Determining the potential Benefits of Using Primavera P6 Technology in Sustainability and Construction Project in Libya

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Abstract

The sustainability of construction projects in Libya is influenced by factors like the lack of enough building resources, poor planning, implementation approaches, and high construction costs. As every engineering sector advances each data, construction industries and not exempted. With Primavera P6 Technology, the construction of companies has been able to organize, plan, schedule, and manage the resources in a better way. Increased construction activities in Libya have made it difficult to make a proper plan and accomplish the project promptly. The data collectively, through a combination of interview and survey, reveals that Primavera P6 Technology serves as essential tool that aid in handling the issue of resources, planning, raw materials, and sustainability issues affecting the

Keywords: Primavera, Construction projects, resources, raw material, and Construction Company.

1 Introduction

Primavera P6 is an essential document used in project management. During the project implementation process, the tool aids in the planning, executing, and managing of activities related to construction and sustainability projects. Besides the construction industry, the tool has been used for thirty years to support the IT and energy sectors. The tool was previously used and bought out by oracle before being modified into a document currently used. Since the development of Primavera P6, the tool has extended its benefits beyond helping project managers, engineers, suppliers, constructors, and manufacturers [1]. The tool is normally used to increase the efficiency of the planning process and minimize the risk of schedule overturn. Ideally, the tool Primavera P6 is used to identify the project's challenges early and initiate the intervention before it causes delays.

1.1 Background

The construction industry in Libya has remained an essential contributor to socio-economic development since 1950. Considering sustainable companies' impact on

overall development, there has always been an overwhelming need to scale up the volume of construction activities in Libya. Similarly, expanding the construction industry also led to resource consumption, contributing to various challenges. For instance, construction companies have been recognized as the major consumers of water and cements. This implies that other sectors have been struggling to ensure the sustainability of resources. Over the last ten decades, the construction industry contributes 5.2 percent of the Gross Domestic Product in Libya. The industry also employs 3.2 percent of the workforce [2]. Despite the significant contribution of the construction industry in Libya, little research and development focus is put into determining the benefits of Primavera P6. The below shows illustration about Primavera P 6 technology[2].

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The picture above demonstrate how Primavera P 6 software technology looks like, how the technology works and the benefits it has when used by the construction industries. The first picture also indicates the trends of positive changes upon the adoption of Primavera P 6 technology. The construction industry has faced challenges due to faster growth trends and reliance on foreign experts to design projects and deliver resources to facilitate the process. Libya's construction industry has failed to meet the housing and supply needs of the country. However, with the introduction of Primavera P 6 technology, the construction industry has been experiencing improvement in service delivery [6]. The technology's exact benefits on the construction industry's progress have not been fully examined. The need to construct hotels and resorts to expand tourism has also opened opportunities to explore the construction industry. However, the building of tourism structures has faced blockage by policies for many years. Similarly, the construction industries previously suffered due to a lack of financial, managerial, and technical capabilities to handle the current needs of construction industries. The construction industry also encounters high demand for technological, social, political, and economic changes to deliver high-quality services [6]. The introduction of Primavera P 6 technology has aided in the elimination of strains affecting the industry. Understanding the benefits of the technology will therefore aid in formulating new policies and changes that will positively influence the building industry. The effective implementation of construction projects has been witnessed since the development of the cement and concrete industry in 1950. The sustainability

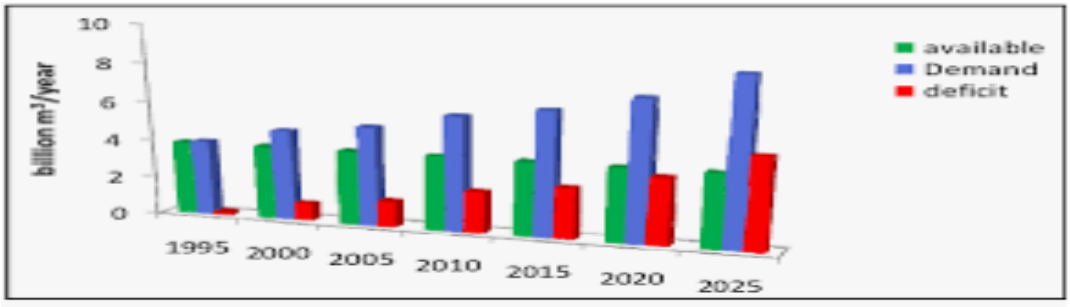
of construction projects normally relies on products like bricks, cements, and concrete, among other materials. Due to increased construction activities, cement consumption rose from 60,000 tons to 5.8 million tons between 1958 and 2003 [6]. However, there is little research on how management tools like Primavera P 6 technology contributed to the expansion of the construction industry, which led to increased cement consumption.

