Safety Management in Construction Project

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ABSTRACT

The purpose of this work is to determine how the key businesses at their construction site managers (engineer, master of work, safety engineer and workers) view safety at work. The interviewees' understanding of few subjects was characterised by qualitative approaches, data collection and treatment, identified and evaluated by reports: causes of accidents, safety-enhancing recommendations, job satisfaction, preparation, main risk, labour load, and the main priority, frequency of accidents and safety awareness. The expectations showed many needs for change, which affect employment protection directly or indirectly. The first objective of the research is to effectively prepare the loading and handling of risks of various types, in line with a special and efficient strategy based on risk management experts and, secondly, to formulate procedures to respond to risks in a way that ensures that these risks are handled in construction projects. This research established a number of risks which actually emerged out of the research of a number of completed building projects, theoretical studies and a number of experts in the construction sector to determine the magnitude of these risks, both to project objectives and to their protection. It appears that the most significant risks in Iraq's construction projects are (lack of plans for site-based infrastructure networks, such as power, electricity, water, etc.) and (differences between implementation and necessary requirements due to poor understanding of plans and specifications). It is focused on the length of the implementation of the project and its stages, on protection, and the preferred method is the method for reacting to risks by setting contract terms, and then clarifying the other procedures. The results of this work show that the performance bond needs to be used tremendously to reduce the impacts of the risk on the projects in this particular sector.

Keywords: Safety management, Construction management, qualitative approaches, safety-enhancing recommendations, job satisfaction

1.0 Introduction

Currently, both in Iraq and in developed countries, civil construction continues to stand out as one of the most problematic sectors with regard to accidents at work. In Iraq, the sector is the fourth largest generator of fatal accidents in terms of frequency and the second in terms of the coefficient per hundred thousand workers[1]. In Iraq, the private construction project segment does not yet act as a pressure factor, since the exclusive use of state insurance (which imposes an equal rate for all companies) is predominant, contrary to what occurs in the countries mentioned, in which Insurance is controlled by the private sector and calculated based on indicators that reflect the real age of each company. Although the economic and social costs of work accidents are high, few companies are largely not trying to avoid them through systematic approaches, limiting themselves to complying with legislation[2]. However, Iraq standards have a restricted scope, focusing mainly on the implementation of measures related to physical security installations (guardrails or landings, for example), and failing to require broader

preventive measures aimed at eliminating and reducing risks in its origins.

It is possible to identify the reality of risk management in private construction projects in Iraq by clarifying the justifications for carrying out this research. The presence of risks and their unpredictability or predictability, but failure to take the necessary precautions to face the impact of art, is a matter that is very debilitating for the national economy and for the contractor and the business owner with a depletion of resources and a temporary waste[3]. To provide contractors with a risk management framework and to show the impact of these risks on the objectives of the project, and to achieve these objectives, it is necessary to study the concept of risks and their management in the construction industry, and then determine the risks that are most likely and affecting the construction projects in Iraq in order to reach the determination of the level of significance These identified risks, and then the possible and appropriate response to these risks and other potential risks. Risk and uncertainty Risk is described as the potential to occur something dangerous as a result of the uncertainty surrounding the progress of the process you carry out[4]. The incertitude is due to the multiple variables used for a generalisation and their uncertainty. Researchers and scholars during their implementation processes have defined building industry as multivariate and of a highly transforming and unpredictable nature[5]. Sharma et al., (2011) [6] Proof of the value of the risk research in the so-called risk management. The potential for future events impacting the project schedules, the financial framework, and the time frame for the project and, thus, the deviation Risks have also been determined. There is a perception that the purpose of the project alone is adversely affected[7]. This idea came from the principle of uncertainty, an event which is a possible risk (Uncertainty), which resulted in two different outcomes, either a win-win or a loss risk (Figure 1)

Figure 1: Uncertainty results

Risk management tools

There are many techniques for each stage of the risk management stage, as any procedure needs to be applied[8], and these stages are:

- **The stage of identifying risks**: Brainstorming and List Check are used more widely than any other techniques, and the questionnaire is also one of the techniques used in this field.
- **The risk loading and evaluation stage**: The techniques used in this stage are classified into two types: Qualitative and Probability as qualitative techniques are used more than quantitative. Impact Matrix
- The stage of responding to risks, many researchers mentioned that there are four methods of responding to risks in construction projects, namely: retention, risk reduction, and risk transfer.
- **Risk response control:** response to changes in risk over the life of the project.

