



RESEARCH ARTICLE - MANAGEMENT

Evaluation of the Application of Quality Management Systems in Projects Quality Management Guidelines According to the Specification ISO 10006:2017: A Case Study in the Department of Engineering Construction

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| Article Info. | Abstract |
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| <p><i>Article history:</i></p> <p>Received 22 April 2022</p> <p>Accepted 07 June 2022</p> <p>Publishing 30 September 2022</p> | <p>The research aims, to identify the level of application of the quality management system in projects by ISO10006:2017, and to determine the size of the gap, between the actual reality and project operations within the seventh requirement of the specification, to achieve sustainable development. The case study method was adopted, and the reality of the application of the quality management system in projects was diagnosed. In the residential complex of Sumo Oil. The sample of the research. The data and information collection were mainly based on the checklist. Which included seven axes to evaluate the application of the quality management system in projects. A set of statistical methods were adopted, including (weighted arithmetic mean, percentage measurement, and gap size measurement). The research reached a set of important results, about the reality of the application of the system Quality management in projects. The most important of which was that the level of actual application of the seventh requirement of the specification in the surveyed department, was 94%, and the size of a gap of 6% was distributed among the procurement processes and operations related to risks and time, The value added value is to link the achievement of the seventh item requirements of the standard to achieve the dimensions of sustainable development.</p> |

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1. Introduction

Interest in sustainable development has increased rapidly in various countries of the world. As this topic has attracted the attention of researchers from all disciplines. Especially in the aspect of project management because the latter is closely linked to infrastructure and its sustainability. As project managers and engineers form the link, between the needs of society and developments in the natural sciences, As they transform natural and environmental resources. To products and services. The increased reliance on the role of project management, whether in building and construction projects or projects to create new products, towards increasing the levels of their effectiveness and efficiency, prompted the International Organization for Standardization to prepare several qualifications in the field of management. Projects in more than thirty countries and reviewing thousands of comments and suggestions from those concerned and interested in this matter, to come up with ISO10006.

The research dealt with the specification ISO10006:2017 and the extent of its application in the Engineering Reconstruction Department of the Ministry of Construction, Housing and Public Municipalities / Sumo Residential Complex Project to identify and address problems that prevent its application and its reflection on sustainable development and achieving its goals. The importance of the current research is highlighted in being the first local and Arab study, according to the researcher's science, discussed in the modern issuance of ISO10006:2017 and how to achieve sustainable development by achieving the requirements of the seventh item in this standard. The site was chosen to conduct the study because one of the most important works of the processor is the implementation and supervision of the implementation of projects, in addition to the department applies quality in its work and holds a quality certificate 9001 and aims to achieve the sustainable development goals in implementing its work by applying quality management in projects.

2. Research Methodology

2.1. Search Problem

The research problem was identified based on the need of the Iraqi organizations in general and the Department of Engineering Reconstruction, in particular, to apply the specification for the requirements of the quality management system in projects ISO10006:2017 in

the Department of Engineering Reconstruction of the Ministry of Construction, Housing and Public Municipalities as it adopts the implementation and supervision of the implementation of many projects in Iraq and its need to adopt Quality in its projects One of the projects that it supervises its implementation is the SOMO Residential Complex project for the SOMO Oil Marketing Company. Accordingly, a set of questions emerged from the research problem, which was represented by the following:

1. To what extent is the quality management system applied in projects according to ISO10006:2017 in the researched project?
2. What is the performance gap between the actual reality of project management in the researched project and the requirements of ISO10006:2017?
3. What are the sustainable development goals in projects and what are their dimensions?

2.2. The Importance of Research

The importance of the research is determined by the following:

1. The need for projects, especially the projects of the department under study, to apply ISO10006:2017 to improve the performance of its projects.
2. The current research contributes to providing a theoretical study for the definition of the project, project management, and the mechanism of its contribution to achieving dimensions of sustainable development in projects in the department under study, which leads to reducing the gap between theory and practice.
3. It is considered one of the contemporary Iraqi studies within the global and local interest, to apply specifications and adopt systems that create a broader awareness of the business environment, early identification of project management problems and obstacles, and taking corrective measures to reach sustainable development in projects.
4. The importance of the field problem is addressed by the research by highlighting the importance of the requirements that are raised in the seventh item of the specification, which is: integration processes, operations related to the field, operations related to time, operations related to cost, operations related to communications, operations related to risks and purchases.

2.3. Search Objectives

1. Reveal the reality of the application of project management processes and activities in the research project.
2. Diagnosing the gap between the actual reality of quality management in the project, the research sample, and the requirements of ISO10006:2017.
3. Identify the sustainable development goals and their dimensions and the role of project management in achieving them.

2.4. Search limits

The limitations of the search are embodied in:

1. Scientific limits: the research specified in its objectives.
2. Spatial boundaries: The research dealt with the Sumo Residential Complex project, which is supervised by the Department of Engineering Construction.
3. Time limits: The research took a period that extended from 12/1/2021 to 10/3/2022. During this period, sources and data were collected to prepare the research, as well as conduct field coexistence and personal interviews at the researched site.

