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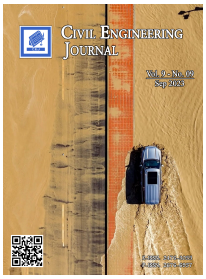

Fundamental Challenges and Management Opportunities in Post Disaster Reconstruction Project

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Abstract

The study examines the root causes of delays that the project manager is unable to resolve or how the decision-maker can identify the best opportunities to get over these obstacles by considering the project constraints defined as the project triangle (cost, time, and quality) in post-disaster reconstruction projects to review the real challenges to overcome these obstacles. The methodology relied on the exploratory description and qualitative data examined. 43 valid questionnaires were distributed to qualified experienced engineers. A list of 49 factors causes was collected from previous international and local studies. A Relative Important Index (RII) is adapted to determine the level of importance of each sub-criterion in the four main criteria (scope, time, cost, and quality) to represent the causing changes in projects. The concluded 13 important factors represent the challenges faced by managers. This process requires active participation in the management role to overcome potential delays that face a great challenge and cause huge waves of displacement that affect the Iraqi economy and lead to social and environmental modifications. Reconstruction projects create jobs, improve the quality of life, and encourage people to return to their homes and rebuild their cities. So, unlocking local potential is the key to sustainable rebuilding in Iraq.

Keywords: Challenges; Opportunities; Post Disaster Cost Overrun; Time Overrun; Construction Projects.

1. Introduction

Post-disaster rebuilding projects involve several phases of adjusting, processing, finishing, or changing an existing facility, including interior expansions, extensions, or renovations to recover the facility's operation, improve reconstruction, and ensure long-term community sustainability, as well as attempts to restore essential services and supporting infrastructure. When a catastrophe is huge and takes a lot of work to accomplish the project's aims, due to the variety of project types, the restricted planning of financial resources, and the requirement to employ unusual procurement techniques, the process can be exceedingly complicated, raise the time needed, and increase complexity and unpredictability [1]. Understanding project management is a comprehensive guide on how to handle the aspects of various projects that the project manager is supposed to cover in the project's scope stages. The Project Management Institute (PMI) has anticipated ten key knowledge areas, including scope management, cost, time, quality, human resources, procurement, risk, communication, stakeholders, and integration. These areas are fully described as new project management knowledge, and they include a set of processes, practices, inputs, and outputs, as well as the identification of their tools and techniques [2].

After the disaster, the local government administration is exposed to uncalculated expectations in its management of post-disaster reconstruction projects. Attention to the basic issues in facing the various challenges can contribute to

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improving the decision, especially if it is dealt with on a scientific and logical basis. Identifying challenges early in reconstruction projects helps the decision-makers provide the basis for the parties involved in the project to meet the challenges at various stages of the project, thus improving the management and delivery of the project and seizing the available opportunities to overcome unexpected delay factors. Moreover, it can be used in formulating suitable policies for future reconstruction projects. So, it is necessary to determine the priorities of the project with its objectives and to consider their impacts and their relationship with the parties involved in the construction. The prioritization process is the most appropriate method used in design and construction and has great effectiveness, especially in complex post-disaster reconstruction projects. since the initial design quality, quantity, cost, and schedule are closely interrelated aspects of all construction projects [3].

According to the particulars of the building project, three fundamental project constraints had to be determined [4]. This constitutes the triple constraint that all engineers must adhere to define the centric point of the triangle in irregular ways and according to different levels of expertise, which require different areas of knowledge and appropriate tools associated with them. Project managers can exchange these constraints or change them depending on changes in other constraints. Most likely, expertise plays a key role in how the issue is resolved to increase flexibility at all levels during the various stages of the project and obtain the practical methodology to ensure that the reconstruction is completed at the actual cost and within the required time frame without delay.

2. Post Disaster Projects Management

The features of post-disaster rebuilding projects are influenced by a variety of elements, including the stakeholders, complexity of social interactions, technological issues, and economic and social considerations required to restore destroyed areas' property.

Reconstruction efforts following a disaster are characterized by a high degree of complexity and uncertainty. Due to the need to resume regular life, financing for post-disaster rehabilitation projects requires prompt results. A survey of the worldwide literature revealed that the primary reasons that contributed to the failure of post-disaster rehabilitation projects included issues with community engagement, ignorance of the needs and culture, and mismanagement of project funds in different ways [5]. Project management in traditional practices operates under normal conditions and needs more methodologies in the application of project management. The rational traditional assumptions are not appropriate to the reconstruction project environment. It is difficult to clearly define goals, limits, end products, or set up functioning supervision and mechanisms of control in hierarchical relationships. Therefore, stakeholder participation and flexibility can be more valuable in control management. In addition to paying close attention to contractual requirements and facilitating informal relations, it is crucial to understand the crucial role that indirect resources such as community participation, trust, stimulating capacities, the issue of transparency, and institutional support play in achieving the necessary balance between them during work. This will help to ensure that construction projects are completed and that future projects overcome challenges [6]. By using flexible management strategies that allow for the development of professional capacities, it will be possible to evaluate these projects' performance in the best possible way [7]. This is only possible by building a flexible vision for projects through several minor activities that are carried out gradually as the circumstances dictate and that are adaptive, as opposed to through a pre-planned approach [8].

