Total Quality Management in Construction Projects in Jordan

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ABSTRACT

The study aimed to know the effect of comprehensive Total quality management on construction projects in Jordan, and the study population consisted of (50) construction companies in the capital Amman, while the study sample amounted to (69) employees in the upper and middle management of construction companies, and the study used the approach Descriptive and analytical by building a questionnaire dedicated to answering the study’s questions. The results showed that the level of applying Total Quality Management to construction projects in Amman according to the management support, Continuous Improvement and Resource Management to the study sample expectations was middle level. The study recommended the construction companies in Jordan issue legislation that promotes the implementation of the quality policy in establishments at all levels, with the administration following up on the implementation of quality requirements in construction projects.

Keywords: Construction Project, Risk management, Total Quality Management.

I. INTRODUCTION

The construction sector consists of a group of activities related to buildings and engineering constructions of all kinds, and what distinguishes this sector is its close relationship with all other economic sectors, which makes an important indicator of the movement of the national economy, but this sector faces many risks, and these risks may affect the implementation of the project and may lead to delay delivery and increase costs, and sometimes affect the quality.

Industry economic repercussions that lead to reducing production costs of correcting defects and errors and the costs of re-carrying out some rejected works, achieving the owner’s satisfaction and reducing maintenance costs during the period of use, which increases the economic life of their eliminating the costs Facility, as well as the executing company gains confidence in its business, increases its share of the labor market, and allows it to compete and continue.

One of the most important things to think about in the size of the risks that are difficult to avoid or predict or their impact on the increased interest in the topic of risks in this industry in the last two decades, and it has become necessary to understand the nature of risks and analyze them in order to develop a specific strategy to manage and deal with them. Risks management in the construction sector is the process of achieving project goals (time, cost, and quality, occupational and environmental safety). Risk management helps project managers in scheduling their priorities and allocating resources, as well as helping them in decision-making in a more reliable manner, which contributes to the success of the project and the achievement of its objectives.

The construction projects are of a special nature affected by many factors, which makes them exposed to many risks as a result of the length of the implementation period and the multiplicity of stages, starting from the decision stage to the stage of implementation and final delivery, which increases the uncertainty and increases the likelihood of the occurrence of risks. Efficiency that is used in the management of construction companies in order to increase the chances of successfully completing the project in terms of cost, time and effort and with the least possible problems.

II. RESEARCH BACKGROUND

Total quality management is one of the administrative methods and methods used in organizations to face the challenges of the surrounding environment, as it is based on the need for continuous development and improvement of the level of performance through building an organizational culture that makes every worker realize that quality in inputs, processes and outputs is a major goal.

The organizations began to implement the comprehensive quality management strategy as a system or philosophy based on a set of principles that focused directly on customer satisfaction and continuous improvement processes in order to overcome challenges and face the increasing demand for services and products of high quality, as continuous improvement includes all activities and processes practiced by the organization In addition to focusing on clients in various departments and focusing on flexibility and doing the required tasks correctly.
All projects of different types, sizes and activities face risks, and these risks must be managed through identifying, analyzing, evaluating, and controlling them in order to achieve the goal of the project, and successful organizations are the ones who know what risks can be accepted and what risks should be avoided (Karman, 2011).

Construction projects are fraught with risks like any economic project, and they are considered important projects in many countries of the world because of their economic impact, and they also need to provide resources, equipment, materials, manpower, financing, and other construction requirements, so these projects are very vulnerable to risks.

In order to ensure the success of TQM, this requires the top management to show strong commitment to its principles, and to become an effective element in the quality strategy in order to confirm the need for the commitment of the rest of the team members to work, and resources must be identified and distributed to the quality strategy programs in order to show commitment and the top management must study all procedures And processes to solve problems facing quality, and it is necessary to note that commitment to the quality strategy is reflected in the mission and purpose of the organization, and the top management should take the initiative in preparing the initial documents related to the quality strategy and distributing them to all business members (Fatemeh and Mohammad, 2017).