2.5. Research Methodology

The research relied on the case study method as an approach based on field experience, and observations through field research. To, achieve the process of analysis. The data obtained regarding the application of the ISO10006:2017 quality management specification in projects. On the researched site, checklists were adopted, and to obtain the highest level of accuracy, the triple scale was relied upon. To identify the extent to which the actual application conforms, to the requirements of the seventh item of The ISO10006:2017 specification, for the Sumo Residential Complex project. And its comparison with the requirements, of the specification in question, as the checklists were prepared by ISO10006:2017, and included 7 main operations, and a specific weight was allocated to each paragraph of the specification according to the level of application and documentation for it, and the Table 1 shows The different paragraphs of the scale, as well as the weightings of these paragraphs, ranging from weight (2) for application and total documentation, weight (1) for application and partial documentation, and weight (0) for non-application and documentation, to show the actual reality of the gaps that exist between the requirements of the standard specification and between the quality management system in Projects in the research project. The statistical tools below were used to measure the paragraphs of ISO10006:2017 after determining the scores for each paragraph in light of the answers to the checklists, the following equations were adopted to extract the percentage of conformity as follows:

1. Calculating the approximate rate of the extent to which the implementation and actual documentation conform to the requirements of the seventh item of the standard in the Department of Engineering Reconstruction of the study sample in comparison with the requirements of ISO10006:2017 by extracting the weighted arithmetic mean and according to the following equation:

$$\text{Weighted arithmetic mean} = \frac{\sum(\text{frequencies} \times \text{weights})}{\sum \text{frequencies}} \quad (1)$$

2. The percentage of conformity of the application and the actual documentation of the requirement in the Department of Engineering Construction with the standard specification and according to the following equation:

$$\text{Percentage of conformity} = \left(\frac{\sum(F \times W)}{\sum F} \right) \times 100 \quad (2)$$

The highest weight in the triangular scale is (2) degrees, and it represents the state of complete conformity with the requirements of the guiding specification.

3. Calculate the size of the gap through the following equation:

$$\text{Gap size} = 1 - \text{the percentage of conformity} \quad (3)$$

4. Then the Pareto diagram, which is one of the traditional quality tools, was used to show the size of the gap obtained from the examination lists for the application of the 7th item requirements of the ISO 10006:2017 in the engineering construction circle.

5.

Table 1 The three-way scale of conformity with the standard (degree)

| Sequence | Paragraphs Scale | Paragraph Weight |
|----------|--|------------------|
| 1 | Fully Applied fully documented | 2 |
| 2 | Partially Applied Partially Documented | 1 |
| 3 | Not applicable Not documented | 0 |

3. The Theoretical Side

3.1 Project and project management:

The project, through what was referred to [1], could be the process of building a factory, warehouse, or hospital, or it could be the development of new products, the introduction of a new system, or the development of programming. And the project is a package of activities and investments that have the main point of the project is that it is something different or unusual. And [2] defines it as a closed, complete, and complex task. Whose characteristics and objectives can be determined. And it must be achieved at a certain time and requires coordination of the efforts of many services. While [3] defines it as a coherent set of activities with a defined start and end point. Defined by [4] according to ISO10006, it is a unique process consisting of a set of coordinated and monitored activities with start and end dates, which are carried out to achieve A goal that aligns with specific requirements, including time, cost, and resource constraints. From the above, a project can be defined as a group of works and efforts that have a definite starting point and end point and are implemented in an organized manner for one time to achieve one or more of the desired goals and results to meet the strategic needs of the organization at present.

As for project management, [3] defined it as a systematic and gradual approach to identifying, organizing, planning, monitoring, and controlling projects. And [5] defined it as the administrative function that could guarantee the responsibility for defining, planning, organizing, and scheduling goals, preparing estimated budgets for them, and implementing and controlling mechanisms to achieve the standards required for the project. For [6], considered it one of the most important main stages involved in project management, which helps and facilitates control of its operations, as most project implementers rely on modern patterns of planning and follow-up, as a clear and effective methodology that includes multiple and useful methods and techniques. , used to reach the best results, also known [7] as the management, organization, planning, and control of projects to achieve their milestones within the specified budget to provide something of value. From what was previously mentioned, we can define project management as a set of knowledge, skills, activities, and tools that ensure responsibility for determining, planning, organizing, and scheduling goals and determining estimated budgets to achieve and accomplish agreed goals.

3.2. Quality management in the project

Project quality management, as indicated by [1], means thinking about quality for all project tasks and activities and their processes from preparation or start-up to closure, as it seeks to integrate interrelated tasks at all levels, and project quality management aims to achieve:

1. Planning for project quality management activities.
2. Determining the standard quality specifications and their priorities in the project.
3. Existence of a specialized department that seeks to achieve quality specifications in the project.

While [8] added, the unique elements of project quality management are as follows:

1. Focusing on the requirements and standards of quality and compliance for which the project is responsible through customers and all stakeholders.
2. Focusing on product/service quality and process quality, especially the project process.
3. Focusing on additional values and requirements that differ from the main requirements and that have a significant impact on the level of customer satisfaction in the final form.
4. Verify that all requirements are met to the satisfaction of customers and all relevant stakeholders.