3. Literature Review

To create a new research methodology, it is crucial to compare the Iraqi studies with several other studies. So, a comprehensive investigation of the overall literature in the field was compiled via the earlier investigations. These studies offer a basic framework for identifying the root causes of all delay problems in various building projects. Concentrating initially on international studies and then on local studies in Iraq. Enshassi et al. [9] found more than 52 causes for the delay in construction projects and concluded that the top 12 factors were the political situation, lowest bid price, payment delays, equipment shortages, owner decision-making delays, sluggish labor output, delayed approval of test material samples, and poor owner-to-construction party communication are all examples of this. Disputes between all parties involved in the building, imperfect equipment, and a deficiency in financing.

According to Tumi et al. [10], the primary causes of delays in Libyan building projects are incorrect planning, inadequate communication, a lack of materials, changes in design, and a lack of funding. Sweis et al.'s [11] special study in Jordan identified the most significant causes of project delays, including financial difficulties and numerous change orders, for a total of 130 projects. While Al-Momani [12] noted that weather factors, site conditions, delivery delays, and economic conditions are major factors affecting the delay in the completion of projects.

Aziz [13] examined the reasons that contributed to delays in Egyptian construction projects. It gathered 99 workers who were responsible for various forms of delays and explained that owner-finance issues were the primary contributing factor. Assaf & Al-Hajji [14] reviewed 73 reasons for delays in construction projects in Saudi Arabia when they studied delays. Another study on construction management in Saudi Arabia conducted by Alkhathami [15] looked at the connection between crucial success and delay elements. Schematic planning, project management, project management

expertise, and professional experiences were determined to be reliable indicators of project success, but planning precautions, goal orientation, and encouraging others had a positive impact on the seven success criteria. Nevertheless, Al Hammadi & Nawab [16] focused their analysis on (design, government finance, market, and employees), which were the primary reasons for delays in the projects included in their study.

Sepasgozar et al.'s [17] research in Iran looked for the key causes of building project delays. The top nine criteria were: material procurement, labor skill, contractor experience, owner ability, design challenge, technological restriction, consultant factors, project factors, and external factors. Another study conducted in Malaysia by Alaghbari et al. [18] utilized a positive approach and included 31 delay causes in its list. The main criteria were financial difficulties, economic problems, weak supervision, consultant experience, contractor financial issues, latent decision-making issues, material shortages, latent material delivery, poor site management, defective work, and significant mistakes in construction work. Fugar & Agyakwah-Baah [19] collected 130 respondents from Ghanaian construction projects to evaluate project delays using a field survey. The majority of those present concurred that finance was a big influence. Afram et al. [20], however, investigated the causes of construction delays in Ghana. The leading cause of the delay was the lack of local government permissions, followed by weak site management, monitoring, and cost projection, which were the least important issues.

Sospeter et al. [21] study provided an appropriate conceptual framework for managing post-disaster reconstruction projects (PDRPs) to avoid cost and time overruns in Angola. Through the use of the research method, explanatory To prepare a program of the components to be considered for the development of an appropriate framework for managing reconstruction projects by including disaster preparedness, community involvement, resources, stakeholder participation, procurement policies, financial evidence, disaster recovery legislation, context-specific variables (social, economic, demographic, and political variables), and cultural.

The fundamental basic inputs for Iraqi projects included in Becker's study were clients, contractors, and consultants who had worked on building projects in Iraq and had a variety of experiences. Bakr's analysis, which looked into the causes of project delays, concluded that many of these projects had been put on hold, which had been a significant financial strain because of the accumulated depreciation. The study's findings about the inputs are regarded as the source of the issues and a significant contributor to the delay. The results of Bakr's research revealed that the most crucial primary elements are security measures, an unstable political situation, government changes, a lack of strategic vision, and more holidays. In addition to the environment and social awareness for the community, other aspects were also discovered, including the bid on the least price, continuous design revisions, and payment delays. In addition to the delays brought on by consultants and contractors, the owner's lack of expertise and overall vision is another significant factor [22].

Waheeb & Andersen [23] examined research that made a specific appearance and included a table with references to all studies that included delay factors. Critical success factors (CSF) of an integrated management system in the development of post-disaster projects in Iraq were identified in the final research on Iraq conducted by Al-Qaicy & Breesam (2021). The main goal was to create a model for the primary reconstruction process that includes fundamental indications. The study included the fundamentals of risk management, stakeholder management, and supply chain management. To confirm its applicability, the study conducted a field survey based on actual data to confirm the stability of the system proposed for the construction sector in Iraq [5]. Waheeb & Andersen [23] investigation, which was based on reliable data, helped to validate time and expense overruns. The biggest influencing aspect was security issues. Study information based on project characteristics was utilized to create a model to predict cost and time.

Mohammadnazari et al. [24] study presented an integrated approach that relied on multiple decision-making (MCDM) techniques to help decision-makers prioritize post-disaster projects. This study provided valuable information for decision-makers who have limited experience with disasters [24]. Waheeb et al. used artificial neural networks (ANN) to find a solution to the problems of delaying reconstruction projects, build a model that helps in finding a solution to delays, and discuss reconstruction strategies [25].

