

THE IMPORTANCE OF RISK MANAGEMENT TO THE DIRECTOR OF THE PROJECT AND ITS IMPACT ON THE TIME AND COST OF THE PROJECT

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Abstract: try to specialists in project management to develop a specific Strategy to counter the risks arising from the implementation of construction projects of various kinds, and therefore the risk management in the contemporary framework represents a phenomenon of a new quality, and can not for this phenomenon to take practical dimensions, but the development of corporate culture and Contractors and the employer towards the risks and deal with all aspects and ways to paint to address them within an integrated program, and requires the availability of new skills and information systems capable of precise coordination between the various parties within the company. The research aims to develop the engineering staff working in construction project management and all stakeholders from the government, companies and contractors through the study and analysis of risk management through the relationship between risk and stages of achieving the goals of the project, the impact of the analysis, and the importance of risk management to the director of the project and its impact on the time and cost of the project. It has been identified a number of risks from the study of a number of construction projects completed and has previous theoretical research and scientific sources and interview and questionnaire number of construction industry experts to determine the impact of these risks on projects for the purpose of responding to the risks and management. It appeared that the most important risk in construction projects is Financial risks one of the factors important is the delayed payment or do not pay the money to the companies and contractors. It also appeared that the biggest effect of the risk is on the duration and cost of the project. And the best response to the risk is to fix certain conditions in the contract followed by other responses.

Keywords: risk management, risk response, achievement of project stages, risks analysis.

ВАЖНОСТЬ РИСК-МЕНЕДЖМЕНТА ДЛЯ РУКОВОДИТЕЛЯ ПРОЕКТА. ВОЗМОЖНОСТИ В УПРАВЛЕНИИ РИСКАМИ, ВЛИЯНИЕ НА ВРЕМЯ И СТОИМОСТЬ РЕАЛИЗАЦИИ ПРОЕКТА

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Аннотация: качественное управление рисками в современных условиях, несомненно, зависит от наличия в штате компании высококвалифицированных специалистов в области управления проектами. Специалистов, способных к четко скоординированной работе между различными структурами компании, способных своевременно приобретать необходимые навыки в использовании информационных систем, разрабатывать конкретные стратегии борьбы с рисками, которые возникают в ходе реализации строительных проектов. В данной статье исследуются действия инженерно-технического персонала, а также работа всех заинтересованных сторон, участвующих в реализации проектов, начиная от правительства государства и

заканчивая компаниями-подрядчиками. На основании анализа управления рисками, изучения взаимосвязи между рисками и поэтапным достижением целей проекта выявлена важность риск-менеджмента для директора проекта, возможности руководителя в управлении рисками, влияние на время и стоимостную реализацию проекта. В процессе изучения ряда строительных проектов были проанализированы теоретические и научные источники, а также мнения экспертов в строительной отрасли. Оказалось, что наиболее весомые риски в строительных проектах - это финансовые риски. Одним словом, задержка выплаты или вовсе невыплаты денежных средств компаниям-участникам проектов и подрядчикам.

Ключевые слова: управление рисками, реагирования на риски, достижение этапов проекта, анализ рисков.

1.-Introduction

The construction projects are designed and implemented according to the needs of the employer in the work program and affordable, and if the employer is not the port, it needs to company or contractor an experienced firm enough to take responsibility, including responsibility for risk management. The challenges facing the construction industry in Iraq, especially in the current situation makes it imperative for workers serious thought in order to accelerate progress in the field of contracting for the better. Oppose the project manager responsible for building the exhibition project for many risks specific budget for the project. And it realises cost engineers and construction of large need for improvements in the cost of the project, and build on what progress it has become increasingly necessary to analyse and manage the risks in each project from construction projects to achieve the objectives of the project, including the cost and time. However, that many of the risks faced by construction projects and construction, these risks may affect the work of implementation of the project may lead to delivery delays and increased cost sometimes affect the quality of work. That the most important thing to be taken into account that the construction industry inherently risky and that are difficult to avoid or predictable their impact, has called for it to interest the subject of risk in the industry in the last two decades at the international level, the experts agreed that in the interests of the owner of the economic work that is avoided or reduce the acceptance or transfer the risk to another party with the capacity and efficiency to afford management and that he must abandon the idea that the Contractor shall be sterile alone all of these risks and that the interest of the project. It has now become necessary to understand the nature of risks and analysed in order to develop certain Strategy is to manage and handle. The administration of the risks in the construction sector is the process of achieving the objectives of the project (time, cost, quality, occupational safety and environmental), and helps project managers manage risk in scheduling priorities and the allocation of resources and also help them in decision-making is more reliable process which contributes to the Success of the project and the achievement of its objectives.

