Investigating and evaluating the effectiveness of project management on disaster management in civil projects

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ABSTRACT

This article examines and evaluates the effectiveness of project management on crisis management in construction projects. In this article, the role and importance of project management and crisis management in construction projects have been examined in detail. First, the role and importance of project management in construction projects have been explained. Project management includes planning, setting resources, controlling costs, and scheduling, which helps to achieve desired results within the time frame and budget. Also, the principles and techniques of project management have been shown to improve project performance, reduce errors, and increase the satisfaction of the organizer and other stakeholders. Then, the role and importance of crisis management in construction projects have been investigated. Crisis management includes identifying and analyzing risks, designing and implementing emergency plans, and controlling and resolving the consequences of accidents. The statistical population of this research includes 180 personnel working in the construction projects offices of General Mechanics Company. Considering the characteristics of the statistical population and the small number and availability of all members, a simple random sampling method was chosen. The reliability of the questionnaire was obtained using Cronbach's alpha coefficient of 0.96 for the crisis management standards questionnaire and 0.97 for project management achievements. We accept the distribution status of the variables using the Kolomogrov and Smirnov tests, which were all normal based on the main hypothesis that project management and crisis management have a meaningful relationship, and based on the results, only the impact of planning dimension and control dimension of communication management on crisis management is significant. And only after project management planning has an impact on crisis management. Finally, the effectiveness of project management on crisis management in construction projects has been discussed. According to the analysis of data and reports, the results have shown that improvement in project management leads to significant improvement in crisis management. This improvement includes reducing the probability of accidents.

Keywords: Project management, crisis management, management effectiveness, construction projects.

1. Introduction

Project management and disaster management are two very important factors in civil projects. Project management is done to plan, organize, and control activities and resources in a project. On the other hand, disaster management is used to identify, evaluate and control any unwanted and unfortunate events during the implementation of a project.[6]

Considering that civil projects are associated with the formation of sensitive and large buildings and infrastructures, the risks and unwanted events in these types of projects are very noticeable. In addition, the high cost of building such a project makes employers, criminals, and other stakeholders pay special attention to disaster management to reduce risks and increase productivity in project implementation. [2]

Therefore, the issue discussed in this article is to investigate and evaluate the effectiveness of project management on disaster management in construction projects. Considering that when a crisis occurs, the role of the project manager in identifying and controlling it is very important, it is necessary to measure the impact of various project management factors (such as resource budget, schedule, staff, and technology) on the manager's performance in identifying and reducing risks and unwanted events of the construction project. [3]

The occurrence of unpredictable events and the occurrence of economic, social, political, and military risks and accidents is a fact that mankind has been familiar with throughout history. In this regard, no matter how much technological and social success has been achieved, the incidence of these unexpected risks has not only not decreased, but has also increased in many cases. The industrialization of societies and the expansion of satellite communications and information transfers on a large scale, as well as the expansion of social, economic, and commercial organizations, have caused most crises to become institutionalized, in fact, they have become an inseparable part of the internal nature of organizations. Therefore, it can be seen that in most cases, the increase in the complexity and production capacity of these organizations has made the strengthening of such situations inevitable [3].

Today, the country's project management community has become aware of the necessity of adopting a scientific approach in the implementation and operation of projects, and fortunately, we are witnessing that defensible projects are being implemented in the global arena. However, we still need significant improvements in many areas to reach global standards. The desire and enthusiasm to learn and get to know the current knowledge of project management among different groups active in the country's projects is a source of hope for gaining more worthy positions in the future. [6]

Project scope management includes the processes required to ensure that all required tasks, and only those required for the successful completion of the project, are included in the schedules. Project scope management is essentially about defining and controlling what the project includes and what it does not include. [5]

1-**1statement problem**

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One of the characteristics of the economic development of any country is its construction plans, which are considered a major criterion and indicator of the economic prosperity of that country. Therefore, the progress, prosperity, and excellence of a nation depend a lot on the success of the construction plans of that country, and it requires success in the implementation of construction plans, mechanisms, and factors so that the cycle of affairs ends in a favorable way with the least cost and the most profit. [12] Project management is one of the special tools for the success of complex activities such as projects. The success of project management is related to the final results of projects. The goals of project management include controlling the time, cost, and progress of projects. project management is a process to control the success of achieving project goals [1].