Our study tries to distinguish its importance from other previous studies that focused on the direct role of the parties involved in the construction process and its impact on project delay, without considering the importance of reviewing the project constraints defined by the project triangle (cost, time, and quality) and studying its impact to determine its importance to investigate the root causes for delays that the project manager cannot resolve, or access and use all relevant parties and resources to carry out reconstruction projects, or to see if these causes are the real challenges, or how the decision maker can determine the best opportunity to overcome these obstacles. This requires the active participation of the project management role in facing these challenges and exploiting the available opportunities to overcome potential delays in reconstruction projects that face a great challenge and cause huge waves of displacement that affect the Iraqi economy and lead to social and environmental modifications. Especially since reconstruction projects in Iraq create jobs, improve the quality of life, and encourage people to return to their homes and rebuild their cities. So, unlocking local potential is the key to sustainable rebuilding in Iraq.

4. Research Methodologies

To investigate the priorities of challenges facing the Iraqi government, the flow chart in Figure 1 explains the methodology of the study. The practical study has been divided into two main parts, as mentioned below.

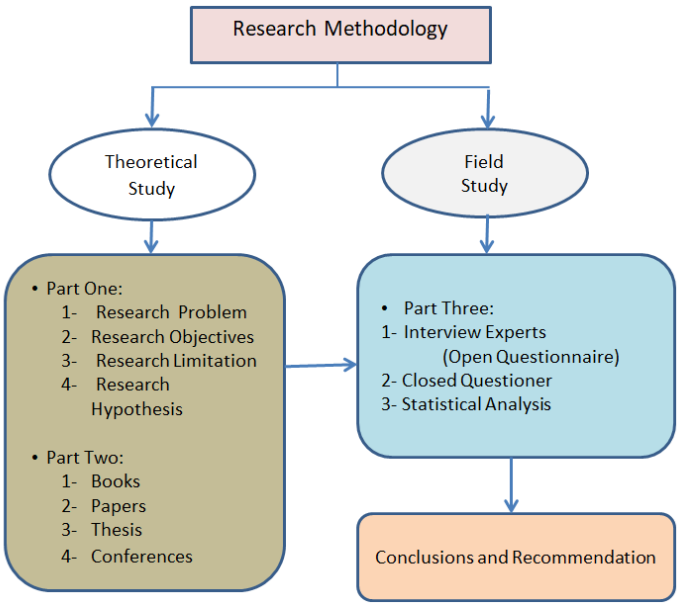

Figure 1. Flow chart of Research methodology

4.1. First: Collecting and Classify the Main Important Factors

A comprehensive preliminary open questionnaire was prepared for all engineers who had previously participated in the reconstruction campaigns to which Iraq was exposed in previous years through a questionnaire organized according to the main important constraints in post-disaster project management. The questionnaire included open questions to allow their respondents to submit observations about their own experiences, the degree of the challenges they faced, and how they overcame them. A purposeful sampling strategy was also relied on to communicate with managers from different Iraqi provinces, in addition to what was collected from literature reviews and international experiences. Personal interviews were arranged face-to-face to achieve the aim of collecting data from experts in different sectors, in addition to university professors who provided consultations to the government in the past years and advisory offices in Iraqi universities, which had an important role in the reconstruction projects previously. Figure 2 represents the investigated axes to explain the main constraint that leads to frequent changes in the project constraints (scope, time, cost, and quality). These were discussed previously, and special focus is placed on Alsaadi & Acar (2021) study due to the comprehensiveness of the criteria [26].

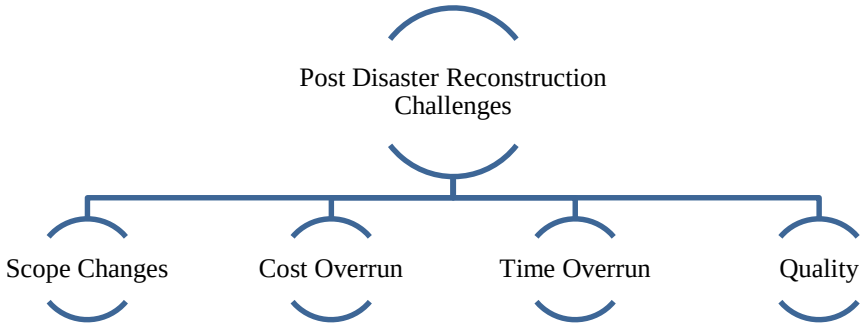

Figure 2. Project Constraint for the Study Axes

4.2. Second: Finding the Relative Importance Index RII

This part dealt with qualitative analysis to identify challenges in the various knowledge areas of project management. The project management triangle was the central axis in the design of the questionnaire and other fields of knowledge to clarify the interrelationships and their joint impact on the main constraints. To complete this part, a closed questionnaire was conducted, including the factors that were collected from the previous stage to find RII for each factor. A hypothetical weight was adopted for each factor on the Likert five-point scale, which consists of (1–5) that mean:

5= Strongly agree; 4= Agree; 3= Neither agree nor disagree; 2= Disagree; 1= Strongly disagree,

Using the following equation to determine the relative importance Index (RII) [27]:

$$\text{RII} = \frac{\sum_{i=1}^{5} fi \times Ni}{\sum_{i=1}^{5} Ni} \quad (1)$$

in which fi is repeat answer for the questionnaire paragraph, Ni is Questionnaire sample size, i is number intimates order.

