

USE OF INFORMATION SYSTEMS IN PROJECT PLANNING TO OVERCOME PROBLEMS IN THE CONSTRUCTION INDUSTRY IN SRI LANKA, AND AFRAMEWORK CAN BE USED DURING DIFFICULT SITUATIONS SUCH AS THE COVID-19 PANDEMIC.

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Abstract: Use of Information system (IS) in the construction sector is still in its development stage, especially in the context of the Sri Lankan construction industry. With the outbreak of the pandemic in the year 2020 and with the travel restrictions that have been imposed in Sri Lanka, the need for managing construction projects by using information systems have been greatly identified. This study provides a review of the use of IS in the construction sector, especially during the project planning stage. Finally, an analysis that includes framework related to the use of IS in the project planning stage as well as the application of IS and its importance in the construction sector is provided. Proposed framework can be used during situations particularly with travel restrictions imposed due to various reasons such as COVID-19 outbreak.

Keywords: Information systems, Construction industry, COVID-19.

1. INTRODUCTION

Project planning of construction projects as discussed by Ryoo, et al. (2009), is a discipline that states how to complete a certain project within the given schedule. Such project plans will usually have designated stages in which project resources are allocated, to accomplish the goals of the project. Further, Segars & Grover (1998), states that the process of construction planning is considered as a challenging activity in the entire management and the execution of a construction project and a good construction project plan is hence considered as the basis for the development of the budget and the schedule of work activities.

With the outbreak of the pandemic in the year 2020, many industries, including the construction industry in Sri Lanka was severely impacted due to projects being unable to accomplish their tasks within the project schedule, thereby impacting the financial structure of the project. A study by Biswas, et al. (2020), states that, while most of the other organizations in the country moved towards a work from home strategy, it was challenging for the construction to implement such strategies, due to its nature.

Further, Boell & Kecmanovic (2015), defines IS as an academic study of systems that gives special reference to information as well as the connection of the network of both hardware and software, which is used by the project participants to collect, filter, creating processing and finally distributing the data. Alter (2008), also states that the use of IS is considered to be different from business to business. Studies have shown that although IS has played an important role in the construction industry, it still lags behind some of the core aspects. However, is likely to change as businesses start embracing big data analytics, real-time data analytics, and other similar technological developments when conducting business functions.

2. LITERATURE REVIEW

2.1. The Construction industry in Sri Lanka and its present situation

As stated by The International Trade Administration (2021),the construction industry in Sri Lanka has been identified as contributing approximately 7.5% to the GDP of the country and is said to be employing over 600,000 workers both as direct employees as well as indirect employees and is therefore considered as one of the main industries that is contributing towards the economy of the country.

The construction sector in the country saw rapid growth after the end of the civil war, in the year 2010, and as industries such as the tourism industry started to grow. However, with the outbreak of the pandemic and as travel restrictions were imposed within the country, the growth of the construction industry was hindered. The chart below represents the changes in the contribution to the GDP from the construction sector, in Sri Lanka, over the past few years.

