81.81	6	71.42	21	65.33	23	Contractor
Low productivity of labors	73.66	16	71.81	27	73.91	16	76	6	Work Force
Inadequate experience of consultant	73.55	17	78.09	14	75.65	13	60	32	Consultant
Delay in approving shop drawings and sample materials	73.44	18	76	20	73.91	16	69.33	16	Owner
Poor communication and coordination by contractor and other parties	72.41	19	74.28	23	70	27	73.33	9	Contractor
Ineffective delay penalties	71.03	20	70.9	30	65.45	42	80	4	Project
Changes in material types and specifications during construction	71.03	20	71.81	27	70.9	23	70	14	Material
Delay to deliver the site to contractor	70.33	22	81.81	6	66.08	40	60	32	Owner
Change orders by owner during construction	70.16	23	75.45	21	67.27	38	66.66	19	Owner
Rework due to errors during construction	69.83	24	73.33	24	70.43	25	64	25	Contractor
Late in reviewing and approving design documents by consultant	69.83	24	70	33	76.36	11	60	32	Consultant
Effects of subsurface conditions (e.g. soil, high water table, etc.)	69.33	26	76.36	16	69.56	28	58.66	37	Environment
Effects of roads and streets closing due to security conditions	69.33	26	76.36	16	64.34	44	66.66	19	External
Suspension of work by owner	69.15	28	72.38	26	72.17	20	60	32	Owner
Original contract duration is too short	68.96	29	67.61	39	77.27	7	58.66	37	Project
Low productivity and efficiency of equipment	68.81	30	72.72	25	70.43	25	60	32	Equipment
Inadequate definition of substantial completion	68.36	31	63	45	76	12	64	25	Project
Equipment failure or breakdown	68.33	32	68.18	37	69.56	28	66.66	19	Equipment
Unavailability of utilities in site (such as water, electricity, telephone, etc.)	67.66	33	70.9	30	68.69	32	48	53	External
Shortage of equipment	66.44	34	68.18	37	67.82	36	61.42	29	Equipment
Complexity of project design	66.42	35	67.6	41	68.57	34	61.42	29	Design
Delay in performing inspection and testing by consultant	66.33	36	70	33	68.69	32	57.33	42	Consultant
Difficulties of skilled workforce to work in different sites because of security conditions	66.33	36	60.9	49	71.3	22	66.66	19	Work force
Poor communication/ coordination between consultant and other parties	66.1	38	69.09	36	69.09	31	54.66	46	Consultant
Shortage of materials on site or market	65.76	39	70.9	30	70.9	23	50.66	50	Material
Traffic control and restriction at job site	65.33	40	74.54	22	58.26	52	52	48	External
Late delivery of materials	64.82	41	67.61	39	68.18	35	56	44	Material
Inflexibility (rigidity) of consultant	63.38	42	63.8	44	66.08	40	58.66	37	Consultant

Type of project bidding and award (Negotiation, Lowest bidder,...)	63.1	43	71.42	29	51.81	57	68	18	Project
Low level of equipment-operator's skill	63	44	66.36	43	63.63	46	61.33	31	Equipment
Poor communication and coordination by owner and other parties	62.71	45	69.52	35	61.73	47	54.66	46	Owner
Damage of sorted materials while they are needed urgently	62.06	46	60	52	63.8	45	62.66	27	Material
Type of construction contract (Turnkey, Construction only,...)	61.4	47	57.14	53	67.61	37	58.66	37	Project
Late in selection of finishing materials due to availability of many types in market	61.35	48	60.9	49	65.45	42	56	44	Material
Hot weather effect on construction activities	61.33	49	67.27	42	57.39	55	58.66	37	Environment
Shortage of labors	59.66	50	62.72	48	61.73	47	52	48	Work force
Public holidays	59	51	60.9	49	58.26	52	57.33	42	External
Delay in obtaining permits from municipality	58.27	52	62.85	46	59.09	51	50.66	50	External
Changes in government regulations and laws	56.27	53	62.85	46	60	50	41.33	55	External
Rain effect on construction activities	56	54	55.45	55	66.95	39	40	57	Environment
Effect of social and cultural factors	53.44	55	55.23	56	60.9	49	40	57	External
Effect of dust storms that fall out repeatedly in Baghdad recently	52.66	56	56.36	54	56.52	56	41.33	55	Environment
Accident during construction	52.54	57	49.52	58	58.26	52	48	53	External
Personal conflicts among labors	51.18	58	52.38	57	50.43	58	50.66	50	Work force

Table 4: Relative importance index and rank of groups (sources) of delay causes

group	Overall		Owner		Contractor		Consultant	
	RII %	Rank	RII %	Rank	RII %	Rank	RII %	Rank
Design	76.521	1	80.157	2	76.946	1	70.574	2
Contractor	76.274	2	80.818	1	74.157	2	72.881	1
Owner	70.847	3	75.540	3	70.375	4	64.952	4
Consultant	68.676	4	71.782	4	72.205	3	58.888	8
Equipment	66.638	5	68.863	5	67.173	7	62.413	6
Project	66.573	6	66.095	7	67.663	5	65.675	3
Workforce	65.351	7	64.954	8	66.260	8	64.533	5
Material	64.778	8	66.238	6	67.272	6	58.918	7
External	59.873	9	64.302	9	61.868	10	50.500	9
Environmental	59.750	10	63.863	10	62.391	9	49.666	10