The traditional approach to disaster management was to believe that disaster management means putting out the fire; This means that disaster managers wait for things to go wrong and after the destruction occurs, they try to limit the damage caused by the failures. But recently, the attitude towards this word has changed. Based on the latter meaning, a set of practical plans and plans should always be prepared to deal with possible future developments, and managers should think about possible future developments and be prepared to face unforeseen events. [2]

Of course, it should also be kept in mind that the generators of disaster are risks and opportunities. disaster indicates an obstacle, harm, threat, and opportunity for growth or decline. Sometimes the crises that arise in the framework of the project, in addition to being very complex and extensive, also have a very large scope of effect, as a result, they can disrupt the order, integrity, and processes of a project. [8]

1-1 significant of research

Today, disaster management is an essential part of the strategic management of construction projects. Before pursuing any long-term project goals, disaster management is necessary to ensure the stability and success of a construction project. projects that are exposed to crisis need more preparation for it. Effective crisis management requires a regular and systematic approach that is based on vigilance, managerial sensitivity, and a good understanding of the importance of detailed planning and organizational preparation of the project.

1-2 Research hypotheses

1-3-1 The main hypothesis

1- Project management and disaster management have a significant relationship.

2- 1-3-2 Sub-hypothesis

Project management dimensions have an impact on disaster management.

1-4 Conceptual model of research

All research studies are based on a conceptual framework that defines the desired variables and the relationships between them.

Chart No. 2: Conceptual model of disaster management

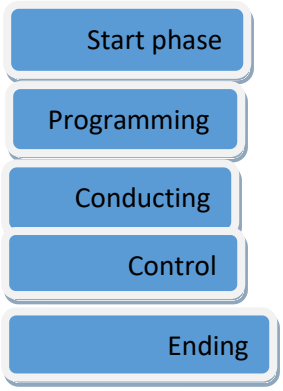

Chart No. 3: Conceptual model of disaster management

2-Research Methodology

Scientific research is conducted to understand a phenomenon in a statistical population. The statistical population consists of all the elements and people who have one or more characteristics on a specific geographic scale (global, regional, local, or spatial). The members of the community of this research include the personnel working in the offices of the construction projects of General Mechanical Company, whose total number is about 180 people. For the present research, according to the situation of the people, the stratified sampling method was determined according to the size due to the limited number of members of the statistical community, and the sample is to be selected proportionally from all the studied companies.

According to the sample size of 180 people, 123 people have been determined, so we can continue the work by selecting 123 people from the personnel working in the construction projects offices of General Mechanic Company.

In this research, Cronbach's alpha coefficient was used to confirm the reliability of the data collection tool, namely the questionnaire.

Cronbach's alpha formula 1:

$$ra = \frac{j}{j-1}\left(1 - \frac{\sum S^2 j}{S^2}\right)$$

To analyze the data and test the research hypotheses, statistical methods of one-sample t-test were used to identify the status of the research variables, and confirmatory factor analysis was used to measure the measurement models. Finally, regression and structural equations were used to test the validity of the research. SPSS 22 statistical software was used to perform these analyses.