2. - A review of previous research:

2.1. The concept of risk:

A clear definition of the concept of risk as highly important because it represents a substantive basis to accommodate its role and functions, the risk is one of the terms that are always reflected in the literature of Business Administration, there are industrial risks in production, operations and risk marketing in marketing management and financial risks in the field of management of financial resources and in the process of life management the term risk repeated use indicates a state (Uncertainty), and in this regard known [1], the risk that any efficacy or activity of azathioprine added value of the product or the customer or that any activity is desirable in the production process leads to the waste of resources various organization such as Alamaab and recycled, damaged and waste and lost time. There is a point of view suggests that the risk is a potential event has only a negative impact on the objectives of a particular project. This idea was originated from the concept (Uncertainty), resulting in two consequences are different, either lost opportunity that results in or risks profit that results in a loss [2], also noted (Alaadai, 1978) [3] that the risk is the accident leads to loss while known [4] that the contrast is desirable for reality.

Also, it represents a risk from the point of view [5] Anything could happen and could give rise to any harmful on cost, time scheduling, quality, project scope [6] that the event is uncertain or the total circumstances and that when they do occur will affect the completion of the goals of the project. The risk was defined as the likelihood of any future incidents that could affect the plans for the project, including the financial and time and thus deviation than planned [7], said that this research tends to the last definition of the notifier and supported.

2.2. Concept of risk management:

The term risk management includes the first and second two-fold risk management, administration according to the commonly understood meaning of planning and organization And control, and the risk it is variation in what is expected [8]. Know management and risk analysis as a process that enables knowledge of the risks and analyse those risks using the appropriate method and then put the right solution that eliminates that risk or reduces the impact and thereby increase the success of the project and the achievement of its goals [7]. The analysis and risk management in the project is considered a continuous process and can begin at any stage of the project cycle and can last and

continue to be the cost of use becomes more than possible and that can be won by their usefulness, and as the project progresses less risk and thus the effectiveness of the use of analysis and risk management tend to shrink so it is advisable to be used in the early phases of the project lifecycle [4]. Also known as the field reached to prevent the risk and reduce the size of the losses when they occur and to not be repeated through the study of the causes of each risk to be avoided in the future, as a risk management extends to the fund-raising to make up for the project for the losses that occur in order not to stop working and production [9].

2.3. Risk management techniques and stages:

There are many techniques for each stage of risk management, as it requires no action on risk management tools for application [10], and these stages are:

- Stage risk identification: using the brainstorming technique (Brainstorming) and (checklist) significantly more than any other techniques, the questionnaire is also of the techniques used in this area .

- Risk analysis and evaluation phase: the techniques used are classified at this stage into two types: the qualitative and quantitative as it used qualitative techniques more than quantity. And also the probability impact matrix and the way the Analytical Hierarchical Process.

- Responding to the risks mentioned by many researchers that stage there are four ways to respond to the risks in construction projects:

Risks retention , risk reduction , risk transfer and risk avoidance .

- Control Risks replies: respond to changes in risk over the duration of the project.

2.4. Risk classification:

Exposed construction projects to the many risks that affect the goals of the project duration, cost, quality, and prevent the realization classifies many researchers, including a researcher these risks to several categories, as follows.