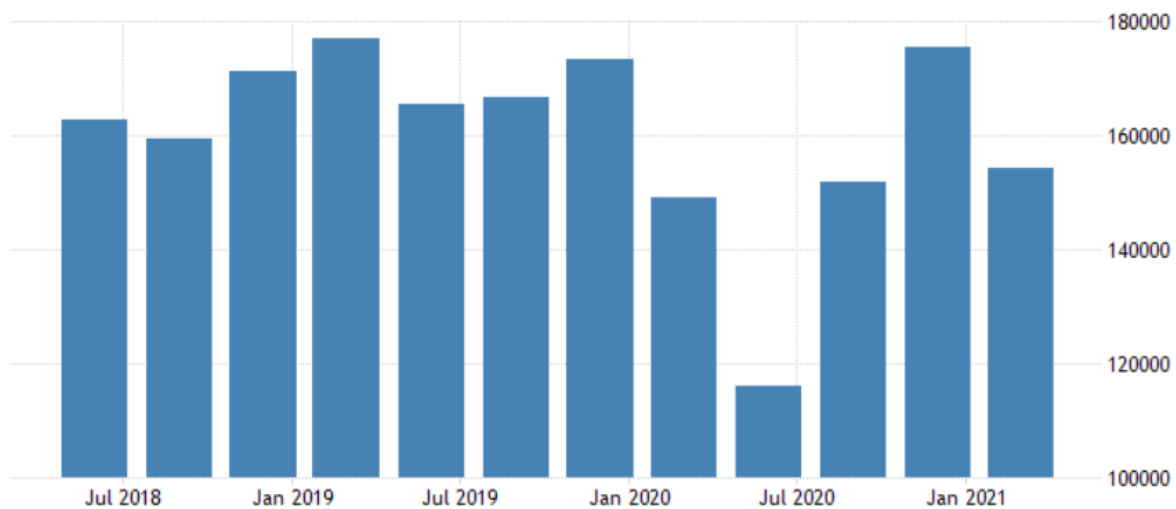


Figure 1: GDP from the construction sector Source: (Department of Census and Statistics, 2021)

However, Gaith, et al. (2012), explains that the construction industry will be able to benefit much from the use of IS in construction and its related activities. Therefore, much of the focus of the industry is now on the use of IS in construction.

2.2. Use of IS in the Construction Industry

As explained by Koekemoer & Smallwood (2007), construction companies are in constant need of accessing the right data at the right time, to assess the level of work that is completed within a project. Accordingly, when the right data is available, it will allow for better analysis and thereby resulting in obtaining reliable outcomes within the project, especially in terms of project planning and achievement of project goals. On the other hand, it contributes towards the achievement of the final end results of the project.

Construction companies are constantly working towards collaborating with different parties and stakeholders to deliver the outcomes of the project. Accordingly, the importance of accessing data is therefore considered as being linked with reducing the risks that are associated with all stakeholders of a construction project. Abdulkareem (2020), states that with the use of data if the project team can predict the future and potential outcomes, it becomes possible for the construction project team to plan for different outcomes.

Research conducted by Sacks, et al. (2020), states that through simulations, the construction sector will be able to identify problems that may exist and thereby plan for the same. Such analytics will help in the process of understanding real-world restrictions to the project as well. It can be stated that obtaining a clear picture of the potential problems by the use of IS will reduce the possibility of unexpected risks within the project.

According to Al-Mamary, et al. (2014), information related to the business, the weather as well as the community around the project are some of the data that is needed to understand and determine the plan for the project. Further, as project participants work on the first phase, it will help them to understand the steps that are required to be taken in the upcoming phases of the project, thus assisting the planning of the project. Domdouzis, et al. in 2004, records that many of the leading construction organizations in the world have started adopting sensor inputs that will allow the decision-makers of the project to develop conclusions from data that is received.

One of the most important uses of IS in the construction sector is that the analytics data that is provided by IS will allow the project team to easily comprehend the status of the project and shall support the decision-making process. Further, Mardonova & Choi (2018), states that the same would also have a positive impact on the mitigation of risks within the project and thereby improving the safety of the site workers. Although limited in use in Sri Lanka, many of the construction projects in other nations have started using smart clothing that is said to be equipped with wearable devices as well as electronic sensors that can detect any sort of risk to the worker of the project site. The image below represents some of the commonly used wearables in construction projects in the present day.



Figure 2: Smart clothing equipped with wearable devices and electronic sensors (Source: (Mardonova & Choi, 2018))

The use of the above-stated systems (Figure 2) allows for the transmission of data and information to the main database, which is accessed by authorized personnel, who would make the final decisions related to any possible risks within the construction project. Further, the use of these systems and devices will also allow decision-makers to identify any sort of break of site rules as well.

A study by Craig & Sommerville (2006), reveals that information systems will also play an important role in the process of tracking the assets as well as the inventory of the project. Some information systems can connect over 10,000 machines and equipment to the system and thus allows for remote supervision while understanding the real-time performance of the connected equipment. Jung, et al. (2015), states that such systems have made it possible for construction projects to be able to predict the capabilities of these systems and have assisted in the process of maximizing their value. The connection to the IS system allows the project team to be able to obtain one clear view, that will also enable the storage of data on one electronic platform, rather than in many different documents.

3. METHODOLOGY

The methodology of this study can be explained in terms of the ability to review existing data and thereby the development of frameworks that can be used in the construction industry, especially in its endeavors in planning construction activities. A systematic review of secondary data is used in this study.

4. ANALYSIS

4.1. Importance of IS in planning in the Construction Industry during the pandemic

There are many benefits of IS in the planning stage of construction projects, especially when it is used during the pandemic. A study by Alaloul, et al. (2020), explains that even with the industrial revolutions that have taken place, only a limited number of construction companies have been able to make profits and this is mainly due to the inability of analyzing the expenses of the project, due to challenges in obtaining historical data and information. Therefore, the main benefit that can be identified, in the planning stage is that this information is important in the process of reducing costs, especially when bidding on new construction projects.

