



Challenges in Construction Technology Encountered by the Construction Consultancy Company in the Kingdom Bahrain

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Technology management is becoming more significant nowadays because of the fast-moving growth of technology in the different fields of specialization. This study focused on the challenges encountered by the construction company as consultant to contractors, challenges during the construction stage of the on-going project and analyze the challenges involving the technology used in the process. This study employed the qualitative method of research using an interview and observation in gathering data about the challenges encountered by the construction consultancy company. The subject of the study includes one project and one contractor being observed and involved in the study. Results showed the challenges encountered by the company being consultant to the project includes working drawing issues, contractor's insufficient fund, contractor's poor financial management, client's choice of contractor, delayed payment to contractor, clients' inadequate fund for the project, and delayed schedule. The challenges during the construction

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stage of the on-going project include construction quality issues, weather conditions, construction methods, piling works issues, gravel and sand supply, concrete pouring issues, timing during Ramadan, workers' alibis on praying, diverse nationalities, insufficient manpower supply. In addition, the challenges involving the technology used in the process are construction technologies and computer aided design. It is recommended that the company create policies on technology management with a focus on technology planning, managerial and financial economics, and technological solutions to environmental problems in the Middle East, particularly those pertaining to weather and human comfort.

Keywords: *Technology management; construction technology; building construction; challenges in construction.*

1. INTRODUCTION

Technology management is becoming more significant nowadays because of the fast-moving growth of technology in the different fields of specialization. Managing a technology helps an organization get ready for the demands for higher performance to meet customer needs.

The Queen's Centre for Enterprise Development (QCED) study found difficulties for fast-growing businesses and each issues has a unique effect on how these businesses develop and manage information technology, which is essential to their expansion (Saunders & Chan, 2002). Successful implementation of technology is challenging to achieve without comprehension and the right tools, and the foundation of a successful implementation team is only made up of skilled, innovative development organizations with connections to the real world (Tulenheim, 2015).

Construction industry in Bahrain is one of the contributing factors for the physical, social, economic, and technological development of the country as it is noticeable in the kingdom of Bahrain, with new construction of high-rise buildings intended for commercial and residential purposes, and road constructions that cater for the improvement for smooth movement of traffic are currently commencing for development. In the report of Tamkeen on the Market Gap Studies, study revealed that the Construction & Real Estate have been active sectors in Bahrain, despite the general economic slowdown with construction of buildings being the largest contributor to revenues in the construction services sector (Tamkeen, 2010).

There are a lot of challenges that the construction company are facing from the pre-construction stage, construction stage and post-construction stage whether you are a consultant, a general contractor, or a sub-contractor to

construction projects. According to study, resource allocation, time, cost, quality, safety, project complexity, changes, uncertainties, and communication were found to be the main obstacles in the project (Alameri & Alhammadi, 2021).

Construction consultants here in Bahrain faces a lot of problems due to issues on poor management and financial management brought by the inexperienced clients and contractors. Studies revealed that information management, poor project relationships, and information exchange delays are the most frequent problems with collaboration on public projects (Danstan, Mutale, & Zikondondo, 2017). Numerous obstacles prevent construction companies, especially small and local ones, from expanding and surviving. There are many financial challenges, such as high startup expenses, restricted financing options, and late client payments (Tayeh, Alaloul, & Muhaisen, 2019). Significant challenges are also presented by economic considerations such volatile material pricing, currency volatility, and poor general economic conditions (Bala, Bello, Kolo, & Bustani, 2009) (Tayeh, Alaloul, & Muhaisen, 2019). Progress is further hampered by government-related problems such as corrupt officials, unattractive business environments, and a lack of enabling policies (Bala, Bello, Kolo, & Bustani, 2009). Recruitment issues, a hazy vision, and the complexity of strategy planning are examples of internal hurdles (Tayeh, Alaloul, & Muhaisen, 2019). Low labor productivity is a major problem for Bahraini construction companies, among other difficulties. Lack of supervision, cooperation across design disciplines, and labor skills are important variables influencing productivity (Jarkas, 2015).

These related studies have cited different challenges of construction projects but failed to address qualitatively the difficulties in terms of

specific technology used in the construction operation as faced by construction firms, during the construction phase of projects in the Kingdom of Bahrain. It is for this reason that this study is conducted to present qualitatively the challenges of construction technology during the project implementation.

