THE IMPLEMENTATION OF EARNED VALUE MANAGEMENT (EVM) TO CONTROL PROJECT PERFORMANCE IN MALAYSIAN CONSTRUCTION INDUSTRY

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DEDICATION

My dearest husband, thank you for being my biggest supporter and walk with
me through this hard and tough journey.
My son is a my sunshine of the day and the light in
the dark.
My father and my mother, who gave me the greatest gift by always believed
in me.
My father and mother in-law. Thank you, I am touched beyond words
My siblings, without you, I am just a bird without wings.

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To my husband and son, **Azwan Bin Yahya** and **Fattah Asyari bin Azwan**, your sacrifices along these years are something I could only repay with my time. It's a blessing in disguise that we are yet to discover.

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ABSTRACT

Earned Value Management is not a new technique in the construction industry and other sectors. Almost seven (7) decade has been widely used in the United Kingdom, Australia and United States. However, in Malaysian construction industry is considered as a new technique. It was introduced in year 1986, even it not commonly used or known by the practitioners. It has been found to be able to reduce the cost of the construction project at least 10 to 30 percent. A few project such as KLIA 2, Institut Aminuddin Baki, Larut Tunnel, educational Building, highway and others. that project has been considered as successful in implemented VM cause project cost reduced. The initiative from government with integrated the VM in Economic Planning Unit (EPU) 2009 and the manual has been released on 2011. The design of this study is survey. this study aimed to attain an objective which to identify the barriers in implementing EVM in controlling project performance in the Malaysian construction industry and to determine critical success factors for implementing EVM in controlling project performance in the Malaysian construction industry. The analysis shows that the types of barriers listed such as lack of proper training and experience of project manager, lack of knowledge and disclosure, cultural resistance/people resistance to implement EVM as control tool and others be the barrier in implementing EVM in construction industry. Meanwhile, the construction practitioners agreed the critical success factor that contribute toward the successful in implementing EVM. this study expected to improve the Earned Value Management used in Malaysian construction industry and give the benefit to the parties who use EVM in the construction sector in future.

ABSTRAK

Peroleh Pengurusan Nilai bukanlah teknik yang baru di dalam industri pembinaan dan sektor lain. setelah hampir tujuh (7) dekad digunakan secara meluas di United Kingdom, Australia dan United States. walaubagaimanpun, di dalam industri pembinaan Malaysia ianya dianggap sebagai teknik baru. Ianya diperkenalkan pada tahun 1986, walaupun ianya tidak biasa digunakan atau dikenali dalam kalangan ahli pengamal industri. Ianya telah membantu dalam mengurangkan kos projek sekurang-kurangnya 10-30 peratus. Beberapa projek seperti KLIA 2, Institut Aminuddin Baki, Terowong Larut, bangunan pendidikan, lebuhraya dan lain lain. semua projek itu telah dikira sebagai berjaya dalam melaksanakan pengurusan nilai kerana kos projek telah berkurang.. Kerajaan telah mengambil inisiatif dalam meningkatkan pengurusan nilai dengan memasukkan ke dalam Unit Perancang Ekonomi 2009 dan mengeluarkan manual pada tahun 2011. Kajian ini adalah mengunakan jenis tinjauan. Tujuan kajian ini untuk mencapa objektif kajian dimana untuk mengenal pasti kekanggan dan faktor kejayaan yang kritikal semasa melaksanakan Peroleh Pengurusan Nilai. Analisa yang diperolehi menunjukkan beberapa jenis kekangan yang di senaraikan seperti kurang pengurus projek kurang latihan and pengalaman, kurang pengetahuan dan pendedahan, kekangan dari sifat dan budaya dalam melaksanakan Pengurusan Nilai yang Diperolehi sebagai alat mengawal dan lain sebagai kekangan dalam melaksanakanya. sementara itu, pengamal industri ini bersetuju bahawa factor kejayaan yang kritikal boleh menyumbang kepada kejayaan pelaksanaan Peroleh Pengurusan Nilai. Diharapkan kajian ini dapat meningkatkan penggunaan Peroleh Pengurusan Nilai didalam industri pembinaan Malaysia dan memberi manfaat kepada pihak yang ingin mengamalkannya pada masa akan datang.