Table 1. Causative factors for compensation claims and extension in construction projects

No	The main factors that cause claims	the type of claim according to damage	The factors that cause claims
1	Reasons for returning to the contract documents	extension and compensation	1. there is a shortage in the contract documents
		compensation	2. there is an error in the contract documents
		compensation	3. there is a conflict between the contract documents
		compensation	4. disagreement over the interpretation of contract documents
2	Reasons for returning to the changes and change orders	extension and compensation	5. Implementation of additional work within or outside the percentage specified
		extension and compensation	6. Implementation of additional work was not covered by contractor
		extension and compensation	7. change the specifications or designs
		extension and compensation	8. Quantitative and qualitative changes
3	Delays from the employer	compensation	9. delay in obtaining approvals necessary for the implementation of entrepreneurship and approvals
		compensation	10. delay the processing of materials, devices and equipment that the employer pledged processed
		extension and compensation	11. delay payments to the contractor
		compensation	12. Delays in obtaining the necessary approvals to implement the contract and approvals
		compensation	13. Delay the processing of materials, devices and equipment that the employer pledge to processing
4	Unexpected circumstances	compensation	14. The difference in the nature of the site

		compensation	15. government decisions and instructions
		compensation	16. economic changes (rising material prices, higher inflation rates)
5	Reasons beyond the control of the employer and the contractor	extension	17. The existence of difficult climatic conditions
		extension	18. exceptional circumstances (except for the climate) or artificial obstacle the contractor can address
		extension	18. delays due to subcontractor named
		extension	19. delays due to the decisions and instructions of the central state
6	Other reasons	extension and compensation	20. temporary suspension of work
		extension and compensation	21. conflict with other acts
		extension and compensation	22. differences on the settlement contractor account in case withdrawal labour or termination of contract
		extension and compensation	23. Exposure to compensation claims to date back to the other Party
		extension and compensation	24. Speed up work
		extension and compensation	25. delay the delivery site and login approvals
		extension and compensation	26. delays due to the implementation of the orders and instructions of the architect of the employer

3. - The benefits of the application of analysis and risk management:

One of the main benefits that can be achieved in the process of analysis and risk management in construction projects are [10].

- A good understanding of the project and this understanding leads us to realistic and logical plans to estimate the cost of the project and determine the duration of the project, and that this understanding can be for all parties related to the project to learn to deal with those risks.
- A good understanding of the risks helps to choose the most appropriate for the type of contract.
- Knowledge of the risks in the project to enable an estimate logical thoughtful away from the random emergency reserve, which actually reflects the risk and directed not to encourage acceptance ineffective projects financially.
- Contribute to building statistical information risk help design good projects.
- Facilitate the adoption of the serious risks to the reasonableness of more than more than interest earned from taking risks.
- Helping to distinguish between luck and good governance and the bad luck and bad management.

4. - Data collection and analysis

The questionnaire of was distributed either personally or via e-mail to 30 members of top and middle management in the construction project managers and engineers in the advisory offices and construction companies and university professors. A sample of 30 practitioners received the questionnaire and 26 valid questionnaires were returned for analysis with a response rate of 87%.

4.1. Risk identification

It has been identified threat that actually happened in the construction projects under study, which included (municipal projects, roads, bridges, buildings, oil projects, school buildings) in the city of Karbala in addition to the theoretical review of the research literature and a number of interviews with experts in the field of construction industry and the results of the questionnaire. And the risk that led to changes in the cost, time and quality of the project

4.2. The impact of the risks in the project's objectives.

It adopted in this research two criteria in risk analysis:

The likelihood of risk occurrence.

- The degree of risk the impact of the project objectives have occurred if those risks.

Integrate the two criteria in the following equation to estimate the importance of the risk for the degree of risk

[6]:

$$R = P * I$$

Whereas:

R = Risk index or degree of the risk, and a value between (0,1).

P = The probability of risk occurring and a value between (0,1)

I = The impact of the risk, and a value between (0,1).

Risk and impact assessment is according to the following themes:

1 - General information for members of the selected sample (competence, the labor sector career center, the number of years of experience) as in tables 2 and 3.

