



FACTORS AFFECTING THE PERFORMANCE OF KLANG VALLEY MASS RAPID  
TRANSIT PROJECT – STUDY ON IMPROVING THE PROJECT PERFORMANCE

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## ABSTRACT

Economic and social development of a country largely depends on the development of infrastructure facilities. In other words, infrastructures development is considered as the backbone of a nation. As for Malaysia, Klang Valley Mass Rapid Transit Sungai Buloh-Kajang line is very important project as it will be a first step forward in placing Kuala Lumpur among the top cosmopolitan and most liveable cities in the world. Identification of the factors affecting the performance of these Klang Valley Mass Rapid Transit project is very crucial in improving the productivity of overall construction work. Therefore, the aim of this research is to study the factors affecting the performance of Klang Valley Mass Rapid Transit Project and mitigation approach that have should taken by the MRT Corp to improve project performance. The study is basically carried out by distributing the questionnaires to MRT Corp. Meanwhile, Relative Importance Index (RII) method was adapted to analyses the data gathered from questionnaire survey. From the result, it can be concluded that client satisfaction factors, time factors, quality factors, cost factors and environment factors are the five main major groups of factors that largely influence the performance of Klang Valley Mass Rapid Transit project. The study also gives some beneficial recommendations for the construction team players, for them to improve the overall project performance.

## ABSTRAK

Kemudahan infrastruktur memainkan peranan penting bagi perkembangan ekonomi dan sosial negara. Dalam erti kata lain, pembangunan infrastruktur boleh dianggap sebagai tulang belakang kepada sesebuah negara. Bagi negara Malaysia, Mass Rapid Transit Lembah Kelang, jajaran Sungai Buloh- Kajang adalah satu projek yang sangat penting kerana ia merupakan langkah pertama bagi meletakkan Kuala Lumpur antara bandar-bandar kosmopolitan yang utama di dunia. Bagi mencapai matlamat ini, pengetahuan tentang faktor-faktor yang mempengaruhi prestasi projek Mass Rapid Transit Lembah Kelang ini adalah amat penting bagi meningkatkan produktiviti kerja pembinaan. Oleh itu, tujuan utama kajian ini dilaksanakan adalah untuk mengkaji faktor-faktor yang mempengaruhi projek Lembah Kelang Mass Rapid Transit dan pendekatan mitigasi yang boleh diambil oleh MRT Corp untuk meningkatkan lagi prestasi projek ini. Secara umumnya, kajian ini dijalankan dengan pengedaran borang soal selidik kepada MRT Corp. Sementara itu, Indeks Kepentingan Relatif (RII) kaedah telah digunakan bagi mengkaji data yang diperolehi daripada borang soal selidik ini. Dengan analisa yang dibuat, dapat disimpulkan bahawa faktor kepuasan pelanggan, faktor masa, faktor kualiti, faktor kos dan faktor persekitaran adalah lima kumpulan utama yang mempengaruhi prestasi projek Mass Rapid Transit Lembah Klang. Kajian ini juga telah memberikan beberapa cadangan yang berguna untuk pasukan pembinaan, bagi mereka untuk meningkatkan lagi prestasi keseluruhan projek.

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**LIST OF ABBREVIATIONS**

KLIA	Kuala Lumpur International Airport Express
KPI	Key Performance Indicators
KTM	Kereta Api Tanah Melayu
LRT	Light Rail Transit
M & E	Mechanical & Electrical
MRT Corp	Mass Rapid Transit Corporation
OSHA	Occupational Safety & Health Administration
RII	Relative Importance Index
SPSS	Statistical Package for Social Science

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 RESEARCH BACKGROUND**

Construction industry plays a pivotal role in the development process of both developed and developing nation as it generates a large number of job opportunities among the skilled and unskilled work force (Khan, 2008). Thus, the construction industry is the basic foundation for the economic growth of the country. However, the development of construction industry largely depends on major infrastructure project which facilitate and accelerate the economic, social and cultural growth of the country (Naumani and Tsegay, 2011). This is supported by Cornick (2011) who states that Infrastructure investment in the development of communications, IT, roads, schools, ports and hospitals important to both economic development and quality of life.