The influence of elements such as those cited on security is generally considered superficially or even unknown by many companies and professionals, which is partly reflected in the lack of scientific studies on strategies for security management[9]. In this context, this article aims to contribute to the identification and discussion of factors of a managerial nature that influence safety at work, and that although invisible, in the opposite way the lack of a guardrail, for example, should also be known and faced, even though the legislation refers to its existence

2.0 Materials and Methodology

2.1 Data collection and sharing:

2.1.1 Identification of risks: Most of the risks that actually occurred in the construction

projects especially in private construction projects under study, which included (roads and bridges projects, buildings, hospitals, oil projects, water and sewage networks, school buildings) in all governorates in Iraq, in addition to the theoretical review of literature and research, a number of interviews with experts in the field of construction industry and the results of the questionnaire, and accordingly, these risks were classified, which led to a change in cost, time and quality of the project, as follows:

Organizational risks, spatial risks, technical risks, financial risks, legal risks and political risks[10]. As shown in the attached download tables, the following is evident from the preliminary study of the verbal data collected from these projects:

1. The regulatory risks were largely concentrated in road and bridge projects, while the technical and political risks were in treatment projects and water networks. As for the spatial, legal and financial risks, they were concentrated in school buildings, hospitals, and others.
2. The most frequent occurrence of risks in these projects is the technical risks, which are differentiated by the spatial, the organizational, then the political risks, and finally the legal and then the financial risks.
3. The quantitative number as a blind limit for the combined risks was in treatment projects and water networks, while the number for other projects was less.

2.2 Impact of risks on project objectives and safety:

In this research, it is adopted together with a link to risk loading:

- Potential risk
- The degree of the impact of risks on the objectives of the project, if such risks occur

Merging these two criteria into the following equation to estimate the significance of the scheme or the degree of risk[11]:

$R = P \times I$ Eq..(1)

Where:

R = risk index or degree of risk, and values ranging between (0, 1)

P = probability of occurrence of the risk and values ranging between (0, 1)

I = Impact of the Notified and values ranging from (0, 1)

To assess the likelihood of risk occurrence and its impact, a questionnaire was designed that included four axes:

The first axis: aims to obtain general information for the response of the selected sample from the respondents, such as specialization, achievement. The occurrence and impact of risks as given in table 1:

Table 1: The occurrence and impact of risks, the academic achievement of the sample response and Years of experience per sample

	Very high	High	medium	low	very low
Probability	0.95	0.74	0.53	0.32	0.11
the influence	0.84	0.42	0.21	0.11	0.05

The academic achievement			
S.No	**Academic achievement**	**Repetition**	**%**
1	Bachelor Degree	22	50
2	Master Degree	15	34
3	Doctorate Degree	7	16
	Total	44	100%
Years of experience per sample			

Experience (years)	Reappearance	percentage	
1 to 5	7	16	52% are less than 15 years old
6 to 15	16	36	
More than 15	21	48	48% are over 15 years old
Total	44	100%	

This scale was developed by relying on its scale (American Institute of National Standards, 200
The third axis: it is designed to determine the probability of occurrence of risks and the percentage of the impact of risks on the objectives of the project.
The fourth axis: It is designed to determine the type of response procedure used to address these risks.
A number of questionnaire forms were distributed to managers of construction projects, Mindsin in consulting offices, contracting companies, public and private sectors, and university professors, and to support the questionnaire with personal interviews.

2.3 Data loading and processing: For processing the data, the computer programme (Excel) was used. It was found that almost a half of respondents sampling have more than 15 years of experience, allowing them to reflect the reality from their experience in the construction industry. It was also found that the information given by respondents is accurate. Make use of these findings and get them together to be united.[12] An equivalent weight was given to the type of education and the number of years of experience as shown in Table No. (2).

Table 2: The weight of the equation for responding to the sample

General personal information	Data description	Equivalent weight
Academic achievement	Bachelor Degree	1
	M.A.	1.25
	PhD	1.5
Experience	Less than 15 years old	1
	More than 15 years	2

This technique has been used in the field of risk management, and by applying the following two equations, respondents' answers can be used to calculate the rate of likelihood and impact for each type of risk (Hussain, 20)

$$\text{The likelihood rate of the risk} = \frac{\text{Sum (likelihood of risk occurrence*Recurrence)}}{\text{Total Iterations}}$$

$$\text{The rate of impact of the risk occurrence} = \frac{\text{Total (Risk Occurrence effect * Frequency)}}{\text{Total Iterations}}$$

Where
The probability and impact of the occurrence of risk = standard values for each of the two
Total recurrences = the cumulative sum of the recurrences of all factors with the weight. The values of the risk index have been arranged in descending order as in Table No. (4) Where it becomes clear that the probability of many organizational, technical and spatial risks is high, and this is also noticed from the verbal data study Reality as mentioned above. There are several measures of probability and impact when replacing the qualitative scale with numbers upon statistical analysis has adopted the following scale[13] (table 3):

Table 3: Scale description for each danger of the magnitude and intensity levels.

the scale	very low	Low	Average	high
the field %	0 to 10	11 to 30	60 - 31	>60

The level of importance was determined by relying on this measure of the likelihood and impact of risks and in accordance with the principle of calculating the difference between the largest value of the risk index and the smallest value from Table No. (4) And the value of D calculated with the following equation:

D = 0.112555 - 0.002564 = 0.109991

Thus, it is possible to calculate the minimum and the upper limit of the risk index (field) at each level, as in Table No. 4. The indicator of very low illiteracy risk is between (0.0026 and 0.0134), while the risk index is located (0.465) and so on. The schemes for service networks passing through the site such as electrical, electricity, water, and others (it is considered highly important, with an index of (0.1126), which reflects the importance of addressing these risks.

