Project Management Procedure for the Construction of Cooled Stores for Drugs and Medicine on Iraq

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ABSTRACT

Iraq is one of the countries that fluctuates in the climate greatly, as well as is characterized by a very hot summer, so the cold storage sector is very important in this country, especially medicine and medical supplies stores. The warehouse sector is one of the most important construction sectors. It includes many facilities, the most important of which are cold stores. After researching and investigating the necessary data in managing this type of project, it was found that there is a great shortage in that data, and this deficiency may be one of the reasons for the failure of this sector in Iraq. In order to evaluate the information and available data related to the management of cold store projects, a questionnaire was asked to take the opinion of engineers and specialists in this field. The questionnaire included several axes, and each axis included a group of questions. The questions were divided depending on their relationship to each other. The questions included gender, age, specialization, experience and the fact that the engineer previously worked in project management and other questions. This article proposes waterfall framework as project management framework for the studied case projects.

Keywords-- Cold Storage, Management, Medical and Drags, Waterfall, Framework

I. INTRODUCTION

Since ancient times, building has been an essential need and having adequate shelter is considered to be one of the most basic needs of humans. Numerous cultures have built impressive cities and buildings across the globe, and after thousands of years, some are still standing. The environmental problem and human printing, however, have never been more difficult for the world environment as it has been during this century. The world population has been able to boom at an incredible pace through developments in agriculture, trade, manufacturing and medicine. Warehouses play an important role in almost every supply chain and industry. The expanding e-commerce market and the need for mass customization have resulted in an increase in the demand for warehouse space and buildings, [1].

Under the term project management, there is a set of activities consisting in planning, organizing, managing and controlling the company's resources with a short-term goal, which was designed to meet specific goals and objectives. In order to fulfill the project's requirements, project management applies experience, expertise, resources, and technology to project activities, [2]. Within the framework of project management, various analyzes are used, the aim of which is to assess and monitor deviations from the original plan, the course of budget execution and compliance with the set deadlines. Inefficiency, overdraft and non-compliance with the project completion deadline are the result of non-use of project management methods. A successful and high-quality project is considered to be one in which the balance of three factors of time, cost and resources is balanced.

II. PROJECTS MANAGEMENTS FRAMEWORKS

Project management consists in the structured planning, organization and management of resources allotted to achieve project goals and results. A project management system is a series of traditional project management procedures, models and techniques for starting, planning, executing, controlling and concluding a project. The establishment of such a structure promotes decision-making, collaboration and teamwork across all portfolio projects and leads in turn to governance and management rigor. In the end, the use of corporate resources has been made more effective.

A project is defined by certain parameters. An activity or series of activities with a fixed beginning and end are defined as a project. A project needs to generate specified results and achieve particular outcomes in a consistent strategy and resource plan to support public policy objectives. In the scope, time, expensive and output criteria should be administered.
Many people confuse project management methodologies and project management frameworks. The two approaches, however, are very different. Table 1 illustrate the difference between the two approaches, [3].

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid rules and practices for completing a project are offered</td>
<td>Provides an overview of how guidelines can be implemented</td>
</tr>
<tr>
<td>Is pretty rigid and prescriptive</td>
<td>Allows for creative adaptation.</td>
</tr>
<tr>
<td>Beginners preferred it</td>
<td>experts preferred it</td>
</tr>
<tr>
<td>All performance guidelines are spelled out in granular detail</td>
<td>Performance metrics development and implementation is hard</td>
</tr>
<tr>
<td>Cannot be embedded with other practices and tools</td>
<td>Other practices and tools have room to be included</td>
</tr>
</tbody>
</table>

Table 1: Project management methodologies vs frameworks, [3]

2.1 Project Management Framework Selection

Project management methodologies and methods can only be useful if they are implemented in a realistic manner. When a structure or technique is forced on a project, it will fail miserably. On the contrary, if you take the time to learn the intricacies of a methodologies or framework and adapt it to your specific business requirements, you will end up with a successful project. Since there are so many project management strategies on the market, it can be difficult to choose the best one. Figure 1 shows the framework selection principles, [3].