1.2 Research Problems

Libya anticipates a boom in the construction industry. The industry expects to construct over 500, 000 housing units for Libya's increased population, which will cost about 25 billion dollars. However, the contribution of a program like Primavera P6 Technology to the effectiveness of future housing projects has not been fully examined. The research indicates that over 70 percent of Libya's construction companies face challenges due to a lack of sufficient materials in the market to facilitate the process. This implies that the plan to increase the number of housing facilities in the future will be paralyzed if the material shortage is not addressed using the right approaches [2]. Similarly, 68 percent of the consultancy firms dealing with construction activities cite issues with raw material availability. However, limited research has been conducted to find how the Primavera P6 Technology may contribute to solving raw materials supply for easy implementation of construction projects. With increased economic hardship in different parts of the world, Libya is not excepted as the issue goes further to affect the construction industries. Ideally, a high construction company investment rate was found to impose a burden on the Libyan economy [4]. This is because the country has to spend significant resources to build the technology that will support the process. However, there is little research regarding investment in technology like Primavera P6 and its known contribution to the industry. Despite the increased effort by the government to make a friendly environment for the operation of all industries, some companies fail to perform to the desired level due to increased raw materials prices. For instance, the construction industries normally fail to meet their set goals due to the high steel, cement, and labour costs. Additionally, foreign workers dominate the construction industry, making sustainability difficult to achieve. Though the company seems to aim at achieving the highest level of performance, its expectation is higher than the material possibility. Therefore, examining the contribution of Primavera P6 technology will help revive hope for achieving the objectives of the construction industry.

The Libyan construction industries have been facing issues due to the size of the country. Libya measures approximately 1 759 540 km2, making it extremely large for construction materials to be delivered from cities to different construction sites (Lokesh & Mahendra, 2018). Since the materials have to be transported for longer distances, coupled with complex communication systems, it has contributed to a rise in the construction cost. For instance, Libyan cities with Muslim communities divided themselves by about 100 miles on the cost of construction materials and more than the distance [4]. Concerning the cost incurred by the transport industries, the research indicates that over 95 percent of the construction companies in Libya cannot deliver

services to customers due to higher transport costs. The construction activities are therefore considered less sustainable. Despite the increased cost of construction services, little research has been conducted to examine how technologies like Primavera P6 can help address transport cost issues to make construction sectors sustainable. For instance, the cost of transporting materials in Libya has increased by 10 to 50 percent, making construction activities difficult. The research will help examine the contribution of Primavera P6 technology towards realizing better transport costs. Water is considered one of the essential resources required for construction activities to be successful. However, Libya's construction industry is known to be largely affected by water scarcity. Ideally, water is an important factor in the processing of raw materials used for construction. Therefore, a shortage of water will lead to a situation where inadequate raw materials are availed for use by construction companies. Water is also used in assembling and manufacturing, and washing construction equipment. The personnel working in the construction points also use water for personal reasons. This makes water an essential construction resource in Libya. Without solving the water scarcity issues, Libya will find it difficult to meet the construction requirements in the future. The research will therefore help examine how Primavera P6 technology can make construction industries thrive despite water scarcity issues. The Problem of water shortage also goes further, affecting a larger population. The research shows that over 4 million people are suffering from a lack of enough water. The number incorporates over 1.5 million children directly affected by water shortage. Therefore, people seeking to run construction projects will have to incur extra costs in securing water, undermining their capacity to fulfil their desires. Despite the extended issues associated with water shortage, little research has been conducted to find out how Primavera P6 technology can help revive the construction industries which are sinking due to water shortage. The graph below shows the trend in water consumption in Libya.