Table No 4 Limits of the risk index for each level of importance

Significance of risk	**minimum**	The upper limit
Very low Priority	0.0026	0.0026 + 10% D = 0.0134
Low Priority	0.0135	0.0135 + 30% D = 0.0465
Medium Priority	0.0466	0.0466 + 30% D = 0.0796
High Priority	0.0797	0.0797 + 30% D = 0.1127

2.4 Hypothesis testing:

2.4.1 ***Independence test (chi-squared test - X^2) between risk potential and impact*:** Independence is imposed for any relationship between two variables in order to make sure that they are independent of each other, and the chi-square method (X^2) finds a measure of errors resulting from approximation of the observed values by imposing independence and this scale is[14],

$$X^2 = \sum_{ij}^{n} \frac{(O_{ij}-E_{ij})^2}{E_{ij}} \quad \text{Eq ..(2)}$$

Where: O_{ij} the number of reviews in the ordered line) (and the column that is arranged)

E_{ij}: The number of values expected in existence in the line in which it is arranged i and in the column in which it is arranged j to assume

$$E_{ij} = \frac{(ni+)(n+j)}{n} \quad \text{Eq ..(3)}$$

Where $ni+$ the sum of the values of the observations in the ordered line i

$+j$: the sum of the observations values in the column in which order j

The imposition of independence is accepted if the value of (X^2) calculated from equation (4) above is less than the value of (X^2) tabular. i.e.

R = number of lines in the compatibility table

C = number of columns in the compatibility table

The calculated value of (X^2) was equal to (1) smaller than its tabular value and equal to (1345.27). This proves that there is no relationship between the variables, so there is no relationship between the likelihood of the occurrence of the risk and its impact, the probability may be high, but the effect is low. In the case of independence between the two variables. The following relationship is used to find the contingency coefficient[15] (G):

$$G = \sqrt{\frac{X^2}{X^2+1}} \quad \text{Eq ..(4)}$$

Where: G < 1

As (G) was approached to the number (1), it is considered to have a high degree of probability, and the value of (G) was equal to (0.71), which confirms the independence relationship, meaning the presence of a lack of dependence between the two variables probability and influence.

2.5 Correlation Coefficient - R test between risk potential and impact:

The extent of the correlation between the results has also been studied by calculating the correlation coefficient, and its values were equal to (R = 0.854) for the level of (significance) significance equal to (α = 0.05), which indicates the existence of a strong correlation between the results.

Table 5: Risks are ranked in descending order according to their indicator and level of importance

Sequence of Risk	Risk	Precautions	the influence	Risk indicator	Level of Importance
1	Unavailability of service networks passing through the site as electrical schemes, telephone, water and other	0.374	0.332	0.118	High Importance
2	Religious, occasions and Sudden Holidays	0.362	0.282	0.097	
3	difference between implementation and require specifications due to misunderstanding schemes and specifications	0.338	0.291	0.094	
4	Poor coordination and communication between the employer and the contractor	0.337	0.232	0.074	Medium Importance
5	our Sourcing work to an inefficient contractor	0.328	0.205	0.064	
6	Manufacture of readymade concrete parts in place far from work	0.311	0.215	0.064	
7	Lack of Necessary information ; Delayed arrival of Correspondence	0.262	0.222	0.055	
8	Aware of clarity of Contractual Obligations	0.301	0.165	0.047	Low Importance
9	Delay in Arrival of Some materials and equipment from the country of origin	0.216	0.168	0.035	
10	approval of the implementation of plans by the Advisory body	0.236	0.130	0.029	
11	Accuracy of the survey related to the project site by the first party	0.111	0.222	0.023	
12	delayed completion of the design or change in Design	0.187	0.131	0.023	
13	Delay on the Starting work on the project	0.217	0.112	0.023	
14	Delay In handling Over site to the contractor due to lack of Site preparation	0.145	0.117	0.016	
15	Internal problems occurs among the contractor team member	0.174	0.094	0.016	
16	Insufficient financial Allocations to the complete project	0.145	0.111	0.015	
17	Lack of Cash Flow Control	0.132	0.117	0.015	Low Importance
18	The Presence of Obstacles at the site Such as Ground water, water Pipes, Tassels	0.151	0.093	0.013	
19	Delay in receiving operational	0.147	0.088	0.012	