Further, the use of IS will also help in the process of collecting data and information related to the equipment, machinery, and human resources that are used within the project. Such information is considered as being important in the planning and the budgeting phases of the project and is, therefore, another important reason for using IS in the construction industry. Studies have revealed that the same would allow the project team to be able to compare actual costs against estimated costs of the project. Construction project budgets are said to be most likely impacted by idle construction equipment. Therefore, the ability to obtain real-time data will assist construction project teams to be able to understand how budget increases can be managed effectively.

A study by Koskela & Kazi (2003), states that one of the main advantages of construction IS is that underutilized data can be also used to obtain relevant insights. The project will be able to benefit even from unstructured data and is therefore considered as the main advantage of using IS. The use of different simulations can also be built to create estimates and will also help in the process of defining the optimistic and pessimistic estimations of a project.

4.2. Framework related to the benefits of IS in Construction Sector Projects

Further, based on the above analysis the framework that can be developed, which is related to the benefits of IS in the construction sector, projects can be demonstrated as represented by the chart below.

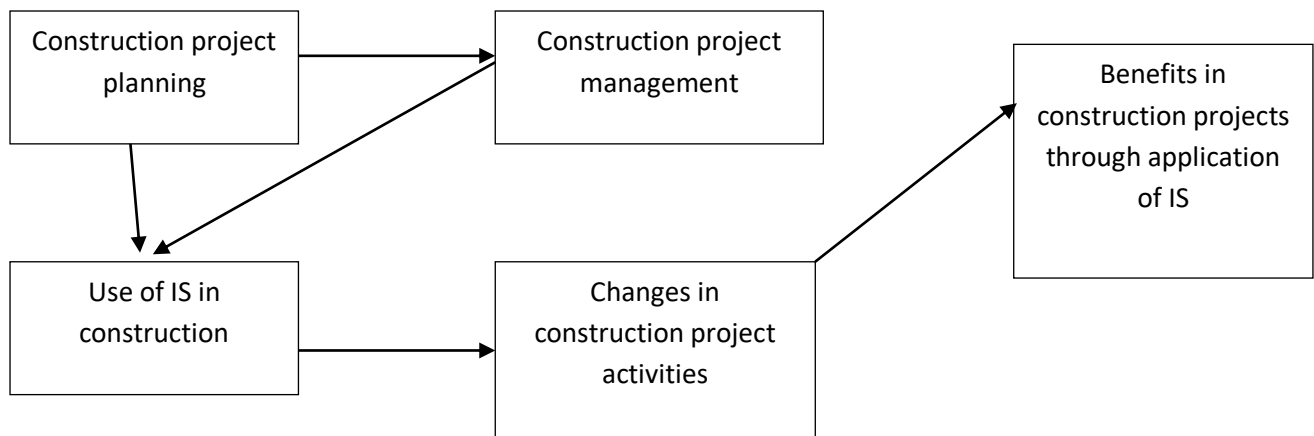


Figure 3: Framework representing the use of IS in construction projects and its outcomes

From the above framework, it can be identified that in the construction planning process as well as the construction management process, the use of IS, will be able to make changes in the construction project activities. According to the above framework, it can be identified that positive changes in the construction project activities will ultimately result in achievement of benefits in the construction project. Therefore, the above framework represents the process in which a construction project that utilizes IS will be able to achieve positive outcomes in its activities.

4.3. The input and output process in IS in the Construction Sector

A study by Zambare & Dhawale (2017), states that in a construction project, the inputs that are fed into the IS system will thereby provide outputs, which are also considered as benefits of using the IS system within the project. According to the review that was conducted and represented above, the use of IS in the construction planning process and thereby outputs that will be achieved from the input data is graphically represented by the Figure 4 below.