The quality management strategy has become part of the organization’s strategy since the spread of its goals and methods throughout all the organization’s operations, as these concerned organizations are working to design these goals, policies and plans to implement them in the long term, and this affects the organization in several aspects such as the organization’s culture, the competitive situation and the market departments. Defining the special goals and the resources allocated to achieve this stems from the process specified in the strategy, so it can be understood how the strategy that adopts quality permeates all the sites of the organization, and provides the basis for developing plans and achieving effective communication through it (Anas and Gözte, 2018).

The success of implementing TQM depends on the support it receives from the senior management and its adoption of the quality philosophy of all activities and processes it practices and the ability to persuade employees and their influence on them and the commitment of the top management is to enhance the culture of quality and raise the capabilities and capabilities of workers in the performance of jobs and tasks while creating clear strategic visions for the goals When applying the philosophy of total quality management.

This stage is considered the solution, and the data and facts collection and analysis team must work to use creative methods to help the management to change the way of thinking and to extract new ideas (Ali, 2014).

Continuous improvement is considered one of the elements that TQM is concerned with, in order to achieve a state of customer satisfaction, and it is considered a continuous endeavor to apply control standards to the organization’s performance and encourages creativity and innovation. Among the sources that help improvement lies in workers and feedback, and distinguishing from competitors, taking into consideration. Establishing a quality department in the organization, setting specific goals in order to improve quality and providing employees with the skills to make the required improvements, and following up on the achievement of work while linking the improvement to systems of incentives, rewards, promotions, and increasing employee salaries whenever the opportunity arises (Gilawi and Muhammad, 2016).

From the foregoing, it can be said that the continuous improvement of quality is part of the culture, strategy, methods, and methods necessary for the continuous development of the specifications and characteristics of the good or service in a way that makes it exceed the expectations of customers.

Human resources management is the department responsible for increasing the effectiveness of human resources in organizations to achieve the desired goals of the individual, the organization and society, as human resources represent the individuals who are employed by the organization to carry out various tasks, duties, and jobs in exchange for salaries, incentives, and other rewards.

The Human Resources Department is the party responsible for attracting and attracting human resources and working to develop and maintain them, and the importance of human resources lies in their ability to avoid mistakes and not appoint inappropriate people, reduce the rate of work turnover among employees, and raise the level of achievement of workers (Pinto, 2016).

The human resources department will also contribute to achieving many benefits in the organization, such as creating a basic base for the organization’s strategic and plans related to human resources, such as selecting, appointing, compensating, and training them, and discovering the deficit in the capabilities of workers.

From the foregoing, the researcher believes that human resources management contributes to a good choice between multiple alternatives, evaluating the performance of workers and developing their professional skills through training, determining appropriate compensation for workers, stating their rights and organizing relations between them.

The organizations paid great attention to quality, whether in terms of its concept, application, or obtaining its results, because of the positive results that the organizations had touched on their performance, achieving a competitive advantage for them, and quality became one of the most important strategic dimensions of the organization and considered it an important part of it, and this interest in quality led to the development of its methods and tools (Francis et al., 2019) and began working in the quality system for projects in 1919 AD, and it became a requirement for all organizations that seek to deal with partners and suppliers, and there are two types of concern for quality, the first is accused of improving the quality of the current used processes, while the second type is accused of applying high quality standards to the activities themselves which Reflect on performance.

The basic knowledge, statistics and procedures used in quality control help the project manager to understand the objectives and performance of the project in companies that adhere to high quality standards (Fisk and Reynolds, 2014).
III. METHODOLOGY

The research method used is the quantitative method, where the aim of the research based on this type of research is to test the hypothesis of the impact of Total Quality management in Construction Project in Jordan with employees from each department as respondents. The time dimension defined in this study is the cross section, which is examined over a period or year using experimental data from several research objects. SPSS was used to test the hypotheses. For data collection this paper used a survey design, where the questionnaire random sample distributed to employees in infrastructure contracting companies in Jordan for a period of 30 minutes. The paper tool was designed in Arabic and English, and it was presented to 6 experts in the field of study, while the Verify data validity and reliability.