Table 2. Academic achievement for members of the sample

Academic achievement	Repetition	Percentage
Bachelor of Engineering	14	54
Master Engineering	8	31
Doctor of Engineering	4	15
Total	26	100

Table 3. Years of Experience to members sample

Years of Experience	Repetition	Percentage	
3 - 8	4	15	50 % less than 15 years
8 - 15	8	31	
More than 15	14	54	50 % more than 15 years
Total			

2 - Description scale used for the probability of occurrence and impact of the risk, as follows:

Table 4. Probability and Influence

	Very few	Few	medium	high	Very high
Probability	0.1	0.3	0.5	0.7	0.9
Influence	0.05	0.1	0.2	0.4	0.8

This measure is placed depending on the status scale (the US National Institute of Standards, 2004) - Determine the probability of the risk occurring and the proportion of the effect of risk on the project goals.

4. - To determine the response action taken to address those risks Type.

Taking the opinion of construction project managers and engineers in the advisory offices and construction companies both public and private sector, university professors, support questionnaire personal interviews recovered, 36 of which form adopted for the purposes of analysis.

4.2.1. Analysis and data processing:

The use of accounting software (Excel) for data processing. In order to benefit from these results and standardization to be of a uniform standard were given weights equivalent to the type certificate and the number of years of experience, as shown in Table 5.

Table 5. WEights equation for members of the sample (Hussain, 2001)

Personal information public	Description of data	Equivalent weight
Academic achievement	BA	1
	M.A	1.25
	Doctorate	1.5
Experience	less than 15 years	1
	more than 15 years	2

The application of the following equations can be used in the calculation of answers probability rate and the impact of risk:

The probability of the occurrence rate of risk =

$$= \frac{\text{Sum(probability of occurrence of risk} \times \text{recurrence risk)}}{\text{Sum duplicates}} \quad (1)$$

The impact of risk occurrence rat

$$\frac{\text{Sum (impact of risk occurrence} \times \text{recurrence risk)}}{\text{Sum duplicates}} \quad (2)$$

Whereas:

The probability of the impact of the risk probability of occurrence of risk = Standard values each.

Recurrence = Number of repetition of certain answer multiplied by weights equation for each answer.

Sum duplicates = the cumulative total of the occurrences of all the factors with weights.

Has been arranged in descending order of risk index values as in the table number 7, where it is clear that the likelihood of risk occurrence. There are several measures of the probability of impact when replacing the scale qualitative numbers when loading the statistical measure has been adopted the following [9]:

Table 6. Scale and percentage of the field

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

It was determined based on the level of importance of this measure of the likelihood and impact of risks and in accordance with the principle of calculating the difference between the largest value Index risk and the smallest value from the table if the No. 4 and the symbol to him the letter D and this principle can be relied upon and to define the limits of Risk index for the purpose of processing, according to the designated resources, as follows:

$$D = 0.799943 - 0.001855 = 0.798088$$

Table 7. Descending order of risk depending on the level of importance Index

No	Risks	Probability	impact	Risk Index	Significance level
1	Failure to pay money to companies and contractors	0.9674	0.8269	0.799943	Very high
2	Delays in the receipt of financial advances to companies and contractors	0.7558	0.4793	0.362254	High importance
3	Delayed decision-making by the employer (approvals)	0.7327	0.4884	0.357850	
4	The presence of pipes, tubes and cables for sewer services, communications or other	0.5321	0.232	0.123447	Medium importance
5	Religious holidays sudden events	0.5336	0.2236	0.119312	
6	Poor coordination and communication between the employer and companies	0.5271	0.2231	0.117596	
7	Delays in the completion of design changes	0.5105	0.2142	0.109349	
8	Differences in quantities between design and speculative detection	0.5016	0.2053	0.102978	
9	Lack of clarity in contractual obligations	0.3674	0.1602	0.058857	
10	The late arrival of some materials and equipment from the country of origin	0.355	0.1568	0.055664	
11	Delayed delivery of location for companies	0.3427	0.1432	0.049074	
12	Direct action by the companies delayed	0.3316	0.1325	0.043937	
13	Delayed delivery of operational advances by companies	0.3211	0.1241	0.039848	
14	The deterioration of the security situation in the city	0.3132	0.114	0.035704	
15	Bad weather conditions	0.3045	0.1002	0.030510	Very low importance
16	Cause internal problems between team members	0.2114	0.0482	0.010189	
17	Scheduling inaccurate project	0.1931	0.0401	0.007743	
18	A slight rise in prices of construction materials	0.1872	0.0373	0.006982	
19	The difficulty of access to the site	0.1588	0.0302	0.004795	