3.3. Achieving quality during the project life cycle

The primary function of project quality management as indicated by [9] is to ensure that the project will achieve all of its set goals within the predetermined time and budget, and there are three operational cycles:

1. Quality planning: refers to designing a quality plan, according to the capabilities of the organization and the level of the project.
2. Quality control: can be defined as a set of activities and efforts undertaken by all employees, which allow for achieving standard levels of quality.
3. Quality assurance: all planning and organizational procedures necessary to gain sufficient confidence in the quality of project implementation will meet the requirements of quality [9]. Which are shown in Fig. 1 and as follows:



Fig 1. Achieves quality during the project life cycle [9]

3.4. ISO10006:20017

The international specification ISO10006:20017 through what is referred to it [10], is called "Quality Management, Guiding Principles for Quality Management in Projects" and was issued in November 2017, the third version of this series of specifications. It was preceded by (ISO10006:1997) and (ISO10006:2003). This specification is considered complementary, to the instructions contained in the specification (ISO 21500: 2012), and it is in line with the specification (ISO 9001: 2015), as all these specifications are based mainly on the seven principles of quality management, which are (customer focus, leadership, employee engagement, management approach, continuous improvement, Evidence-Based Decision Making, Relationship Management) is a broad specification (it can be used for small, medium, large and very large projects [11]).

Added that this specification provides guidelines for general use that help improve the level of quality management in projects, regardless of shape, size, area, duration [12], complexity, processes involved, and project deliverables. Experienced in project management and motivated by the desire for their organization to achieve excellence and satisfy all parties interested in quality, across all levels of the organization, senior management has the greatest responsibility for achieving quality goals, but each organization-wide department must be responsible for its specific processes and products. From the above, ISO10006 can be defined, as an international standard developed by the International Organization for Standardization, and Specifications that gives guidance on the implementation, of the quality management system, in projects. And applies to projects of varying complexity, small or large, short, or long term, in different environments, regardless of the type of product or process involved.

The application of the standard (ISO10006) in the field of project management, in general, will achieve the following benefits: [13]

1. Delivering the project in the agreed form through proper and prior planning and realistic estimation of the timings for each stage of the project.
2. Speed in delivery through the use of project quality management processes.
3. Reducing risks during project implementation.
4. Improving customer satisfaction by providing the right product or service at the right time.

Added that there are other benefits at the level of the organization, as follows [11]:

1. Assisting in the transfer of knowledge and experiences between pioneering and emerging projects and organizations.
2. Improving the project delivery steps.
3. The process of obtaining tenders is more efficient and effective through the use of realistic offers.
4. The decision-making process is transparent and improved at all organizational levels and is characterized by effective communication at all administrative levels.

3.5 Sustainable development in projects

The interest and focus on sustainable development and its dimensions have increased in various countries of the world because it is a multidisciplinary topic as a result of the various aspects and dimensions involved [14]. There are many definitions of sustainable development, as it has been defined [15] as development that meets the needs of the present without compromising the capacities and capabilities of the future. He defined it [16] as the process through which the available resources are exploited to achieve environmental sustainability, meet the current and future needs of individuals and society, and improve living conditions, taking into account the environmental aspects and ensuring the right of future generations to these resources. Through, the foregoing and discussed above, we can clarify the definition of sustainable development. As a way of life that aims to preserve the environment, and its resources by the current generation, to enable the future generation, to enjoy the components and resources of the environment. By providing them with knowledge and developing their skills. To understand the relationship between man, society, and the environment.

As for the dimensions and pillars of sustainable development that most researchers agreed on, including [14], [17], they are:

1. Environmental dimension: It is concerned with the aspects related to the sustainability of the natural environment in which humans and living creatures live, to preserve natural resources from waste and loss, especially non-renewable resources.
2. The social dimension: It means achieving justice and equality among people in society, through obtaining natural resources and income, and reducing the poverty line in the world.
3. The economic dimension: It means achieving economic well-being by raising the standard of living and increasing consumption rates for current generations without compromising and damaging the capabilities of future generations.

And also [18] added a fourth dimension, which is the political dimension, which is based on the exercise of economic, political, and administrative authority to manage the affairs of organizations. While [19] and [20] agree to add two other dimensions: the human dimension, which is intended to reduce the steady population growth, develop human resources, provide health care for them, invest in human capital, and the technological dimension. What is meant is the need to switch to clean technology in industrial facilities to prevent the deterioration of the ozone layer, reduce energy consumption and provide manpower to carry out this transformation. Achieving sustainable development means achieving development whose most important goal is to balance the three basic dimensions and pillars represented by the environmental, social, and economic dimensions, as the occurrence of development in one of these dimensions does not lead to a breach in the other dimensions [21]. There are some roles, that contribute to helping project management, to play its role in sustainable development [22], which are:

1. Preparing and developing development programs for local culture, not ready-made imported solutions.
2. Focusing on developing competencies and helping to gain knowledge.
3. Designing and implementing project management programs that lead to a change in current ideas.
4. Presenting success stories and lessons learned to follow to implement new projects.
5. The commitment of private organizations to project management for sustainable development should be consistent with the political and legislative motives in society.

While [23] explained sustainable project management. This means planning, and monitoring the implementation of the project and controlling its delivery, taking into account the environmental, economic, and social aspects of the life cycle of the project resources processes. Outputs and effects to achieve benefits for stakeholders and implement them transparently and fairly. As the application is applied Sustainability perspective on project management and delivery processes. Such as stakeholder identification and involvement, procurement processes,

feasibility study development, project control, identification and management of risk and time, communication within and outside the project, and selection and organization of the project team, which means if the seventh item in ISO10006:2017 is applied The project will achieve sustainability. The role of engineers in projects is important in achieving sustainability, by exercising their functions in design or innovation, or by suggesting ways to employ nature and its components in the service of man. technical, economic, and social. Most of the indicators for measuring sustainable development are qualitative indicators, which are difficult to measure and express in quantitative ways and tools, so we will only explain them qualitatively and theoretically.