A. Survey

The questionnaire is a data collection technique that is conducted by presenting a set of questions or written questions to the respondent, in this case the employees of Construction Project companies in Jordan. However, the questionnaire divides to four sections. First section is demographic variable, which include the respondent's gender, age, education, Job position, Experience. Second section is comprehensive quality management requirements dimensions which was (18) items representing the three dimensions; Management support, Continuous Improvement, Resource Management, and Construction project dimensions which was (5) items. Moreover, the table below shows the mean and the standard deviation about Demographic Sample Characteristic.

Table I below shows the frequencies and percentage of the respondent answer about the gender, the results were higher for (Male), and the lowest for (Female). Moreover, age level was higher for (20≤ 30 years) and the lowest for (More than 51 years). Furthermore, the results found scientific qualification were higher for (bachelors) degree and the lowest for (Diploma) degree. Work position was higher for (Employee) and the lowest for (department chief). The experience results were higher for (Less than 5 years), the lowest for (More than 16 years).

| Variable       | Categories      | Redundant | Percentage% |
|----------------|-----------------|-----------|-------------|
| Sex            | Male            | 43        | 62.3%       |
|                | Female          | 26        | 37.7%       |
| Age            | 20≤ 30 years    | 32        | 46.4%       |
|                | 31≤ 40 years    | 24        | 34.8%       |
|                | 41≤ 50 years    | 10        | %14.5       |
|                | More than 51 years | 3        | %4.3        |
| Scientific qualification | Diploma or less | 3 | %4.3 |
|                | Bachelor degree | 39        | %56.5       |
|                | High diploma   | 5         | %7.2        |
|                | Higher education| 22        | %31.9       |
| Work position  | Employee        | 39        | %26.5       |
|                | supervisor      | 13        | %18.8       |
|                | Department manager | 9        | %13         |
|                | department chief | 8         | %11.6       |
| Years of experience | less than 5 years | 30 | 43.5% |
|                | 6≤ 10 years     | 22        | 31.9%       |
|                | 11≤ 15 years    | 10        | %14.5       |
|                | More than 16 years | 7        | 10.1%       |

The analysis was done also for the second moderator variable which is Competitiveness. Showing the values ranged between (0.95-0.84) for the study tool and score of Management support scores (0.95), Stages of the Continuous Improvement scores (0.92) and Resource Management scores (0.88), Construction project scores (0.84). The values score more than 0.60 (Zikmund-Fisher et al., 2013) which means that there is internal consistency between the questionnaire items.

B. Collinearity Test

Collinearity is a condition in which some of the independent variables are highly correlated because Collinearity tends to inflate the variance of at least one estimated regression coefficient. To ensure that there is no collinearity problem in relationship between the independent variables, variance inflation factor (VIF) was calculated. The variance inflation factor (VIF) statistically quantifies the severity of Multi-Collinearity in an ordinary least squares regression analysis. It shows the measures of how much the variance of an estimated regression coefficient is increased because of collinearity. For total quality management, the values of VIF are less than 5 ranged between (1.12-1.60), whereas, implementation of the Management support scores (1.38), Stages of the Continuous Improvement scores (7.28) and Resource management scores (6.23). This indicates that there is no highly relationship between Total quality dimensions and there is no Collinearity problem in these variables. According to Kaiser (1981), value of $VIF = 1/Tolerance$ must be less than 10. However, there is no highly relationship between total quality and Construction Project dimensions and there is no collinearity problem in these variables.