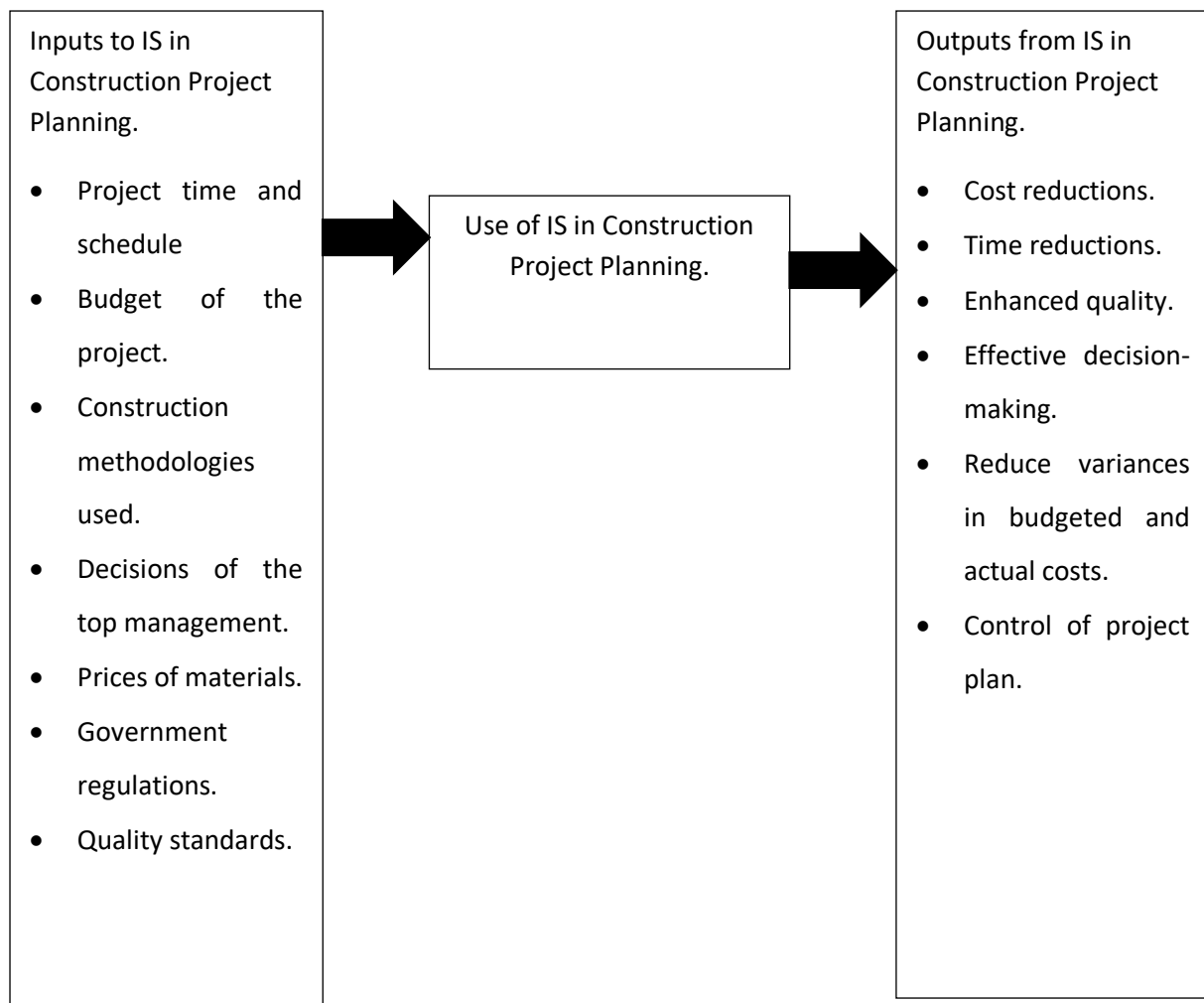


Figure 4: The process of IS use in construction project planning

From the above illustration in Figure 4, it can be identified that IS in construction will convert the inputs to the system, into outputs that can be considered as important data and information that is required for successful project planning. Further, through the use of IS systems, the project team will be able to understand how to obtain project success, in terms of the achievement of the objectives of the project.

5. CONCLUSION

Information system use is one of the commonly identified areas in many industries. With the outbreak of the pandemic, the use of IS has increased, socially in the construction sector, as the need for managing projects remotely is felt greater than ever before. Accordingly, many uses and benefits can be achieved by construction projects that are operating in Sri Lanka as well. This study was conducted to understand the use of IS within a construction project, especially in the project planning stage. The uses and importance of IS and on how the same can create benefits for construction projects. Finally, a framework related to the use of IS and the ultimate benefits that can be achieved is represented, along with a framework that represents the input and output process of IS systems, which is one of the important areas that is required by construction project teams in the process of understanding the use of IS in their projects.

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