4. The practical side

4.1. About the research department

The research dealt with an important project, which is the SOMO residential complex project, which is supervised by the Engineering Reconstruction Department for the Oil Marketing Company (SOMO). The department in question contracted with the Oil Marketing Company SOMO to supervise the project, and the actual completion rate amounted to more than 83%. This residential complex was allocated to the employees of the Ministry of Oil / SOMO Company. The project consists of (31) residential buildings with (453) apartments and four types of buildings (A, B, C, D) with different heights ranging between (4_5) floors, and areas ranging from (125 m², 150 m², 175 m²), 200 m²). As well as service buildings with integrated infrastructure, event halls, an administrative building, a security building, a group of restaurants, a commercial center, a gas station, and a car park. The research sample project is one of the important projects in the city of Baghdad. This project also contributed to providing job opportunities for local staff in various specializations. He also contributed to the provision of several housing units that would reduce the housing crisis in Baghdad due to the large population density there.

4.2. Assessment of the application of the requirements of Clause Seven of ISO10006:2017

The topic seeks, to present the results of the field research, for the checklist and its analysis, based on the answers obtained, by the researcher from personal interviews, and access to records, and documents. Related to the quality management system, in projects of the Department of Engineering Reconstruction, up to the arithmetic mean to know the true rate of application of the requirements of the quality management system in projects. And the standard deviation and application gap for each paragraph of the checklist, at the total level of the main axes, Table 2, and Tables 3, 4, 5, 6, 7, 8 in Annex 1. Shows the checklist for item (7) related to quality management activities and processes in projects to explain how this test was performed.

Table 2 A checklist for matching the requirements of the integration processes

| Sequence | Specification requirements Operations related to the field | Fully implemented | Partially applied | Not applicable |
|----------|---|-------------------|----------------------|----------------|
| | | Fully documented | Partially documented | Undocumented |
| | | 3 | 2 | 1 |
| 7.2 | Integrations (7.2), (7.2.1), (7.2.2), (7.2.3), (7.2.4), (7.2.5), (7.2) | | | |
| 1 | The integration processes (project initiation and project management plan development, integration or interaction management, change management, process and project closure) are determined by the project manager and usually one of these processes affects the others. | ✓ | | |
| 2 | The integration processes (project initiation and project management plan development, integration or interaction management, change management, process and project closure) are determined by the project manager and usually one of these processes affects the others. □ 2 Develop the project management plan, which must include or refer to the project quality plan, and update it constantly. | ✓ | | |
| 3 | The degree of detail in the project management plan included depends on factors: (eg project scope, scale, and complexity). | ✓ | | |
| 4 | During project initiation, details of relevant previous projects are identified from the originating organization and sent to the project organization. | ✓ | | |
| 5 | The project management plan: returns documented requirements of the customer and other interested parties and project objectives, documents the input source for each requirement to allow traceability, identifies and documents project operations and purposes, identifies organizational interfaces, defines, warrants or references product/service characteristics and how they should be measured and evaluated Provides a baseline for measuring and controlling progress, identifies performance indicators and how to measure them. | ✓ | | |
| 6 | Plans in project quality management include quality plans, work organization structure, project schedule, project budget, communication plan, risk management plan, and procurement plan. | ✓ | | |
| 7 | Interaction management includes A. Create interface management processes B. Conduct multifunctional project meetings C. Problem solving, such as responsibilities conflicting or changes in exposure to risk D. Dr. Measuring project performance, using techniques such as analysis Earned value (a method for monitoring overall performance project vs budget baseline) | ✓ | | |

| | | | | |
|----|---|----|------|---|
| | E. Conduct progress assessments to assess the status of the project and planning the remaining work. | | | |
| 8 | Analyze the intent, extent, and impact of change. as it is done Agree on those changes that affect project objectives with the client and other interested parties. | ✓ | | |
| | Change management also takes into account the following: A- Managing changes in project scope and project objectives and project management plan | | | |
| 9 | B- Coordination of changes across interrelated project processes and resolve any conflict of operations C- Documenting the change D- Improvement E- Aspects of change that affect employees. | ✓ | | |
| 10 | Root cause analysis for impacts is done, and the results are used to produce solutions and implement improvements in the project process. Before any change is implemented, the change request is submitted according to the project processes defined in the project management plan. The relevant documented information provided with the application should include a justification for the change. | ✓ | | |
| 11 | Particular attention is paid to closing project operations during the project initiation phase, and they are included in the project management plan. | ✓ | | |
| 12 | Ensure that all documented project closure information is collected and distributed within the project and parent organization, as appropriate, and retained for a specified period whatever the reason for project closure. | ✓ | | |
| 13 | A full review of project performance is conducted. This must take into account all relevant documented information. | ✓ | | |
| 14 | Formal delivery of the project product/service to the customer as project closure is not completed until the customer formally accepts the project product/service. The closure of the project must be communicated to the interested parties. | ✓ | | |
| | Weights | 2 | 1 | 0 |
| | Repetitions | 14 | 0 | 0 |
| | Result = (weights * repetitions) | 28 | 0 | 0 |
| | Weighted arithmetic mean = (score / sum of frequencies) | | 2 | |
| | Matching percentage = (weighted mean / highest weight in the scale) 100% | | 100% | |
| | Gap size = 1-percentage | | 0% | |

Table 2 indicates that there is no gap and a matching percentage of 100%.