IV. RESULT

The analytical section in this paper includes the relationship between the variables and hypothesis testing which requires certain statistical techniques. However, the Means and Std. Deviation of the sample’s estimates about the items of the dimension “management Support” ranged between (3.23-3.69) with a middle evaluation score, and item (6) Came first, which states “Supports senior management by focusing on customer satisfaction and the quality of their projects” with the mean of (3.69) with a Middle degree. Item (2) is on the last rank, which states “senior management attaches the utmost importance to quality as one of the top priorities” with the Mean of (3.23) with a Middle degree, and the mean of the dimension as a whole is (3.49) with a Middle evaluation score.

In addition, the Means and Std. Deviation of the sample’s estimates about the items of the dimension “Continuous Improvement” ranged between (3.24-3.40) with middle evaluation score, and item (4) Came first, which states “The
company is keen to continuously improve in reducing the time of service to the customer” with the mean of (3.40) with a middle degree. Item (2) is on the last rank, which states “The company determines the resources necessary to implement and maintain the comprehensive quality management system,” with the mean of (3.30) with a middle degree. Item (5) is on the last rank, which states “The company has the ability to raise the level of performance.” with the Mean of (3.29) with a middle evaluation score.

The Means and Std. Deviation of the sample’s estimates about the items of the dimension “Resource Management” ranged between (0.304-3.30) with a middle evaluation score, and item (1) Came first, which states “The company determines the resources necessary to implement and maintain the comprehensive quality management system,” with the mean of (3.30) with a middle degree. Item (5) is on the last rank, which states “The company has the ability to raise the level of performance.” with the Mean of (3.04) with a middle degree, and the mean of the dimension as a whole is (3.17) with a middle evaluation score.

A. Hypothesis Testing

The First Main Hypothesis: There is no statistically significant effect at the significance level (α ≥0.05) for total quality management in terms of its dimensions (Management Support, Continuous Improvement, Resource Management) on construction projects in terms of their combined dimensions (Cost, Time, Quality, Work Safety).

The researcher Confirm from the validity study model to use multiple regression analysis. The value of (F) and its significance were Recruit, as indicated in Table III. The value of (F = 72.353) had a significant level of less than 0.05, which confirms that the components of the three models (management support, Continuous improvement, resource management) was able to explain the variation in the level of construction projects, indicating the validity of the model and then the possibility of performing a multiple regression analysis on the study data.

First Sub-Hypothesis: There is no effect at the significance level (α ≥0.05) for total quality management in terms of (Management Support) on construction projects in terms of their combined dimensions (Cost, Time, Quality, and Work Safety).

To test this hypothesis, the researcher used a simple linear regression analysis to measure the impact of Continuous improvement in terms of their dimensions (cost, time, quality, work safety) on construction projects in Amman.

Table IV shows that the calculated value of (F) amounted to (325.106), which is a statistically significant of the level of significance (α ≥0.05), and from it the validity of the first sub-hypothesis test model is valid.

The results of the previous table also showed that the value of the coefficient of determination = (R²) (0.495), and this is explained by the fact that the effect of total quality management in terms of management support paragraph explains (49.5%) of the variance in the variable dependent on construction projects, and the Beta value indicates (0.687) indicates that an increase of one unit in the independent variable leads to an increase in the dependent variable in terms of the calculated value (T) of (18.624), which is a statistically significant value at the level of significance (α ≥0.05).

From the above, the results of the hypothesis test showed, that the main null hypothesis was rejected, and the alternative hypothesis was accepted, which states there is effect at the significance level (α ≥0.05) for total quality management in terms of (Management Support) on construction projects in terms of their combined dimensions (Cost, Time, Quality, Work Safety).

Second Sub-Hypothesis: There is no effect at the significance level (α ≥0.05) for total quality management in terms of (Continuous Improvement) on construction projects in terms of their combined dimensions (Cost, Time, Quality, Work Safety).

To test this hypothesis, the researcher used a simple linear regression analysis to measure the impact of Continuous improvement in terms of their dimensions (cost, time, quality, work safety) on construction projects in Amman.