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LIST OF ABBREVIATIONS

AC   Actual cost

ACWP   -   Actual Cost of Work Performed

ANSI   -   American National Standards Institute

BAC   -   Budget at Completion

BNM   -   Bank Negara Malaysia

BCWP   -   Budgeted Cost of Work Performed

BCWS   -   Budgeted Cost of Works Scheduled

CIDB   -   Construction Industry Development Board

CPI   -   Cost Performance Index

C/SCSC   -   Cost/Schedule Control Systems Criteria

CV   -   Cost Variance

DOD   -   Department OF Defense

EAC   -   Estimate at Completion

EIA   -   Electronic Industries Alliance

EPU   -   Economic Planning Unit

ETC   -   Estimate to Complete

EV   -   Earned Value

EVM   -   Earned Value Management

ICT   -   Information and Communications Technology

JKR   -   Jabatan Kerja Raya

KLIA	-	Kuala Lumpur International Airport
PERT	-	Project Evaluation and review Technique
PMBOK	-	Project Management Body OF Knowledge
PMI	-	Project Management Institute
PV	-	Planned Value
SPI	-	Schedule Performance Index
SPSS	-	Statistical Package for the Social Sciences
SV	-	Schedule Variance
TCPI	-	To Complete Performance Index
UTM	-	Universiti Teknologi Malaysia
VA	-	Value Assessment

LIST OF SYMBOLS

$\sum$ Symbol for summation

n   Total number of items

X   The symbol we use for mean (pronounced as *X* bar)

X_i Value of the *i*th item *X, i* = 1,2,….,n

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1.2.   Issue/ problem statement

Nowadays, construction industry facing the growth rate of delay in project delivery by contractor which is gives an effect to all parties such as developer, contractor, consultant and client. It became worse when the project were abandoned due to some reason when the end of contract period (Ariffin et al., 2018). As stated by Gomarn & Pongpeng (2018), the major contribution towards unsuccessful projects is the lack of understanding or defining project and product scope at the beginning of the project. A properly defined and managed scope results in delivering a quality product, in agreed cost and within planned schedules to the stakeholders. Some time, without proper and poor site management from contractor side would lead to delay of the construction work.

Mydin et al., (2014) & Ullah et al., (2018) defined project delay as an incident which affecting to the completion of work either to be extended all the works or the part of a particular work. It also defined as the time overrun, either ahead of the date for project completion specified by the contract or further than the extended contract period where an addition of time has been granted.

The common causes of the delay are due to weather conditions, poor site conditions, poor site management, incomplete documents, lack of experience, financial problems, contract modifications, delay in approving of major variations, contractor coordination problem with other parties and construction mistakes and defective works. It would lead to time overrun, cost overrun, different in opinions, negotiations, legal actions and total abandonment (Mydin et al., 2014; Mishakova et al., 2016).

However, the project might face an obstacle and pressure due to many factors for instance project time, cost overruns, as well as safety, health and environmental issues (Zulkefli et al., 2017). Projects are executed within the constraint of time, budget and quality, thus project manager should control and manage the project to ensure project delivery within these constraint (Nkiwane et al., 2016). Project manager should understand the key of success indicator and the failure indicator to be as a guide in analysis and prevention for future project (Gomarn & Pongpeng, 2018). Other than that, the lack of an effective monitoring and controlling will be affected the overall performance of the projects. Hence, there is a need for an accurate and useful approach that takes into account any uncertainty matter to be an alarm to detect any problem during the progress of the project (Ibrahim et al., 2019).

One of the approaches that has widely used as a concept for evaluating the performance of the project is Earned Value Management (EVM). These combination such as scope, cost and time of project, and easy for stakeholder to monitor the progress of the project during life cycle and it assists in correcting the work in a timely manner (Najafi & Azimi, 2016).