The questionnaire sample included (43) experiences from various specializations who provided consultations to the government in the past years, and advisory offices in Iraqi universities, which had an important role in the reconstruction projects previously. Table 1 displays the findings for two-dimensional matrix numbers and respondents with a fixed rate for each group concerning professional qualifications and approvals.

Table 1. Engineering and Academic and work matrix certificates

Degree	Disciplines				Total	Percentage
	Civil	Architect	Mechanic	Electric		
B.Sc.	11	4	3	3	21	49 %
M.Sc.	5	3	3	4	15	35 %
PhD	3	1	1	2	7	16 %
Total	19	8	7	9	43	100 %
Percentage	44 %	19 %	16 %	21 %		

4.3. Questionnaire Survey

The questionnaire was divided into two sections. The first section requested demographic data from respondents. The second section solicits the perceptions of the respondents regarding the level of influence of each of the 42 factors using a 5-point Likert scale (from 1 = very low to 5 = very high). After a pilot test with feedback on the first version of the questionnaire, minor revisions were undertaken to refine the questionnaire, and then it was distributed in the survey to engineers and technicians employed in the maintenance department of Iraqi hospital buildings.

5. Results and Discussion

A screening process was conducted on the survey responses to ensure that only reliable data would be analyzed. Missing data, outlier values, and suspicious responses were discarded. After the screening, 43 responses remained, which were analyzed in this study.

5.1. Respondents' Demography

Figure 3 represents the percentage of respondents according to the number of experience years. The majority of respondents in the survey (26%) have work experience ranging between 15 -20 years, while 21% have 5-10 years, 19% have more than 20 years, 16% had 10-15 years, and (14%) have less than five years of experience. The results of Figure 4 also indicate that the highest percentage of respondents (49%) have a bachelor's degree in engineering disciplines, 35% have a master's degree in engineering sciences, and 16% have a Ph.D., and most of them are academics in Iraqi universities. Figure 5 indicates that most of the participants (40%) were civil engineers, followed by electrical engineers (21%), architects (19%), and mechanical engineers (16%).