	advances in accordance with the contract until the legal procedure is completed				
20	mismatch between place	0.109	0.118	0.012	
21	the deterioration of the security situation in the project in addition to the repeated bombing	0.125	0.090	0.011	
22	Disputes during the construction phase between work parties	0.109	0.092	0.010	
23	inflation and price fluctuation during the project implementation period	0.125	0.079	0.009	
24	not setting aside a place for throwing rubble	0.153	0.062	0.009	
25	bad weather conditions	0.122	0.075	0.009	
26	Project land I expropriated by the state, but no payment has made benefits of owners	0.111	0.070	0.007	
27	Inaccurate Project Scheduling	0.092	0.085	0.007	
28	death of contractor	0.073	0.102	0.007	
29	A Significant increase in the price of rebar	0.107	0.068	0.007	
30	Delayed arrival of Materials due to security measures	0.086	0.084	0.007	
31	the difference in the nature of soil	0.146	0.049	0.007	
32	switching worksite	0.094	0.073	0.006	
33	contractor unable to receive the site due to security incidents	0.073	0.094	0.006	
34	the possibility of benefiting from the project due to deficiencies such as elevators	0.107	0.061	0.006	
35	conditions of war stabilization of the military unit in the project for a long period	0.066	0.088	0.005	
36	contractor claiming a price difference due to increase in material prices due to delay	0.119	0.045	0.005	
37	Lack of Space inside the site, difficulty of Movement of Equipment and unavailability of Place for preparing materials in addition to the traffic momentum in the area	0.139	0.038	0.005	
38	Damage in some Parts of the Project due the security incidents	0.085	0.063	0.005	
39	The Project was exposed to gunshots	0.069	0.068	0.004	
40	the implementation of some works due to the forbidden areas of the	0.086	0.054	0.004	

Moderately important

	Project				
41	Difficulty accessing the site (Location in Remote area)	0.107	0.034	0.003	
42	Delay in transferring to heirs	0.069	0.041	0.003	

3.0 Discuss the consequences of the impact of risks on the objectives and safety of the project:

The results can be studied in Table No. (5), where it becomes clear what follows:

1. The risks with a high level of significance were of the organizational and technical risks, as it appeared that both -The three risks (the lack of plans for service networks passing through the site, such as electrical plans, electricity, water, and others) with a degree of impact = 0.3159 per day of the notifier (religious occasions and sudden holidays) with a degree of impact = 0.2682, then the notifier (differences between implementation and the required specifications due to poor understanding of the plans and specifications) Impact score = 0.277, in addition to the high probability of occurrence, so the level of emetic was high in Table (5), which reflects the priority of taking response measures to it when managing risks.
2. The risk of medium importance was also of the organizational and technical risk category, as we see that the risk (poor coordination - and communication between the employer and the contractor) with a degree of impact = 0.205 and the risk (the work tearing up for an inefficient contractor) where the degree of impact was not high = 0.1955, but the probability of occurrence is high = 0.3125, and therefore its index was high, so it became if it was medium, then the notifier (the manufacture of ready-made concrete parts in places far from work) had a degree of influence = 0.2045, then the notifier (lack of necessary information (late arrival of official correspondence to the work site)) degree of influence = 0.2114 Therefore, these risks are the priority of responding to it in the second place when managing risks.
3. As for the rest of the risks, they were divided between low literacy and very low literacy. - But it is worth noting that the technical notifier (the inaccuracy of the in-depth surveys of the project site by the first party) was a low emito level despite the degree of its influence equal to the average illiteracy organizational scheme (lack of necessary information (delay in official correspondence arriving at the work site)). Because the probability of occurrence was low = 0.1057, we deduce from this that for risk management, response procedures depend on the level of significance of the risk, which in turn depends on the three factors, which is the probability and degree of occurrence of the risk and its indicator. The project goals are shown in the questionnaires obtained and Table (6) shows these percentages. In contrast to the effects on length, cost and efficiency, it is evident that the influence of risk on safety and security is very low. There are only three risks (manufacturing finished concrete parts in places far from work) and (Failure to allocate a place for throwing rubble) and (difficulty in accessing the site (the site in a remote area) has clearly affected safety in the area more than (30%). Greater than (30%), that is, from average or more, according to the previously approved measure of probability and impact, and they have been arranged in the table. Table No. (7) Shows the frequency rates in respect of the frequency of all project targets within the retrieved answers for each (percent) goal. It is noticed that the period was repeated with a rate of (47.69%) as a maximum frequency, while safety was repeated (6.7%), with

the lowest frequency, and this reflects the peak attention paid to safety in construction projects and the weakness of the safety culture in risk management.

Table 6: The frequency percentages of each risk's impact on the project's objectives

Risk rating	**Sequence of Risk**	**Risk**	cost	Duration	Quality	Safety
Organizational Risks	1	Unavailability of service networks passing through the site as electrical schemes, telephone, water and other	31.5	91.9	7.9	0.0
	2	Religious, occasions and Sudden Holidays	39.4	91.9	5.3	0.0
	3	difference between implementation and require specifications due to misunderstanding schemes and specifications	18.4	97.1	7.9	0.0
	4	Poor coordination and communication between the employer and the contractor	42.0	63.0	55.1	34.1
	5	our Sourcing work to an inefficient contractor	26.3	55.1	49.9	2.6
	6	Manufacture of readymade concrete parts in place far from work	70.9	39.4	36.8	18.4
	7	Lack of Necessary information ; Delayed arrival of Correspondence	7.9	65.6	55.1	0.0
	8	Aware of clarity of Contractual Obligations	5.3	68.3	42.0	18.4
	9	Delay in Arrival of Some materials and equipment from the country of origin	10.5	89.3	13.1	2.6
Spatial	10	approval of the implementation of plans by the Advisory body	15.8	94.5	2.6	0.0
	11	Accuracy of the survey related to the project site by the first party	55.1	70.9	21.0	18.4
	12	delayed completion of the design or change in Design	21.0	28.9	39.4	52.5
	13	Delay on the Starting work on the project	36.8	55.1	13.1	21.0
	14	Delay In handling Over site to the contractor due to lack of Site preparation	18.4	81.4	36.8	21.0
	15	Internal problems occurs among	44.	81.4	10.5	0.0