4.2.1. Strength points

1. A detailed plan for the project is drawn up by the project contract, through which profits and implementation time are determined, and any details related to previous projects are documented to benefit from us in the current project, and the project management is the one who converts the contract requirements into executive plans and presents them to the project manager and the department manager for approval and then starts implementation.
2. All requirements are reviewed with the beneficiary before signing the contract, and they are reviewed periodically during the project life cycle, through field visits and meetings, and documented in work progress tables, which are discussed monthly at the consultative body meeting in the department under study.
3. Project performance is measured using different techniques and mechanisms and is documented in the completion percentage form. Work progress reports are documented and discussed periodically in the meetings of the advisory body, to resolve any conflicts or obstacles that occur and are documented in the project management files.
4. The management of change in the project is documented in the application forms for the additional period and spare orders by the contractor, and by the beneficiary, the party is documented with an official change request, and the changes are coordinated after discussion with the concerned parties that pertain to the project and documented in the financial and engineering plan, and the change is controlled by the minutes of the meetings and spare orders.
5. The closure of the project's operations or the termination of the project is determined and documented in the site's final receipt form, and all documents and records are kept in the project file.
6. The feedback from the customer and other concerned parties is documented in the customer satisfaction form.

4.2.2. Weaknesses

There are no weaknesses.

Table 3 A checklist to match the requirements of related operations in the field

| Sequence | Specification requirements Operations related to the field | Fully implemented Fully documented | Partially applied Partially documented | Not applicable Undocumented |
|----------|--|---------------------------------------|---|--------------------------------|
| 7.3 | Operations related to the field (7.3), (7.3.1), (7.3.2), (7.3.3), (7.3.4), (7.3.5) | 3 | 2 | 1 |
| | Weights | 2 | 1 | 0 |
| | Repetitions | 11 | 0 | 0 |
| | Result = (weights * repetitions) | 22 | 0 | 0 |
| | Weighted arithmetic mean = (score / sum of frequencies) | 2 | | |
| | Matching percentage = (weighted mean / highest weight on the scale) | 100% | | |
| | Gap size = A- % of match | 0% | | |

Table 3 indicates that there is no gap and a matching percentage of 100%.

4.2.3. Strength Points

1. The needs and expectations of the customer and other concerned parties are translated into activities and operations documented in the technical specifications form, in the contract, and in the minutes of meetings, and kept in the project file on the site and the project management department in the department.
2. As for the measurement methods, they are agreed upon in the minutes of the meetings between the department and the beneficiary, and it is possible that the product characteristics be matched according to the standard specifications set, and what has been agreed upon with the concerned parties.
3. The workflow of the project is organized through the time plan and work progress schedules, which the planning department checks, and the department's engineers conduct field visits to the project to follow up on the project plan.
4. A meeting is held by the director of the projects department, the project manager, and the project cadre to discuss the development of a financial and time plan, methods, and tools for implementing the project and the number of staff for the project to achieve the project's goal and to prevent overlap between activities, operations and tasks, and document the project minutes.

4.2.4. Weaknesses: There are no weaknesses.

Table 4 A checklist to match the requirements of time-related operations

| Sequence | Specification requirements Time-related operations | Fully applied | Partially applied | Not applicable |
|----------|--|------------------|----------------------|----------------|
| | | Fully documented | Partially documented | Undocumented |
| | | 3 | 2 | 1 |
| 7.4 | Time Related Operations (7.4), (7.4.1), (7.4.2), (7.4.3), (7.4.4), (7.4.5) | | | |
| | Weights | 2 | 1 | 0 |
| | Iterations | 5 | 1 | 0 |
| | Result = (weights * repetitions) | 10 | 1 | 0 |
| | Weighted arithmetic mean = (score / total of repetitions) | | 1.8 | |
| | Matching percentage = (weighted mean / highest weight on the scale) | | 90% | |
| | Gap size = A - % of match | | 10% | |

Table 4 indicates that there is a gap of 10% and a matching ratio of 90%.

4.2.5. Strength points:

The period for each of the activities and operations in the project is estimated based on previous experiences, and the customer and other concerned parties are involved in estimating the time, and the specialized employees estimate the time of each process and activity in the initial completion and receipt form, the project time plan form, and the facts form daily.

4.2.6. Weaknesses:

Input data for schedule development are identified and checked against specific project conditions and discussed in project meetings, but not documented.

Table 5 A checklist to match the cost-related process requirements

| Sequence | Specification requirements Cost related processes | Fully implemented | Partially applied | Not applicable |
|----------|--|-------------------|----------------------|----------------|
| | | Fully documented | Partially documented | Undocumented |
| | | 3 | 2 | 1 |
| 7.5 | Operations related to cost (7.5), (7.5.1), (7.5.2), (7.5.3), (7.5.4) | | | |
| | Weights | 2 | 1 | 0 |
| | Iterations | 18 | 0 | 0 |
| | Result = (weights * repetitions) | 36 | 0 | 0 |
| | Weighted arithmetic mean = (score / sum of frequencies) | | | 2 |
| | Matching percentage = (weighted mean / highest weight on the scale) | | | 100% |
| | Gap size = A- % of match | | | 0% |

Table 5 indicates that there is no gap and a matching percentage of 100%.

4.2.7. Strength points:

1. The total and detailed project costs are determined and documented in the project's initial pricing committee report, as the cost estimates take any current or future trends in the economic environment, and the cost estimates are verified from the previous experiences of previous projects, and this is documented in the project budget.
2. All costs are documented in the financial plan form, and capital is determined to meet the establishment and maintenance of a quality management system through the project's initial pricing committee report.
3. A project budget is established based on cost estimates and bills of quantities and is documented in the financial plan form, as the allocated budget must be consistent with the project's objectives.
4. A system is being set up to monitor costs and documents them electronically in programs dedicated to the project to monitor costs and analyze trends in costs and deviations to ascertain by the project and the department of the remaining budget to complete the remaining work.

