

Management and Cost Control of Construction Projects in Jordan

Sireen Mamoun Arabiyat¹, Ayman Hasan Al-Momani²

¹ MA in projects management, School of Engineering, University of Jordan, Amman, Jordan

² Professor in Civil Engineering, School of Engineering, University of Jordan, Amman, Jordan

Correspondence: Sireen Mamoun Arabiyat, MA in projects management, School of Engineering, University of Jordan, Amman, Jordan.

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Abstract

The variations in time and quality are vital to the projects' success. Though the cost variation is the most impacting variation, the objective of this study is to recognise the significance of the cost controls in the construction projects in Jordan. Moreover, it aims to determine the factors that lead to reduce these costs. For the methodology, the study used the questionnaire instrument for the data collection. The study sample entailed 154 respondents who hold the responsibility in relevance positions with experiences in contracting and consultants engineering field in Jordan under first and second-grade classification. The study results revealed that there is a significant relationship between cost reduction and all investigated factors, namely, the demographic variables, the pre-execution conditions and specification, and managerial, technical, or financial dimensions. Further, the results showed a significant impact of proper resource planning. In summary, the key factors affecting the project cost during the pre-execution stage involves the appropriate resources planning (i.e., workforce, funds, data). In details, the most critical factors affecting the project cost from managerial dimension are the project manager assignment and integrity of consultant. For the technical dimension, the elements are the skilled workers, the applied methods, the statements and specifications. Lastly, for the fund allocation dimension, the most critical factors that affect the project cost from a financial point of view. Lastly, a set of recommendations are proposed to the project managers to reduce the cost.

Keywords: construction industry, construction cost, cost factor, construction projects, Jordan, emerging markets

1. Introduction

Numerous challenges are facing construction projects all over the world. As construction projects are well known for being over-budget, behind schedule, unclear scope and low quality. All these dilemmas have been broadly debated across the prior literature. The traditional construction management schools paid massive attention to find out practical solutions to such problems. Therefore, the scholars agreed that construction management as the overall planning of a project by the allocating the appropriate resources to reduce the project cost (Tung & Otto, 2019).

Across the construction projects, project managers and contractors face difficulties to include the poor planning, inferior materials, the lack of qualified labour, the dramatic growth in material costs, the shifts in the deliverables and milestones delivery dates, the wastage of content, over budgeting, unexpected weather changes, the lapse in management and control, loss of equipment, poor communication and others. All these factors result in cost and time overruns, also the case in conflicts in the project outcomes. Therefore, there is a need to study the project costs, to identify cost reduction/ control techniques to carry out the construction projects effectively. Such reductions and improvements are common goals across the construction industry. One way of reducing construction cost is to adopt innovative technologies, as well as to develop plans to increase productivity. Otherwise, the gaps in the management of cost reduction techniques, then the contractor will suffer from losses while carrying different activities of projects.

In Jordan as an example of the emerging markets, the construction sector faces significant challenges even it is one of the leading sectors in the Jordanian economy, and it has a substantial impact on the GDP, the employment and the foreign investment. However, in the last few years and as a result of Syrian crises and political instability, many sectors including the construction sector suffered are in unstable situation associated with the political and economic risks (El-Namrouty 2012). Therefore, this study attempts to identify the factors that help in realizing a

cost reduction in the construction industry, also to investigate the impact of the cost reduction factors on the whole project.

1.1 Research Problem

All business operates in the professional environment strive to reduce the costs and increase the profits. Construction companies are not an exception in this regard; depressing prices is one of the main contributors in organizational success. Therefore, there is a necessity to shed lights to these crucial issues to avoid failures increasingly happening across the last few years. In contrast, the gaps in tackling the cost and problems saving at the same level that the project performance, scope, quality and deliverables are, this will lead to cost overrun and unsatisfactory outcomes. Such concerns are common in the construction projects; hence, its urge to have proper planning, management, and control on a project to eliminate them.

The cost management function provides information for internal users who need accurate, detailed and frequent economic facts for making decisions. Specifically, cost management identifies, collects, measures, classifies and reports information that is useful to managers to determine the products cost, customers, and suppliers pricing. Further, this supports the planning, controlling, making continuous improvements as well.

Project cost management includes three significant functions called cost estimating, budgeting and cost control (Project Management Institute PMI, 2005). Thus, they stressed on the project is executed in a cost-efficient, profitable manner, and according to business principles and from the perspective of the entire company (Kivil äet al., 2017). Consequently, the primary objective of this study is to This objective of this study is to identify the significance of cost controls across executing the construction projects in Jordan, also to determine the factor affecting this cost reduction.

1.2 Research Significance

The research has theoretical and managerial significances. The study shed lights on the cost reduction methods during the construction project executing, which, in turn, the most critical factors in determining the success of any project. Moreover, it serves in analysing any existing issues in cost control throughout the construction period as a sort of cost management. Mainly, the paid attention to all matters related to cost control in the early phases of construction is a necessary corrective action for the project's success. Therefore, reforming and adopting measures could offer some references for this purpose. The significance of cost reduction programs within any construction company could not be neglected. Companies in standard cases need to mitigate any monetary lose, also to increase profits, be more competitive, and cut expenses and costs to enjoy the achievement. Thus, it is valuable to investigate to develop the know-how about implementing effective cost reduction strategies across any construction company.