		the contractor team member	6			
	16	Insufficient financial Allocations to the complete project	36.8	34.1	44.6	5.3
	17	Lack of Cash Flow Control	49.9	21.0	31.5	52.5
Artistic	18	The Presence of Obstacles at the site Such as Ground water, water Pipes, Tassels	15.8	91.9	5.3	0.0
	19	Delay in receiving operational advances in accordance with the contract until the legal procedure is completed	34.1	13.1	81.4	0.0
	20	Mismatch between place	28.9	86.6	7.9	0.0
	21	the deterioration of the security situation in the project in addition to the repeated bombing	21.0	49.9	76.1	0.0
	22	Disputes during the construction phase between work parties	21.0	47.3	55.1	5.3
	23	inflation and price fluctuation during the project implementation period	28.9	55.1	49.9	5.3
	24	not setting aside a place for throwing rubble	5.3	68.3	28.9	10.5
	25	bad weather conditions	21.0	86.6	18.4	0.0
Political	26	Project land I expropriated by the state, but no payment has made benefits of owners	21.0	78.8	13.1	13.1
	27	Inaccurate Project Scheduling	18.4	89.3	5.3	2.6
	28	death of contractor	60.4	49.9	21.0	21.0
	29	A Significant increase in the price of rebar	44.6	34.1	26.3	10.5
	30	Delayed arrival of Materials due to security measures	23.6	89.3	10.5	31.5
	31	the difference in the nature of soil	23.6	89.3	15.8	7.9
Finance	32	switching worksite	18.4	84.0	18.4	0.0
	33	contractor unable to receive the site due to security incidents	5.3	57.8	49.9	10.5
	34	the possibility of benefiting from the project due to deficiencies such as elevators	39.4	73.5	13.1	0.0
Legal	35	conditions of war stabilization of the military unit in the project for a long period	70.9	44.6	23.6	0.0

	36	contractor claiming a price difference due to increase in material prices due to delay	94.5	18.4	5.3	0.0
	37	Lack of Space inside the site, difficulty of Movement of Equipment and unavailability of Place for preparing materials in addition to the traffic momentum in the area	89.3	18.4	5.3	0.0
Legal	38	Damage in some Parts of the Project due the security incidents	44.6	60.4	5.3	0.0
	39	The Project was exposed to gunshots	26.3	78.8	2.6	0.0
	40	the implementation of some works due to the forbidden areas of the Project	15.8	84.0	2.6	0.0
	41	Difficulty accessing the site (Location in Remote area)	13.1	89.3	7.9	0.0
	42	Delay in transferring to heirs	10.5	91.9	13.1	0.0

Table 7: Frequency of project objectives in general.

Project goals	Repetition	Percentages
Cuff	680	24.75
Duration	1310	47.69
the quality	573	20.86
Enamel safety	184	6.7
Total	**2747**	**100%**

4.0 Risk Response Procedures:

To study the possible procedures applied in construction projects in Iraq to respond to risks focusing only on the risks (high and medium importance)[16]. This questionnaire includes widely used risk response procedures for risks that are not listed in the questionnaire form.

- Add the terms of the contract.
- Avoiding risks: it is to minimise the risks and protect the goals of the project from the impact of these risk adjustments that have been made in the project plan.
- risk acceptance: and a definition contrary to the principle of risk reduction, meaning the acceptance and division of losses when these occur:
    - Expected acceptance Threats by internal action: installing an inflammable material fire-alarm device.
    - Acceptance is not planned: with the chosen money and with the participation of the generation.
- Minimize losses by considering the risk effect in estimates when evaluating the price of the offer;
- To move the notifier to another party: i.e. to move the notifier and transfer its financial assets to another party, for example, with a subcontractor, in order to carry out certain activities which pose a risk.

4.1 Data collection: (50) questionnaire forms were distributed to a number of experts, from which (37) were approved only because of the inaccuracy of the other forms. (15) Years, and this is an indication of the trustworthiness of their answers.

4.2 Uploading the data and discussing response procedures: The usage of the (Excel) software also shows the percentages of frequency of answer procedures in respondents ' responses for a person risk for downloading of the data collected from questionnaire questionnaires and table (8). 57.5 The notifier will be handled by respondents by the addition of contractual terms to respond to this risk (lack of plans to move through site service networks, such as power plans, energy , water and more) showing the significance of this risk, since plans must be given in a phases feasibility study The first decision-making approach for the project Less than (30 percent) has been included as the second indicator of response (religious opportunities and sudden holidays) in the light grey colour to be taken. The report (Leah ratio *t* Less than (50 percent)[17] shows that most respondents did not agree with the risk. The percentage of repetition of each action was measured in the retries as shown in Table No (9) for defining the reaction procedures most frequently utilised for risk. That is, the quantitative sum of all answers (with a frequency equal to (21.05%)), a procedure (accepting risks), with a repeat rate (20.22%), and an action (avoiding risks) with a repeat rate (17.59%), then Other than all issues.

