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Successful criteria for large infrastructure projects in Malaysia

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Abstract

Large infrastructure project is one of significant category in the development of Malaysian construction industry. This type of project has been recognized as a high complexity project with numerous construction risks, large cost involvement, highly technical requirements and divers of resources. Besides, the development of large infrastructure such as highway, railway, Mass Rapid Transit (MRT) and airport are also needed a large investment of public and private sector. To accomplish the development successfully, several challenges has to be determined prior the project commencement. To date, a comprehensive assessment of key success criteria particularly for large infrastructure in developing country such as Malaysia is still not systematically defined and therefore, it needs further investigation. This paper aims to explore the potential success criteria that would be useful in gauging overall performance of large infrastructure implementation particularly in developing country. Previous successful criteria studies were used to develop a conceptual framework that possibly suitable for measuring large infrastructure performance. The findings show that successful criteria of infrastructure projects implementation could be grouped according to several key elements as it seems significant to the participants in prioritizing project challenges more systematically.

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1. Introduction

The construction industry makes up an important part of the Malaysian economy. Although this industry is relatively small, but it has been extensively interrelated with many other parts of the economy, particularly those for basic metal products and electrical machinery. This means that, construction can be described as some kind of an economic engine for Malaysia. To deliver large infrastructure project successfully seems a big challenge as it has been highlighted in a substantial of previous literatures. Project success factors was first introduced by Rubin and Sealing in 1967 and have since then been used frequently within project management [1]. In Malaysia, several numbers of key infrastructure projects are being delivered under the Economic Transformation Programme (ETP), the real estate market is still remaining optimistic, and the construction sector in Malaysia is enjoying a relatively busy economic cycle [2]. There are number types of large infrastructure projects such as new trunk roads, airports, port, power stations, nuclear facilities and chemical work. In order to implement the project successful, several of criteria that contribute to project success need to be investigated further since study on this regards is still not fully discovered. Therefore this paper provides a review of the potential successful criteria particularly for large infrastructure projects in Malaysia. The definition of challenges in the implementation of large infrastructure from the previous studies might be helpful for participants to improve their performance and project delivery.

2. Overview on Malaysian Construction Industry

The construction industry and the private sector play important roles in generating wealth and improving the quality of life for Malaysians. It can be achieved through the translation of government's socio economic policies into social and economic infrastructures and buildings. The construction industry also provides job opportunities to approximate 800,000 people [3]. Additionally, the construction industry has endured monotonous financial performance over the past five years. While Gross Demand Profit (GDP) grew at an average rate of 3.3% from 2012 to 3.5% GDP in year 2013 [4]. In addition, a number of supportive government policies such as the tenth Malaysian Plan (2011-2015), Economic Transformation Programme (ETP) and the 2012 National Budget also played an important role in sustaining the strong growth in economic sector [7]. In the first quarter of growth has been determined in most economic sector especially the construction, manufacturing and services. Backed by the ongoing implementation of various public large-scale project, the construction industry is expected to improve significantly. Adversely, the agriculture sector is showing moderate growth due to lower output of crude palm oil due to the natural production down cycle and the mining sector is expected to recover with improvement in crude oil output and supported by a moderate increase in output of natural gas [4]. As depicted in Table 1.1, there are several sectors are namely, agriculture, mining, manufacturing and construction.

<table>
<thead>
<tr>
<th></th>
<th>CHANGE (%)</th>
<th>SHARE OF GDP (%)</th>
</tr>
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<tbody>
<tr>
<td><strong>Agriculture</strong></td>
<td>5.9</td>
<td>0.6</td>
</tr>
<tr>
<td><strong>Mining</strong></td>
<td>-5.7</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Manufacturing</strong></td>
<td>4.7</td>
<td>4.2</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>4.6</td>
<td>15.5</td>
</tr>
<tr>
<td><strong>+Services</strong></td>
<td>7.0</td>
<td>5.5</td>
</tr>
<tr>
<td><strong>GDP</strong></td>
<td>5.1</td>
<td>4.5-5.0</td>
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</tbody>
</table>

3. Large Infrastructure Projects

This section discusses on definition of large infrastructure projects and large infrastructure development in Malaysia. Large Infrastructure is the basic physical systems of a business or nation. Transportation, communication, sewage, water and electric systems are all examples of large infrastructure. These systems tend to be high-cost investments, however, they are vital to a country's economic development and prosperity. Additionally
Infrastructure projects may be funded publicly, privately or through public-private partnerships. Large infrastructure projects covered by the high cost over [6].