This article aims to suggest a framework for the construction process. This framework will be easy to learn and can be used as a tool for project managers in organization. The proposed framework is selected to be as a reference for projects managers and engineers in cooled stores in hot environments.

This study focuses at the roles of the project manager and other engineers in the construction industry, with the project manager's job being to take overall responsibility for the project's execution, as well as budget and accountability, and the other engineers' roles being determined by their specialization and responsibility. The work is based on a case study of the construction of drug and medicine cooling stores in Iraq, and the concluding recommendations are thus appropriate. An appropriate project management framework based on waterfall framework proposed as a solution for this type of construction project management.

III. LITERATURE REVIEW

As the project management focuses on people's jobs, the aspects of harmony are extremely important to consider. This chapter emphasizes the value of advocating within the company a harmonized community for the proper application of the project management strategy. In addition, this chapter analyzes the role of stakeholders in the approach to project management and how they have shaped its implementation. Project management helps to produce efficient outcomes within the time needed and maintains the organization's growth by maintaining clients and ensuring their satisfaction, [4].

A further part of the chapter explores the different methods and strategies used to carry out project management effectively. It was however found that no tool can carry out all duties and no strategy for a specific problem is further recommended. It is upon the discretion of the project manager to implement a technique that he thinks fits into the particular situation.

3.1 Project Definition Concepts

The concept of the project assists in the creation of realistic and derivable project management objectives. The project process does not occur during the entire project management but during the initial time when performance criteria are obtained and before the final and full planning permits are granted, [5]. The concept of concepts is the beginning and starting point for the definition and interpretation of project management qualifications. Various factors contribute significantly to the design phase growth, such as external participants, internal stakeholders, project team and customer end-users. Most of the conceptual process consists of factors such as...
encouragement and coordination to ensure that correct concepts for project definitions are defined. [6].

3.2 Project Management Definition

To comprehend the concept of project management, it is important to first comprehend the meaning of the term project. The word ‘project’ is described as an endeavor of a temporary nature that aims to develop a new product or service. A project can be defined as a process that has a definite beginning and an end; it also has a clear need for resources. Construction of a building or the implementation of a new software or application to improve business operations are examples of projects. To handle these tasks, the project management principle was developed, [7]. As a result, project management is described as the application of expertise and experience, as well as tools and techniques, by experts to meet the project's requirements. By implementing the principle of project management, it can be assured that the project carried out by the experts is done on time and that the result of the project is positive and the best that can be achieved. There are five roles in the project management process. These roles are the start of the project, the proper preparation, the implementation of the planned phase, the monitoring and control of the process and the completion of the project, [8]. Project Management is considered to be the application of expertise, experience, strategies and tools to the different tasks of the project that are intended to fulfill the requirements of the project, [9]. The implementation of Project Management shall be carried out by implementing and incorporating within it the preparation, initiation, execution, supervision, monitoring and finalization processes. The project manager is the person in charge of ensuring that all of the project's objectives are met. Project management is also characterized as the process of identifying, planning, tracking, managing and implementing projects with the goal of achieving common and agreed benefits. Projects are a temporary and special effort that starts with a willingness to accomplish a certain result. The shift that is brought about by the project is most easily realized through the project management approach, [10].

Project management has different meanings, but can generally be characterized as an academic area devoted to certain planning techniques. These methods may be used to refine the theory or engineering sciences, [11]. There are several generic variables responsible for the project performance. The academic field of project management has also attracted attention from other disciplines over the last decade. There are several new viewpoints in the area of project management and project organization. These viewpoints vary from stakeholder management to project expense, quality and time management, [12].

