IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

DESIGN AND ANALYSIS ON THE DEVELOPMENT STATUS OF THE CONSTRUCTION PROJECT MANAGEMENT SYSTEM

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ABSTRACT

Globally, the construction industry is a significant one. The success of the construction business relies heavily on the ability to effectively manage projects from conception to completion. An in-depth look at project management from a construction company's perspective is provided in this chapter To keep up with the ever-increasing volume of data generated by ever-more-complicated engineering construction projects, a computer-based management information system must take advantage of computers' powerful processing and storage capabilities as well as the many different ways in which data is collected and preserved. Thus, it provides an overview of construction project management and identifies numerous supporting features, such as the characteristics of a successful construction project, the life cycle of a successful construction project and the participants in the construction project organisations.

1. INTRODUCTION

As computer technology has advanced at such a quick pace, it has become ubiquitous, having had a tremendous impact on human society. It is becoming increasingly apparent that construction project and project management information is critical as China's construction industry develops at breakneck speed. Investment in construction engineering and construction project management, as well as project management of construction engineering project investment forecasts, is the fundamental basis for modernising traditional artificial cost management patterns to meet the internationalisation of development path needs. At the same time however, the construction project cost budget is the primary control for the entire construction project cost budget, and the construction project cost budget of accuracy directly impacts the project investment funds and the project implementation schedule [1]. As much as practicable, a computer-based management system must be established to handle all aspects of management.

When discussing project management, it's important to think about it as a lifecycle of a project, and the many stages it goes through must be considered. One way to think about projects is to think of them as a dynamic and ever-changing system. For a typical project, this means that it goes from an idea or a concept to feasibility studies, implementation, and eventually completion (Peters 1981). Projects, on the other hand, have become more difficult than ever before. Projects that require

a huge amount of money, multiple disciplines, a large number of people, tighter deadlines and stricter quality requirements are more difficult to manage. A new generation of project management tools and technologies has emerged as a result of rapid advancements in information and communications technology (ICT).

1.1 Overview of the Global Construction Industry

Construction is an essential business in practically every country, no matter how advanced their economy is at the time of construction. In countries like China, India, and Brazil where the economy is quickly rising, this industry is seen as a major indicator of economic progress. It is estimated that the building industry accounts for about 10% of worldwide gross domestic product (GDP). The construction sector is also a key source of employment and employs almost 7% of the world's workforce.

Construction projects in metropolitan regions tend to focus on the construction of real estate properties and their associated infrastructure in most countries. Another facet of the construction industry is the repair and modification of existing structures and infrastructure. " Accordingly, there are three key divisions in the total building business (Economy Watch 2010b, Bureau of Labor Statistics 2012).

- Building Construction: Single- or multi-family, commercial, institutional, and industrial structures are all included.
- Heavy, Highway, Infrastructure and Civil Engineering Construction: A wide range of projects relating to infrastructure are included in this category.
- Specialty Trade Construction: In this category, you'll find anything from foundation work to equipment installation to painting to plumbing and electrical work done by specialty trade firms.

2. LITERATURE REVIEW

In order to increase productivity, Ngwu Okolie Ezeokonkwo et al. (2015) identified the areas where material management was lacking. It was from this data that the structured questionnaires were created for proper analysis and recommendations. Eighty-seven of the ninety questionnaires sent to the sites were completed and returned. The material schedule will help with the scheduling of materials, such as defining what supplies are needed and when they should be delivered. Contracting firms should take action to improve their performance after identifying the problem areas. Full-time estimators or Quantity Surveyors and material controllers could be employed to accomplish this.

Materials management plays a critical part in the success of construction projects, according to Abhilin Vishak et al. (2015). Classifying inventory and compiling a case study of a corporation using ABC analysis is a common practise. An ICT technique can be used to obtain the exact consumption, stock, and location of material. Some building materials management technologies and procedures, such as: Creating data for materials categories, local suppliers, overseas suppliers, and costs, were not really used by most contractors. Updating information on local and foreign vendors as well as the costs of the materials they supply, as well as using the internet to learn about new items and their prices, List of supplies needed to complete a task or activity.

According to Mat Kasim et al. (2016), as materials make up a large part of the entire project cost, effective material management is a vital part of project management. As every building project relies on the correct resources, it also plays a significant role. As a result, the focus of this study is on identifying the elements that affect project performance due to poor material management. They came to the following conclusion: - Time, quality, productivity, and performance are all affected by the availability and sufficiency of materials and equipment. The time, cost, and quality of a project are all affected by the use of the right materials. Changes that are reasonable have an impact on timing. Waste management is impacted by effective material control.