I. spearman's rank correlation:

Spearman's rank correlation coefficient (r_s) is used to demonstrate whether there is the agreement or disagreement of ranking between any two parties. The spearman's rank correlation is a non-parametric test. Non-parametric tests are also referred to as distribution-free test. These tests do not require the assumption of normality or the assumption of homogeneity of variance. They compare the medians rather than means and, as a result, if the data have one or two outliers, their influence is excluded. The correlation coefficient varies between +1 and -1, where +1 implies a perfect positive relationship (agreement), while -1 results from a perfect negative relationship (disagreement). And it is calculated by the following formula:

$$r_s = 1 - \left[\frac{6 \sum d^2}{(n^3 - n)} \right] \tag{2}$$

Where:

d = the difference between the ranks given by any two respondents for an individual cause

n = the number of causes or groups, which in this case is 58 causes or 10 groups.

The rank correlation coefficients for the delay causes are 0.69, 0.72 and 0.66 for owner and contractor, owner and consultant, and contractor and consultant respectively. This shows high agreement between rankings.

II. Discussion of results:

From table (3) above Overall respondents agreed that the top ten most important causes resulting delay in the construction projects in Baghdad city are:

1. Mistakes and discrepancies in design documents
2. Ineffective planning and scheduling of project by contractor

3. Poor site management and supervision by contractor
4. Poor qualification of the contractor's technical staff
5. Unclear and inadequate details in drawings
6. Inadequate design-team experience
7. Insufficient data collection and survey before design
8. Difficulties in financing project by contractor
9. Obsolete or unsuitable construction methods
10. Unqualified workforce

Also from table (4) above, based on different groups (sources) of delay causes, the respondents generally agreed that the top three groups are:

1. Design
2. Contractor
3. Owner

The following brief discussion for 58 causes of delay explained with their groups, illustrated in the descending order of the groups ranking:

1st – Design:

This group of delay causes was ranked highest from all the respondents put together, where its RII is (76.521%), that means it represent the main group causes that cause delay for construction projects in Baghdad city, which the cause (Mistakes and discrepancies in design documents) in that group was ranked at the first cause of delay of RII (83.05%), where the cause (Unclear and inadequate details in drawings) ranked as the 5th cause of delay from the 58 cause, therefore table (5) explains causes of delay ranking from design group.

Table 5: ranking for causes of delay from design group and its overall ranking

Cause	RII %	Ranking in their group	Overall ranking
Mistakes and discrepancies in design documents	83.05	1	1
Unclear and inadequate details in drawings	78.96	2	5
Inadequate design-team experience	78.94	3	6
Insufficient data collection and survey before design	78.27	4	7
Delays in producing design documents	74.73	5	13

2nd – Contractor:

The contractor group delay causes were ranked the second most important causes responsible for construction delay. This is not surprising because the following causes of that group (Ineffective planning and scheduling of project by contractor),(Poor site management and supervision by contractor) and (Poor qualification of the contractor's technical staff) were ranked as 2nd, 3rd and 4th causes respectively from the 58 causes, that indicate the main effect of that causes group in resulting delay in the projects in Baghdad, so table (6) explains the ranking of causes from contractor group and overall ranking

Table 6: Ranking of causes from contractor group and overall ranking

Cause	RII %	Ranking in their group	Overall ranking
Ineffective planning and scheduling of project by contractor	80.33	1	2
Poor site management and supervision by contractor	80	2	3
qualification of the contractor's technical staff	79.64	3	4
Difficulties in financing project by contractor	77.58	4	8
Obsolete or unsuitable construction methods	76.55	5	9
Frequent change of sub-contractors because of their inefficient work	73.79	6	15
Poor communication and coordination by contractor and other parties	72.41	7	19
Rework due to errors during construction	69.83	8	24

3rd – Owner:

Contractor, Owner and consultant together ranked owner group as the third most crucial source in construction delay with RII of 70.365%, 75.540% and 64.952% respectively. All the respondents denote especially the contractor that the causes (Low speed of decision making) from the owner and (Delay in progress Payments by owner) represent the 1st and 2nd important cause in their group of overall ranking 11th and 12th in causing delay for projects. Where the following table (7) explains ranking for causes of delay from owner group and overall ranking

Table 7: ranking for causes of delay from owner group and its overall ranking

Cause	RII %	Ranking in their group	Overall ranking
Low speed of decision making	75.25	1	11
Delay in progress Payments by owner	74.91	2	12
Delay in approving shop drawings and sample materials	73.44	3	18
Delay to deliver the site to contractor	70.33	4	22
Change orders by owner during construction	70.16	5	23
Suspension of work by owner	69.15	6	28
Poor communication and coordination by owner and other parties	62.71	7	45

4th – Consultant:

This group of delay causes was ranked fourth. In this group the cause (Delay in approving major changes in the scope of work by consultant) is ranked as 14th cause from the overall 58 causes of delay of RII (74.57%), for that cause owner and contractor agreed that is the most important cause from consultant group causing delay in the construction projects. then (Inadequate experience of consultant) was ranked as second important cause in their group of overall rank 17th of RII (73.55%).