However, any large infrastructure project is always bound to face many challenges and unprecedented changes throughout the construction process. Moreover, in the developing countries, these challenges and uncertainties are present alongside with the socio economic problems, serious material shortages and management weakness issues. There are also evidences to show that these problems have become even more serious in recent years (Ofori, 2000). Hence, the study of factors affecting the project performances in this study means of understanding those factors and problems affecting the construction project and thereby improving the effectiveness of construction industry.

## 1.2 PROBLEM STATEMENT

Successful construction industry is the key sector of the economy of every country (Ofori, 2000). In addition, the infrastructure projects which are a part of construction industry also pave the way for the country to keep or speed up their economic development (Mostert, 2007). However due to larger size, complexity and high demands by client side, it is more difficult for the construction project to be finished within the required time, money, and quality (Puspasari, 2006).

The rate of success of a construction project depends largely on the clear briefing process, good schedule, client involvement, and effective monitoring and controlling of projects (Puspasari, 2006). Although there are clear guidelines for the monitoring and controlling of project success, there are still a few construction companies find difficulty in finishing up the projects according to the project mission (Puspasari, 2006).

Research has shown that a majority of the infrastructure projects overrun the allocated resources where in some cases the projects exceeded about 200 percentage of the initial estimation (Morris, 1990 and Lee, 2008). Meanwhile, studies conducted by Assaf and Al-Hejji (2006) shows that only thirty percentage of the construction projects in Arab Saudi finished within the time and the average time overrun is between 10% to 30%. World Bank also discover that 63% of the 1778 construction projects financed face poor performance with overrun budget at an average of 40% (as cited by Ameh et al., 2010 and Zujo et al., 2010). Other than that, in 2006 it's reported that many construction projects end up in poor performances. Those largely due to obstacles from the client side, material shortage, improper design and drawing, delay in getting out variation orders (UNRWA, 2006 & 2007). The construction industry in Malaysia, which is regarded as one of the fast developing nation in South East Asia has not escape from the problem of delay either. In 2005, around 17.3% out of 417 government projects considered delay or abandoned (Sambasivan & Soon, 2006).

In light of these issues, this study will examines and ranks the factors affecting the performance of Klang Valley Mass Rapid Transit project in Malaysia. This allows

the contract parties to identify which factors deserve the most attention during the life cycle of a construction project. Basically, a project is considered success when the project is finished within the time, cost and with appropriate quality. Other than that, functionality, profitability to contractors and absence of any claims also used as a measure of successful projects (Puspasari, 2006). Further investigations to evaluate the mitigation approach will enable the project members of this mega infrastructure project to prevent the negative factors and achieve significant performance improvements.

### **1.3 RESEARCH OBJECTIVES**

The main objectives of this research can be outlined as follows:-

- 1.3.1 To study MRT Corporation perception of the factors affecting the performance of the Klang Valley Mass Rapid Transit Project
- 1.3.2 To study the mitigation approaches that should be taken by the MRT Corp to improve the project performance

### **1.4 RESEARCH QUESTIONS**

The research questions for this thesis work can be outlined as below:-

- 1.4.1 What are the main critical success factors that can help to improve the performance of Klang Valley Mass Rapid Transit Project?
- 1.4.2 What are the mitigation approaches that should be taken by the MRT Corp in improving the project performance?

### **1.5 SCOPE OF WORK**

In accordance to the objectives, these will be the scope of the research:

- (a) This study will be conducted on the Project Managers and the crew team from the MRT Corporation.
- (b) The factors affecting the project performance and the mitigation approach that should be taken will be studied throughout this research.

- (c) This study only focuses on the factors affecting the project performance and not the construction sequence of the project.
- (d) The information will be collected through literature review and questionnaire.

## **1.6 SIGNIFICANCE OF STUDY**

Construction field is complex in nature because it involved many parties such as clients/developers, architects, consultants, main-contractor, sub-contractor, suppliers, local authority and so on. This causes construction projects to face so many problems and complex issues when comes to performance criteria because of many factors and reasons.