- Any changes or modifications to the financial plan require the approval of the project department manager, the general manager, and the employer on the spare orders issued by the project, to ensure the appropriate expenditure of the capital specified in the financial plan.

4.2.8. Weaknesses:

There are no weaknesses

Table 6 A checklist for matching the requirements of communications-related operations

| Sequence | Specification requirements Operations related to communications | Fully implemented | Partially applied | Not applicable |
|----------|---|-------------------|----------------------|----------------|
| | | Fully documented | Partially documented | Undocumented |
| | | 3 | 2 | 1 |
| 7.6 | Communications Related Operations (7.6), (7.6.1), (7.6.2), (7.6.3), (7.6.4) | | | |
| | Weights | 2 | 1 | 0 |
| | Iterations | 7 | 0 | 0 |
| | Result = (weights * repetitions) | 14 | 0 | 0 |
| | Weighted arithmetic mean = (score / sum of frequencies) | | 2 | |
| | Matching percentage = (weighted mean / highest weight on the scale) | | 100% | |
| | Gap size = A- % of match | | 0% | |

Table 6 indicates that there is no gap and a matching percentage of 100%.

4.2.9. Strength points

- Communication planning takes into account (the needs of the organization, customers, and stakeholders) to determine official and informal correspondence and meetings, while the project plan is sent in an official letter to the beneficiary, and meetings are held with the concerned authorities at the agreed times.
- The department and project management shall ensure the appropriate level of security for the information specified in an official letter to show the extent of confidentiality and integrity.
- All official, semi-formal and informal communications of the project, any rules, guidelines, topics raised, and decisions taken in the advisory body's report shall be documented.

4.2.10. Weaknesses

There are no weaknesses.

Table 7 A checklist to match the requirements of operations related to risks

| Sequence | Specification requirements Risk related processes | Fully implemented | Partially applied | Not applicable |
|----------|--|-------------------|----------------------|----------------|
| | | Fully documented | Partially documented | Undocumented |
| | | 3 | 2 | 1 |
| 7.7 | Risk-related operations (7.7), (7.7.1), (7.7.2), (7.7.3), (7.7.4), (7.7.5) | | | |
| | Weights | 2 | 1 | 0 |
| | Repetitions | 12 | 1 | 0 |
| | Result = (weights * repetitions) | 24 | 1 | 0 |
| | Weighted arithmetic mean = (score / total repetitions) | | 1.7 | |
| | Matching percentage = (weighted mean / highest weight on the scale) | | 83% | |
| | Gap size = A- % of match | | 17% | |

Table 7 indicates that there is a gap of 17% and a matching rate of 83%.

4.2.11. Strength points

- The Projects Department Manager holds a meeting with the project manager and staff to identify any problems and obstacles that obstruct or negatively affect the project management, to be presented to the senior management in the department to take decisions to overcome them.
- The risks are applied and documented for the project according to the risk identification and analysis form, and they are periodically followed up by the Quality Management Division in the department, which not only includes risks related to time, cost and product, but is more comprehensive than that, to identify risks related to the product, operations, and activities, risks related to developments and use of technology, risks Health, safety and environment, and risks related to applicable legal and regulatory applications.
- Qualified persons who have been trained on the concept of risk and risk by ISO9001:2015 are appointed to be responsible for risks and quality in the project.
- A ready-to-use risk plan is being used and kept in project records.

4.2.12. Weaknesses

- The criteria and techniques that will be used in the assessment of risks are not evaluated, as the risk is evaluated in the Quality Division in the department using a mathematical equation, the impact level * the severity of the impact using computer programs, and no modification or evaluation has been made on it.

2. Not paying special attention to developing solutions to potential risks arising from interactions related to the activity, process, and product/service between the project, the organization, and the interested parties is not implemented and are not documented.
3. Project risk monitoring reports are not part of project progress assessments.

Table 8 A checklist to match the requirements of procurement-related processes

| Sequence | Specification requirements Purchases | Fully applied | Partially applied | Not applicable |
|----------|---|------------------|----------------------|----------------|
| | | Fully documented | Partially documented | Undocumented |
| | | 3 | 2 | 1 |
| 7.8 | Purchases (7.8), (7.8.1), (7.8.2), (7.8.3), (7.8.4), (7.8.5), (7.8.6) | | | |
| | Weights | 2 | 1 | 0 |
| | Repetitions | 13 | 1 | 2 |
| | Result = (weights * repetitions) | 26 | 1 | 0 |
| | Weighted arithmetic mean = (score / total repetitions) | | 1.7 | |
| | Matching percentage = (weighted mean / highest weight on the scale) | | 84% | |
| | Gap size = A- % of match | | 16% | |

Table 8 indicates that there is a gap of 16% and a matching rate of 84%.