The area of project management has grown to organize, schedule and monitor the activities of manufacturing, commercial and IT ventures. These programs involve a diverse collection of tasks that need to be handled effectively. Projects in various fields have a similar trait, i.e., their innovations as well as their activities are entering into new activities. Risk elements that remain in a project become an impediment to the project's successful completion. Activities require specificity and risk reduction techniques, [13]. The project management process is highly complex and makes use of the proper and appropriate resources available to the company in a manner that ensures organized and managed achievement. The project management process is very complex, and it makes use of the proper and adequate tools available to the organization in such a way that the goals are coordinated and handled according to the organization's needs. Project management takes place within a distinct set of variables and constraints, [14]. The project's effectiveness is determined by how well it is handled in terms of expense and time. The components needed for the project's success are depicted in Figure 2, [15]:

Figure 2: Components of Project Success

3.3 Benefits of Project Management

The advantages of using project management to meet the needs of those involved in the project management process are numerous. Project management is a roadmap with a collection of tools to help managers direct them from one stage to the next when doing a project, [16]. Improved productivity when providing services-helps steer the project's deliverables in the right direction, ensuring smart work and integrating efficiency. Some of the benefits of project management:

1. Enhanced level of customer satisfaction-when projects is finished on schedule and without reaching the proposed budgets, the consumers of the project are satisfied and can easily be kept in the long run.
2. Improved effectiveness while delivering services—s a planned and systematic approach with clear project deliverables helps in becoming effective.

3. Better competitive edge and market standing—project management helps ensure superior results and keeps consumers happy and pleased, has an over-arching impact on the company’s overall standing and helps to achieve competitive edge over other competitive firms, [17].

4. Improved levels of growth and development for the whole team – positive work helps to ensure greater teamwork between the members of the team, making them more productive and improving their personality as a whole[17].

5. Enhanced job versatility—project management aims to incorporate flexibility into the project structure. It helps to discover the smarter action or course needed for a better outcome, [18].

6. Better opportunities to expand the business and project— it is a by-product of enhanced market standing as great performance ensures exposure of new and better opportunities.

7. Better risk assessment: Potential risk elements can be easily detected when the approach works as expected. Project management helps to recognize risk elements before they ultimately meet project results, [19].

8. Improved quality: quality is improved by increasing the performance of work and operations, [20].

3.4 Challenges of Project Management

Project management is not a single-person task but requires the efforts of multiple individuals at the same time. Thus, when applying the strategy and discipline of project management, the entire team, including project managers, chief financial officers, directors of professional services as well as other members of the team, faces numerous challenges. These problems are:

1. Project teams that are geographically scattered: when teams that are part of the same project are geographically dispersed, it becomes impossible to follow a structured approach to project management. This challenge is new to project management and has come as new outsourcing and offshore construction work continues to evolve. It is impossible for a team living in distant continents to hold meetings at regular intervals, [20].

2. Over-use of resource mismanagement: often it has been seen that the project management team does not have sufficient details on the availability of resources. Teams are demanding more tasks even though there is a small number of project team members working with them and this leads to mismanagement or over-use of resources.

3. Implementation of the wrong task completion tool: many companies use local tools to handle work under project management. This leads to poor governance. It is therefore very critical that the project manager is well aware of sophisticated and innovative technology and resources, as well as of when they should be implemented to ensure the desired outcome. If inaccurate or outdated tools are placed in place, the whole purpose of introducing project management would be lost, [21].

4. Wasting time while searching for assets or documents: project scope documents such as issues lists, risk lists, emails, files and deliverables are included in project assets. In fact, it’s difficult for the project manager to keep track of all of these records in a safe manner, and much of the time is lost in identifying and searching documents even though they are stored in highly advanced software systems. In addition, files for project management purposes may also be accessible to members of the other project team, which may lead to leakage of important information, [21].

5. Overspending time on the organization of status meetings: updating the status of programs, meetings are held. However, it is complained that these meetings waste a lot of time and money and serve as an obstacle in executing and achieving the goals of project management. The model for updating the status of the project should therefore be updated and made virtual in order to address this obstacle, [22].