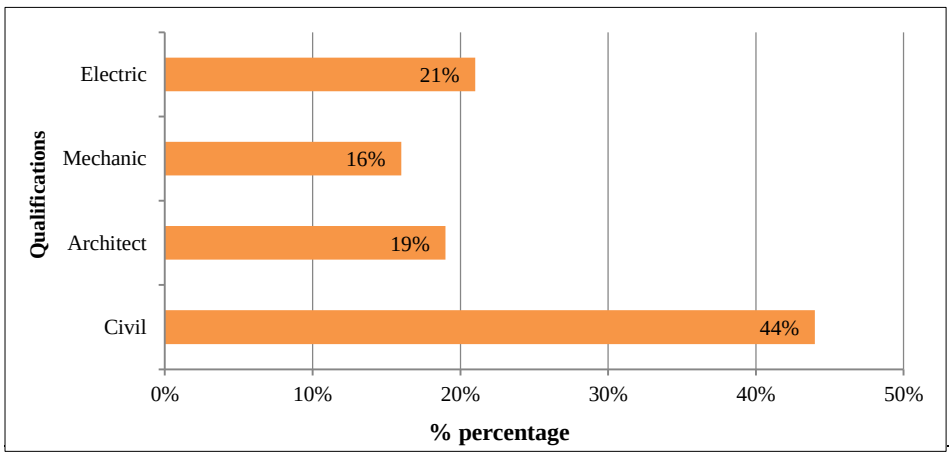

Figure 3. Qualifications of the Respondents

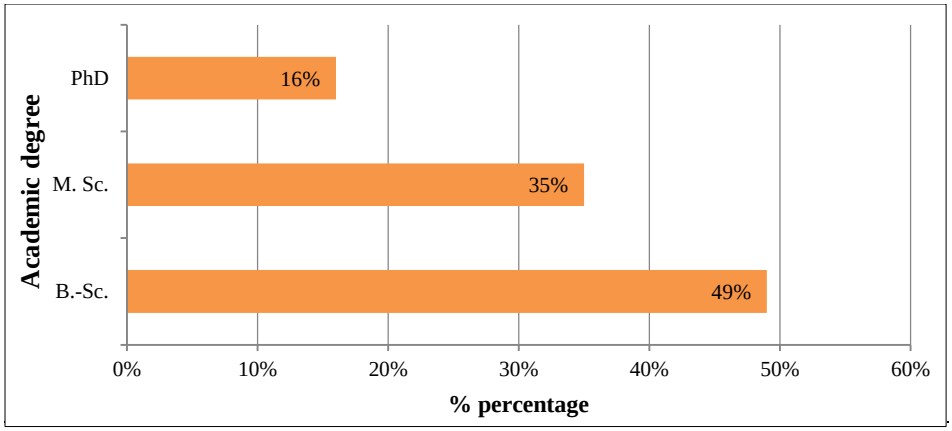

Figure 4. Academic degree of the Respondents

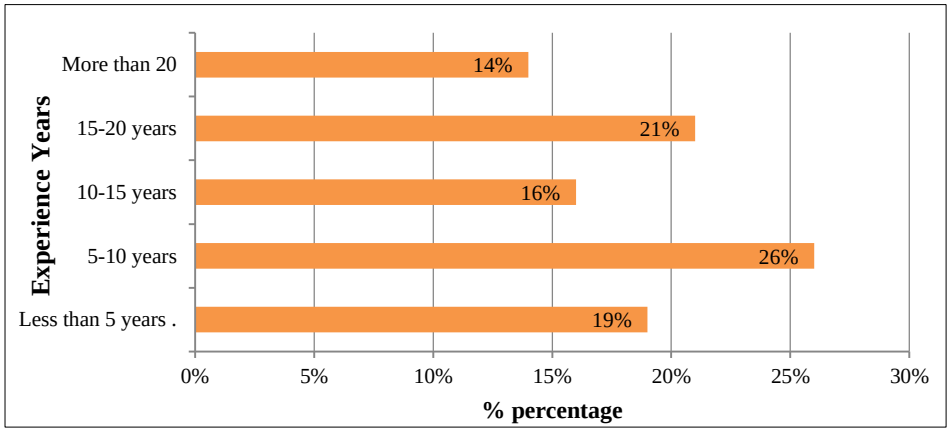

Figure 5. Experience years of the Respondents

The previous figures indicate the correctness of the diverse selection from among all the engineering formations that affect the correctness of the decision and the answer with high professionalism within their engineering specialties and years of scientific experience.

5.2. Reliability Statistics

By using SPSS Software (version 25) to determine the reliability of the responses, Cronbach's alpha coefficient for the identification of the four main groups and total questionnaire as shown in Table 2.

Table 2. Cronbach's Alpha coefficient for the questionnaire forms

Group	Code	No. of items	Cronbach's Alpha
Scope Changes	SC	10	0.891
Cost Overrun	CO	5	0.882
Time Overrun	TO	9	0.893
Low Quality	LQ	5	0.864

Cronbach's alpha coefficient was calculated for each group. Cronbach's alpha values range from 0.864 to 0.893 so a reliability coefficient of more than 0.70 is considered "acceptable" in this study.

5.3. Validity

Table 3 shows the validity of the questionnaire. The higher validity coefficient was equal to (0.931) and the lower validity coefficient was (0.898), which is statistically significant. The first group enjoyed validity with high correlation coefficients in the closed questionnaire items [28].

Table 3. Validity coefficients

Group	Code	Cronbach's Alpha	Validity coefficient
Scope Changes	SC	0.891	0.931
Cost Overrun	CO	0.882	0.904
Time Overrun	TO	0.893	0.920
Low Quality	LQ	0.864	0.898

5.4. Discussion

SPSS Software (version 25) was used to determine the statistical analysis, mean and standard deviation were calculated for each sub-criteria. Based on the RII values, the factors were classified according to their importance classification in Table 4 [22], depending on the study of Akadiri [28].

Table 4. Importance level criteria

RII values	Importance level	
0.8 ≤RII≤1	High	H
0.6 ≤RII≤0.8	High-medium	H-M
0.4 ≤RII≤0.6	Medium	M
0.2 ≤RII≤0.4	Medium-low	M-L
0 ≤RII≤0.2	Low	L

Table 5 showed the Relative importance (RII) for each factor within the four main axes. Rearrange the factors in descending order within each axis. The challenge factors which obtained the highest importance index (RII>70%) will be discussed, as indicated in the final results shown in Table 6.

Table 5. The Relative Importance (RII)

No.	Scope Changes	Mean	Std.	RII%
1	Diversity and number of stakeholders	4.71	0.638	94
2	Lack of communication among projects	4,61	0.75	92
3	Difficulty to build consensus	4.30	1.15	86
4	Difficulty to identify the needs of the affected population	4.02	1.247	80
5	Conflicting aims and objectives	3.91	1.219	78
6	Lack of accurate information in the early stage	3.57	1.315	71
7	Uncertainty and unpredictability about inputs	3.47	0.774	69
8	Difficulty to assess damage and risks	3.45	1.389	69
9	Limited time for planning and design	3.45	1.389	69
10	Unique requirements	3.30	1.376	66
11	Lack of accurate information in the early stage	3.10	1.129	62
12	The urgency to meet essential needs	2.90	0.897	58
13	Wide geographical spread / expansiveness-remoteness of the work site	2.57	0.847	51
No.	**Cost Overrun**	**Mean**	**Std.**	**RII%**
1	Unrealistic financial and cost estimate	4.74	0.439	95
2	Instability of local currency exchange rate	4.24	1.182	85
3	Political instability in the country	4.12	1.211	82
4	Difficulty to develop a cost plan	3.94	1.364	79
5	Poor funding	3.79	1.274	76
6	Limited time for acquisition planning in the initial stage	3.47	1.274	69
7	Failure to get the best price for resource	3.42	1.27	68
8	Inflation	3.31	1.275	66
9	Dependency on local resources and sellers	3.30	1.337	66
10	Failure of donors to fulfil commitments	3.26	1.345	65
11	Lack/ shortage of material and qualified human resources in the disaster area	3.23	1.242	65
12	Dependency on imported building materials and migrant /day labor/staffing from other countries	3.14	1.288	63
13	High financial uncertainty	3.11	1.336	62
14	Lack of insurance system	2.93	1.12	59