Earned Value Management is a tool which adaptation from Value Management or Value Engineering. EVM is a technique used in project management commonly practising by contractor. It is a technique to measure the progress of a project in a defined and objective manner and assess whether resources are being used efficiently (Churcher, 2017). Meanwhile, Value Management (VM) is a multi-disciplinary, team orientated, structured, analytical process and systematic analysis of function which seeks best value via the design and construction process to meet the client's perceived needs (Jaapar et al., 2009). VM is an approach that improve the worked relationship among the team and able to achieve better value for money. In United States there has a legislation and standard requirement to be followed when to execute the government project. However, in Malaysia there is no regulation or legislation, standard requirement and policies for EVM to implement in project either for government or private. The legislation and standard requirement is vital to ensure the project achieve the requirement in controlling and monitoring the project.

CHAPTER 1

INTRODUCTION

1.1.   Background of the study

Construction industry is one of the vital towards the contribution of the economic and social development in Malaysia (Gomarn & Pongpeng, 2018; Ariffin et al., 2018; Sruthi & Aravindan, 2020). As reported in Economic Report 2018/2019, Department of Statistics, BNM Annual Report the growth of construction industry become expand from 4.5% in 2018 to 4.7% in 2019 (CIDB, 2019).

The construction industry is one of the contributors to the country's economic. It consists of building structures such as roads, bridge, repairing works and keep the building safe. It also involves metalwork, electrical, mechanical, and architectural and another related project to ensure the main objective of each project to be completed (Zakaria et al., 2013).

As described by Becker (2017), project is a temporary endeavour undertaken to create a unique product or service. It might consist of a series of activities or tasks, specific objective/scope of work, expected end to be completed according to certain specifications (requirements) as agreed by both parties, end and start date has be determined, the budget of the project and funding, and the resources require to be used in the project.

The effects of delays in the construction industry was identified such as schedule overrun, budget overrun, differences among construction stakeholders, arbitration, claims, litigation, and project abandonment (Ullah et al., 2018). Abandoned project can be defined as construction work not completed for 6 months or more, during the completion period or it beyond the schedule date of completion. Due to this cases it would be effect many parties involved in contract for instance developer, contractor, consultant and client (Ariffin et al., 2018).

Mean Score Value

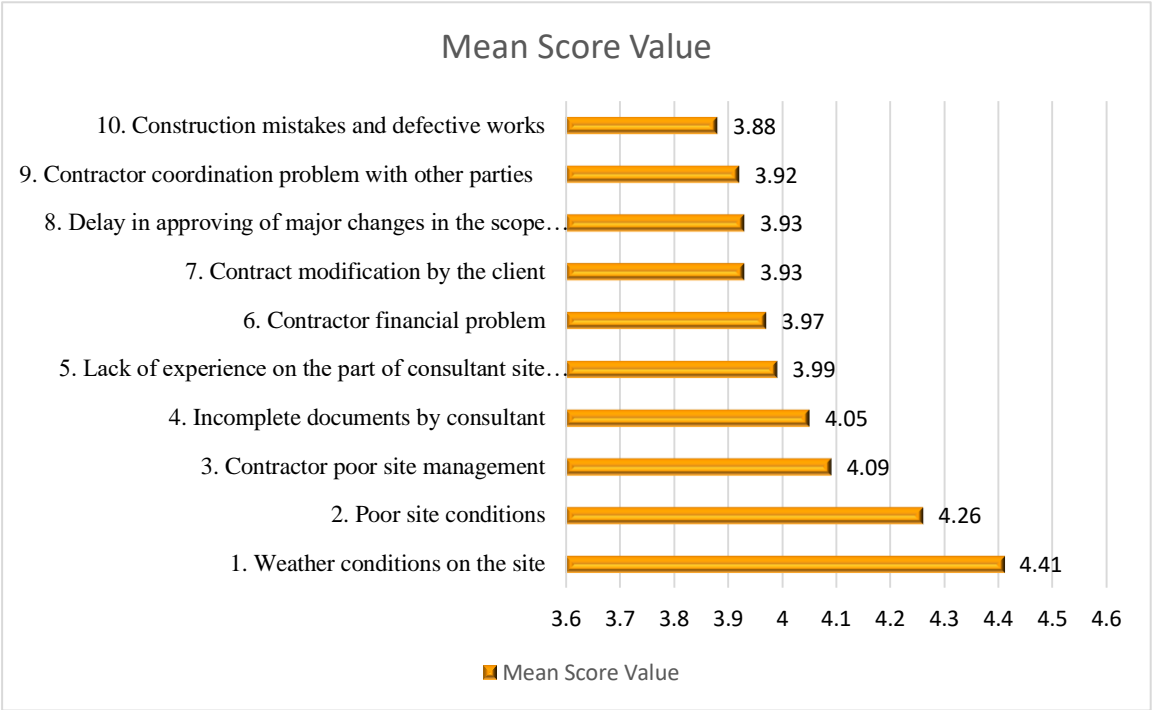| Cause	Mean Score Value
10. Construction mistakes and defective works	3.88
9. Contractor coordination problem with other parties	3.92
8. Delay in approving of major changes in the scope…	3.93
7. Contract modification by the client	3.93
6. Contractor financial problem	3.97
5. Lack of experience on the part of consultant site…	3.99
4. Incomplete documents by consultant	4.05
3. Contractor poor site management	4.09
2. Poor site conditions	4.26
1. Weather conditions on the site	4.41