3.5 Project Management Techniques

The role of project management is demanding and requires a number of diverse responsibilities. Fortunately, project management provides a range of strategies that can allow project managers and team members to carry out projects and fulfill their roles effectively, [23]. Project managers must select a strategy that complements the management style embraced by the company. A single methodology cannot solve all the problems and satisfy all the requirements of project management, [24]. The most widely used methods for project management include Gantt Charts and Program Assessment Analysis Technique (PERT). Both strategies can either be purchased manually or as software programs that are readily accessible on the market. PERT is a strategy that ensures efficient preparation and monitoring and helps to clearly identify the activities that need to be done for the project. PERT maps can be used interchangeably with Critical Path Approaches.
or CPM charts. [25]. The time estimation for each task is the only difference between the two approaches. Both charts show a sequential list of scheduled activities for the entire project. The interrelationship of project components can be graphically illustrated using "CPM Diagram or "Project Network," it helps to clearly demonstrate the tasks that need to be carried out in a sequential order, [26].

Simulation methods are helpful in calculating project completion time in order to complete stochastic networks. A number of studies have been done to analyze an efficient project management methodology, but the best technique out of a variety of techniques is simulation techniques that can be conducted using the Monte Carlo or GERT network techniques, [27].

IV. METHODOLOGY

The project manager's goal is to complete the project on schedule and on budget, while maintaining a high level of quality. Adjustments that take more time and money (sometimes even after the project is completed) are needed when the output is poor. To achieve these goals, project management must perform the following roles and responsibilities:

- Planning,
- Organizing,
- Staffing,
- Controlling,
- Directing.

Products intended for use in food or veterinary animals in their finished dosage form which may be marketed to patients without a prescription, biologics, and vaccines, and which are subject to the pharmaceutical law of either the exporting or the importing country, including those products for which a prescription is required. Not including medical equipment. Systems with or without a thermostatic regulator maintaining a temperature-controlled environment within an adjoined structure, using a finite amount of preconditioned coolant as chilled or confined gel, phase-change goods, ice dry or other materials, [28][29].

Construction project management framework is a framework used to describe processes, methods, resources, tools, and tasks used to construct the project from beginning to end. According to the project type and size, there are many different types of frameworks implemented in project management. Waterfall one of the project management framework in the construction project, [30].

4.1 Waterfall Model Phases

The system analytical and design approach from Waterfall was the first modern approach to system construction to be built. In 1970 Winston W. Royce represented this method, [31]. It was easily gained administrators' approval because everything works logically from start to finish. Sources vary as regards the fundamental steps in the waterfall process, and the next paragraph details some of these variations. In each interpretation the fundamental reason and the fundamental steps are discussed, [32]. The Waterfall Model was the first process model to have been introduced. It's effortless to grasp and use. Each stage must be finished in the Waterfall model before the next phase can start and no overlap exists in the stages. The waterfall model for applications is the first SDLC technique, [33]. In the "Waterfall" approach the entire process of software creation is divided into various phases. A process' outcome will serve as input for the next step sequentially. Every step of the process can therefore only start with the completion of the previous phase. The waterfall model is a sequence design process that shows improvement in design, initiation, study, design, development, testing, manufacture/application and maintenance phases to be progressively downward (like waterfall). In this work, the drugs and medicine cooling stores will build according to model guidance for the storage in WHO technical report series No. 961, 2011. The waterfall model consists of four phases, Initiation; Planning (Design); Construction (Implementation); Management (Verification), and Deployment following section describes each phase in detail. The proposed waterfall model is shown in figure 3, [34].

![Waterfall model stages](image)

Figure 3: Waterfall model stages

During the phase of requirements, Waterfall assumes that all requirements should be obtained in advance. Contact with the customer is now readily available as the Project Manager does her best to consider the user's needs. Once this stage has been completed, the process will run "downhill", [35]. The easiest way to understand the design process is to divide it into the subphases of logical design and physical design. System analysts use the knowledge collected during the requirements stage to design the system independently of hardware or software systems during the logical design phase (Hoffer et al., 2008). If a higher-level logical design is completed, it will begin to be
converted to a physical design based on specific specifications for hardware and software technology. When all actual code is written, the implementation process takes place. This process is part of Waterfall's programmers because they comply with the project requirements and specifications and code the applications.

In order to ensure the project meets customer expectations, Royce initially needed the verification process. In real world research and design, however, this stage is sometimes ignored. The project is implemented for the client and the maintenance process starts. The customer uses the built application during the maintenance process. Since issues are identified because of incorrect specifications or other design errors or adjustments to user requirements, changes to the system will be made during the process.