4.2.13. Strength points

1. A purchase plan is prepared and all details are documented in the purchase form, such as costs, responsibility, delivery date, and customer requirements, as well as reviews of purchases and procurement processes and compared them with the purchase plan. Any defect or error that occurs is informed to the responsible authority of an official position, and all project transactions are directed at the same levels of Control through the procurement committee and the price moderation committee.
2. The department maintains a record of suppliers and a record of supplier evaluation in the administrative and financial section of the Import and Supply Division, which is followed up and reviewed periodically by the Quality Management Division in the department.
3. The department contracts with its suppliers through a contract that is kept in the Administrative and Financial Section / Import and Equipment Division, as well as in the records of the procurement committees and in stores, which are kept last. There are forms and contracts for purchase and supply that are kept in the records of the project itself.
4. The performance of the external supplier is monitored and its performance is documented through inspection and receiving committees, as the terms of the contract and customer requests are verified by the receiving committee.

4.2.14. Weaknesses

1. The external supplier is not required to submit a Contract Quality Plan as part of the bid evaluation process. In bid evaluations, this procedure is not documented and not implemented.
2. The external supplier's quality management system is not evaluated before contracting to supply products/services, and this procedure is not implemented or documented.
3. It is verified that all contract conditions are met and that comments were obtained on the performance of the external supplier to update the register of approved external service providers before closing the contract, which is applied but not documented.
4. From the foregoing, we conclude that there are gaps between the reality of the application and the main and subsidiary requirements of the quality management system in projects, which generated a gap in the application of the system, as a summary of the results of the level of conformity can be drawn up for the actual implementation of the requirements of the seventh item.

From the foregoing, we conclude that there are gaps, between the reality of the application, and the main, and subsidiary requirements, of the quality management system in projects. Which generated a gap in the application of the system. A summary of the results, of the level of conformity, can be drawn up for the actual implementation, of the requirements of the seventh item. In the Table 9.

Table 9 Summary of evaluation of operations of the seventh clause of ISO10006:2017

| Sequence | Requirements | Percentage of commitment rate | Gap size |
|----------|---|-------------------------------|----------|
| 1 | Integrations | 100% | 0% |
| 2 | Operations related to the field | 100% | 0% |
| 3 | related operations time | 90% | 10% |
| 4 | Cost related operations | 100% | 0% |
| 5 | Communications related operations | 100% | 0% |
| 6 | Operations related to risks | 83% | 17% |
| 7 | Purchases | 84% | 16% |
| | The overall rate of application of the standard | 94% | 6% |

Through the results in Table 9, the Parito diagram can be used to explain the differences between the rates of gaps in the extent of application and documentation of the practices of project management in the ISO 10006:2017.