1.3 Relevant Scholarship

In the construction industry, the project controls aim to ensure that projects are accomplished under time and budget constraints without lack of commitment towards the objectives. It is not easy to undertake the projects by project managers in practice, the most critical tasks evolve the measurement progress that evaluates the plans and the corrective actions taken on demand and need (Kerzner, 2003). Project planning cannot be completed satisfactorily through planning and scheduling activates only. Project controlling as well (which consists of project monitoring) ought to be carried out to accommodate the dynamic nature of construction work. Without proper controlling, even a well-planned and scheduled construction system is there, it is highly expected to face problems, delays, and cost overruns. In general, the majority of construction projects experience time delays and cost overruns during their implementation. Cost overruns are considered as one of the most critical issues encountered during the execution of construction projects (Susana, 2012).

The costs of construction projects are affected by a comprehensive set of factors (Chan and Park, 2005); these are related to using effective techniques, manage materials, and human resources effectively. They all contribute to obtaining the cost reduction and having the added value of the buildings or structures.

Another research was surveyed by (Arditi et al., 1985) using quantitative methods. They concluded that significant factors for cost reduction entail inflation material price, followed by changes in design specifications, fluctuation price of materials, underestimation of the cost, and poor project management.

Morris (1990) was mentioned ten factors that influencing cost overruns of construction projects. These factors are inadequate project preparation, planning, and implementation, delay in construction as the first cause of cost overruns. The second factor was the supply of raw materials and equipment by contractors. The third one was changed in the scope of the project. The fourth factor of cost overruns was resources constraint: funds, foreign exchange, power; associated auxiliaries not ready. The delays in decisions making by government, failure of

specific coordinating bodies was the fifth factor. The sixth cause was wrong /inappropriate choice of site. The seventh one was technical incompetence and poor organizational structure.

Fisk (1997) reveals two cost reduction measures. The first is the application of a value engineering concept, which aims at a careful analysis of each function and the elimination or modification of anything that adds to the project cost without adding to its functional capabilities. He argued that by carefully investigating charges, availability of materials, construction methods, procurement costs, planning and organizing, cost/benefit values and similar cost influencing items, an improvement in the overall cost of a project could be realized.

In the year 2009, a team of researcher found that the factors causing cost reduction in the construction project located in Gaza were caused by increment of materials' prices due to continuous border closure, fluctuations in the number of building materials, project materials monopoly by suppliers, contractors lack planning, poor project management, and design error (Al-Nijjar, 2008).

Chimwaso (2001) evaluated ten projects to assess their cost performance. The results have shown that seven out of ten projects had reported cost overruns. The factors that influence cost overruns have been identified and ranked in order of significance. These factors have further been classified under categories according to the format of final account reports. By classifying them, helps to deal with them effectively. The four categories arrived at are variations, measurement of provisional works, contractual claims, and fluctuations in the cost of labour and materials, with exceptions being the most significant. Frimpong et al. (2003), he found that overall ranking result shows, the significant factors that contribute to cost reduction are poor contractor management, monthly payment difficulties from agencies, material procurement, and deficient technical performance, inflation of material price. Quality management is the contributing factor also on the cost reduction, quality management principles and tools are critical requirements in construction management practice to accommodate the variability adequately in production, relative to the diverse interests of multiple stakeholders involved in construction projects, and lack of it may result in frequent changes, errors and omissions (Love et al., 2000). Hence, the lack of quality focus throughout the construction supply-chain may result in poor quality activities, which is considered as non-value adding activities (Josephson et al., 2002) which can effect on the cost/time of the project.

1.4 Hypothesis Development

(Tomtsongas, 2011) concluded that The project site condition such as poor soil conditions, wetlands, contaminated materials, conflicting utilities (a buried pipe, cables, overhead lines, etc.), environmentally sensitivity area, groundwater, river or stream crossings, heavy traffic, buried storage tanks, archaeological sites, endangered species habitat and similar existing conditions etc. can increase construction costs. A. Enshassi, J. Al-Najjar, and M. Kumaraswamy (2009) concluded that lack of materials in markets, delay of material delivery to site, cash flow problem during construction, shortage of construction materials at the site, poor site management, no adherence to materials standards relating to site storage were factors effect on construction cost. Yong and Mustaffa (2012) find that the financial capability of the clients is the primary factor critical to the success of a construction project in Malaysia. Finally, Dharwadker (1996), suggests that cost control can be achieved by selecting the right man for the right job, the right equipment, and tools for the proper work and the right quality of materials, in the right quantity, from the right source, at the right price and delivered at the right time, managers are expected to execute the project as estimations of time and costs bearing in mind the high quality of work performed.