Thus, this study is very vital to identify the main factors affecting the performance of Klang Valley Mass Rapid Transit Project and to formulate recommendations to improve the effectiveness of project delivery. A smooth and better management of construction projects will be important in providing a solid foundation to reviving Malaysia economy and also to build a more balance and independent economy during the stable political period. So, it can be said that a quality delivery of infrastructure projects is a key ingredient for sustainable development of a country.

## **1.7 SUMMARY**

In this chapter, the importance of infrastructure project for the development of a nation has been thoroughly discussed. Through various studies, it has been found that majority of the infrastructure projects bound to face many challenges and unprecedented changes throughout the construction process. By taking this into account, our research will evaluate the factors affecting the performance of Lembah Klang Mass Rapid Transit Project. Besides that, the mitigation approaches that should be taken by MRT Corp to improve the project performance also will be discussed throughout this research paper. In conjunction to that, this study is expected to give relevant information to the parties involved in the construction industry about the critical factors that affect the performance of construction projects in local construction industry. Recommendations which will be given in this study are also expected to guide the project team players to improve the overall project performance.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

This chapter highlights the construction project performance, followed by a review of the background of Mass Rapid Transit project. Other than that, this chapter will also emphasize on the Key Performance Indicator which serves as a tool for the measurement of the construction project performance and organizational performance. In addition, mitigation approaches which serve as a key to successful project completion will also be discussed in this chapter.

#### **2.2 KLANG VALLEY MASS RAPID TRANSIT PROJECT**

As Malaysia accelerates towards becoming a high-income nation by the year 2020, the demand for the mobility of people and goods will increase. As such, it is imperative that a reliable and efficient land public transport system be put in place. With this, the construction of Klang Valley Mass Rapid Transit Sungai Buloh-Kajang Line as the single largest infrastructure project in Malaysia may serve as an efficient and environmentally sustainable transport infrastructure within the Wilayah Persekutuan and Selangor state. Other than that, this Klang Valley Mass Rapid Transit Sungai Buloh-Kajang Line involves the construction of a rail-based public transport network which together with the existing LRT, Monorail, KTM Commuter, KLIA Express, and KLIA Transit systems forms the backbone of the Greater Kuala Lumpur/Klang Valley area. In this mega construction, MRT Corp plays a massive role as the client, developer

and also as an asset owner of this largest public infrastructure project in our country. It also vital to note that, any infrastructure project of this size is bound to face many challenges throughout the construction process (Land Public Transport Commission Annual Report, 2011). Thus, the study of the factors affecting the factors affecting the performance of Klang Valley Mass Rapid Transit project is essential to indirectly help the project parties to improve the productivity of overall construction work.

### **2.3 DEFINITION AND CONCEPT OF PROJECT PERFORMANCE**

As mentioned by Chitkara (as cited in Rosli et al. n.d.), performance is “the degree of achievement of certain effort or undertakings”. It relates to the well-defined objectives and goals which form the overall projects scope objectives. Besides, Okuwoga (1998) mentioned that the performance of the construction industry is considered as a source of concern to both public and private sector clients. This makes the performance of a construction process is constantly being influenced by different stakeholders of the projects which include construction industry representatives, society and government (Zavadskas, Vilutienė, Turskis & Šaparauskas, 2014). From the perception of the project management, performance of a construction project is all about satisfied the stakeholders needs and requirements from a project. It involves giving constant considerations on three important elements of a project namely time, cost and quality (Project Management Institute, as cited in Rosli et al., n.d.). In other words, a successful project performance happens when construction project is finished and delivered to the clients within the cost, time and appropriate quality (Puspasari, 2006). Other than that, profitability to contractors, absence of any claims and functionality also being used as measures of successful project performance. This shows that even though many parties tend to emphasise on the elements of time, cost and quality only, but all other factors are still vital for the measurement of project performance (Puspasari, 2006).



## 2.4 PROBLEM OF PERFORMANCE IN CONSTRUCTION INDUSTRY

The failure of a construction projects is mostly because of failure in overall performance. These failures could occur due to many reasons and factors (Shaban, 2008). In Thailand, Ogunlana and Promkuntong (1996) have conducted a survey regarding the construction projects delay. They observed that the construction industry problems and challenges can be divided into three distinct groups which consist of incompetence of contractor side, shortage of required resources and problems caused by clients or consultant. Meanwhile, Okuwoga (1998) have conducted a survey to examine the performance of construction projects in Nigeria. The result from this survey indicated that the problems facing the construction industry is mainly due to poor budgetary and time control.