No.	Time Overrun	Mean	Std.	RII%
1	Unrealistic schedule	4.60	0.901	92
2	Legal and bureaucratic restrictions for tendering, acquisition and construction	4.55	0.945	91
3	Difficulty to control activity duration	4.44	0.931	89
4	The urgency to meet essential needs	4.35	1.07	87
5	Lack/shortage of material and qualified human resources in the disaster area	3.95	1.256	79
6	Complicated logistics to transport and distribute building material	3.88	1.247	78
7	Lack of financial vision	3.61	1.188	72
8	Frequent changes in scope	3.10	1.129	62
9	Difficulty to anticipate arrival times	3.07	1.315	61
10	Limited time for planning and design	2.83	1.02	57
No.	**Low Quality**	**Mean**	**Std.**	**RII%**
1	Dependency on imported building materials and migrant/day labor/staffing from other countries	4.55	0.945	91
2	Dependency on local sellers	4.35	1.07	87
3	The relatively large size of the damaged area	3.82	1.268	76
4	Difficulty to control quality	3.63	1.242	73
5	Limited time for acquisition planning in the initial stage	3.45	1.268	69
6	Legal and bureaucratic restrictions for tendering, acquisition, and construction	3.42	1.292	68
7	Need a large number of consultants to monitor and follow up with the work	3.41	1.292	68
8	Uncertainty precision (UNPR)	3.34	1.284	67
9	Time overrun from other	3.10	1.129	62
10	Lack/ shortage of material and qualified human resources in the disaster area countries	3.09	1.242	62
11	Lack/ shortage of material and qualified human resources in the disaster area	3.01	1.242	60
12	Poor funding	2.91	1.216	58

Table 6. Most Important factors (final results)

Group	Factors	Mean	Std.	RII%	Level
SC	Diversity and number of stakeholders	4.7	0.638	94	H
CO	Unrealistic financial and cost estimate	4.7	0.439	95	H
SC	Lack of communication among projects	4,61	0.75	92	H
TO	Unrealistic schedule	4.6	0.901	92	H
TO	Legal and bureaucratic restrictions for tendering, acquisition, and construction	4.6	0.945	91	H
LQ	Dependency on imported building materials and migrant/day labor/staffing from other countries	4.6	0.948	91	H
TO	Difficulty to control activity duration	4.4	0.931	89	H
TO	Urgency to meet essential needs	4.4	1.07	87	H
LQ	Dependency on local sellers	4.4	1.07	87	H
SC	Difficulty to build consensus	4.3	1.15	86	H
CO	Instability of local currency exchange rate	4.2	1.182	85	H
CO	Political instability in the country	4.1	1.211	82	H
SC	Difficulty to identify the needs of the affected population	4	1.247	80	H
TO	Lack/shortage of material and qualified human resources in the disaster area	4	1.256	79	M-H
CO	Difficulty to develop a cost plan	3.9	1.364	79	M-H
TO	Complicated logistics to transport and distribute building material	3.9	1.247	78	M-H
SC	Conflicting aims and objectives	3.9	1.219	78	M-H
LQ	The relatively large size of the damaged area	3.8	1.268	76	M-H
CO	Poor funding	3.8	1.274	76	M-H
TO	Lack of financial vision	3.6	1.188	72	M-H
LQ	Difficulty to control quality	3.6	1.242	73	M-H
SC	Lack of accurate information in the early stage	3.6	1.315	71	M-H

First: Frequent Scope Changes Results

According to the results, six challenge factors are the higher relative important index:

- The main cause was the difficulty building consensus at the first stage of reconstruction projects in Iraq. The RII of diversity and the numbers of stakeholders were equal to (94%).
- Conflicting objectives between stakeholders that lead to the Lack of communication among projects (92%), and urgency to meet essential needs to achieve the main purpose.
- Difficulty to build consensus (86%) led to undefined time for planning and design with
- Inaccurate information was another main cause that led to the difficulty in determining the needs of the affected population in provinces (80%).
- Lack of accurate information in the early stage (71%) with the absence of requirements was another factor in relationships to scope management with stakeholders, risk, and communication.
- Uncertainty and unpredictability about inputs (70%) were one of the factors influencing difficulty assessment for damage and risk,
- The results showed why the scope of any projects in Iraq not only in post-disaster reconstruction failed, for evolving the project with updating required but it was very difficult to improve and grow it.

Second: Cost Overrun Results

The statistical results indicated five main reasons that lead to cost overruns, as follows:

- Unrealistic estimates (95%) led to not obtaining the best prices for resources due to dependence on them local sellers, as well as on Importing building materials and using migrant workers from other countries.
- Instability of local currency exchange rates (85%) with the American dollar, which is handling the negative accumulations caused by the past wars.
- The political instability in Iraq (82%), in addition to inflation and time overrun.
- Difficulty to develop cost plan (79%) to get the best price for resources, materials, and qualified human resources, therefore Iraq is considered to be one of the least economically developed among other countries.
- Poor funding (76%) due to donors failing to meet their commitments which caused high financial uncertainty in Iraq.

Project managers had to place special emphasis on the interrelationships between cost management, procurement management, and time management. These difficult restrictions on cost were imposed at the time of the announcement of the reconstruction projects, which are difficult to announce because of the time schedule and cost. There are other restrictions due to the political and legal situation in Iraq, so Iraq is still a weak investment environment compared to other countries.