Based on the study objectives the study formulated the following hypothesis:

H01: There is no statistically significant impact for the organizing pre-execution stage in the reducing the cost among construction projects.

H02: There is no statistically significant impact for the organizing during execution stage in the reducing the cost among construction projects.

H03: There is no statistically significant impact for the management organizing during execution stage in the reducing the cost among construction projects

H04: There is no statistically significant impact the technical organizing during execution stage in the reducing the cost among construction projects.

H05: There is no statistically significant impact the financial organizing during execution stage in the reducing the cost among construction projects.

H06: There is no statistically significant impact the organizing during execution stage in the reducing the cost among construction projects according to the specialist.

2. Study Methodology

2.1 Design

The study utilized quantitative research approaches as the study relied on data collection of the questionnaire in order to achieve the study objectives.

2.2 Participant Characteristics

The study population consists of the Engineers registered in the Engineers Association and working in Construction, Design and Consultant Companies of 1st and 2nd class in Jordan. Particularly, directed to contracting Construction, design and consultant Companies that work on the design, construction and consultant projects, totalling (400) companies distributed in three fields (250 in the construction, 75 in the designing and 75 in the consulting fields), which represented all the study population in the time of the study (Source: Construction Association: 2018).

2.3 Sampling Procedures

Sample of the study were chosen by the purposive approach from the Engineers in the three fields (constructions, design and consultant), the study distributed (158) questionnaires for the study sample, (154) were returned, and (4) questionnaires were excluded from the analysis due to incomplete information. So (154) questionnaires were valid for analysis which gives 97.5% response rate.

3. Results

3.1 Descriptive Analysis of Study Variable

The degree of reducing the cost of executing construction project in Jordan, During the Execution Stage.

Table 1. Arithmetic Mean, SD, Item Importance and Importance level of reducing the cost of executing construction project in Jordan, during the Execution Stage

No	Reducing the cost of executing construction project in Jordan, during the execution Stage	Mean	Std. Deviation	Item Importance	Importance Level
2	Technical	3.95	0.51	1	High
1	Management	3.92	0.57	2	High
3	Financial	3.87	0.62	3	High
Total		3.92	0.52		High

It's clear from Table (1) that the mean of this dimension (reducing the cost of executing construction project in Jordan, during the Execution Stage), ranged between (3.95 – 3.87), where the whole dimension scored a total mean of (3.92), which is a level of High. Dimension (2) (Technical) scored the highest mean of (3.95), with standard deviation of (0.51) which is a level of High. As, the people which they have high technical knowledge can highly effect on cost The project technical part also by the construction method and technology of production to be employed determine the construction program, organizational structure and successful execution of the project which will lead finally to run the project within given cost constrain and dimension (1) (Management) scored second with mean of (3.92), with standard deviation of (0.57), which is a level of High, this result due to study and identify and manage what the project need such as planning Project manager assignment.., Successful personnel management during the whole project period. , Time sheet commitment for all parties (consultant, contractor, engineer). , Personnel management (planning, delegation of authority, follow up, building work teams). and the dimension (3) (Financial) scored last with mean of (3.87) and standard deviation of (0.62) which is a level of high which means that technical and management are more important than financial dimension since both affected and arrange the project cash flow.

7-2 (The role of company management in reducing the cost of execution construction project in Jordan, during the execution Stage)

Table 2. Arithmetic Mean, SD, Item Importance and Importance level of the role of company management in reducing the cost of execution construction project in Jordan, during the execution Stage

No	Attributes	Mean	Std. Deviation	Item Importance	Importance Level
16	Project manager assignment.	4.43	0.77	1	High
27	Integrity of consultant.	4.06	0.86	2	High
17	Successful personnel management during the whole project period.	3.95	0.76	3	High
19	Time sheet commitment for all parties (consultant, contractor, engineer).	3.94	0.76	4	High
28	Personnel management (planning, delegation of authority, follow up, building work teams).	3.94	0.75	5	High
26	Integrity of contractor.	3.92	0.94	6	High
24	Employer follow up of project.	3.90	0.75	6	High
22	Formal language and corresponded between parties, avoid interference between parties.	3.88	0.83	7	High
18	Site clear of obstacles hidden or obvious during site acquisition.	3.85	0.78	8	High
25	Related Authorities with project and permits (personnel, safety requirement, ...etc.).	3.82	0.95	9	High
23	Proper mobilization and stock piling, specimens storage.	3.79	0.93	10	High
21	Proper transportation/vehicles available for personnel, materials and testing.	3.77	1.01	11	High
20	Providing proper work environment (offices, furniture, tools, computers...etc). according to tender terms.	3.71	0.90	12	High
Total		3.92	0.57		High