The previous Table V shows that the calculated value of (F) amounted to (366.545), which is a statistically significant of the level of significance (α ≥0.05), and from it the validity of the first sub-hypothesis test model is valid.

The results of the previous table also showed that the value of the coefficient of determination = (R²) (0.514), and this is explained the effect of total quality management in terms of continuous improvement paragraph explains (51.4%) of the variance in the variable dependent on construction projects,

| Dependent variable | Continuous improvment on construction project |
|--------------------|---------------------------------------------|
| (F)                | 366.545                                    |
| Sig                | 0.0                                         |
| R                  | 0.717                                       |
| (R²)               | 0.514                                       |
| Beta               | 0.717                                       |
| t                  | 19.167                                      |
| Sig                | 0.0                                         |

* Significant at level of 0.05.
and the Beta value (0.717) indicates that an increase of one unit in the independent variable leads to an increase in the dependent variable in terms of the calculated value (T) of (19.167), which is a statistically significant value at the level of significance (α ≥0.05).

From the above, the results of the hypothesis test showed, that the main null hypothesis was rejected, and the alternative hypothesis was accepted, which states that there is effect at the significance level (α ≥0.05) for total quality management in terms of (Continuous Improvement) on construction projects in terms of their combined dimensions (Cost, Time, Quality, Work Safety).

Third Sub-Hypothesis: There is no effect at the significance level (α ≥0.05) for total quality management in terms of (Resource Management) on construction projects in terms of their combined dimensions (Cost, Time, Quality, Work Safety).

To test this hypothesis, the researcher used a simple linear regression analysis to measure the impact of resources management in terms of their dimensions (cost, time, quality, work safety) for construction projects in Amman.

### TABLE VI: SIMPLE LINEAR REGRESSION RESULTS TO MEASURE THE IMPACT OF HUMAN RESOURCES MANAGEMENT IN TERMS OF RESOURCE MANAGEMENT IN THEIR DIMENSIONS (COST, TIME, QUALITY, WORK SAFETY) ON CONSTRUCTION PROJECTS

| Dependent variable | Continuous improvment on construction project |
|---------------------|-----------------------------------------------|
| (F)                 | 253.175                                       |
| Sig                 | 0.0                                           |
| R                   | 0.652                                         |
| (R^2)               | 0.431                                         |
| Beta                | 0.652                                         |
| t                   | 16.487                                        |
| Sig                 | 0.0                                           |

* Significant at level of 0.05.

The previous Table VI shows that the calculated value of (F) amounted to (253.175), which is a statistically significant of the level of significance (α ≥0.05), and from it the validity of the first sub-hypothesis test model is valid.

The results of the previous table also showed that the value of the coefficient of determination = (R^2) (0.431), and this is explained the effect of total quality management in terms of Resource Management paragraph explains (%43.1) of the variance in the variable dependent on construction projects, and the Beta value (0.652) indicates that an increase of one unit in the independent variable leads to an increase in the dependent variable in terms of the calculated value (T) of (16.487), which is a statistically significant value at the level of significance (α ≥0.05).

From the above, the results of the hypothesis test showed, that the main null hypothesis was rejected, and the alternative hypothesis was accepted, which states that there is effect at the significance level (α ≥0.05) for total quality management in terms of (Resource Management) on construction projects in terms of their combined dimensions (Cost, Time, Quality, Work Safety).

### V. DISCUSSION

Based on the results of the analysis on the impact of Total Quality management in Construction Project in Jordan, where it was found that there is a positive relationship between the implementation of the Management support dimensions in Construction Company in Jordan for Management support application (18.062), the stages of the Continuous improvement (19.167), and the Resource Management (16.487) on the Construction Company in Jordan. The results also indicated a positive impact of Total Quality management in Construction Project in Jordan. Moreover, the results also indicated a positive effect of Total quality management, development on the performance quality. This finding is consistent with Ali (2014), they indicate that the organizational performance improves in light of the discovered practices of quality management that is the application of the total quality followers affect the quality of performance.