[5]

From the graph above, water consumption has been on the increase since 1995. The graph also shows that water usage will increase further by the year 2025. This implies that the construction industry will suffer due to lack of enough water as one of the resources used in building and construction sectors.

Over the past years, construction industries in Libya have been suffering due to political and economic issues. The national economy and political instability undermine the availability and affordability of building materials, thereby affecting the industry's

progress. For instance, the political instability that led to the removal of the long-term ruler Muammar Gaddafi in the year 2011 affected the ability of the projects to run smoothly. This is because; the absence of peace in some parts of Libya due to the death of Gaddafi interfered with the transportation of raw materials for use by the industries, leading to slow growth of the construction sector. Considering the economic situation, Libya relies majorly on the oil business. For example, Petroleum contributes to over 95 percent of the total exports, generating revenue of about 40 billion dollars annually. The oil business, therefore, contributes 60 percent of the total GDP. However, individuals not in the oil business are likely to suffer due to financial challenges.

Most consultancy firms working with the construction industries are also experiencing the effects of raw materials shortage. The breakdown in the availability of raw materials is that some are not made within the country; hence, the contractors must ship them from abroad. For example, the electrical fittings are usually sourced from other countries; hence delays are experienced before the materials are received [7]. Ideally, Libya tends to receive such electrical materials from Saudi Arabia and USA. The shipment of the electronics and electrical materials used in construction may be too expensive or involve a complex process. For instance, Saudi Arabia and Libya paid about 4.39 million dollars for importing electronic products to facilitate construction activities. Additionally, 24.49 million dollars was paid by Libya to ship the products from the US. Since the shipment cost is significantly higher, some construction companies tend to utilize cheaper and local resources, increasing low-quality structures. On the other hand, some companies who manage to source high-quality building materials from abroad have been found to charge the customers highly, reducing their urge for construction. Despite the continued effects of shipping construction resources, little research has been conducted to discover the role of new technologies in solving issues associated with imported materials [10]. The research will, therefore, seek to examine whether Primavera P6 technology has contributed to solving the construction issues emanating from materials being imported from other countries.

1.3 Research Objectives

The research utilizes the objectives include the following;

1. To determine the potential Contribution of Primavera P6 Technology in Sustainability and Construction projects in Libya
2. To find out how the Primavera P6 Technology may contribute to solving raw materials supply
3. To determine the contribution of Primavera P6 technology in reviving hope for the achievement of the objectives of the construction industry and handling the issues
4. To determine the role of Primavera P6 Technology in solving raw material unavailability and issues of transport costs

2 Materials and Methods

A research method incorporates the structural approaches used in collecting and analyzing the data. The data collection and analysis can be done using a combination

of approaches. Ideally, the data collection approach should provide sound and comprehensive information presented as both quantitative and qualitative data (Mahure & Ranit, 2018). Quantitative data are generated through questionnaire analysis, while quantitative data is generated through interviews. The methodology of this research utilized the following places.

2.1 Issue Identification

The issues and the aspects were identified surrounding the construction industry including building materials and the contribution of Primavera P6 Technology. The identification and analysis of the issues were used through the review of different publications and literatures. The step was meant to examine the existing information and view of current researchers in the construction industry.

2.2 Place of Study

The study was based on Libya and its environment. It was done majorly for learning purposes and to advance knowledge. The construction industry dominates most parts of the region. Therefore, the place provided the best opportunity to examine the contribution of Primavera P6 Technology in construction.

2.3 Actual Data Collection Exercise

During the data collection exercise, the aim was to ask a similar question repeatedly to different people examining the answers provided by the participants. For an effective data collection process, 42 questionnaires were distributed and answered by the consultancy firms. Fifty-eight construction companies were also provided with a questionnaire. Each party was given 30 minutes to fill out the questions before the papers were collected for analysis. Ideally, the issuance of a questionnaire was done by the trained research assistant to ensure that the right information was gathered. Additionally, significant time was spent with a team of engineers and people working in the ministry of resources, trade, and transportation departments. The informal interview was also done to help gather a significant amount of data. Other than the interview, data were collected through direct observation of the activities taking place within the construction sectors in Libya and the influence of Primavera P6 Technology. Ideally, the data was collected through the visual and physical survey as well as the analysis of the publications related to constructions and contribution of Primavera P6 Technology. The researcher also gathered visual results for sound survey results like photographs of construction activities and audio records of discussions by different participants. The below shows some photographs taken during the research process;

