

**APPLICATION OF
VALUE MANAGEMENT BY
IBS CONTRACTORS IN MALAYSIA**

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UNIVERSITI TUNKU ABDUL RAHMAN

**APPLICATION OF
VALUE MANAGEMENT BY
IBS CONTRACTORS IN MALAYSIA**

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**A project report submitted in partial fulfillment of the
requirements for the award of the degree of
Bachelor of Science
(Hons.) Construction Management**

**Faculty of Engineering and Green Technology
Universiti Tunku Abdul Rahman**

May 2016

DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

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APPROVAL FOR SUBMISSION

I hereby certify that this project report entitled “**APPLICATION OF VALUE MANAGEMENT BY IBS CONTRACTORS IN MALAYSIA**” was prepared by **YAP CHUN LIM** has met the required standard for submission in partial fulfillment of the requirements for the award of Bachelor of Science (Hons.) Construction Management at Universiti Tunku Abdul Rahman.

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Specially dedicated to my pillar of strength all these years, and they are no other than my beloved father and mother.

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It has been a great 3 years of time here in UTAR. Happy days, sad times, stressful midnight studies and not to forget, disastrous last minute work have all shaped us to be a stronger and more independent individuals. What does not kill you really does make you stronger.

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ABSTRACT

According to Industrialized Building System (IBS) Roadmap 2006-2010 and Construction Industry Master Plan (CIMP) 2006-2015, the required implementation of IBS is to be as high as 80%. However, according to MIDA, the implementation of IBS is still very low, just approximately 15-20% in Malaysia. This research will be studying on the barriers of implementation of IBS in Malaysia, the Critical Success Factors (CSF) of IBS in Malaysia. This research also aims to address such issue via the integration of Value Management (VM) approach. Value Management is a holistic multidisciplinary team-oriented approach that gathers stakeholders to achieve the needed outcome for the satisfaction of the client by maximizing the value for money. It is believed that the methodologies inside of Value Management approach (ie: 40-hour Job Plan, The Charrette, The Concurrent Study etc) is able to help solve the barriers of the low implementation of IBS, which will then allow improvement on IBS implementation in Malaysian construction industry. In addition, the government has outlined for the 10th Malaysia Plan – to implement VM for all projects that cause more than RM 50 million – so integrating IBS with VM will also allow more awareness and acceptance of IBS in the construction industry in Malaysia.

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CHAPTER 1

INTRODUCTION

1.1 General

The construction industry plays vital role in the country's effort to fuel the domestic activities to enhance the country's growth (CIDB, 2007). Hence, it is crucial to take safety measures to increase the quality and productivity in construction. The types of system used are crucial in the determination of time and quality factor of the construction. According to Badir-Razali on building classification system, there are four categories namely conventional building system, cast in-situ formwork system, prefabrication system and also composite system; the last three being Industrialized Building System (Badir et al, 1998). In terms of time factor, it was found that IBS provides an average of 2.1 manhour/m² while conventional system provides 7.0 manhour/m² (Abang Abdullah Abang Ali & Sapuan S. M., 2006). In terms of quality, IBS provides buildings with higher long term durability and performance (Sharma, 2004). Hence, IBS is a more promising method to enhance the country's construction industry.

Industrialized Building System is defined as a construction related method that produces components in a controlled environment, be it on or off site, and are to be delivered, placed, hoisted and finally assembled to that of a building structure with little effort (Hamid, 2008). According to Construction Industry Development Board (CIDB) Malaysia, there are up to five (5) different methods of structural classification, namely (1) Precast Concrete Framing, Panel and Box System, (2) Steel Formwork System, (3) Steel Framing System, (4) Prefabricated Timber Framing

System and (5) Block Work System. All of the aforementioned structural erection method will be further elaborated in Chapter 2 of this research. Such effectiveness in construction was recognized and Ministry of Works, through CIDB and Public Works Department, took initiatives to promote IBS. Though, the usage of IBS in Malaysia construction industry is relatively low, topping at approximately 15% in 2003 (IBS Survey, 2003). In addition, one of three projects were using IBS or less (CIDB, 2007). Even after having established a goal in Construction Industry Master Plan (CIMP) 2006 – 2015 for IBS to achieve 80% usage by 2015, according to deputy CEO of Malaysian Investment Development Authority (MIDA) Datuk Phang Ah Tong, IBS implementation is still in infancy stage in Malaysia (The Star, 2015). Such shortcoming of IBS in Malaysia's construction can however, be tackled by integrating IBS with Value Management approach.