4.3 The decision hierarchy

It was a graphic procedure that was commonly employed in the study of the decision in cases of confusion with the inclusion of potential methodologies, and the name of the procedure was an indicator of its formality.[18] The tree branches into branches of a building, either on a choice we choose, or children of future events, which we do not know which will take place. There are points for a decision, from which the different decisions are branched out, symbolized by the rectangle, and there are points for conditions that branch out from them with different future conditions, and they are symbolized by the circle[19]. The conclusions reached in Tables No. (6) and (8) regarding the impact of risks on the objectives of the project and the procedures for responding to risks with an impact ratio greater than (30%) have been drawn in the decision tree shown in Figure No. (2) and (3) in order to facilitate the work of the decision-makers regarding the selection of the appropriate procedure to respond to a general problem, any aim to allocate the required budget and to train the workers to face that risk on that goal[20].

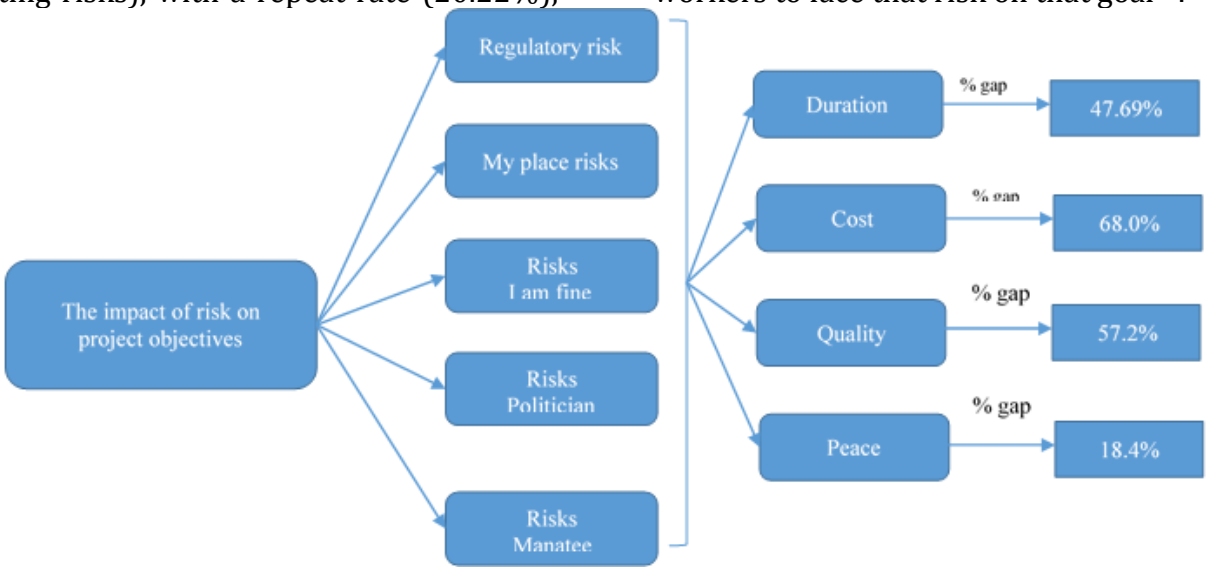

Figure 2: Decision Tree of the Impact of Risks on the Objectives of the Construction Project