Meanwhile, Long et al. (2004) have remark those problems in construction performance use to occur due to many reasons which include site related problems, incompetence of contractors, poor initial estimation, and also usage of improper technique during the construction process. Besides that, Sambasivan and Soon (2006) who conducted a survey to identify the delay factors and its effects on Malaysian construction industry. The result indicated ten most important causes of delay in construction projects which includes lack of communications between the parties, inadequate experience among the contractors, shortage in materials, labour supply, disputes with subcontractors, equipment availability, contractors improper planning, poor site management, lack of finance from the clients and also mistakes during the construction stages. Similarly, Sambasivan and Soon (2006) indicated that the main causes of delays in construction is mainly related to late deliveries, economic situation, increase in quantity, site conditions, weather conditions and also user changes, escalation of material prices, material shortages, inaccurate rate estimation, poor contract management and also payment arrangements.

Sambasivan and Soon (2006) have added some other factors that contribute to delays such as poor site management, unstable ground condition, slow decision making, client initiated variations and also variations of works. On other side, Navon (2005) who conducted a research on project performance control of construction projects, have

classified the performance problems into two main parts which include unrealistic goal setting and also causes originating from the actual construction.

Moreover, Ernawati, Kamal, Syarmila, Norhidayah & Faizal (2006) have addressed the characteristic and problems facing the Malaysian construction industry. They mentioned that the construction industry in Malaysia having a high dependence on incompetence foreign workers as they are widely available, relatively low cost and highly flexible. This chronic situation occurs because many construction industries in Malaysia still works through the traditional ways by choosing the systems that are inefficient, low speed and labour intensive. Moreover, these unskilled foreign workers also do not have sufficient talent to absorb and transfer the new technology into their construction life cycle.

## **2.5 MEASUREMENT OF PROJECT PERORMANCE- KEY PERFORMANCE INDICATORS (KPI)**

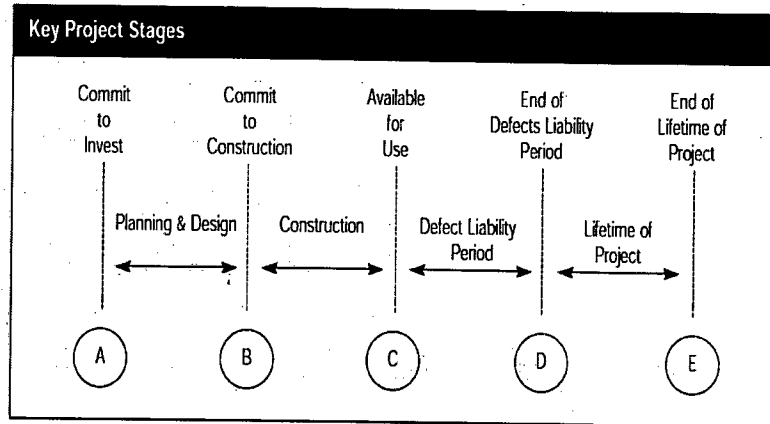
The main purpose of KPI is to enable measurement of the construction and organizational performance throughout the project phases (KPI Report for The Minister for Construction, 2000). The data obtained from the KPI can later be used in the benchmarking process of construction projects and will be a key for any project parties that move towards succeeding project performance. Meanwhile, Shaban (2008) who conducted a survey to identify the factors affecting the construction project performance in Gaza Strip, stated that the main purpose of KPI is to enable comparisons between different projects and enterprises to identify the existence of particular patterns. He also stated that the use of KPI can aid in determining the dysfunctional in the procurement process.