There is an average material cost of 60% to 80%, according to Shet Sayali and Narwade Raju (2016). Material management has as its primary goals the

reduction of costs, the improvement of quality, and the reduction of production time. Use material management approaches to do this. Different methods of inventory control include the ABC analysis, the VED analysis, and the SDE analysis. Material inventory value is used in ABC analysis. VED analysis prioritises the material's utility, whereas SDE analysis prioritises the material's marketability. They point out a few things to keep in mind while placing an order for supplies. Scheduling of events Second, the amount of material needed. III) Capacity and time required to get to the location. This is the fourth factor to take into consideration: 67.30 percent of the entire project cost is accounted for by the 23.07 percent of material. It costs 25.01 percent of the 30.76 percent of the material to produce. 7.69 percent of the overall project cost is accounted for by the 46.17 percent of materials. In comparison to other methodologies, ABC analysis results in lower interest charges. It demonstrates that ABC analysis is the most cost-effective approach.

Approximately 60-70% of overall production costs are allocated to materials, according to Krishna Satyanarayana Rao et al. (2017). Management of raw materials will seek to address the problems of raw material scarcity and supply delays as well as changes in price as well as damage and wastage as well as the lack of available storage space. According to their findings, the materials are handled in a succession of processes, including acquisition and transportation; shipment; graded and stored; and supplied to industrial centres. Risk reduction at all of the aforementioned levels gives management a competitive edge as well as improved resource efficiency.

As Antony Roger Navodaya et al. (2017a) found, even though construction costs more than 60 percent of the entire project cost, there are no systems in place to manage the materials and components utilised in construction. An NFC/GPS technology combo can provide low cost, straightforward implementation options for identifying and tracking products and components, scientists added.. All steps of manufacture (offsite), transportation (en route), and construction site identification and tracking are handled by this system, which is completely automated (onsite). The construction resources may be tracked in real time and accurately thanks to this technology. Additionally, it aids in quickly distributing the information to all of the project's stakeholders. Using NFC and GPS as a powerful portable tool, this strategy collects, stores, shares, and reuses field data accurately, totally, and virtually instantly.

Using morphological analysis, Goel et al. (2019) categorised the literature of sustainable integration in the management of building projects under seven aspects of motives, stakeholder orientation and organisational context as well as 31 variants of each.

3. PROJECT MANAGEMENT THEORY

3.1 Life cycle of Project Management

"The steady flow of a project from its beginning to its end," says the Project Management Institute (PMI 2000).

Each stage of a project's life cycle is broken down further into phases. Even yet, iterations are a common occurrence in some phases of most projects, albeit in varying degrees depending on the particular project.

It is generally agreed upon that a normal PLC is made up of two broad eras, each of which contains two significant stages (i.e. four in all). The first stage is developing a concept and testing it using a business case. Setting up a project brief or charter follows. Phase two involves implementation, i.e. designing, building and delivering a product to a target audience.

PLC is defined in a variety of ways by various Project Management researchers (de Cos 1995, Gomez-Senet 1997). Although these phases are referred to by various names in different project contexts, they are traditionally separated into the following:

- Phase 1: An idea in its inception. The ability to see the bigger picture.
- Phase 2: The development of an idea into a

workable strategy. Commitment, listening and analysis are all part of the process.

- Phase 3: Execution of a strategy or plan. Production, testing, and coordination.
- Phase 4: Project accomplished. Product and information transfer, review, and finalisation.

In general, each phase requires a different amount of management focus and a different set of skills to manage effectively.

In some cases, these standard phases may be split down into sub-phases or iterations, depending on the project's size, complexity, risk, and sensitivity. They'll be distinctive to the project, and they'll be influenced by the general strategy of the project.

Projects are complex and time-consuming if we focus on the building of them. A project's development often involves a number of distinct phases, each of which necessitates a wide range of specialist services. Each stage of the average construction project requires input from a wide range of different stakeholders, including financial and government agencies; engineers; architects; lawyers; insurers and guaranty companies; contractors; suppliers; and builders. Even a simple building requires a wide range of talents, resources, and hundreds of distinct processes to be completed. Assembly must follow a natural sequence of events that includes a complex pattern of individual time requirements and constrained sequential linkages among the structure's various parts.