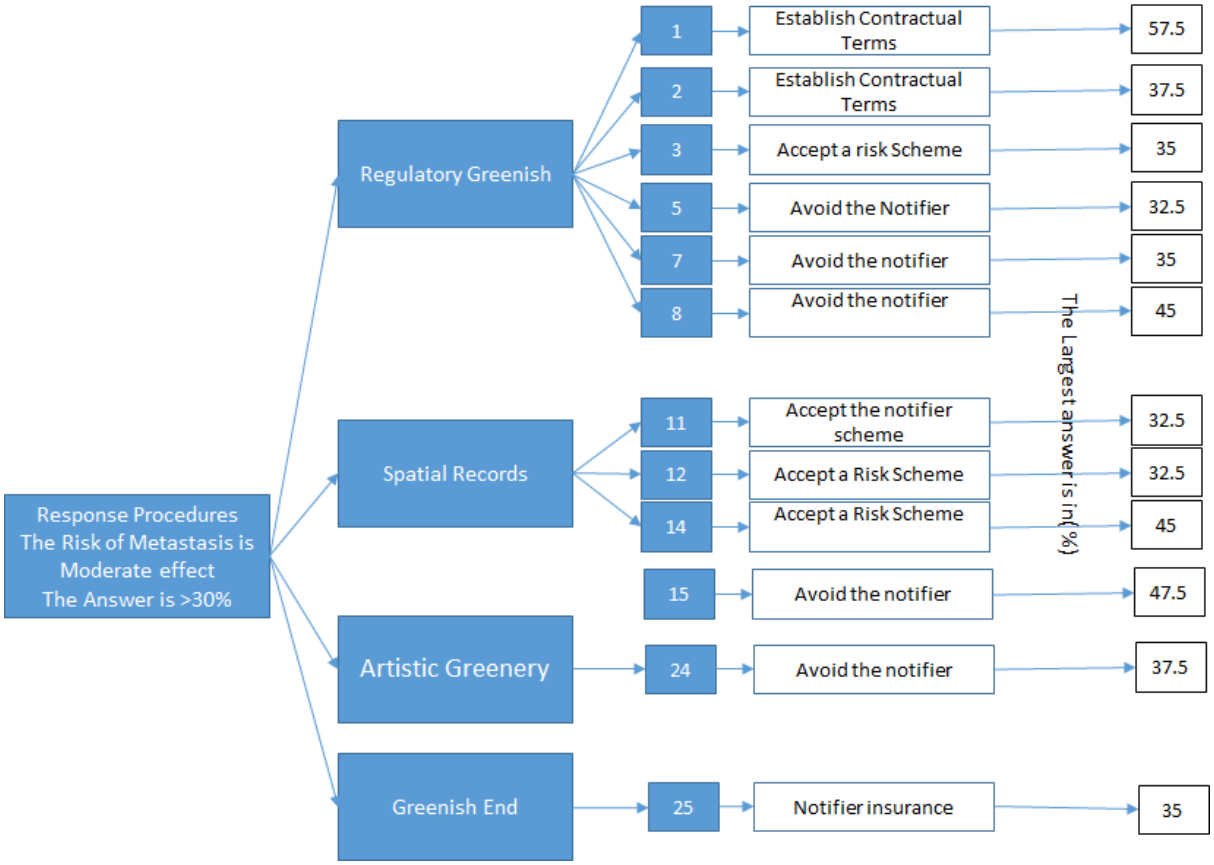

Figure 3: decision tree for risk response procedures

Table 8: Percentage of frequency of risk response procedures in recovered responses

Risk rating	**Risk Sequence of**	**Risk**	Contractual Terms	Avoid	Acceptance	Neglect /Ignorance	At Offer price	Insurance	Transfer to the /From other party	Other than All
Organizational Risks	1	Unavailability of service networks passing through the site as electrical schemes, telephone, water and other	54.63	11.88	11.88	4.75	0.00	2.63	2.63	7.88
	2	Religious, occasions and Sudden Holidays	35.63	33.25	16.63	2.38	0.00	2.63	2.63	2.63
	3	difference between implementation and require specifications due to misunderstanding schemes and specifications	4.75	4.75	33.25	9.50	2.63	5.25	2.63	15.75
	4	Poor coordination and communication between the	9.50	19.00	23.75	0.00	5.25	13.13	15.75	7.88

		employer and the contractor								
	5	our Sourcing work to an inefficient contractor	21.38	30.88	19.00	4.75	2.63	7.88	5.25	5.25
	6	Manufacture of readymade concrete parts in place far from work	14.25	28.50	16.63	4.75	10.50	5.25	2.63	13.13
	7	Lack of Necessary information ; Delayed arrival of Correspondence	23.75	33.25	7.13	9.50	0.00	7.88	7.88	7.88
	8	Aware of clarity of Contractual Obligations	4.75	42.75	16.63	4.75	2.63	5.25	5.25	7.88
	9	Delay in Arrival of Some materials and equipment from the country of origin	11.88	28.50	19.00	7.13	0.00	7.88	5.25	10.50
Spatial	10	approval of the implementation	28.50	14.25	23.75	7.13	0.00	10.50	5.25	7.88

		of plans by the Advisory body								
	11	Accuracy of the survey related to the project site by the first party	11.88	4.75	30.88	2.38	5.25	15.75	5.25	21.00
	12	delayed completion of the design or change in Design	11.88	14.25	30.88	7.13	2.63	10.50	10.50	13.13
	13	Delay on the Starting work on the project	11.88	7.13	26.13	4.75	0.00	18.38	0.00	26.25
	14	Delay In handling Over site to the contractor due to lack of Site preparation	4.75	2.38	42.75	9.50	5.25	10.50	15.75	7.88
	15	Internal problems occurs among the contractor team member	9.50	45.13	9.50	4.75	0.00	0.00	2.63	13.13
	16	Insufficient financial Allocations to the	21.38	14.25	21.38	2.38	2.63	0.00	10.50	13.13

		complete project								
	17	Lack of Cash Flow Control	23.75	14.25	9.50	4.75	2.63	5.25	7.88	15.75
Artistic	18	The Presence of Obstacles at the site Such as Ground water, water Pipes, Tassels	16.63	7.13	28.50	4.75	2.63	21.00	2.63	7.88
	19	Delay in receiving operational advances in accordance with the contract until the legal procedure is completed	14.25	14.25	23.75	2.38	2.63	15.75	18.38	2.63
	20	Mismatch between place	21.38	23.75	7.13	0.00	2.63	10.50	26.25	2.63
	21	the deterioration of the security situation in the project in addition to the repeated	7.13	23.75	19.00	0.00	2.63	10.50	18.38	7.88