20	Delayed the implementation of some clauses of the project	0.1329	0.0286	0.003801	
21	A slight difference of course the ground	0.1243	0.0203	0.002532	
22	Failure to allocate a place to throw the rubble	0.0982	0.0189	0.001855	

And so can the minimum and maximum index of risk calculation (area) at each level, as in the table (8) note that the figures are rounded to four orders of ease, so the upper limit for each group is the minimum for a group of risk that followed in importance, is located index risk is very low importance between (0.0018 and 0.0101), while the low importance risk indicator is located between (0.0305 and 0.0588), and so on, and has been the risks are ranked according to the level of importance in the grandfather well No. 4, where is located top importance first, the risk (Failure to pay money to companies and contractors and others) is an important indicator of very high (0.799943), and this reflects the importance of addressing these risks. The risk (Failure to allocate a place to throw the rubble), the index (0.001855), meaning that the level of significance is very low in the goals of the project.

Table 8. Limits the risk index for each level of importance

Significance level	minimum	maximum
Very low importance	0.001855	0.010189
Low importance	0.030510	0.058857
Medium importance	0.102978	0.123447
High importance	0.357850	0.362254
Very high importance	0.799943	0.799943

Table 9. Matrix (probability - effect) or qualitative risk [7], [10]

A certain measure of risk danger					
possibility	Degree of risk (risk factor) = P*I				
0.9	0.05	0.09	0.18	0.36	0.72
0.7	0.04	0.07	0.14	0.28	0.56
0.5	0.03	0.05	0.10	0.20	0.40
0.3	0.02	0.03	0.06	0.12	0.24
0.1	0.01	0.01	0.02	0.04	0.08
	0.05	0.10	0.20	0.40	0.80
The impact on one of the goals (such as cost, time or achievement scale)					

Table 10 shows that the controllable risk sources as identified in the study could be further broken down into six sub-categories: Reasons for returning to the contract documents, Reasons for returning to the changes and change orders, Delays from the employer, Unexpected circumstances, Reasons beyond the control of the employer and the contractor, Other reasons .

Table 10. Risk categories

No	Categories	Impact 0.05 (very low)- 0.8 (very high)	Probabilit y 0.1 (rare)- 0.9 (very high)
Reasons for returning to the contract documents			
C 1	1. there is a shortage in the contract documents	0.2231	0.5271
C 2	2. there is an error in the contract documents	0.2142	0.5105
C 3	3. there is a conflict between the contract documents	0.2053	0.5016
C 4	4. disagreement over the interpretation of contract documents	0.1602	0.3674
Reasons for returning to the changes and change orders			
R 1	5. Implementation of additional work within or outside the percentage specified	0.1568	0.355
R 2	6. Implementation of additional work was not covered by contractor	0.1432	0.3427
R 3	7. change the specifications or designs	0.1325	0.3316
R 4	8. Quantitative and qualitative changes	0.1241	0.3211

Delays from the employer			
D 1	9. delay in obtaining approvals necessary for the implementation of entrepreneurship and approvals	0.8269	0.9674
D 2	10. delay the processing of materials, devices and equipment that the employer pledged processed	0.4793	0.7558
D 3	11. delay payments to the contractor	0.4884	0.7327
D 4	12. Delays in obtaining the necessary approvals to implement the contract and approvals	0.232	0.5321
D 5	13. Delay the processing of materials, devices and equipment that the employer pledge to processing	0.2236	0.5336
Unexpected circumstances			
U 1	14. The difference in the nature of the site	0.114	0.3132
U 2	15. government decisions and instructions	0.1002	0.3045
U 3	16. economic changes (rising material prices, higher inflation rates)	0.0482	0.2114
Reasons beyond the control of the employer and the contractor			
B 1	17. The existence of difficult climatic conditions	0.0401	0.1931
B 2	18. exceptional circumstances (except for the climate) or artificial obstacle the contractor can address	0.0373	0.1872
B 3	18. delays due to subcontractor named	0.0302	0.1588
B 4	19. delays due to the decisions and instructions of the central state	0.0286	0.1329
Other reasons			
O 1	20. temporary suspension of work	0.0286	0.1329
O 2	21. conflict with other acts	0.0203	0.1243
O 3	22. differences on the settlement contractor account in case withdrawal labour or termination of contract	0.0189	0.0982