Third: Time Overrun Results

The statistical results (RII%) showed that there are many major reasons (seven factors) that lead to time overrun in the reconstruction projects in Iraq, which are described below:

- Unrealistic schedule (92%) for this project with the urgent need to meet the needs of post-disaster reconstruction in Iraq,
- Absence of legal and bureaucratic restrictions for tendering, acquisition, and construction (91%), Lack of procurement regulations, laws, and government regulations related to it, which requires a long time during implementation.
- The statistical results showed that it is difficult to control activity duration (89%).
- The urgency to meet essential needs (87%) with the complex interrelationships between time management, procurement, scope, and cost management.
- The Lack/shortage of human resources, expertise, and engineering (79%) without forgetting the lack of material and qualified human resources in the disaster area competencies in the field of rehabilitating for the post-disaster reconstruction in Iraq, especially in the city of Mosul.
- Difficulty in providing complex logistical requirements (78%). It is a complicated logistics to transport and distribute building materials.
- Lack of local financial resources (72%), and the dependence on donors, who, in many cases, do not provide their services on the accurate time.

Lack of funding is one of the main factors and Schedule and resource requirements are always changing. They may be limiting factors for the reconstruction projects, in addition, it is difficult to add additional resources, if necessary, especially since Iraq suffers from a great budget deficit, and most of the engineering expertise travelled outside the country after 2003.

Fourth: Low-Quality Results

Four reasons lead to the low quality of post-disaster reconstruction projects, according to the statistical results, including the following:

- Reliance on Importing building materials and using migrant workers from other countries without improving the skills of local workers (91%), as new experiences due to the scarcity of material and immaterial resources in the local market, especially in confined time for planning in the initial project stage because Lack of local material and qualified human resources in the disaster area.
- Reliance on local vendors, lack of qualitative control over resources, and difficulty in controlling quality due to several factors, with RII (87%).
- The relatively large size of the damaged area (76%) with no adhering to the work plan and accelerating the timetable to an unrealistic one.
- Difficulties to control quality (73%) mean the projects need many engineering sites and consultants to monitor and pursue the work. The results showed that project managers should focus in particular on the interrelationships between quality management in post-disaster reconstruction projects and procurement management; time management; Scope management and cost management.

Most of the references indicated that the most important challenges in reconstruction projects are related to total quality management, and it is possible to increase the size of the project and the time and cost due to the inability to conduct comprehensive monitoring and evaluation for the projects. Therefore, many consultants and engineers are required to monitor and follow up on work and train new employees who do not have enough skills because they hurt the work that is being implemented.

Finally, the study was able, through the above results, to identify the most important factors in the project constraints identified previously in the study, which are scope, cost, time, and quality, and their impact on the root causes of delays in reconstruction projects. The study showed the necessity of linking the direct role of the relevant participating parties to the implementation of the project in a predetermined process. Thus, it helped the decision-maker determine the best opportunities to overcome these delays in advance by knowing and identifying the most important criteria. The contribution of the project management role in facing these challenges and taking advantage of the available opportunities is very important to overcome the potential delays suffered by the projects of the liberated cities. This is what distinguishes our study from previous studies, especially the local ones, which adopted absolute and general concepts without defining the important fundamental aspects.

6. Conclusions

The first questionnaire's results, obtained through RII, revealed the opinion of experts in determining the primary challenges facing post-disaster reconstruction projects. They also revealed that managers with extensive experience in such projects placed a strong emphasis on the strong connections between time, cost, and quality management through scope management. Investigate risks and their effects on the fundamental project components (time, cost, and quality), as well as the scope. Turn on the management of communication between stakeholders.

Resource management in reconstruction projects, as demonstrated by case studies, depends on the necessity of multi-stakeholder agreement, government intervention, improvement of strategic tools and policies, as well as facilitating laws and regulations to make an adaptation for the market. It must be taken into account that the procurement strategy is required to achieve long-term sustainability because of its important role in contributing to the development of local communities and reducing areas affected by disasters, especially environmental disasters. By supporting design solutions in construction, selection of building materials, and recycling and reuse options when available, shortages or depletion of availability of imported construction resources in the local market could lead to delays in the implementation of construction and increase the total cost.

The assessment of local capacities is a critical component of the procurement strategy, particularly given the lengthy bureaucratic process in Iraq to obtain the necessary approvals. In addition, the lack of experience and control over the construction work can affect the estimates of activity periods. The complex logistics of transportation and resource distribution are also important obstacles. Accordingly, procurement management has an important influence on project management about how to control time, cost, and quality in a balanced construction environment without delay or loss.