To put it another way, a project's primary goal is to meet the demands of the market as quickly as possible. The following is a generic description of a building project from conventional Project Management studies. At this step of the project planning process, many options are reviewed and compared in order to identify the best potential project that can be implemented with the least amount of risk. The offered alternatives' funding methods must also be assessed, and the project's schedule and available cash flows must be taken into consideration. In order to control costs, detailed engineering design provides the blueprint for construction, and a definitive cost estimate serves as a baseline. There must be a comprehensive strategy for the delivery and building of the project on site during procurement and construction. When a new facility is put into use for the first time, there is usually a short period of start-up or shake-down. As a last step, the facility's management is handed over to its owner for full occupancy until it is either demolished or converted.

Construction project management can be divided into four stages:

- **Market Demands or Perceived Needs.** Defining the project's goals and scope are the primary goals of this phase. A new facility must be defined and budgeted for after an owner has identified a need for a new facility. An important part of this process is determining the broad project characteristics such as site and performance criteria as well as project size and configuration in order to plan the project's layout.

- **Conceptual Planning and Feasibility Study**. Although a significant amount of preparatory architectural or engineering work may be required, conceptual planning may not include comprehensive design. Although a design professional may be called in for technical support and guidance, the definition of the profession is largely the responsibility of the owner.

- **Design and Engineering**. Construction plans and specifications are the goals of this stage. In this stage, the entire project's architecture and engineering are conceptualised and designed. As a last step, the final building designs and specifications are drawn up. Constructing a building is a multi-stage process that begins as soon as the design is complete and the plans and specifications are available.

- **Procurement and Construction**. Key project equipment and materials, especially those that may require lengthy delivery times, are procured through procurement. This may or may not be a separate process from the building itself. In order to complete a construction project, it is required to provide the people, construction equipment, supplies, supervision and management, as well as the materials and equipment needed to complete the work.

- **Start-up of occupancy.** There is normally a short time of start-up or shake-down of the facility when it is initially inhabited after construction is done. Once the occupancy permit has been issued and the facilities have been accepted, occupancy is permitted.

- **Operation and maintenance.** A full transfer of the facility's management has been completed. It is during this stage that the building's facilities are utilised and maintained. The building's possible improvements are also taken into consideration at this point.

- **Disposal of facility**. Demolition or conversion of a facility occurs when its usable life expires. The facilities and building components will be demolished and maybe recycled during this phase.

4. BUSINESS PROCESS ANALYSIS OF THE CONSTRUCTION PROJECT COST INFORMATION SYSTEM

It's become an inevitability that construction firms will adopt an information-driven approach to managing project costs as the Internet grows. Today, computer and Internet technology are advancing at a rapid pace, allowing them to fulfil the demands of business for information construction and administration. This has contributed to the growth of businesses and given them a new sense of momentum. In order to achieve information sharing, the primary idea is to implement a construction project cost information system for project cost management. Business leaders, template design, template for examination and approval of personnel, the project cost, the project management, system management staff, suppliers and the demand for the system function are all included in a construction project cost information system. Figure 4.1 depicts the business process of the construction project cost information system.

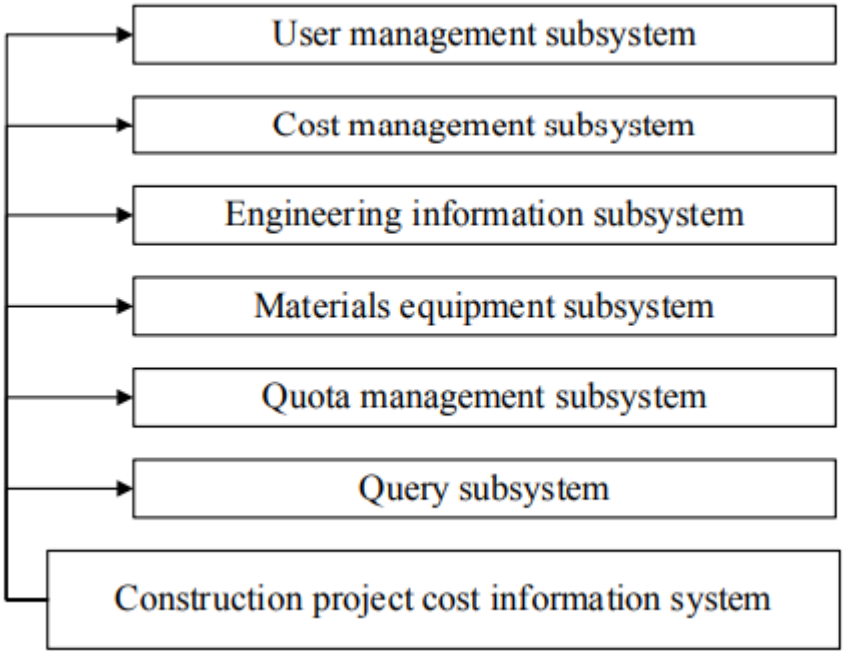

Figure 4.1. Functional module of the construction project cost information system