Table 11. Risk matrix

A certain measure of risk danger					
Probability					
0.9					D1
0.7				D2,D3	
0.5			C1,C2,C3,D4,D 5		
0.3		C4,R1,R2, R3,R4,U1,U2,			
0.1	U3,B1,B2,B3,B 4, O1,O2,03				
	0.05	0.10	0.20	0.4	0.8
	The impact				

Once the risks and probabilities are determined, the risk score can be calculated. The risk score is detailed in Table 8. The probability and impact matrix (Table 9) illustrates a risk rating assignment for individual risk factors in the identified risks categories. The risk matrix shows the combination of impact and probability that in turn yield a risk priority (shown by the white, gray, and black colour). Qualitative risk analysis can lead to further analysis in quantitative risk analysis or directly to risk response planning.

Conclusions and recommendations:

I've been studying the risks that have already occurred in a number of construction projects has reached the effect of research to many of the most important conclusions of the following:

1.- It was observed that the risks occur at all stages of the achievement of the project are concentrated in the implementation phase.

2.- The risks were distributed so unevenly on all kinds of contracts and construction works covered by the research.

3.- The more the number of occurrences of the risks in these projects is the financial risk, followed by artistic followed by spatial risk and regulatory and political.

4.- The total maximum risk was combined in road projects, bridges and other projects were the lowest numbers.

5.- It was noted that there is precedence for the occurrence of the risk has been organized in the work program for referring to the need to take action before responding to others.

6.- It was also noted that the value of precedence vary depending on the stage and depending on the contract and construction work which shows the close relationship

Between risk and these themes.

The researcher also recommends a number of recommendations including:

1.- Need to focus on studying the risks and their impact since the early stages of the project.

2.- The need for attention to the primacy of these risks occurring to focus on the management of the most important of them, then it is important.

3.- The need for attention to the relationship between the priority of risk occurrence and stage of achievement of the project and the type of contract and construction work.

4.- The use of advanced software and sophisticated know the priority of risk occurrence and management.

Список литературы на английском языке / References in English

1. *Malcolm N.E. and McKennon J.A.* Process Driven Approach to Integrate Environments, Proceedings INCOSE International Symposium, 1997. 52 p.
2. Duncan Cartlidge Frice. Quantity Surveyor's Project Book, First Edition, Elsevier Science and Technology, Department in Oxford. UK, 2009. 227 p.
3. Lewis James P. Project Planning, Scheduling and Control a Hands-On Guide o Bringing Projects in On Time and On Budget, Third Edition, McGraw-Hill Companies. Inc-U.S.E, 2001. 218 p.
4. Taylor I. and Bassler. Application J. of ANSI Standard to Space Station Resources, Proceedings INOSE International, 1997. 25 p.
5. Mohammad A. Mustafa, Jamal F. Al-Bahar. Project Risk Analytic Assessment Using the Hierarchy Process, IEEE, 1991.18 p.
6. Whitticksu Edward. Construction Contracts, Gulf publishing company, 2005. 37 p.
7. Project Management Institute. Guide to the project management body of knowledge (PMBOK® Guide). 4th ed. Newtown Square: Project Management Institute; 2008. 78 p.
8. Mona Hamada, Dr. Mohammad Naifeh and Dr. Omar Aamori, "construction for construction projects in Syria risk management", Damascus University Journal of Science and Engineering, Volume VIII Twenty, First Issue 2012.
9. Dr. Atef Abdel Moneim and Mohammed Mahmoud Kashif, "risk management evaluation," University of Cairo in 2000. 97 p.
10. Alaa Muhsin Mahdi. Causing the risk of claims in government construction project management, Master Thesis, Faculty of Engineering, University of Baghdad in 2013. 37 p.