A. The Effect of Management Support on Construction Project in Jordan

The support and support of the Management support of TQM is one of the most important requirements for the success of the implementation of total quality in any organization, and it is not possible to implement any program aimed at improving the level of performance without the full support of the upper management, so quality according to the administrative perspective means change for the better and involves taking many measures And practical steps in order to achieve the required quality, and who has the power to make change within the organization except the senior management, and in the event that the senior management does not provide support and assistance to achieve the overall quality within the institution, the efforts will not be feasible in achieving the required quality. Whereas the support of the top management is what creates the appropriate environment for the implementation, improvement and development of comprehensive quality, as the application of total quality is a strategic decision whose long-term goal is the result of the senior management's conviction of the need for continuous improvement and development.

Also, the application of total quality within the institution requires reshaping the culture of the institution and it is necessary to create an appropriate culture and change the traditional administrative methods and thus create a creative climate, and this will not be done without the upper management's conviction of the importance of total quality and this requires the activation of quality practices within the institution, so the support of the higher management to implement quality Comprehensive thing is essential and necessary for its success. This is what was confirmed by the results of the study Al Sabah (2014) on the importance of supporting senior management on the success of implementing total quality in contracting companies.

B. The Effect of Continuous Improvement on Construction Project in Jordan

Continuous improvement is change for the better and continuous improvement, and its work is to make all processes improved and to identify all the changes that occur in the work and what are the processes that need improvement and development, so it aims to improve all factors related to activities and processes that transform inputs into outputs on a continuous basis, It is a comprehensive process that includes...
all activities in the organization and the continuous improvement processes result in reducing inputs, increasing outputs, improving their quality, raising the level of customer satisfaction and the satisfaction of the parties related to the institution, whether internal or external, and the philosophy of continuous improvement is based on continuing development time after time and takes the form of chains interconnected with each other. And there are many elements that interact with each other to work within the method of continuous improvement in the organization, the most important of which is the focus on customers, the spirit of cooperation, team work, the commitment of management and the relationship of management with workers in addition to the use of technology. Based on the results of the research on the effect of Continuous improvement on Construction Project in Jordan, it is stated that Continuous improvement has a partially significant impact on Construction Project.

This is confirmed by the results of the study of Abbas and Amer (2017) that there is an effect between continuous improvement processes and the principles of total quality management.

C. The Effect of Resource Management on Construction Project in Jordan

Resource management practices such as training and employment within the organization are considered one of the comprehensive quality requirements that work to bring about the necessary change within the organization. Resource management is also considered necessary to ensure the organization’s success in implementing comprehensive quality management and reaching the goals. Quality resource management is considered one of the principles of comprehensive quality application. Achieving the success of total quality, it requires training and improving the skills and capabilities of employees, and this process is one of the tasks of human resources management. The resource department is responsible for providing human competencies and skills and training them, which is considered one of the most important pillars in the activation of total quality and falls within the human resources concerns, such as increasing the rate of work turnover, reducing absenteeism, and exercising control and supervision of workers. This is confirmed by the results of the study Al Tarawneh and Arishi (2019) on the role of human resources in the application of total quality management.

VI. CONCLUSION AND RECOMMENDATION

The construction industry consists of many participating parties, and each party has a role in achieving product quality. Poor achievement in any department will affect the completion of the rest of the departments. Poor achievement will lead to a conflict between the parties involved in the construction process, and this dispute will lead to putting future achievement at risk. This, in turn, poses a challenge to construction companies.

- Recommend the construction companies in Jordan issue legislation that promotes the implementation of the quality policy in establishments at all levels, with the administration following up on the implementation of quality requirements in construction projects.

- Classify construction companies according to the classification of the quality level that they apply in the construction projects that are implemented.

- Recommend construction companies to spread the culture of comprehensive quality among their workers.

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