Figure 1.1: Top 10 causes of Private Housing Delays in Malaysia

(Mydin et al., 2014)

As shown in Figure 1.1 above listed the top 10 causes of private housing delays in Malaysia. The highest is the weather conditions on the site it would be a big effect to the construction work on site. The work might be delay and the progress of work become slow. The third is poor site management from contractor site that lead to the delay of the construction work. It show without proper management on site during construction period would lead to the various problem.

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Regarding abandoned project, the fifth Malaysian Prime Minister, Abdullah Ahmad Badawi was on 22.09.2005, The Star quoted as saying,

"If the projects have been monitored on a regular basis from the start, any sign of them being abandoned could have been detected and the salvaged".

(Abdullah Ahmad Badawi, 2005)

According to Abdul Rahman et al. (2012), the key factors that lead to the success of any project are time and cost performance, construction waste, poor productivity and over dependent of foreign workers. However, construction industry in Malaysia faces poor performance which being one of the failure factor in achieving effective time and cost. Abdul Rahman et al., (2012) stated that 92% of construction projects were overrun and only 8% of project could achieve the target of project. It may be cause by any party to the contract. In term of cost performance the finding shown only 11% finished within the budgeted the rest were facing the problem of cost overrun with the average at 5-10% of contract price.

Other than that, these factors can be majorly classified in categories for instance contractor's site management, design and documentation, financial management related factors, information and communication, human resource (Workforce), non-human resource, project management and contract administration and external factors. These factors were also investigated and mitigation measures were proposed to control these factors (Abdul Rahman et, al. 2012;Mishakova et al., 2016).

As discussed by Alias at al., (2014), there are several factors that can be look into it which lead to the successful project delivery for example project schedules/plans, client acceptance, monitoring and feedback, communication,

trouble-shooting, and characteristics of the project team leader. Hence, the construction stage is where all the project goals of the contractual parties like time, cost, performance, quality, safety and so on are established and put to the test. The degree of effectiveness of the project management functions and the degree of success of the project goals will determine the degree to which the individual party will perceive the project as being successful from its own viewpoint.

In study made by Mydin et al. (2014), shown without proper management such as irregular meeting, lack of site valuation with parties in order to resolving any issue, lack of control and monitoring of site works and less productivity. That give an impact and can be one of the cause of delay and lead to the various of issue. Abandoned project can be defined as construction work not completed for 6 months or more, during the completion period or it beyond the schedule date of completion. Due to this cases it would be effect many parties involved in contract for instance developer, contractor, consultant and client (Ariffin et al., 2018).