1.1 Research Objectives

This study aimed to know the challenges encountered by the construction consultancy company in the Kingdom Bahrain. Specifically, it aimed to:

1. Determine the challenges in construction technology encountered by the construction company as consultant to contractors.
2. Determine the challenges during the construction stage of the on-going project.
3. Analyze the challenges involving the technology used in the process.

2. METHODOLOGY

2.1 Research Design

This study used qualitative research in determining the challenges in construction technology during project implementation as faced by the construction consultancy firm during construction stage and the issues encountered with different clients. Qualitative research is a method of research which explores real life situation focused on phenomenon using in depth data collection about detailed views of the participants, collects comprehensive responses from them in the form of words or images, then analyzes the data for description and themes (Creswell, 2012).

2.2 Data Gathering

The data were gathered from observations and interview with the structural engineer who is the project coordinator of the company. The subject of the study includes one project and one contractor being observed and involved in the study. This paper identified the challenges encountered by the construction company as consultant to contractors, the challenges during the construction stage of the on-going villa project, and the challenges involving the technology used in the process.

3. RESULTS AND DISCUSSION

The findings of this paper are based on the subjects' narratives and observation which highlight the challenges of organizations' construction operations as consultant to the contractors on various construction projects and specifically the challenges encountered during the construction of five housing villa projects.

3.1 Challenges Encountered by the Construction Company as Consultant to Contractors

The discussion below shows the challenges on various construction projects by the consulting firm as consultant to contractors as cited by the respondent.

Working Drawing issues. Some issues on inadequacy of plan and specifications drafted. For example, there is a failure in the specification of materials, and discrepancies of construction working drawing details.

Contractors' insufficient fund. There are some contractors who are incapable of completing the project which resulted to the termination of contract. Thus, another contractor is introduced to complete the project which causes big problem to the consultant and to the project.

Contractors' poor financial management. Contractor's poor financial management is due to instances like the allotted budget in project A is used in project B resulting to failure in completing the project A.

Client's choice of contractor. Since the contractor was selected by the owner rather than from a properly based competitive bidding process, the consultant has issues with the contractor's work performance.

Delayed payment to contractor. This is one of the common issues in the construction industry due to contractor's insufficient fund and poor financial management.

Clients' inadequate fund for the project. Client money that was loaned from the bank was mismanaged by the owner and partly utilized for pleasure.

Delayed schedule. One of the common problems in construction industry due to cost and

time over runs which is caused by poor project management.

This is similar to the study of Mohammed which states that there are numerous obstacles affect the performance and success of construction projects. Conflicts between project participants, cost overruns, and delays are key issues in the project (Mohamed, Moustafa, & Arabia, 2016).

3.2 Challenges during the Construction Stage of the On-Going Villa Project

Construction Quality issues. Failure of the contractor to follow specifications such as spacing of bars are not well observed due to weather conditions which affect the workers' performance.

Weather conditions. The extreme weather conditions in the Middle East gave a construction company a challenge to come up with environmentally friendly designs to achieve human comfort. This challenges the working conditions as well in terms of coping up work schedules which forces the contractor to introduce variety of work shifting schedules.

Construction methods. The method of being environmentally friendly challenges the consultants in imposing disciplines on the contractor like proper waste disposal techniques and some management strategy linked to protecting the environment.

Piling works issues. Contractor failed to confirm the details in the plan like soft type of soils in contrary to boring tests from geotechnical exploration.

Gravel and sand supply. Insufficient supply in the country is one of the issues in construction industry where supply is imported from Saudi Arabia and nearby gulf countries.

Concrete pouring issues. Due to traffic congestion which causes delay of delivery, there is a tendency of violation to specifications of ready-mix concrete which has maximum of 90 minutes from introduction of concrete to aggregates during concrete mixing in the plant to the pouring of concrete on the structure.

Ramadan month. Since Bahrain is a Muslim country, a shortened working hours are mandatory for Muslim brothers during Ramadan

time which became a challenge in the construction management and operations.

Workers' alibis on praying. This is a common issue to the construction and a challenge to the site project engineers. Workers tend to make "Sala" or praying time as an excuse to skip working hours.

Diverse nationalities. The composition of workforce with varied nationalities creates language barrier issues and worst case a fight between nationalities.

Insufficient manpower supply. The limited number of contractor's workers causes big challenge to the need of achieving desired performance of the client.