It's clear from *Table (2)* that the mean of this dimension (The role of company management in reducing the cost of execution construction project in Jordan, during the execution Stage), ranged between (4.43 – 3.71), where the whole dimension scored a total mean of (3.92), which is a level of High. Factor (16) (Project manager assignment) scored first with mean of (4.43), with standard deviation of (0.77), which is a level of High, which means that project manager (the project leader) can play as quality control as master monitor of the whole procedures (people activities, machines ... etc). it's very significant to put high conditions to assign project manager, and factor (27) (Integrity of consultant) scored second with mean of (4.06), and standard deviation of (0.86), which is a level of High as consultant monitors all contractors activities and make sure everything applied as per contract documents and within time schedule, and factor (17) (Successful personnel management during the whole project period) scored third with mean of (3.95) with standard deviation of (0.76) which is a level of high which means successful personnel lead to successful work and compliance with contract conditions and specifications

Factor (20) (providing proper work environment “offices, furniture, tools, computers...etc” according to tender terms) scored last with mean of (3.71), and a standard deviation of (0.90), which is a level of high that means that as long as environment is appropriate as personnel can do their jobs precisely, and Working a positive environment presents many benefits to both employees and the company.

the result of factor (21) came in the penultimate with mean of (3.77) with standard deviation of (1.01) which is a level of high, and its stipulated (proper transportation / vehicles available for personnel, materials and testing). Since good transportation means activities are performed in a proper time and to make sure no waste of time for managerial people, technicians and labours.

Moreover, proper work environment “offices, furniture, tools, computers...etc” according to tender terms) scored last, working in a positive environment presents many benefits to both employees and the company. It starts with better health, no stress and other negative factors. Better conditions also lead to less employee absenteeism, which can have a negative impact on productivity.

- The role of company technical in reducing the cost of execution construction project in Jordan, during the execution Stage)

Table 3 . Arithmetic Mean, SD, Item Importance and Importance level of the role of company technical skills in reducing the cost of execution construction project in Jordan, during the execution Stage

No	Attributes	Mean	Std. Deviation	Item Importance	Importance Level
42	Skilled workers.	4.15	0.80	1	High
39	Method statement and specifications.	4.09	0.80	2	High
38	Equivalent materials use and consultant consent.	4.03	0.85	3	High
30	Providing an accurate and precise site grid including axes.	4.02	0.79	4	High
31	Qualified contractors personnel approval according to tender terms.	3.99	0.80	5	High
35	Conformity in performing works according to tender documents.	3.99	0.79	5	High
41	Adequate tools and material for work at proper timings.	3.97	0.82	7	High
34	Early Materials submittal to avoid delay.	3.96	0.77	8	High
32	Experience in similar project scope.	3.95	0.83	9	High
36	Testing.	3.95	0.82	9	High
40	Adequate machinery for works and time.	3.95	0.90	11	High
37	Quality assurance (works, materials).	3.93	0.83	12	High
29	Preparing a logical and proper time schedules.	3.88	0.94	13	High
33	Laboratory for testing.	3.86	0.79	14	High
43	Employers input regarding work techniques.	3.56	0.92	15	Medium
Total		3.95	0.51		High

It's clear from *Table (3)* that the mean of this dimension (The role of company technical skills in reducing the cost of execution construction project in Jordan, during the execution Stage), ranged between (4.15 – 3.56), where the whole dimension scored a total mean of (3.95), which is a level of High. Factor (42) (Skilled workers) scored first with mean of (4.15), with standard deviation of (0.80), which is a level of High which means the contractor ability in effective site management is a vital requirement for controlling project costs, Skilled workers can increase the speed of work, that they can increase the quality of the work, and factor (39) (Method statement and specifications) scored second with mean of (4.09), and standard deviation of (0.80), which is a level of High since the method statement helps to manage the works and factor (38) (Equivalent materials use and consultant) scored third with mean of (4.03) with standard deviation of (0.85) which is a level of high which give more flexibility to work achievement that means saving time and money and could select better and lower cost materials .

Factor (43) (Employers input regarding work techniques) scored last with mean of (3.56), and a standard deviation of (0.92), which is a level of medium which it is less importance as this is not their main task. the result of factor (33) came in the penultimate with mean of (3.86) with standard deviation of (0.79) which is a level of high, that means tests are always important to keep vendors comply with related specifications.

- The role of company finance in reducing the cost of execution construction project in Jordan, during the execution Stage)

Table 4. Arithmetic Mean, SD, Item Importance and Importance level of the role of company financial in reducing the cost of execution construction project in Jordan, during the execution Stage

No	Attributes	Mean	Std. Deviation	Item Importance	Importance Level
44	Allocation of sufficient funds for works.	4.01	0.91	1	High
52	Contractors financial status.	4.01	0.94	1	High
45	Approving interim payments for contractor to guarantee job progress.	3.98	0.84	3	High
48	Observing changes in project budget.	3.98	0.83	3	High
47	Budgeting of funds suitable for work (materials, wages, tools...et.).	3.97	0.83	5	High
49	Resources determination (personnel, funds, data).	3.88	0.91	6	High
50	Insurance including (personnel, machinery, tools, materials).	3.83	0.81	7	High
53	Inflation in long time of completion projects.	3.80	0.90	8	High
46	Feasibility studies after job project completion.	3.68	0.88	9	High
51	Variation orders.	3.59	1.26	10	Medium
Total		3.87	0.62		High