5th – Equipment:

Equipment as delay group was ranked fifth. Owner, contractor and consultant together were agreed that (Low productivity and efficiency of equipment) and (Equipment failure or breakdown) was the most important two causes of that group of overall rank 30th and 32nd respectively.

6th – Project:

Owner, contractor and consultant together ranked this group as sixth. The 1st and 2nd most important cause in that group are (Original contract duration is too short) of RII (68.96%) and (Inadequate definition of substantial completion) of RII (68.36%) were ranked as 29th and 31st from overall causes respectively.

7th - Work force:

Ranking of delay causes from work force group and its overall rank is explained in table (8) shown below:

Table 8: ranking for causes of delay from work force group and its overall ranking

Cause	RII %	Ranking in their group	Overall rank
Unqualified workforce	75.66	1	10
Low productivity of labors	73.66	2	16
Difficulties of skilled workforce to work in different sites because of security conditions	66.33	3	37
Shortage of labors	59.66	4	50
Personal conflicts among labors	51.18	5	58

This group was ranked as seventh. In this group the cause (unqualified workforce) is in the most ten important causes of delay, was ranked as 10th of RII (75.66%) as shown in table above, also this group include the cause (personal conflicts among labors) that was ranked as the last cause of delay from the 58 overall cause.

8th – Material:

Material as delay group has RII of (64.778%) was ranked as eighth. Owner, contractor and consultant agreed all that (Changes in material types and specifications during construction) was the most important cause of delay, ranked as 20th from overall causes.

9th – External:

External as a delay group was ranked low as ninth. The most important cause in this group is (Unavailability of utilities in site (such as water, electricity, telephone, etc.)) of rank 33rd with RII (67.66%). Where the cause (Traffic control and restriction at job site) was ranked 2nd in this group and 40th from overall causes

10th – Environmental:

All parties ranked the environmental group of delay causes as the lowest with RII of (59.75%). From all causes in the group, all parties have seen (Effects of subsurface conditions (e.g. soil, high water table, etc.)) a high cause, ranked 26th from the 58 causes that causing delay in construction projects identified for Baghdad city.

Summary And Conclusion:

The delay in construction projects in Baghdad city is studied in a field survey. The relative importance index (RII) is calculated for the 58 causes of delay that were identified through research for Baghdad city. In the field survey, 60 engineer represents (owner, contractor and consultant) filled a questionnaire list to indicate relative importance index for each cause.

The study showed that all the parties of respondents agreed that the most ten important causes of delay for construction projects arranged in descending order of importance are:

1. Mistakes and discrepancies in design documents
2. Ineffective planning and scheduling of project by contractor
3. Poor site management and supervision by contractor
4. Poor qualification of the contractor's technical staff
5. Unclear and inadequate details in drawings
6. Inadequate design-team experience
7. Insufficient data collection and survey before design
8. Difficulties in financing project by contractor
9. Obsolete or unsuitable construction methods
10. Unqualified workforce

The 58 causes were categorized into 10 groups of delay causes and were ranked. The results show that all parties agreed together that design group was the most influential causes group. Contractor group was considered the second most important causes group causing delay in construction projects followed by owner group of delay causes.

Recommendation:

Results show that the most important ten causes mainly came from the design group and contractor group; the following recommendation can be suggested in order to reduce and control delays in construction projects:

A-designer (Architect, structural, others)

1. Mistakes and discrepancies in design documents should be eliminated totally, otherwise; they are common causes for redoing designs and drawings and may take additional time to make necessary corrections.
2. Data collected from project site and exact survey information give a good base to design the projects facilities from (maps, drawings) accurately so no lost time in redesign some details that be incorrect.

B- Contractor (Companies, persons)

1. Site management and supervision from project manager and project technical staff should be assigned as early as project is awarded even earlier to do their missions to achieve completion within specified time with the required quality and estimated cost.
2. Contractor should manage his financial resources in order to not face money problems and plan a cash flow by utilizing progress payments.
3. Contractor must employed workforce well qualified especially skilled labors with high productivity and work always to improve their skills and productivity so avoid errors in works and that resulting exact execution in specific time.

C- Owner (Mostly government ministries and directorates)

1. High speed in making decisions regarded to the projects, minimize change orders as possible during the construction to avoid delays.
2. Pay progress payments to the contractor on time because it impairs the contractor ability to finance the work and also motivate him to continue working in high rate.
3. Owner should ensure when awarded the project to contractor of the lowest bidding or others. That contractor has the capabilities to satisfy the project conditions so achieve the construction works in specific time.

Suggested Future Papers:

1. Similar studies can be performed in other governorates/cities in Iraq.
2. Study can be done for a specific type of projects, such as bridges construction, sewage projects, pavements projects or others.
3. Detailed study can be done to evaluate the effects of delays on the cost overruns in construction projects.

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