This is related to the study of Alshehri which states, design differences, poor craftsmanship, and inefficient communication are the main causes of problems in Saudi Arabia, which result in project delays and cost overruns (Alshehri, 2019).

3.3 Analysis of the Challenges Involving the Technology Used in the Process

Construction Technology. The weather in the Middle East makes it difficult for construction companies to create environmentally friendly designs that nevertheless provide for human comfort. This involves an excellent construction technology which aims to achieve sustainable methods using efficient construction materials and technology in designing and constructing residential villas which provide comfort to occupants while providing protection to environment. This also makes it difficult for the contractors to manage work schedules and forces them to introduce a variety of fluctuating work schedules. Alshebani and Wedawatta (2014), states that the expertise of managing projects in extreme hot weather circumstances plays a crucial role in future planning and scheduling of site activities as it aggravates the management and planning challenges that occur during the lifetime of a project (Alshebani & Wedawatta, 2014).

In addition, piling works issues utilize construction technology in performing actual site exploration and laboratory testing technologies.

Computer Aided Design. The use of computer aided design technology addresses the issues on drawing inconsistencies which are found in different working drawings for architectural and structural plans.

4. DISCUSSION ON THE MAJOR PROBLEM ENCOUNTERED

Poor financial management. This is a big challenge to the consultant because of contractors' poor financial management and client's choice of contractor, which causes delay in payments and eventual delays in schedule and poor construction performance. This is similar to a study, the performance of construction companies in general and self-financing companies was significantly impacted by the financing situation (Muhsin, 2020).

Construction methods. The utilization of construction technologies which aims to achieve quality and environmentally friendly are the two methods which challenges the consultants in implementing or imposing disciplines to the contractor in achieving an effective waste management and management strategy which helps in protecting the environment. A model that includes the management strategies required by the various stakeholders to carry out the implementation of environmentally friendly construction methods was developed because of the research on sustainable construction strategies for building construction projects in the Kingdom of Bahrain (Nebrida & Gomba, 2023).

5. TECHNOLOGY MANAGEMENT ON THE IDENTIFIED MAJOR CHALLENGE

Engineering Technology Design. The company uses ETABS (Extended Three-Dimensional Analysis of Building System), a highly developed and practical special purpose analysis & design programme, used to analyze structural designs, particularly for building systems. In addition, AutoCAD is used for drafting of working drawings for architectural and structural design of buildings and other projects. These technologies were used in addressing the challenges encountered by the company like issues on working drawing inconsistencies, architectural drawing and structural analysis.

Sustainable Construction Technology. The use of the following methods which are environmentally friendly addresses the challenge

in achieving the issues of weather conditions in middle east and responding to the needs of environmentally friendly approach of construction operations.

- a) Energy and Materials-based techniques. Consideration of design using High efficiency fixtures, insulated materials, human sensor types of electrical and mechanical fixtures and zoning control of Heating, Ventilating and Air Conditioning (HVAC) systems.
- b) Waste-Based Techniques. The methods of considering recycling materials back into the process, controlling waste management, and optimization of the design of structural steel reinforcement design
- c) Management strategy linked to the environment. Consideration of the environmentally friendly materials in the design, awareness campaign in promoting environmentally sustainable construction, environmentally friendly construction methods on site, and environmental consciousness of designers.

According to Abramyan et al (2020), future buildings will likely use more sophisticated materials and technology which are energy efficient and good to the environment (Abramyan, Mikhailova, Vayngolts, & Kotlyarevskaya, 2020).

6. CONCLUSION AND RECOMMENDATION

This paper focuses on the Challenges in Construction Technology encountered by the construction company as consultant and challenges encountered during the construction stage of the on-going villa project. Findings showed that the contractor encountered challenges on various construction projects like working drawing issues, poor financial management, and time overrun issues. In addition, it faces issues in an ongoing project like quality issues, construction methods, weather issues, Ramadan shifting schedule, Muslim prayer issues, and diversity of nationalities. It is concluded that technology management like the use of computer aided software and sustainable construction technologies can specifically help in addressing construction quality and environmental construction issues with the use of energy and material-based technique, waste-

based techniques, and management strategy linked to protecting the environment.

From the results of the findings, it is recommended that the company will develop policies on the following:

- Technology management specifically on technology planning to address the use of working drawing issues and construction methods.
- Managerial and financial economics on assisting the contractors and clients regarding poor financial management.
- Technological solutions to environmental issues in Middle East especially on matters of weather issues and human comfort.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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