6.1. Recommendations

In spite of this, there is no clear way to accommodate challenges in Iraq for such an extensive and complex reconstruction scheme. But learning lessons from previous post-disaster reconstruction, the reconstruction efforts should not ignore the role of social participation in the planning phase to minimize the risks and challenges required. From the previous debate, field survey, and practical study, the following are some suggestions for broad themes:

- The success of Iraq's reconstruction efforts requires finding an appropriate and acceptable solution for the political future of Iraq by all parties. Reconstruction also requires the availability of objective conditions, like security, social and economic stability, achieving stability in the currency exchange rate, developing of banking sector, heading towards privatization, and openness in attracting direct tax investments.
- Setting a framework for founder to deal with investors and facilitate the establishment of their projects, as well as setting clear rules for doing business, rehabilitating Iraqi leaders, and establishing the infrastructure for the digital economy.
- Developing an appropriate strategy that is based on reality as it is on the ground and allows for a quick response to the immediate needs of the Iraqi people, which will be determined based on a development plan.
- Develop an economic map to identify investment opportunities and identify stable and safe areas to start investment.
- Activating monitoring and evaluations of M&E organizations for measuring NGOs' performance during construction.
- Prepare a plan for involving NGOs for effective community participation.
- Develop governmental contracting and consulting companies with suitable training on the suggested framework for enabling them to carry out the reconstruction responsibility.

7. Declarations

7.1. Author Contributions

Conceptualization, M.R.A. and M.M.D.; methodology M.R.A.; validation, M.R.A., M.M.D., and I.F.M.; formal analysis, M.R.A.; investigation, I.F.M.; resources, M.R.A.; data curation, M.R.A.; writing—original draft preparation, M.R.A.; writing—review and editing, M.R.A.; visualization, M.R.A.; supervision, M.R.A.; project administration, M.R.A.; funding acquisition, M.R.A. All authors have read and agreed to the published version of the manuscript.

7.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

7.3. Funding

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7.4. Conflicts of Interest

The authors declare no conflict of interest.

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Appendix I

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Questionnaire Form

Dear response,

The questionnaire form developed for the purpose of: *Fundamental Challenges and Management Opportunities in Post Disaster Reconstruction Projects.*

The study examines the root causes of delays that the project manager is unable to resolve or how can the decision-maker identify the best opportunities to get over these obstacles, by considering the project constraints defined as the project triangle (cost, time, and quality) in post-disaster reconstruction projects to review the real challenges to overcome these obstacles. The aim to finding the relative importance of the indicators and factors that affect the success of the construction project. The questionnaire consists of two parts: the first part involves sample description, and the second part is to find the relative importance index according to Likert scale (5 to 1).

In view of your long experience and practice in your field of specialization, you have been chosen to answer this questionnaire, hoping for your cooperation with your observations and answers that will enrich the research and provide it with scientific strength.

With Best Regards

Part One: Personal Information

1. Name (Optional):

2. The gender: Male …… Female ……

3. Work place: ……

4. Work sector: Public……. Private …….

5. Educational level: Bachelor ……. Master……. Ph.D……..

6. Specialization: Civil …… Architect …… Electrical ……Mechanical ……Other....

7. Years of Experience: 1-5 Years ……. 6-10 Years …….10-15Years …….10-15Years ……More than 20 years…

Part Two: Respondents' Demography

To what extent do you agree with the following failure factors?

5= Strongly agree; 4= Agree; 3= Neither agree nor disagree; 2= Disagree; 1= Strongly disagree,

A. Scope Changes

No.	Factors	5	4	3	2	1
1	Diversity and number of stakeholders					
2	Lack of communication among projects					
3	Difficulty to build consensus					
4	Difficulty to identify the needs of the affected population					
5	Conflicting aims and objectives					
6	Lack of accurate information in the early stage					
7	Uncertainty and unpredictability about inputs					
8	Difficulty to assess damage and risks					
9	Limited time for planning and design					
10	Unique requirements					
11	Lack of accurate information in the early stage					
12	The urgency to meet essential needs					
13	Wide geographical spread / expansiveness-remoteness of the work site					

B. Cost Overrun

No.	Factors	5	4	3	2	1
1	Unrealistic financial and cost estimate					
2	Instability of local currency exchange rate					
3	Political instability in the country					
4	Difficulty to develop a cost plan					
5	Poor funding					
6	Limited time for acquisition planning in the initial stage					
7	Failure to get the best price for resource					
8	inflation					
9	Dependency on local resources and sellers					
10	Failure of donors to fulfil commitments					
11	Lack/ shortage of material and qualified human resources in the disaster area					
12	Dependency on imported building materials and migrant /day labor/staffing from other countries					
13	High financial uncertainty					
14	Lack of insurance system					

C. Time Overrun

No.	Factors	5	4	3	2	1
1	Unrealistic schedule					
2	Legal and bureaucratic restrictions for tendering, acquisition and construction					
3	Difficulty to control activity duration					
4	The urgency to meet essential needs					
5	Lack/shortage of material and qualified human resources in the disaster area					
6	Complicated logistics to transport and distribute building material					
7	Lack of financial vision					
8	Frequent changes in scope					
9	Difficulty to anticipate arrival times					
10	Limited time for planning and design					

D. Low Quality

No.	Factors	5	4	3	2	1
1	Dependency on imported building materials and migrant/day labor/staffing from other countries					
2	Dependency on local sellers					
3	The relatively large size of the damaged area					
4	Difficulty to control quality					
5	Limited time for acquisition planning in the initial stage					
6	Legal and bureaucratic restrictions for tendering, acquisition, and construction					
7	Need a large number of consultants to monitor and follow up with the work					
8	Uncertainty precision (UNPR)					
9	Time overrun from other					
10	Lack/ shortage of material and qualified human resources in the disaster area countries					
11	Lack/ shortage of material and qualified human resources in the disaster area					
12	Poor funding					