The infrastructure sector has received the largest share of public sector development expenditure in every one of the Malaysian Plans [7]. New development in the oil and gas industry, residential in Iskandar Malaysia, and the mass-rapid transit (MRT) system in Kuala Lumpur (KL), are expected to have both immediate and indirect impact on demand for industrial, commercial and residential buildings. Construction firms are also compensating for the limited size of the domestic market by increasingly seeking overseas contracts in the Middle East, Russia and the growing ASEAN region [2]. While, in year 2012 and year 2013 expectations are broadly positive, it is unclear whether there is the domestic demand or the labour supply to maintain strong growth in the sector over the medium to long term. Moreover, the state-directed, privately operated approach that Malaysia adopted to spur economic growth has raised questions about the connection between government and business, and concerns about ethics and efficacy. The ETP, launched in 2010, attempts to break Malaysia out of the middle-income trap and into the sphere of high-income countries by 2020 [2].

4. Definition of Project Success in Construction Projects

Project success criteria as the set of principles or standards by which project success can be judged [8]. Similarly, project success criteria as something that projects can be measured against [9]. In other words, criteria are somewhat used in order to compare goal level against performance level. If project success is the goal, then the accepted objectives of the project are the criteria to achieve the goal [10]. Success criteria as the expectations of the project and further add that expectations are dependent on participants, scope of services, project size, technological implications and other factors [10] [9] [12] [21]. However, the literature seems to agree on the limits of only referring to these criteria and consequently new criteria and models for deciding criteria have emerged [9][13].

Incomplete definitions of project management has steered managers to only use the Iron Triangle as criteria to measure physical success [9][19]. This view of success criteria might result in biased measurement of project success. Atkinson further argues that many times a project can be perceived as unsuccessful even though the known success criteria were reached. Thus, the Iron Triangle does not consider how well the project is used by the client, whether it was liked by sponsors or if it improved effectiveness or efficiency for the organization. Consequently, continuing using an incomplete set of success criteria will result in repeated reported failures [9]. Stuckenbruck further adds that every project has criteria for success. These could be dependent on the client, but are most usually characteristics based on the specific industry. Success criteria in the construction industry are characterized by certain standards and codes. Likewise, commercial and public projects have criteria to be acceptable to the public [14]. Previous studies also highlighted that the perspectives of project success can be grouped into two categories namely the macro and micro viewpoints as show in Figure 1 and Figure 2 [8].

![Fig. 1. the macro environment of project](9)
In the micro viewpoint smaller components of the project achievement are addressed. Most often the micro viewpoint considers the conclusion of the construction phase and typically concerns the construction parties. Completion as criteria for micro viewpoint and both completion and satisfaction as criteria for macro viewpoint [8]. Together, completion and satisfaction represents two sets of criteria for determining project success. The completion set of criteria could differ dependent on which viewpoint one look at. From the micro point of view completion typically involves the contractor’s concern of achieving their own project objectives, such as time, cost, quality, performance and safety. The satisfaction set of criteria involves the users’ perceived success of the project and could be utility and operation [8][21].

5. Success Factors in Construction Projects

A general description of success factors is defined as personal characteristics that are necessary to perform the job, such as knowledge, attitude and skills [1]. In other words, the factors or influence which contributes to the result can decide as the factor of project success. While success criteria is one set of conditions necessary to make a judgment of project success, success factors are something that contribute to the project success [8]. Successful of construction projects have to develop a framework on Critical Factor Success (CFS by grouping factors affecting project success into six different categories which [11]:

- Project-related factors are factors that describe the projects characteristics, such as type of project, nature of project, complexity of project and size of project.
- Project procedures consist of two attributes; procurement method and tendering method. Procurement method is described as “the selection of the organization for the design and construction of the project” and tendering method as “procedures adopted for the selection of the project team and in particular the main contractor” [11][17].
- Project management factors are characterized by the actions of the project management. Those actions are a key to achieve project success. Project management attributes that affect the project success are adequate communication, control mechanisms, feedback capabilities, troubleshooting, coordination effectiveness, decision making effectiveness, monitoring, project organization structure, plan and schedule, related previous management experience.
- Human-related factors represent factors concerned with characteristics of all key players such as project manager, client, designer, contractor, consultants, subcontractor, suppliers and manufacturers. For instance,
examples of variables concerning the client are client experience, knowledge of construction project organization, project financing, client confidence in the construction team etc. [11].

- The factors of the participants can be divided into categories related to client and related to the project team. Further on suggests that team spirit is crucial for project success and underlines the important of team building among the different participants [11].

- External factors consist of the external influences affecting the project, such as economic environment, social environment, political environment, physical environment, industrial relation environment and level of technology advanced. The variables within each category are interrelated and interrelated. This means that a variable in one group can affect a variable in another group and vice versa [11].

6. A Proposed Framework for Measuring Project Success in Large Infrastructures Development

All the success factors that were revealed from the previous study which is not possible to ensure project success by fulfilling the success factors but they will provide a higher tendency to do so if more success factors are being met. All the success factors that were revealed during the literature review is based on the five categories that is projects management action, human related factors, project related factors, external environment and project procedures [4]. All the success factors were further graded into the categories based on the specific case, and research conducted by the researcher. They are several success factors found by the previous research which are conducted Chan [11].

- Implementing an effective quality assurance program
- Develop an appropriate organization structure
- Client's contribution to construction
- Control mechanism
- Feedback capabilities
- Project team leaders experience
- Implementing an effective safety program
- Project team leader's early and continued involvement in the project

While ensuring that key messages about factor of project success, project design and impacts are widely disseminated and clearly understood remains an important aim, other factors such as building trust, facilitating dialog among all stakeholders, and assessing social and political risks and benefits have come to the forefront in communication processes for development projects also defined the main success factors of managing the large infrastructure projects are [10] [15] [18]. Figure 3 shows the components of a proposed framework to measure project success in large infrastructure projects particularly in Malaysia.

Several previous studies were used in developing the framework. The Successful criteria are consists of four main component which are comfort, competence, commitment and communications. Successful factors ensuring that resources, efforts and leadership are well aligned for the implementation of the project. Competence requires having appropriate technology, experience, and specialties available for the project. Commitment ensures that all parties concerned with the project and all levels in the management hierarchy of each participating organization are willing to manage, plan, design, construct and operate the facility harmoniously. Communication helps clarify and disseminate all necessary project information and status to all internal and external project stakeholders.

The project will then have the opportunity to avoid failure and reach for success through the achievement of team-spirit and a sense of ownership. It should be possible to develop a practical advisory tool for project management based on the success factors. Various factors can contribute to the success factor of large infrastructure projects. The four categories of success factors are seen key elements of success of a construction project. The four categories of these look to various reasons such as the need of project success, both internal and external projects, the risk management of the project and the expected results of the project. Based on literature review gathered the four top factors contributing in the success of large infrastructure projects. This is because in order to determine the success of large infrastructure project requires a large quantity of high risk.
7. Conclusion

The success of large construction projects, especially infrastructure projects is most important for all the participants in the project management. There are several of factors that affect to complete the project success. The main objective of this paper is to review the success factors and determine the key factor success of the large infrastructure project. Most of the factors are contributed to the success of the project management. The criteria that require much effort tends to be perceived as more successful when the project are achieved and the criteria that requires less effort are perceived as less successful when they are achieved. This implies that different project participants will have different perceptions of achieved success dependent on what criteria have focused most on. To success in the large infrastructure project needed all the participants in the project to archive the aim and objective of the project. The empirical findings of this study hopefully will help the construction players to find the potential success criteria that would be useful in assessing the implementation of large infrastructure projects. Further work will be carried out in gaining more information on interview data about challenges in large infrastructure project in Malaysia.

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References