The above pictures were taken in some of the construction sites which formed part of catchment area for the research. The pictures demonstrate the nature of materials used for construction and the extent to which to which the build environment is much advanced in Libya. As evident in the picture, the structures are made of blocks, cement and metals which are important construction materials.

The participants were identified through random sampling and snowballing to ensure the right sample size was obtained. During the participant selection process, the 12 construction companies were randomly selected from different parties in the country. After random selection of the companies, the snowball approach was used in identifying and engaging civil and structural engineers who were attached to the companies. In the snowball sampling method, a few participants were identified, after which they were asked to guide how to identify more targeted participants. Other than civil and structural engineers, other experts and stakeholders that influence the construction industry were identified through the snowballing process. The snowballing process made it possible to focus only on individuals interested in participating in research while eliminating non-experts [5]. To successfully test the validity and reliability of the questionnaire, the pre-testing was first done to check how participants responded to the questions before the data collection exercise, including the time taken to complete the process. After the pre-test exercise, changes were made to the arrangement and structure of the questions before the actual data collection exercise.

3 Theories and Calculation

The research was grounded on the theory of sustainable development. The theory asserts that there must be economic, social and ecological aspects to achieve the development agenda, including the construction projects [5]. The sustainable development theory aims to consider how economic development, like the use of Primavera P6 Technology, can impact the construction project. The research went further into examining whether technology influences the project's sustainability by determining the flow of raw materials and the availability of resources needed in the building industry.

3.1 Mathematical Expression and Symbol

Schedule variance (SV) decides if a project is on time or behind schedule. It is computed by deducting the projected value from the earned value.

Schedule variance = Earned value (EV) -Planned value (PV)

The Schedule Variance (SV) may be represented as a percentage by dividing it by the projected value (PV): SV% = SV / PV

Schedule performance index (SPI) denotes how well the project team uses their time.

Schedule performance index = Earned value / Planned value

Time estimate at completion {EAC(t)}

We can give you an informed approximation when the job will be completed.

Estimate at complete {EAC(t)} = (BAC/SPI)/ (BAC/months)

BAC = Budget at completion

Cost analysis and forecasting

Cost variance (CV) - We can give you an informed approximation of when the job will be completed.
Cost variance (CV) = Earned value (EV) - Actual cost (AC)
This statistic may be represented as a percentage by calculating the cost variance (CV) by the earned value (EV).
CV% = CV / EV

Cost performance index (CPI)

It is one of the most obvious measures of the project's overall cost-effectiveness.
Cost performance index (CPI) = Earned value (EV) / Actual cost (AC).

4 Theories and Calculation

4.1 Results

Based on the interview and analysis of the questionnaire, most of the construction industries engaged in the research were already aware. They used Primavera P6 Technology to facilitate their activities. 86% of the contractors had used the technology and could narrate the benefits. In contrast, only 14 % of the contractors engaged during the research exercise were unaware of the Primavera P6 Technology and its roles in addressing the construction industry's challenges [5]. Additionally, 76% of the consultancy firms recognized the importance of Primavera P6 Technology in handling the modern issues affecting the construction industry. However, 26 percent of the consultancy firms had no idea about the Primavera P6 Technology and how it may impact construction activities. The findings also indicate that Primavera P6 Technology influences raw material supply. From the interview, 83% of the participants stated that they could easily source building materials after incorporating Primavera P6 Technology in their program. Meanwhile, 17% of the contractors were still experiencing issues with supply despite using the new management approach. The table below shows changes in building materials supply before and after the adoption of Primavera P6 Technology.