It is now possible for executives to see project details, including the project's cost and progress. After logging in, the template designer can construct a template for engineering costs, template kinds, and template contents in an effort to satisfy the realistic engineering and management needs of the field.. It is possible to submit a template for personnel examination and approval following the login system, which will be reviewed by a project cost information system database and will not be returned to a design team member who created the template. Additionally, you can access the project's details.

4.1 Functional requirements analysis for the construction project cost information system

User management, cost management, project information management, materials and equipment management, identifying markers for statistics, and system auxiliary functions are all included in a construction engineering cost management system, as depicted in figure 4.2.

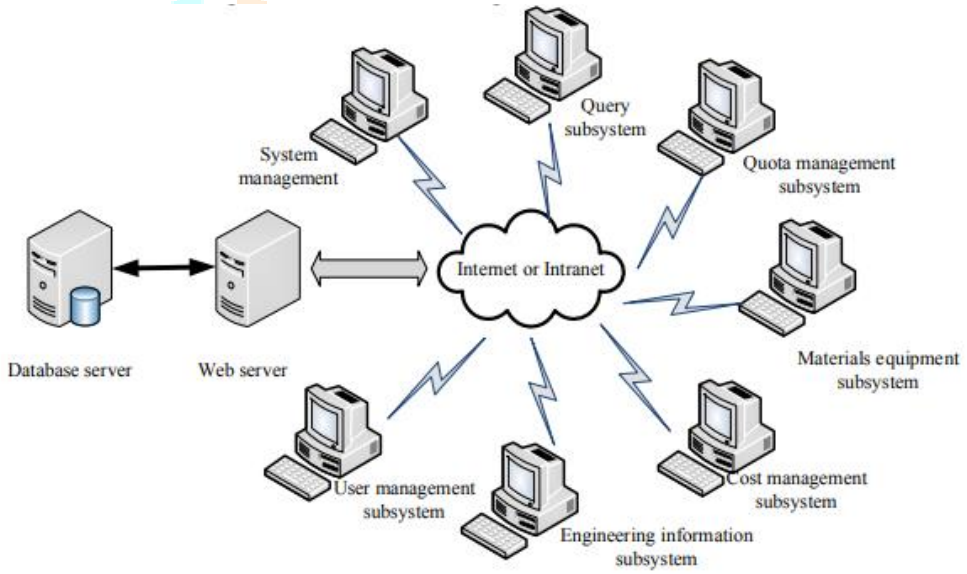

Figure 4.2. Hardware structure of the construction project cost management system

4.1.1 User management subsystem.

To engage in construction engineering project management of all personnel information, such as adding new members (join), updating user information, setting rights for various users, and deleting users when they leave the project, the user management subsystem is employed.

4.1.2 Cost management subsystem.

Progress payment examination and approval; construction statistics; project fund plan management; material plan approval; accounting settlement audit; cost analysis etc. are all included in the cost management subsystem for engineering construction

4.1.3 Engineering information management subsystem.

Subsystems for engineering information management include project addition, modification, deletion, project classification, and statistics on quantity, among other things. Subsystem for managing materials and equipment. Procurement planning, bidding management, purchase contracts, material storage registration and outflow are some of the functions provided by

this subsystem for engineering materials and equipment needed for management.

CONCLUSION

There have been tremendous technological advancements in the 1990s that have resulted in the development of strong software packages for the construction sector that have transformed the way construction projects are managed. Personal computers have had a major impact on the way many individuals do their jobs because of its rise and growth. When it comes to construction projects, managing information and communication is a crucial part of the process. The use of e-mail and other new ways of working have transformed the relationship between partners and exacerbated the gap between those who use IT tools and those who don't. Organizational communication has undergone a radical shift as a result of the development of associated technologies. Information is now available to managers and other staff in greater amounts than ever before, and it is also available in a faster and more dependable manner than previously. Managing and monitoring information networks is now an essential part of the modern information management process.

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