It's clear from *Table (4)* that the mean of this dimension (The role of company finance in reducing the cost of execution construction project in Jordan, during the execution Stage), ranged between (4.01 – 3.59), where the whole dimension scored a total mean of (3.87), which is a level of High. Factors (42 and 52) (Allocation of sufficient funds for works), (Contractors financial status) scored first with mean of (4.01), with standard deviation of (0.80, 0.94) respectively, which were a level of High as financing project properly maintain work procedure to keep going with no extra cost , and factor (45) (Approving interim payments for contractor to guarantee job progress) scored second with mean of (3.98), and standard deviation of (0.84), which is a level of High that makes the contractor to afford activities and don't ask for financial claims due to payment delay.

Factor (51) (Variation orders) scored last with mean of (3.59), and a standard deviation of (1.26), which is a level of medium as most of projects are subjected to variation orders due to project needs ,the result of factor (46) came in the penultimate with mean of (3.68) with standard deviation of (0.88) which is a level of high, and its stipulated (Feasibility studies after job project completion) since analysis after completion is very useful for future projects to make better contract documents. Allocation of sufficient funds for works), (Contractors financial status) scored first that's because the Project Finance aims to get the project off the balance sheet of the sponsor. By doing so the funding that is required will be repaid from the revenues of the project only. Any project financing therefore requires positive cash flow.

Variation orders scored last in term of cost reduction in finance term, so by the ability to manage change orders effectively has a direct impact on your project's profitability. Establishing a consistent, detailed, and logical methodology to classify and justify costs for recoverable direct costs, overhead/mark up, and consequential costs are vital to gaining change order acceptance and for project success.

- The Research Hypothesis

H01: There is no statistically significant impact at the level of (0.05) for the organizing pre-execution stage in the reducing the cost among construction projects.

Table 5. One Sample T-test to show the effect of organizing in the pre-execution stage in the reducing the cost among construction projects

Mean	St. Deviation	T- Tabulated	T-calculated	Df	sig	Result
3.97	0.52	1.96	23.009	153	0.000*	reject

*t) tabulated = 1.96, (t) value = 3.00 * Significant at (0.05)*

From *Table (5)*, the results shown that the total mean of the organizing in the pre-execution stage and its impact in the reducing the cost among construction projects was (3.97), with standard deviation (0.52), and (t) value calculated was (23.009), and its more than value of (t) Tabulated = (1.96). The results also shown that there is a statistically significant differences between the mean of the scale and the default mean = (3.00),

and the result shown that (t) calculated more than (t) tabulated = (1.96), that assure rejection of the null hypothesis and accept alternative.

H02: There is no statistically significant impact at the level of (0.05) for the organizing during execution stage in the reducing the cost among construction projects.

Table 6. One Sample T-test to show the effect of organizing in during execution stage in the reducing the cost among construction projects

Mean	St. Deviation	T- Tabulated	T-calculated	Df	sig	Result
3.92	0.52	1.96	22.030	153	0.000*	reject

*(t) tabulated = 1.96, (t) value = 3.00 * Significant at (0.05)*

From Table (6), the results shown that the total mean of the organizing in the during execution stage and its impact in the reducing the cost among construction projects was (3.93), with standard deviation (0.52), and (t) value calculated was (22.030), and its more than value of (t) Tabulated = (1.96). The results also shown that there is a statistically significant Differences between the mean of the scale and the default mean = (3.00), and the result shown that (t) calculated more than (t) tabulated = (1.96), that assure rejection of the null hypothesis and Accept alternative.

H03: There is no statistically significant impact at the level of (0.05) for the management organizing during execution stage in the reducing the cost among construction projects.

Table 7. One Sample T-test to show the effect of the management organizing during execution stage in the reducing the cost among construction projects

Mean	St. Deviation	T- Tabulated	T-calculated	Df	sig	Result
3.92	0.57	1.96	19.903	153	0.000*	reject

*(t) tabulated = 1.96, (t) value = 3.00 * Significant at (0.05)*

From Table (7), the results shown that the total mean of the management organizing during execution stage and its impact in the reducing the cost among construction projects was (3.92), with standard deviation (0.57), and (t) value calculated was (19.903), and its more than value of (t) Tabulated = (1.96). The results also shown that there is a statistically significant Differences between the mean of the scale and the default mean = (3.00), and the result shown that (t) calculated more than (t) tabulated = (1.96), that assure rejection of the null hypothesis and Accept alternative.

H04: There is no statistically significant impact at the level of (0.05) for the technical organizing during execution stage in the reducing the cost among construction projects.