All the problems discussed the current situation faces by the parties involved in the construction field. The implementation of the best tool in controlling project performance should be used. Earned Value Management (EVM) is the tool had been used over five decades. The previous projects which implemented EVM as a tool had been success and proved in reducing the problems such as cost overrun and schedule overrun. However, the implementation of the EVM has barriers which need to faces by the parties. Meanwhile, the project can be success by determining the critical successful factors of EVM in project.

1.3. Research question

1. What are the barriers in implementing EVM in the Malaysian construction industry?

2. What are the critical successful factors in implementing EVM in the Malaysian construction industry?

1.4. Aim

The aim of the research is to investigate Earned Value Management (EVM) in controlling project performance in the Malaysian construction industry.

1.5. Objective of research

1. To identify the barriers in implementing EVM in controlling project performance in the Malaysian construction industry.

2. To determine critical success factors for implementing EVM in controlling project performance in the Malaysian construction industry.

1.6. Research Methodology

Research methodology is a guideline to identify approach for conducting research from the early stage to the final, it utilizes methods on how to gather a data, how to analyse data, make conclusions based on the available data from the interview session and legal cases and lastly, it makes recommendation for improvement and future works. Every step has been organized to make sure all the data and information could be done in systematic ways. The steps of the research methodology as shown in Figure 1.2:
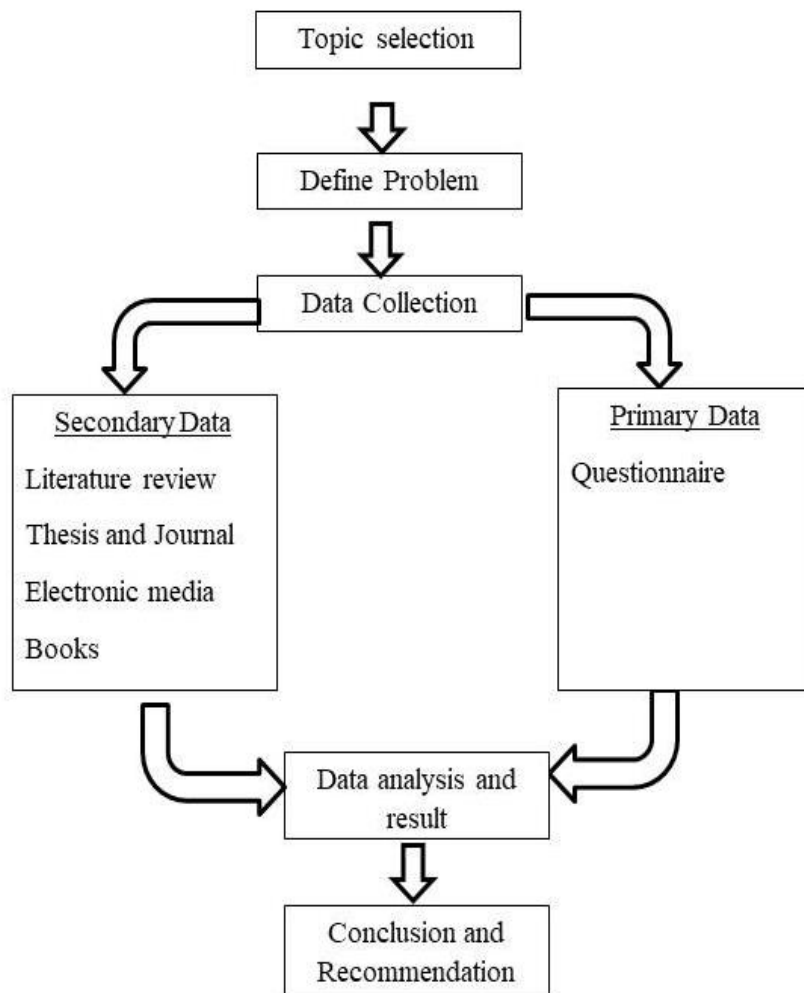

Figure 1.2: The stage of the research methodology

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