According to KPI Report for The Minister for Construction, (2000), the decision taken on needs and requirements at the analysis stage is most likely will influence the end outcome of the whole development process. They also mentioned that the initial stages of the project when the major decisions are taken such as the decision on project execution planning and project objectives also has a larger influence on the overall project performance. However, most of the time a matter becomes much more

serious when the present activity that should be taken depends on the outcome of the earlier project activities. Hence, it is very important for the project team players to determine the performance indicators for the benchmarking process to achieve a good project performance. On the other hand, since performance is an individual contribution to execution of the task required in completing a construction project, the performance of each team players should be constantly evaluated and measured using the performance indicators at every stage of construction life cycle in order to determine the real extent to which the project has succeeded (Liu and Walker, 1998).

These are five key stages in construction project where the KPI is largely applied (KPI Report for The Minister for Construction, 2000):-

- (a) Commit to invest – the point where the client take final decision to invest in a project, sets out the needs and requirements for the project and select the suitable team players to proceed with the conceptual design.
- (b) Commit to construct – the point where the client side give approval to the team players to start with the construction of the projects.
- (c) Available for use – the point where the project is ready to be used. This is an advance stage of project completion
- (d) End of defect liability period – the point where the period within the construction contract during which the contractor is obliged to rectify defects ends (often 12 months from point)
- (e) End of life time of a project – the point at which the whole construction life cycle is over.



**Figure 2.1:** Five key stages in construction

Source: KPI Report for the Minister for Construction (2000)

On the other hand, Cheung et al. (2004), who have carry out a research to describe the development of Web-based construction Project Performance Monitoring System (PPMS) have stated that there are seven main performance indicators used in construction projects namely cost, time, client satisfaction, safety and health, client changes and business performance. Meanwhile, Ugwu and Haupt (2007) have conducted a case study at South Africa to develop the KPI for performance valuation. The main indicators discovered from this case study were economy, resource utilization, society, project management and administration, health and safety, environment and society. Based on previous studies about performance of construction industry, the main groups (KPI groups) that affecting the performance of construction projects can be summarised as shown in Table 2.1 (Shaban, 2008):

**Table 2.1: Main groups (KPI groups) that affecting the performance of construction projects and their references**

Key Performance Indicator	Okuwoga (1998)	Dissanayaka And Kumaraswamy (1999)	Reichelt and Lyneis (1999)	Karim And Marosszeky (1999)	Brown and Adams (2000)	DETR (2000)	Lehtonen (2001)	Chan (2001)
Cost	✓	✓	✓	✓	✓	✓	✓	✓
Time	✓	✓	✓	✓	✓	✓	✓	✓
Quality			✓			✓		
Productivity		✓	✓					
Client satisfaction factors						✓		
Regular and community satisfaction								
People								
Safety and Health			✓		✓		✓	
Innovation and Learning								
Environment								

Source: Shaban (2008)

## 2.6 FACTORS AFFECTING THE PERFORMANCE OF CONSTRUCTION INDUSTRY

As construction field is very complicated with combination of several parties, many project phases and having a long period of work until completion date, there are many factors which will significantly affect the performance of a construction project (Shaban 2008). In relevant to this, many researchers have conducted studies on factors that affect the performance of construction projects.

### 2.6.1 Factors Affecting the Cost Performance

Generally, construction cost is one of the most important criteria of success of a construction project (Memon, Rahman, Abdullah and Azis, 2010) However, it has been so common nowadays for the construction industry to face problems in cost management that lead to serious cost overrun issues (Asmi, Aftab , Ismail and Tarmizi, 2013). This makes the problem to be given serious attention to improve the construction cost performance as many of the construction industry can seldom finish up the projects within the allocated cost (Chimwaso, 2001).

Cost overruns in construction project can happen due to many reasons (Arditi et al., 1985). Arditi et al. (1985) conducted questionnaire survey in public construction projects at Turkey and found that the main reasons for cost overrun are increase in material prices, which mainly caused by high inflation rate at Turkey between the years 1970 to 1980. Apart from that, increase in inflation rate also makes life difficult for the contractors to buy and sell the construction materials at the official prices. In addition, it was pointed the shortage in resources, changes in design specifications and financial problems as some of the other factors that caused cost overrun in construction projects.

