

CHAPTER 1  
INTRODUCTION OF STUDY

**1.1 Introduction**

Construction project management is a field of civil engineering which includes organization, administration and management of the entire project life cycle in order to ensure its technical and financial viability. The outputs of construction projects are facilities that are required by human beings as their residences (for example, single-storey/multi-storey house or apartments), commercial or service buildings (for example, shopping malls, hospitals, school and universities). Other examples of deliverables are heavy civil construction like motor-ways/high-ways, airports, dams, shipyards, process industries etc. Construction projects are usually organized in to following main types [1];

- a) Residential
- b) Commercial buildings
- c) Industrial
- d) Infrastructure/Heavy Construction

Construction projects are unique in nature as each of them has its own characteristic. For example, residential and building construction projects are different from each other. Although both of them are constructed from the same resources, but each require different regulations, legal considerations, code of practices and so on. In addition to this, construction projects involve varying concerns and expectations of different stakeholders such as financiers, buyers (clients), sellers, contractors, end-users, public, regulatory authorities and

government agencies [2]. All these attributes assigns a unique and distinctive status to construction projects.

The three main players of construction projects are client, designer and contractor with each having its own distinct roles and responsibilities. The term construction project is commonly used for an outsourced project by the user organization to an external project team for carrying out the job. Nevertheless, projects can also be executed with in the host organization by using its indigenous resources [2]. The construction project management life cycle usually classified in to the following management phases;

- a) Preparatory phase
- b) Procurement phase
- c) Contract award phase
- d) Contract management phase

All these phases connect each other to make a close loop. The completion of each phase determines the commencement of the succeeding phase. The brief description of each phase is discussed below;

#### **a) Preparatory Phase**

In the preparatory phase, business needs are addressed and realistic alternative for meeting these needs are identified and assessed for their efficiency and effectiveness. An outline business case is prepared covering specific business plan, risk analysis and budget constraints. Generally, the outcome of preparatory phase is a formal document known as 'Project Feasibility Study'. It decides that whether the project is feasible or not [3].

## **b) Procurement Phase**

The formal procurement phase starts with the publication of invitation to tender notice in the official journals, newspapers and websites. In general, a negotiated tendering procedure with a call for competition is appropriate for construction projects procurements. Bidders are screened through a prequalification process and a list of potential bidders is compiled. In the selection stages, the long list of bidders is reduced to a short list based upon the qualifying criteria. The business needs are also refined at this stage which may include project basic design and engineering requirements, timelines, work plan and scope of work. An invitation to negotiate is then offered to bidders giving them detailed information to use in formulating their bids. After bids are received, discussions are conducted with each bidder to clarify and assess their proposal and negotiations are aimed at ensuring that requirements are met and defining terms of the contract and bidders are then asked to submit their best and final offer [4].

## **c) Contract Award Phase**

Based on the best and final offer, the plans are reviewed to confirm that the objectives can be achieved. If there are no problems, the contract is awarded to the successful bidder whose bid is substantially responsive and to be the best evaluated bid. The bidder is then asked to sign a contract agreement with the client which incorporates all the agreements between the two parties. The contract agreement is a formal document that defines the working relationship between the client and the contractor [5].

## **d) Contract Management Phase**

Contract management is the process of administrating the terms and conditions of a contract throughout the contractual period. It is vital for all key stakeholders to understand its importance as a core process of a project life cycle. It also serves as measure of working relationship between the client and the contractor [6].

The contract management phase will ensure the following activities but are not limited to:

- Project performance monitoring
- Control the scope, cost and schedule baselines
- Quality control and inspection
- Risk management
- Periodical project progress review meetings and reporting
- Approve interim progress payments to the contractor
- Compliance with the contractual terms and conditions
- Balance the conflict of interest between the client and the contractor

Among all, the performance monitoring of a construction project is considered as a core and integrated activity of contract management phase. In construction industry, the project performance is usually appraised in terms of ‘hard’ and ‘soft’ measurements. The first type includes cost, time and quality measurements whereas the later involves the customer satisfaction, productivity, defects, environment, team working and so on [7]. The main intention of client and contractor is to complete the project within the approved budget, time and desired level of quality. However, the time and cost are the two important parameters which are widely been adopted for the performance measurement of construction projects [8]. They are the clear indicators of a project success or failure. The traditional approach of project time and cost monitoring is based on simple parameters using two data sources that is the budget (or planned) and the actual expenditures. The comparison of budget versus actual values merely indicate what was planned to spent versus what was actually spent at any given time. Beside this, it does not relate any current performance trend to forecast future performance [9].

Due to these limitations in traditional practices, Earned Value Management (EVM) methodology integrates project scope, cost and schedule for an objective

performance measurement [10]. It is an emerging concept and an internationally recognized project management technique to monitor and control project performance. It provides a system to determine the actual amount of work performed on a project in order to predict cost and completion timelines. It also indicates that how well a project is performing compared to its baseline, and given the information to anticipate how well the project will perform in the future [11]. In Malaysia, EVM has not yet become widely practiced as the current industry trend is more towards the traditional planning and controlling tools such as S-curve, progress curves etc. [12]. Hence, this study investigates the current understanding and perceptions of EVM and its applications to the Malaysian construction industry.