Table 8. One Sample T-test to show the effect of the technical organizing during execution stage in the reducing the cost among construction projects

Mean	St. Deviation	T- Tabulated	T-calculated	Df	sig	Result
3.95	0.51	1.96	23.296	153	0.000*	reject

*(t) tabulated = 1.96, (t) value = 3.00 * Significant at (0.05)*

From Table (8), the results shown that the total mean of the technical organizing during execution stage and its impact in the reducing the cost among construction projects was (3.95), with standard deviation (0.51), and (t) value calculated was (23.296), and its more than value of (t) Tabulated = (1.96).

The results also shown that there is a statistically significant Differences between the mean of the scale and the default mean = (3.00), and the result shown that (t) calculated more than (t) tabulated = (1.96), that assure

rejection of the null hypothesis and Accept alternative.

H05: There is no statistically significant impact at the level of (0.05) for the financial organizing during execution stage in the reducing the cost among construction projects.

Table 9. One Sample T-test to show the effect of the financial organizing during execution stage in the reducing the cost among construction projects

Mean	St. Deviation	T- Tabulated	T-calculated	Df	sig	Result
3.87	0.62	1.96	17.582	153	0.000*	Reject

(t) tabulated = 1.96, (t) value = 3.00 * Significant at (0.05)

From Table (9), the results shown that the total mean of the financial organizing during execution stage and its impact in the reducing the cost among construction projects was (3.87), with standard deviation (0.62), and (t) value calculated was (17.582), and its more than value of (t) Tabulated = (1.96).

The results also shown that there is a statistically significant Differences between the mean of the scale and the default mean = (3.00), and the result shown that (t) calculated more than (t) tabulated = (1.96), that assure rejection of the null hypothesis and Accept alternative

H06: There is no statistically significant impact at the level of (0.05) for the organizing during execution stage in the reducing the cost among construction projects according to the company type.

Table 10. Mean, Standard Deviation for the perspectives of the study sample about Organizing during execution stage according to the company type

		N	Mean	Std. Deviation
Management	Contracting	72	3.95	0.61
	Consultant	43	3.90	0.55
	Design	39	3.77	0.32
	Total	154	3.92	0.57
Technical	Contracting	72	3.99	0.47
	Consultant	43	3.88	0.55
	Design	39	4.00	0.56
	Total	154	3.95	0.51
Financial	Contracting	72	3.94	0.67
	Consultant	43	3.78	0.56
	Design	39	3.82	0.42
	Total	154	3.87	0.62
Total	Contracting	72	3.96	0.54
	Consultant	43	3.85	0.49
	Design	39	3.86	0.39
	Total	154	3.92	0.52

Table (10) showed there were a variance between the means values for the study sample perspectives about the impact of organizing during execution stage in the reducing the cost among construction projects according to the company type, all means values were in the high level in the management, technical, financial and the total according to the company type, and to show the significant differences, the study used (One Way ANOVA test) (What is this) , and The one-way Analysis of Variance (ANOVA) can be used for the case of a quantitative outcome with a categorical explanatory variable that has two or more levels of treatment as shown in table (4-12) below:

Table 11. One Way ANOVA test to show the statistically significant impact at the level of (0.05) for the organizing during execution stage in the reducing the cost among construction projects according to the company type

		Sum of Squares	Df	Mean Square	F	Sig.
Management	Between Groups	0.395	2	0.197	0.598	0.551
	Within Groups	49.851	151	0.33		
	Total	50.246	153			
Technical	Between Groups	0.414	2	0.207	0.801	0.451
	Within Groups	39.036	151	0.259		
	Total	39.45	153			
Financial	Between Groups	0.869	2	0.435	1.146	0.321
	Within Groups	57.271	151	0.379		
	Total	58.141	153			
Total	Between Groups	0.417	2	0.209	0.783	0.459
	Within Groups	40.249	151	0.267		
	Total	40.667	153			

Table (11) showed that there, (F) values were (0.598, 0.801, 1.146, 0.783) respectively, and (F-test is the ratio of systematic variance : unsystematic variance, so higher scores are better), and it's not significant at level of (0.05), that assure all companies types have very close perspectives about that the organizing during execution stage necessary and its impact in the reducing the cost among construction projects.

H06: There is no statistically significant impact at the level of (0.05) for the organizing during execution stage in the reducing the cost among construction projects according to the Specialist.

Table 12. Mean, Standard Deviation for the perspectives of the study sample about Organizing during execution stage according to the Specialist

		N	Mean	Std. Deviation
Management	Civil Engineer	100	3.97	0.63
	Architecture Engineer	14	3.64	0.37
	Mechanical Engineer	14	3.88	0.39
	Electrical Engineer	26	3.91	0.49
	Total	154	3.92	0.57
Technical	Civil Engineer	100	4.00	0.52
	Architecture Engineer	14	3.49	0.54
	Mechanical Engineer	14	4.11	0.40
	Electrical Engineer	26	3.93	0.34
	Total	154	3.95	0.51
Financial	Civil Engineer	100	3.89	0.67
	Architecture Engineer	14	3.53	0.26
	Mechanical Engineer	14	3.96	0.66
	Electrical Engineer	26	3.95	0.45
	Total	154	3.87	0.62
Total	Civil Engineer	100	3.95	0.56
	Architecture Engineer	14	3.55	0.34
	Mechanical Engineer	14	3.98	0.42
	Electrical Engineer	26	3.93	0.37
	Total	154	3.92	0.52