Meanwhile, studies conducted by Sambasivan and Soon (2006) have indicated that the shortage of materials such as sands, cements, stones and bricks also can cause high amount of cost in projects. Usually excess demands of construction materials in fast developing nations like Malaysia can cause increase in price of materials. This will make the contractors to postpone the construction activities until the prices to decrease. Such delays in construction project can eventually cause the project to undergo cost overrun. Similarly, Okpala and Aniekwu (1988) have conducted a survey at Nigeria to discover the main factors that contribute to cost overruns in construction projects. Their findings states that there are three main factors that contribute to cost overrun in project, consist of materials shortage, finance and payment for completed works, poor contract management and also price fluctuations.

On the other side, Asmi et al. (2013) have identified five most severe categories of factors that contribute to cost overrun in Malaysian construction projects.

These include contractor's site management, project management and contract administration, labour related factors, material and machinery and also information and communication. Information and communication factor are considered important because as known construction projects involves different group of companies consisted of M&E contractors, civil engineering contractors, subcontractors and others. This makes an advance communications and information system very vital not only to provide a reliable and faster data sharing but also to help the team players to take any decision at the early stages of problems to avoid delays in activities. Information and communication also very vital for the economic development (Ameh, 2010) but rarely communication system is properly being used in construction projects which subsequently are the main reason for cost overrun. Meanwhile, contractor's site management affects overall progress of a project and considered as the main contributor to project cost overrun. Meanwhile, project management and contract administration factors focus mainly on the applications of techniques, skills and tools for the construction activities to meet the needed requirements. However, project management and contract administration related problems are being so common in many countries such as Pakistan (Azhar et al., 2008) and being the main contributor to cost overrun in project (Elinwa and Buba, 1993). Labour related factors are also one of the major contributors to cost overrun. This because success of a project is not only dependent on number of labours but also the level of efficiency of the labour forces (Asmi et al., 2013). Material and machinery related factors are also very vital for construction projects. A good management of materials is very important in attaining a good success of projects as any problems related to materials will subsequently affects the cost performance of a construction (Koushki, 2005).

### **2.6.2 Factors Affecting the Time Performance**

Basically, project duration is termed as the number of days/weeks/months from start to actual completion date of a construction projects. Completing the project within the time is an important indicator for project success; however construction industry is often criticized for schedule overruns (Eriksson & Westerberg, n.d). And these schedule overrun/delays usually occur during the construction process where many unforeseen reasons are always involved (Chan and Kumaraswamy, 1997).

However, different author having different opinions on the causes of time overrun (Haseeb, Xinhai-Lu, Bibi, Maloof-ud-Dyian, Rabbani, 2011). According to Chan and Kumaraswamy (1997), the most important causes of delays are variations of works, poor supervision and management, variations by clients, slow decisions and also unpredictable site conditions. Meanwhile, studies conducted by Mansfield (1994) indicated that the main factors contributing to delay in Nigerian construction industry were poor handling of contract, finance and payments, increase in prices, inaccurate estimations, shortages of materials and also poor handling of contract. Meanwhile, Ayman (2010) studied the factors contributing to delays in 130 public projects in Jordan. Based on the above study, the main causes of time overrun in construction are mainly related to designers, user changes, weather, site conditions, late deliveries, economic conditions, and also increase in quantity.

On the other side, studies conducted by Sambasivan and Soon (2006) have identified ten most important causes of delays in Malaysian construction industry. These include contractor's poor site management, labour supply, problem with subcontractors, inadequate contractor experience, client's finance and payments for completed work, shortage in material, equipment failure, lack of communication between parties, mistakes during the construction stage and also contractor's improper planning. Contractor's improper planning occurs because of failure among the local contractors to submit a workable "work planning" at the initial stages of a construction phases. These improper planning indirectly causes delays in various stages of construction process. Contractor's site management also being one of the main contributors to schedule overrun in construction projects. This because a poor site management not only can cause delays in project responding to issues that arise at the site, but also can influence the overall performance of the project. Insufficient experience among the contractors is also an important factor because this inadequate experience in planning and managing the project can lead to some negative implications on the overall project progress. As known construction projects involve a huge amount of money and most of the contractors find it very difficult to bear the heavy daily construction expenses when the payments delayed. This indirectly makes the work progress to be delayed too due to late payments from the clients. Sambasivan and Soon (2006) have added that the quality and quantity of labour supply also can significantly