## **1.2 Problem Statement**

An effective project performance control can not be achieved by traditional approach as it only monitor the actual physical progress with the planned progress and actual cost expenditures with the budgeted values. Nevertheless, this approach may be deceptive as it does not consider the worth of the work which is completed during a particular period [13]. As a remedy of these limitations in traditional monitoring practices, EVM methodology integrates the work scope, cost and schedule to produce objective performance control. It allows the organizations to ensure that the project is progressing as per work plan and within the approved budget [14]. The concept of EVM is widely accepted and practiced in developed countries. In United States, NASA has mandated the use of EVM on its strategic procurements [15]. South Korean Congress in 2004 passed a bill i.e. ‘The Effective Plan of the Public Construction Industry Bill’ which also mandated the construction firms to adopt Earned Value Management System (EVMS) in their projects [16].

Therefore, to study and promote the applications of EVM method in the Malaysian construction industry, it is important to investigate its current state of understanding and perceptions before a project monitoring system based on EVM methodology can be developed to suit the needs of the local construction industry.

### **1.3 Aims and Objective**

The aim of this research is to investigate the applications of Earned Value Management (EVM) method for the Malaysian construction industry. The primary aim of the study is supported by the following objectives;

- i. To determine the current level of EVM usage and its perception as a monitoring and controlling method.
- ii. To investigate barriers and enablers of EVM implementation.
- iii. To study potential scope, explore knowledge and opportunities for using EVM method through case studies of real projects.

### **1.4 Scope of the Research**

This research reviewed available literature to give a clear and precise understanding of EVM method in time and cost performance monitoring of construction projects. It discusses the significance advantages of EVM applications with respect to the limitations of traditional time and cost monitoring approach. This data is further used for the development of a structured questionnaire that aims to explore the understanding of EVM methodology in the Malaysian construction industry and investigate its current level of applications. This part of the study has provided useful and relevant information for more detail statistical analysis. The scope of this research also includes four descriptive case studies to analyze contextual data in order to gain insights of the EVM applications in real projects. Case studies from infrastructure, housing, upgradation and building projects were selected that helps to examine how and why organizations can employ EVM method on their particular projects. Furthermore, two interviews were also carried out mainly in a semi-structured format in which data is first collected on the background of each company and the role of senior executives in the projects. These field discussions with the construction experts help to gain opinions and arguments on the applications of EVM method in the industry.

## **1.5 Limitation of the Study**

The constraints of this research work are as follows;

- i. The assessment on level of EVM understanding and its usage in the Malaysian construction industry would be more accurately determined, if an entire population of G7 contractors as classified by CIDB Malaysia are taken in to consideration in the questionnaire survey. However, lack of time and resources have lead to application of randomly selected of suitable sample size from the total population for this research.
- ii. The data for analysis of case studies were taken from already completed projects or ongoing construction jobs. However, the effectiveness of EVM applications can better be achieved by implementing the proposed methodology from the planning phases of a project.
- iii. The case studies are limited to design and build fixed price contracts. This is due to the accessibility of data base support from these construction projects only.

## **1.6 Research Contribution**

The main theoretical contribution of this research is to explore the understanding of EVM method in the Malaysian construction industry and its perception by identifying potential barriers and enablers. This study has also extended the knowledge and practical applications of EVM method by examining case studies of ongoing and completed construction projects. The publications arising from this work is listed in the Appendix.

## **1.7 Structure of Thesis**

This research dissertation is organized as follows:

Chapter 1 is preamble and discusses the construction project management discipline, its basic types and outlines their development process. It has included the research problem statement; associated aims and objectives; scope and limitation of the study. It also highlights the significance of the study and the research publications from the study.

Chapter 2 comprises of literature review in a two-fold manner. Firstly it describes the different types of construction procurement system; secondly, the traditional and non traditional methods of project time and cost monitoring are discussed. It describes the limitations of traditional techniques and highlights the Earned Value Management (EVM) method as an effective project monitoring technique by discussing its standards, procedures and applications.

Chapter 3 derives an EVM Framework from the available EVM Standards which sets out the basic understanding and steps required for an implementation of EVM System in construction projects.

Chapter 4 elaborates the research design process and methods that were adopted to achieve intended aims and objectives. In this regard, quantitative as well as qualitative approach was carried out for primary and secondary data collection and its analysis.

Chapter 5 presents the results and analysis of the data. It uses statistical tools as well as descriptive case studies to express the quantitative and qualitative data. It investigates understandings and perceptions of EVM methodology in the Malaysian construction industry and studies its applications. It also presents two semi-structured interviews in order to examine the views and arguments of construction experts about the anticipated use of EVM as a standardised project monitoring methods beside traditional techniques.

Chapter 6 presents the conclusions and future recommendations of this research study.