Table (12) showed there were a variance between the means values for the study sample perspectives about the impact of organizing during execution stage in the reducing the cost among construction projects according to the specialist, means values were varied between the medium the high level in the management, technical, financial and the total according to the specialist and to show the significant differences, the study used (One Way ANOVA test) as shown in table (14) below:

Table 13. One Way ANOVA test to show the statistically significant impact at the level of (0.05) for the organizing during execution stage in the reducing the cost among construction projects according to the specialist

		Sum of Squares	Df	Mean Square	F	Sig.
Management	Between Groups	1.375	3	.458	1.406	.243
	Within Groups	48.871	150	.326		
	Total	50.246	153			
Technical	Between Groups	3.665	3	1.222	5.121	.002*
	Within Groups	35.785	150	.239		
	Total	39.450	153			
Financial	Between Groups	1.931	3	.644	1.718	.166
	Within Groups	56.209	150	.375		
	Total	58.141	153			
Total	Between Groups	2.077	3	.692	2.691	.048*
	Within Groups	38.590	150	.257		
	Total	40.667	153			

*: significant at level of (0.05)

Table (13) showed that, (F) values were (5.121, 2.691) respectively, and these values were significant at level of (0.05), that assure rejection null hypothesis for this dimension and the total, Sheffe test was used to show the source of the variance as shown in table (17) below. “Scheffe’s procedure is perhaps the most popular of the post hoc procedures, the most flexible, and the most conservative. Scheffe’s procedure corrects alpha for all pair-wise or simple comparisons of means, but also for all complex comparisons of means as well. Complex comparisons involve contrasts of more than two means at a time”

And the result showed that, (F) values were (1.406, 1.718) respectively, and these values were not significant at level of (0.05), that assure accepted null hypothesis for these dimensions.

Table 14. Sheffe test for Multiple Comparison

Dependent Variable	(I) Specialist	(J) Specialist	Mean Difference (I-J)	Sig.
Technical	Civil Engineer	Architecture Engineer	.51562*	.000
		Mechanical Engineer	-.11295	.419
		Electrical Engineer	.06800	.528
	Architecture Engineer	Civil Engineer	-.51562*	.000
		Mechanical Engineer	-.62857*	.001
		Electrical Engineer	-.44762*	.006
	Mechanical Engineer	Civil Engineer	.11295	.419
		Architecture Engineer	.62857*	.001
		Electrical Engineer	.18095	.266
	Electrical Engineer	Civil Engineer	-.06800	.528
		Architecture Engineer	.44762*	.006
		Mechanical Engineer	-.18095	.266
Total	Civil Engineer	Architecture Engineer	.40279*	.006
		Mechanical Engineer	-.03017	.835
		Electrical Engineer	.02507	.823
	Architecture Engineer	Civil Engineer	-.40279*	.006
		Mechanical Engineer	-.43297*	.025
		Electrical Engineer	-.37772*	.026
	Mechanical Engineer	Civil Engineer	.03017	.835
		Architecture Engineer	.43297*	.025
		Electrical Engineer	.05525	.743
	Electrical Engineer	Civil Engineer	-.02507	.823
		Architecture Engineer	.37772*	.026
		Mechanical Engineer	-.05525	.743

(I-J) Mean value of (I) – Mean value of (J), Mean difference = the result value between I-J, when the value has positive variance and its significant at level of (0.05)*, the variance in favor of (I) group, and when the

value has negative variance and its significant at level of (0.05)*, the variance in favor of (J) group.

Table (14) showed that the variance in the means values in the technical organizing and total during execution stage and its impact in reducing the cost among construction projects was in favor of (Mechanical Engineer) then the variance was in favor of (Civil Engineer) and finally the variance was in favor of (Electrical Engineer) since changes (variation orders) usually the highest value in Mechanical work then Civil work then Electrical work. In addition, prices for Civil work are normally clearer than Mechanic which means no surprises. By all means, Electrical work has the least value which means lowest effect.

4. Discussion

Based on the main findings that revealed, the study demonstrated that the most crucial phase to reduce the cost is the pre-execution stage. The essential factors affect the project cost during this stage are the extent of clarity in the aim of project and planning of resources (workforce, funds, data). The study found that the top vital dimensions that assess in reducing the costs entail managerial, technical, and financial aspects in the executing construction project phase. Thus, the functional is the most effective one.

During the execution stage also, it is essential to stress on the project manager assignment, integrity of consultant factors to reduce the costs. The project manager is responsible for managing the project by meeting objectives and deliver the desired value and benefits to the organization. Likewise, the project manager ought to be capable of identifying any warning regarding cost variations. A project manager must regularly compare the amount of money spent on the budgeted amount and report this information to managers and stakeholders. It is necessary to establish an understanding of how this progress will be measured and reported.