TABLE 1: CHANGE IN BUILDING MATERIALS SOURCES WITH THE USE OF PRIMAVERA P6 TECHNOLOGY

Sources	Cement		Rein steel		Blocks		Finishing Material	
State Factories	47.4 %	65.2%	49.1%	70.2%	15.8%	41.6 %	22.8 %	46.1%
Private Factories	-	-	-	34.6%	73.7%	80.3 %	19.3 %	36.2%
Shops	78.9 %	95.2%	70.2%	86.3%	15.8%	34.8 %	80.7 %	93.6%
Importation	43.8 %	67.3%	10.5%	23.7%	16.3%	26.1 %	35.1 %	58.9%

From the table above, the building materials like rein steel, cement, finishing materials, and blocks experienced an increase in supply from the source following the adoption of Primavera P6 Technology. For instance, the table indicates that after the consultants and contractors had started using the Primavera P6 Technology, the percentage of cement received from state factors increased from 47.4% to 65.2%. The analysis indicates that 79.5% of the contractors and 87.3% of the consultants achieved the work objectives revived. Both constructors and consultants had improvement in their work toward meeting the construction objectives after embracing the use of Primavera P6 Technology in every activity. Additionally, 91.2% of the contractors and 84.2% of the consultants were able to use Primavera P6 Technology in solving raw material unavailability and issues of transport costs [5]. Both consultants and contractors go through a breakthrough with the raw materials access. Also, 81.3% of the consultant and 85.4% of the contractors engaged had their construction sustainable after embracing the technology.

4.2 Discussions

The findings indicate that most of the contractors and consultants who used technology reaped several benefits compared to when the old construction approaches were in place. During the interview process, the participants could assert that Primavera P6 Technology creates an avenue for smooth project management by allowing the engineers to design a strategy that enables them to control delays in the delivery of construction materials, transportation, and importation [3]. The Primavera P6 Technology was therefore appropriate in ensuring that the projects are accomplished on a timely basis which is in line with findings by [4]. The contractors also confirmed that the technology is useful in their planning events, enabling them to accomplish the entire construction requirement within the stipulated schedule, time, and budget. Contractors and consultants, therefore, regard Primavera P6 Technology as maintaining trust with customers through delivering their construction services at a pace that is favourable to the clients at a friendly cost. Ideally, the participants believed that the lack of Primavera P6 Technology in their planning and project implementation was more effective. During the interview process, participants reiterated that before the adoption of the technology; they were experiencing challenges like the inability to manage time effectively, complete the project on the right budget, and maintain a steady supply of the construction materials, as also evident in an article by [5] and [2]. The absence of Primavera P6 Technology in the construction process contributes to a situation where resources are not properly managed, an unstructured way of handling the contracts, improper project scheduling, weak project management strategies, and a sound scheduling process. The absence of such an important ingredient during the construction exercise undermines the ability to deliver customers the best and most desirable services. The research also recognizes the Primavera P6 Technology as an important tool for managing resources like water and other building materials like cement, steel, and electrical appliances. The finding is in line with the publication by [9], which reveals that limited building resources can be effectively managed if the

technology is used. This is because the use of Primavera P6 Technology by all construction companies creates the ground where the building materials and other resources are effectively utilized. The demand for building materials is balanced with the supply rate, as supported by [4] & [2]. Ideally, participants confirmed that the tools assist them in identifying the right construction project to venture in at a particular time thereby making it difficult to suffer raw material shortages.

Most participants supported that using Primavera P6 Technology is an important requirement in meeting the objectives of construction projects. The participants confirmed that the tool enhances the quality construction schedule. Ideally, the proper use of Primavera P6 Technology enhances keenness when setting the activity ID and taskbars to ensure that projects end at set dates, similar to the results of [3]. The tool normally enables efficient understanding of schedules, promoting efficient development of construction projects.

5 Conclusions

In a nutshell, the result was seeking to examine the contribution of Primavera P6 Technology to the construction industry. A close examination of the construction sector with respect to associated issues reveals that the use of technology aid in addressing problems that undermine the company's progress, thereby leading to success. Ideally, Primavera P6 Technology is an essential requirement for effective planning, monitoring, and controlling of the project, influencing success. The objectives of this research have been met through reviewing relevant publications and collecting and analysing data from specific participants. The results provide sound evidence of how future construction projects should be managed to the point of success.

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