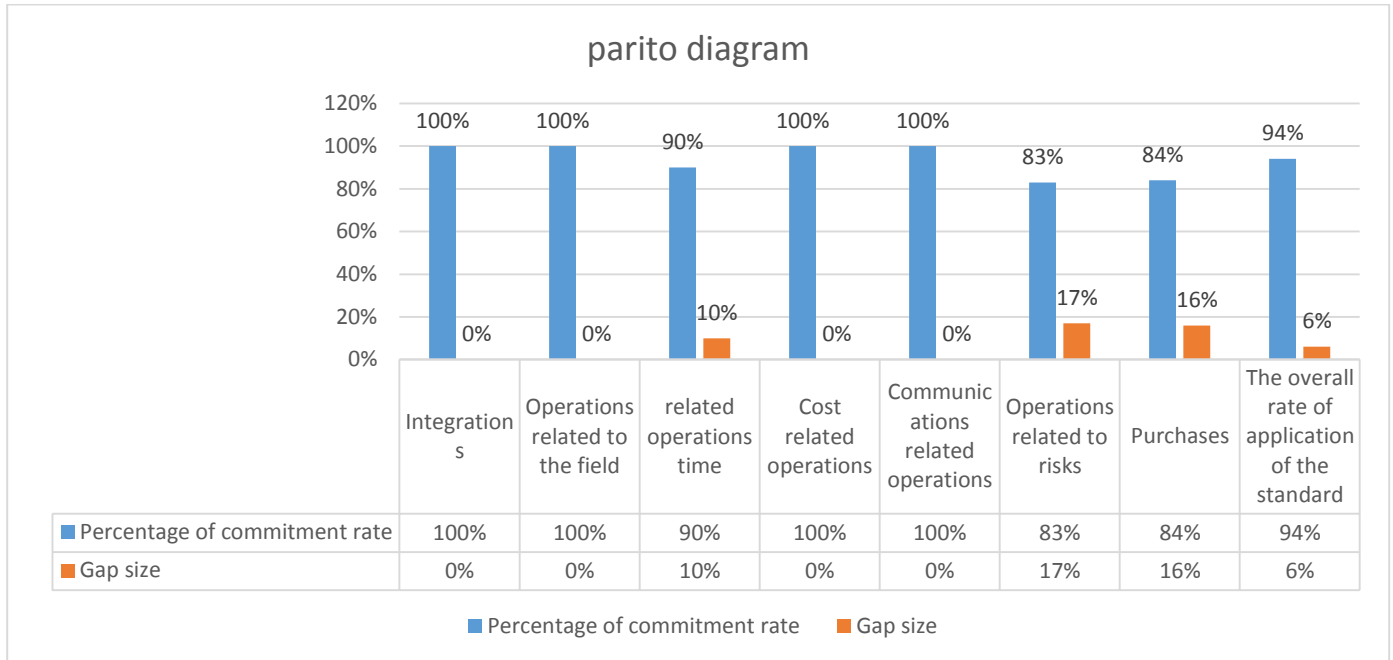


Fig 2. parito diagram

4. Conclusions

1. The overall rate of the application of the standard in the department under study came with a matching percentage of 94% and a gap size of 6%, and this percentage is considered high in the application of the specification items.
2. A detailed plan for the project has been drawn up by the project contract, through which profits and implementation time are determined, and any details related to previous projects are documented to benefit from us in the current project, and that the project management is the one who converts the contract requirements into executive plans and presents them to the project manager and department director for approval And then start implementation, that all requirements are reviewed with the beneficiary before signing the contract, and are reviewed periodically during the life cycle of the project, through field visits and meetings, and documented in work progress tables, which are discussed monthly at the meeting of the advisory body in the surveyed department, the project performance is measured Using different techniques and mechanisms, they are documented in the completion percentage form, work progress reports are documented and discussed periodically in the meetings of the advisory body, to resolve any conflicts or obstacles that occur and are documented in the project management files, that the change management in the project is documented in the forms requesting the additional period and spare orders by the contractor And by the beneficiary, an official request for change is documented, and the changes are coordinated after being discussed with the concerned parties that pertain to the project and are documented in the plan. Finance and engineering, and the change are controlled by minutes of meetings and spare orders, the closure of project operations or project termination is determined and documented in the final receipt form for the site, and all documents and records are kept in the project file, and the feedback from the customer and other concerned parties is documented in the customer satisfaction form, The absence of a gap in the application and documentation of the integration processes in the project, and thus the paragraph is in the degree of a fully documented application.
3. The needs and expectations of the customer and other concerned parties are translated into activities and operations that are documented in the technical specifications form, in the contract, and the minutes of the meetings, and kept in the project file on the site and the project management department in the department. There is no gap in the application and documentation of operations related to the field and thus the paragraph is in the degree of fully applicable and fully documented.
4. The period for each of the activities and operations in the project is estimated based on previous experiences, and the customer and other concerned parties are involved in estimating the time, and the specialized employees estimate the time of each process and activity in the initial completion and receipt form, the project time plan form and the facts from Daily, input data for schedule development are identified and checked against specific project conditions and discussed at project meetings, but not documented. This indicates that there is a gap between the requirements for achieving the product and the processes related to the time and the actual performance of the project, and thus the paragraph is located in the degree of evaluation partly applied and partly documented.
5. The total and detailed project costs are determined and documented in the project's initial pricing committee report, documented in the project budget, all costs are documented in the financial plan form, and capital is set to meet the establishment and maintenance of a quality management system through the project's initial pricing committee report, as the establishment is underway A budget for the project based on cost estimates and bills of quantities, and it is documented in the financial plan form so that the allocated budget is consistent with the project's objectives. As a cost control system is being established and documented electronically in dedicated programs in the project to monitor costs and analyze cost trends and deviations to ascertain by the project and the department from the remaining budget to complete the remaining work, which indicates that there is no gap between the requirements for achieving the product represented in the processes related to cost and the actual performance of the project, Thus, the paragraph falls within the degree of fully applied and fully documented evaluation.
6. Communication plans, are developed as communication planning takes into account (the needs of the organization, customers, and concerned parties) to determine official and informal correspondence and meetings, while the project plan is sent in an official letter to the beneficiary, and meetings with the concerned authorities take place at the times that are It is agreed upon, and the department and

project management guarantee the appropriate level of security for the information it specifies in an official letter to show the extent of confidentiality and integrity.

All official, semi-official and unofficial communications for the project, any rules, guidelines, topics raised, and decisions taken in the advisory body's report are documented, which indicates that there is no gap between the requirements to achieve the product represented by the communications-related processes and the actual performance of the project, and thus the paragraph falls within the degree of fully applied and fully documented evaluation.

7. The risks are applied and documented for the project according to the risk identification and analysis form, and they are periodically followed up by the Quality Management Division in the department, which not only includes risks related to time, cost and product, but is more comprehensive than that, so that risks related to the product, operations, and activities, and risks related to developments and use of technology, are identified. Health, Safety, and Environment, and risks related to applicable legal and regulatory applications, qualified persons who have been trained in the concept of risk and risk by ISO9001:2015 are being appointed to be responsible for the risks and quality of the project.
8. The criteria and techniques that will be used in the assessment of risks are not evaluated, as the risk is evaluated in the Quality Division in the department using a mathematical equation, the impact level * the severity of the impact using computer programs, and no modification or evaluation has been made on it, and no special attention is given to developing solutions to potential risks arising from activity, process and product/service related interactions between the project, organization and stakeholders Not implemented and undocumented Project risk monitoring reports are not part of project progress assessments, indicating a gap between product fulfillment requirements and processes related The risks and actual performance of the project, and thus the paragraph falls within the degree of evaluation partially applied and partially documented.
9. A purchase plan is prepared, and all details are documented in the purchase form, such as costs, responsibility, delivery date, and customer requirements, as well as reviews of purchases and purchase operations and comparing them with the purchase plan. Any defect or error that occurs is reported to the responsible authority with an official position, and all project transactions are directed at the same levels Control is through the Procurement Committee and the Price Moderation Committee. The department maintains a register of suppliers and its supplier evaluation record.
10. The external supplier is not required to submit a Contract Quality Plan as part of the bid evaluation process. In bid evaluations, the external supplier's quality management system is not evaluated before contracting the supply of products/services, it is verified that all contract terms are met and that feedback on the performance of the external supplier is obtained to update the register of approved external service providers before closing the contract, which is actually in place but Not documented, which indicates that there is a gap between the requirements for achieving the product represented by purchases and the actual performance of the project, and thus the paragraph is located in the degree of evaluation partially applied and partially documented.

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