Correspondingly, the project manager ought to be reasonable in the decisions making the process, also ought to control the risk and minimize the uncertainty. Further, study pointed out that the project manager is responsible for the overall success of initiation, planning, design, execution, monitoring, controlling, and closure and execute stages.

From a technical perspective, it is essential to reduce the cost during the execution stage by employing skilled workers, clear method statement, and well-defined specifications, besides sufficient funds for works and contractor's financial status. The study showed that there is no significant impact for the organizing during execution stage in reducing the cost among construction projects according to the company type, and there is a significant impact for the technical and total of organizing during the execution stage in reducing the cost among construction projects according to the specialist.

Finally, the study presented theoretical and practical significances subject as from the academic perception, the study is attained by determining the impact of cost reduction on the performance of construction companies in Jordan. As well, the study figured out a positive effect of cost reduction in the performance of the Jordanian construction sector, which affects the productivity and goals achievement.

The study recommended to determine the primary goal of the project must be evident with particular emphasis on the designer and tendering team and the Contractors team must be qualified, and the technical staff also must have the appropriate experience to be able to follow the different technical and managerial aspects of the project. In addition, the team will be more effective if it consists of enough numbers of engineers, technicians, and supervisors so that the responsibilities would be shared by all. Contractors are advised to prepare a method of statement and the schedule for the project that takes into consideration both reality and project type. Also, it would be advised to follow such a plan and update it from time to time and to compare it with available resources. Further, consultant should be flexible and helpful to assist owner and contractor implementing the project up to tender documents and best specification within the schedule. In terms of planning and scheduling, they should be followed continuing processes during construction and match with the resources and time to develop the work to avoid cost overrun and disputes.

References

- Arditi, D., Akan, G., & Gurdamar, S. (1985). Cost overruns in public projects. *International Journal of Project Management*, 3, 218-224. [https://doi.org/10.1016/0263-7863\(85\)90053-5](https://doi.org/10.1016/0263-7863(85)90053-5)
- Chimwaso, K. D. (2001). *An Evaluation of Cost Performance of Public Projects*. Case of Botswana, Department of Architecture and Building Services, Gaborone.
- Dharwadker, P. P. (1996). *Construction Management* (2nd ed). Oxford & IBH Publishing Co. PVT.LTD New, Delhi. India.
- Elnamrouy, K. (2012). The Impact of Construction Sector on Palestinian Economy-Case Study:(Gaza

- Strip). *The Impact of Construction Sector on Palestinian Economy-Case Study:(Gaza Strip)*, 4(5).
- Frimpong, Y., & Oluwoye, J. (2003). Significant Factors Causing Delay and Cost Overruns in Construction of Groundwater Projects in Ghana. *Journal of Construction Research*, 4, 175-187. <https://doi.org/10.1142/S1609945103000418>
- Josephson, P. E., Larsson, B., & Li, H. (2002). Illustrative Benchmarking Rework and Rework Costs in Swedish Construction Industry. *Journal of Management in Engineering*, 18, 76-83. [https://doi.org/10.1061/\(ASCE\)0742-597X\(2002\)18:2\(76\)](https://doi.org/10.1061/(ASCE)0742-597X(2002)18:2(76))
- Kerzner, H. (2003). *Project management: A systems approach to planning, scheduling, and controlling*. Hoboken, NJ: John Wiley & Sons, Inc.
- Kivilä J., Martinsuo, M., & Vuorinen, L. (2017). Sustainable project management through project control in infrastructure projects. *International Journal of Project Management*, 35(6), 1167-1183. <https://doi.org/10.1016/j.ijproman.2017.02.009>
- Lean, C. S., & Park, M. (2005). Project cost estimation using principal component regression. *Construction Management & Economics*, 23, 295-304. <https://doi.org/10.1080/01446190500039812>
- Morris, S. (1990). Cost and time overruns in public sector projects. *Economic and Political weekly*, 25, 154-168.
- Project Management Institute. (2005). *PMBOK – A Guide to the Project Management Body of Knowledge*. Sylva, NC: The Project Management Institute.
- Susana, G. A. (2012). Avoiding Cost Overruns In Construction Projects In The United Kingdom. *Nature*, 362(6420), 486-486.
- Tomtsongas. (2011). Scope, Time and Cost – Managing the Triple Constraint. Retrieved May 27, 2016, from <https://programsucces.wordpress.com/2011/05/02/scope-time-and-cost-managing-the-tripleconstraint/>
- Tung, A., & Otto, C. (2019, December). *Decommissioning Cost Reduction by Effective Planning of Decommissioning Projects Using Facility Removal Date as a Reference Point*. In SPE Symposium: Decommissioning and Abandonment. Society of Petroleum Engineers. <https://doi.org/10.2118/199195-MS>
- Yong, Y. C., & Mustaffa, N. E. (2012). Analysis of factors critical to construction project success in Malaysia. *Engineering, Construction and Architectural Management*.

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