		bombing								
	22	Disputes during the construction phase between work parties	30.88	26.13	4.75	0.00	0.00	5.25	13.13	2.63
	23	inflation and price fluctuation on during the project implementation period	14.25	11.88	9.50	0.00	0.00	21.00	21.00	15.75
	24	not setting aside a place for throwing rubble	7.13	35.63	14.25	7.13	0.00	7.88	2.63	15.75
	25	bad weather conditions	16.63	23.75	23.75	4.75	0.00	2.63	13.13	0.00
Political	26	Project land I expropriated by the state, but no payment has made benefits of owners	7.13	2.38	11.88	4.75	0.00	36.75	15.75	18.38
	27	Inaccurate Project Scheduling	4.75	2.38	16.63	4.75	0.00	26.25	21.00	21.00
	28	death of	2.38	14	19.00	2.38	0.00	28.8	15.75	15.75

		contractor		.25				8		
	29	A Significant increase in the price of rebar	2.38	7.13	19.00	7.13	5.25	28.88	15.75	13.13
	30	Delayed arrival of Materials due to security measures	9.50	7.13	21.38	2.38	0.00	26.25	15.75	10.50
	31	the difference in the nature of soil	11.88	9.50	19.00	4.75	5.25	15.75	21.00	10.50
Finance	32	switching worksite	35.63	11.88	14.25	4.75	5.25	10.50	2.63	7.88
	33	contractor unable to receive the site due to security incidents	33.25	16.63	2.38	9.50	2.63	5.25	5.25	15.75
	34	the possibility of benefiting from the project due to deficiencies such as elevators	21.38	14.25	11.88	7.13	7.88	13.13	10.50	10.50
Legal	35	conditions of war stabilization of the	30.88	2.38	11.88	4.75	10.50	21.00	0.00	13.13

		military unit in the project for a long period								
	36	contractor claiming a price difference due to increase in material prices due to delay	11.88	0.00	26.13	7.13	5.25	23.63	0.00	10.50
	37	Lack of Space inside the site, difficulty of Movement of Equipment and unavailability of Place for preparing materials in addition to the traffic momentum in the area	40.38	4.75	19.00	2.38	5.25	7.88	7.88	7.88
Legal	38	Damage in some Parts of the Project due the security incidents	23.75	9.50	9.50	2.38	2.63	10.50	10.50	21.00

	39	The Project was exposed to gunshots	45.13	16.63	2.38	2.38	0.00	10.50	7.88	10.50
	40	the implementation of some works due to the forbidden areas of the Project	35.63	9.50	21.38	0.00	0.00	10.50	2.63	23.63
	41	Difficulty accessing the site (Location in Remote area)	19.00	4.75	19.00	0.00	0.00	15.75	18.38	21.00
	42	Delay in transferring to heirs	14.25	4.75	16.63	0.00	2.63	13.13	23.63	31.50
		The number of risks addressed by the given procedure by more than 30%	1.90	5.70	3.80	5.70	6.30	1.05	6.30	6.30

Table 9: Frequency of response procedures in the recovered answers.

Measure the response	Reappearance	Percentages
Contractual terms	**329**	**21.05**
Avoid risks	**275**	**17.59**
Scheme acceptance	**316**	**20.22**
Email or generation	**74**	**4.73**
At offer price	**40**	**2.56**
Insurance	**201**	**12.86**
Transfer to another party	**132**	**8.45**
Other than that	**196**	**12.54**
Total	**1563**	**100%**

5 Conclusions and recommendations:

The research has reached some results on the subject of assessing the impact and risk management in construction projects in Iraq and from it: The main risk in construction projects is the lack of plans for service networks passing through the site, such as electrical, electricity, water, and others differences between Implementation and the required specifications as a result of a poor understanding of the plans and specifications.

The occurrence of some risks is the cause of the occurrence of other risks, which clarifies the importance of follow-up and control. There is a relationship of lack of independence of any relationship between the probability and the impact of the risks, which indicates the existence of a relationship between risks and risks, since mitigating some risks leads to mitigating other risks in the same procedure.

- It appears that the greatest impact of risks is on the duration of the project implementation, then on the cost of the project and its values, on financial safety.
- In general and in response to all responses by defining contractual conditions it turns out that the chosen method for responding to risks and accepting risks is followed by the risk transfer protocol and other procedures.
- Amongst the guidelines on which this research may be based are:
    - The improvement of project managers' administrative culture by using new technologies in all project building sites.
    - Rehabilitation and growth of Minds in engineering cadres, through instructional and coaching sessions for implementation in and gain of construction projects, with regard to the risk loading and management.
    - Work on the production of contractual formulas for risk loading and control between the employer and the contractor in a manner that protects the interests of both parties with the implementation of risk management programmes.

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