3- Basics and background of research

A crisis is an unknown risk that is not part of the project's goal and is not even part of the crisis management plan. The main purpose for dreaming about unknowns and crises is not to fail against them and to be equipped with the necessary equipment to recover from their occurrence. [6]

3-1 Project Management

Project management (in English: Project management) allocation, follow-up, and use of resources to achieve specific goals in a specific period is called project management. In other words, project management is the application of knowledge, skills, tools, and techniques for project activities to fulfill project requirements. [9]

It is a process to maintain the project path, to achieve an economic and justified balance between the three factors of cost, time and quality, during the implementation of the project, which takes help from its special tools and techniques in

doing this. it is the control of the exact and complete implementation of the program developed for the project so that when leaving the program, the project can be returned to the closest possible state to its original path by identifying the causes and planning the most economical activities. In this way, project control uses the following three factors. [11]

1- Determining the actual status of the project
2- Comparing the actual situation with the plan
3- Consider corrective action

Engineering Project Management (in English: Project Management and Construction) is a combination of science, art, and technology, and it is designed for training to carry out activities of preparation, supervision and implementation of projects, especially construction projects. The main specialty of project management engineering is its interdisciplinary nature. This field is a combination of civil, industrial, and management fields. [10]

There are many methods and plans for project management, which are adopted depending on the type of project and its special conditions. The way the project is managed has a direct impact on achieving its goals. Although the project management approach is a completely contingent approach, by formulating the issue, it is possible to ensure the correctness of the decisions made.

The history of project management in the world is usually related to the management of huge projects such as the construction of the Egyptian pyramids, the Great Wall of China, and the construction of Persepolis by the order of Darius. Each of the projects is among the large and most complex projects in the history of mankind, which are built with high standard quality and the employment of huge human resources. By order of Koresh Kabir, the engineers, and builders of Pasargad were required to present their work description and also their work plan for the next day in tablets known as Karnamek. [12]

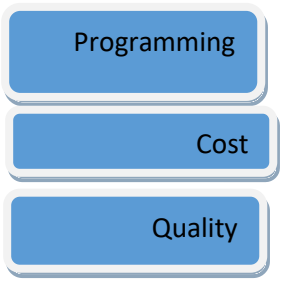

Diagram number 4: project control triangle

Project management is the most important part of a successful project and it causes order and discipline in planning, organizing, providing and managing resources and provides them for the successful completion of specific goals and objectives of the project. Traditionally, these constraints are expressed as priority, time, and cost. The concept of construction project management has deep roots in the construction and procurement system.

3-2disaster management

A series of natural and unnatural factors including storms, earthquakes, leakage of gases or dangerous substances, technological inefficiencies, invasions, landslides, floods, storms, massive fires, infectious diseases, epidemics, inefficiencies or non-use of

emergency services, possible or actual attacks or something similar to war, etc., have occurred and caused the endangerment of human lives or vulnerability, disease, disaster or endangering the security of communities or national and public property, and only through the relevant services. The crisis cannot be dealt with and requires a serious response or coordination from other organizations that cooperate in the field. the occurrence of any kind of unusual situation at the level of society can be considered a crisis. [10]

A disaster is an unknown risk that is not part of the project's goal and is not even part of the disaster management plan. These unknown things do not happen only because of the conditions that cause them to happen and have not been experienced before, but because the project team did not adequately anticipate, analyze, or challenge the possibilities and risks of unprecedented issues. [13]

Some risks are time-dependent, others are development-dependent, and others are only residual risks after risk reduction. Incidents and events that are unknown in nature and various currents are included in this category and a detailed evaluation is needed for them. An event must be evaluated according to impact, occurrence, flow and similarity to be considered as unknown. When all these areas are not covered by any crisis management plan, we can call them unknowns. [4]

3-2-1 disaster assessment

The disaster management process is a special task that requires management approval and a disaster response plan. Some of the common tools used during the evaluation process are as follows:

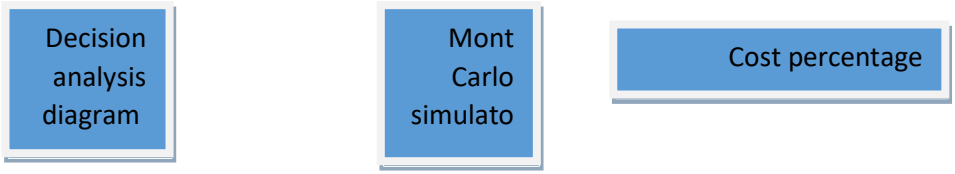

Chart No. 5: Common disaster assessment tools

Disaster management programs set powerful forces in motion that reinforce each other. As organizations become more complex, managers are more likely to face increasing opportunities and threats, stronger competitive forces, and less opportunity to react. In this situation, the negligence of the employees may also increase; therefore, managers are forced to use all the available tools and methods to control the situation. Managers must make sure that the increase in creativity and innovation is not achieved at the cost of losing control of affairs. Two important mistakes that usually occur when facing a crisis and increase the damage caused by the disaster are: [14]

1- Ignoring the first warning signs
2- Denying the existence of a problem, when an unfortunate incident is happening.
3- disaster management programs should effectively prevent such mistakes from occurring.

row	Describe
1	Minimizing the adverse outcomes of the crisis
2	Creating the necessary preparation to face

	the crisis
3	Raising the ability needed to control the crisis
4	Giving managers the opportunity to assess the crisis
5	Information about the level of the crisis

3-3 background research

S. Reus et al. (2014) in research titled "Project Management Competencies for Regional Development in Romania: Analyzes of the 'Working with People' Model". The results show that the main skills, abilities, and capacities for regional development in Romania are focused on three products, which are: technical, entrepreneurship, social, moral, and political context.

Avisu et al. (2018) in research entitled "Allocation of human resources in organizations under disaster conditions: Fuzzy optimal modeling framework" in this research, the results show how the proposed fuzzy input-output optimization model can provide decision support for practitioners in the industry to reduce the effects of human resource shortages on business continuity during the disaster.

Tobiaso colleagues (2015) in a research titled "Relationship between human characteristics and the adoption of project management information systems in non-governmental organization projects in Nakuru city (Kenya)" purpose of this research is to determine the relationship between human characteristics and the adoption of PMIS project management information systems in non-governmental organization projects in Nakuru city. The independent variable (human characteristics) was modeled in the following cases: resistance to change, project management skills, user skills and awareness, power struggles, and perfectionism. These indicators were individually related to the adoption of the project management information system.

4- Research findings

4-1 main hypothesis

If we assume that:

Y- Criterion variable (dependent), crisis management

X- Predictor variable (independent), project management

H0: Project management and disaster management have no meaningful relationship.

H1: Project management and disaster management have no meaningful relationship.

4-2 Sub-hypothesis

If we assume that:

Y: Criterion variable (dependent), disaster management

X: Predictor variable (independent), dimensions of project management

Due to the normality of the distribution of project management and disaster management variables in sample 9, the structural equation test will be used to determine the correlation.

Therefore, we must test the following hypothesis:

H0: The dimensions of project management and disaster management have no significant relationship.

H1: The dimensions of project management and disaster management have a significant relationship.

5- Conclusion

In this article, the effectiveness of project management on crisis management in construction projects has been investigated and evaluated. The research results have shown that project management directly has a significant impact on crisis management in construction projects.

Among the results obtained, the key factors affecting crisis management in construction projects include proper timing, correct resource allocation, compliance with laws and regulations, proper cooperation and coordination with other team members, and the use of proper technology. In addition,

compliance with standards and optimization methods in project management plays a key role in reducing risks and unpleasant incidents during project performance.

According to these results, it can be concluded that project management should be considered an essential factor in crisis management. Careful planning, resource control, and proper coordination with other team members can significantly reduce risks and unpleasant incidents and improve project performance. Therefore, the use of appropriate project management methods and their correct implementation in construction projects can significantly reduce risks and accidents and, as a result, increase the efficiency and performance of the project.

According to the main hypothesis, the impact of project management on crisis management is 69%, which is acceptable, and it is suggested to establish a closer relationship between project management and crisis management.

According to the sub-hypothesis, only the dimension of planning on crisis management is equivalent to 70 percent and significant. The relatively good effect of this dimension indicates that with proper and powerful planning at the beginning of the project, project management can become the arm of crisis management in times of disaster.

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