4.2 Proposed Framework Checking

To check the proposed framework a questionnaire was asked, the questionnaire includes many questions related to the gender, age, educational level, specialist, experience, and some questions related to the proposed construction framework. The answers of all question are analyzed in chapter four so as to be used as an indicator about the knowledge among the project manager and engineers about cooled stores construction process.

The questionnaire used to check the hypothesis for the proposed work includes the following questions:

- Gender
- Age
- Specialization
- Experience
- Have you worked as a project manager previously?
- Do you have information about cold storage projects?
- Do you support the idea of introducing a framework for managing cold storage projects independently?
- Are the available information and documents sufficient in the management of cold storage projects?
- Do you have a desire to acquire a booklet or file specialized in managing cold storage projects?
- Have you worked as a project manager like this before?
- Do you agree to share your experience in managing cold storage projects to develop the proposed framework?
- Are cold stores for medicines and medical materials different from those for foodstuffs?
- Do you consider the intervention of the project beneficiary in the project specifications or their modification could affect the project negatively?
- By virtue of your experience in managing cold storage projects, are the procedures followed in these projects sufficient and do not require development?

4.3 Results and Discussion

The results of the research were analyzed using SPSS software for its ability to analyze these data. The questions are divided into three axes according to the type of information required. The first fixed operation was "frequencies", and this operation gives the percentage for each answer.

The second axis in the questionnaire is depending on the experience in project management and the engineer's information about cold projects management. The first question in this axis is about if the engineer was work as a project manager before? Figure 4 shows the graphical expression for this question answers.

![Figure 4: First question in second axis answers](image)

The same results for the same question are listed in table 2.

**Table 2: Have you previously worked as a project manager?**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Val</td>
<td>yes</td>
<td>136</td>
<td>87.7</td>
<td>87.7</td>
</tr>
<tr>
<td>id</td>
<td>No</td>
<td>19</td>
<td>12.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>155</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

4.3.1 Hypothesis proof

To show if the work hypothesis is true or not, Chi-Square Test is used to show that. Table 3 contains the
result of chi-square analysis for the question "Are the available information and documents sufficient in the field of managing cold store construction projects?"

<table>
<thead>
<tr>
<th>Table 3: Test Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are the available information and documents sufficient in the field of managing cold store construction projects?</td>
</tr>
<tr>
<td>Chi-Square</td>
</tr>
<tr>
<td>df</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
</tr>
</tbody>
</table>

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 104.0.

V. CONCLUSIONS AND RECOMMENDATIONS

The objective of this work is to promote theoretical and practical awareness in the field of cold storage project management by developing a comprehensive integrative project management framework. Several project management methodologies and frameworks are discussed in the introduction, and the Waterfall framework was selected because it is suitable for managing a construction project in Iraq. The waterfall framework in terms of its design is the closest to the hierarchical administrative system in Iraq, which makes this framework more suitable for learning and easier to implement.

The methods used in this work are based on an interpretive philosophy that uses the construction of theory in the context of system thought. This study focuses on a qualitative approach that results in a comprehensive review of the proposed data via questionnaire. The data collected and analyzed in this work reveals the complexity and variety of this method of project management, since the limited availability of data. The questionnaire designed in such a way to cover more than one engineering field so as to check which specialist is close to this type of project management. Also, the questions contain very clear expressions in each part of project management stages. The experience in general and in cold storage project management is a switch question, depending on its answer the project manager can give his opinion on the following questions. The data collected and analyzed using SPSS program. The data analysis results proof the hypothesis proposed in this work.

Smart technology offers huge potential to automate construction companies' systems and processes, deliver better data/information to managers, and assist them in accomplishing more tasks and activities while remaining visible to their communities. As a result, additional smart technology projects in the Iraqi construction sector are required. It is suggested that legislation be put in place to encourage major organizations to incorporate smart devices into their projects, as well as to subsidize its implementation in small and micro businesses.

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