Value Management (VM) is a mean of achieving values through a systematic and analytic check on functions that gives an overview on the design and construction process to meet the clients' needs (Jaapar and Torrance, 2005). It is also a creative problem-solving service which practices a multi-disciplinary team approach which involves significant parties to make unambiguous the clients' value system. The discipline of such system is currently gaining much of the attention in the construction industry. According to Malaysia's Economic Planning Unit (EPU), it is the rules and regulation of the country for all 10th Malaysia Plan projects to adopt such approach for any projects worth RM50 million or more. Therefore, by studying the process of VM, we can identify which stage we can integrate IBS into it. It is also highly beneficial for such integration to take place as IBS's aim is to maximize efficiency and improve productivity, which is in line with that of VM's aim to increase value for money. By creating awareness through this research, we can induce IBS into VM, which then increases the implementation of IBS in construction. Therefore, now, it is essential to focus on increasing more on application of VM in the construction industry. With that, we will automatically increase IBS in construction.

1.2 Problem Statement

According to IBS Roadmap 2003-2010, Budget 2005 declared all new government projects to have minimum of 50% IBS content. And according to Construction Industry Master Plan (CIMP) 2006-2015 as well, CIDB expected IBS implementation by 2015 to have reached 80% above. However, Industrialized Building System (IBS) in Malaysia's construction industry only accounts to approximately 15% (IBS Survey, 2003) and less than one third projects utilized IBS concept (CIDB, 2007), despite the various advantages it offers. It was also reported in TheStar that Malaysian Investment Development Authority (MIDA) stated IBS implementation is still very low in Malaysia as of 2015 (only 15 to 20%). IBS is in some way, a value achieving method, which is quite similar to VM process. Their difference lie in the fact that IBS does not include clients' value system in the process of achieving value, unlike what VM has to offer.

Value Management is a multidisciplinary, team oriented, structural and analytical approach that seeks the best value through design and construction process to meet clients' needs (Jaapar and Torrance, 2007). According to Malaysia's Economic Planning Unit (EPU), VM is a mandatory process to be adopted for projects of RM 50 million and over. This means that all mega projects in the 10th Malaysia Plan will adopt VM process and if IBS partake in VM process, the application problem in IBS can be addressed. On the other hand, IBS who utilizes more prefabrication and is more knowledgeable in materials can advise VM on what kind of materials that are needed. Hence, the integration offers favorable endings for both VM and IBS.

Generally, client's consultation team usually discusses in a closed meeting room, which neglects real time on-site activity and would sometimes omit key problem in achieving value. Hence, it is time to shift to the perspective and gather information from real-time workers on-site, for example, the contractors. Contractors are the ones who plan the flow of work and supervise them will usually find loopholes in the system and so gathering information from them is much needed.

Value Management methods currently involve only construction professionals to contribute to value management, but they are not the ones who are exposed to the site most; the contractors are. Hence, including IBS contractors in VM process can solve not only low IBS application but also increase VM effectiveness.

1.3 Aim and Objectives

The aim and objectives are as follow:

Aim : To appraise the application of VM in Malaysia's construction industry by IBS contractors.

Objectives : To determine the level of awareness of VM in Malaysia's construction industry.

: To determine the level of VM application by IBS contractors.

: To determine how VM is helpful towards IBS adoption in Malaysia

: To determine the most which stage IBS contractors are mostly included in VM methodology

1.4 Research Significance

At the end of this research, it will be clear of the latest implementation of IBS in the construction industry of Malaysia. It is predicted not to be high after completing some thorough literature review on the latest implementation level of IBS. Fragmentation problem being the main reason of this low implementation issue, can be addressed by integrating IBS with VM process. This is because VM is a team approach that seeks to perform analytical and structural approach to identify clients' value system to achieve value in the project. Finally, it is also possible to identify means of ways (after questionnaire analysis) to increase VM implementation in the industry, in hopes of bringing along IBS through the road of higher implementation rate in Malaysia construction industry.

1.5 Research Scope

The study will be based on questionnaire given to IBS contractors in Malaysia. The IBS contractors selected will be G7 and are focused at Selangor and Wilayah Persekutuan (majority Kuala Lumpur) area.

1.6 Outline of Research

This research will be carried out firstly through problem statement together with aim and objectives, followed up by literature review and then collecting data through questionnaires. Then, there will be analysis of the data collected, which would then be given suitable recommendations and conclusion. Finally this is ended with presentation and feedback from supervisors and the panel judges.

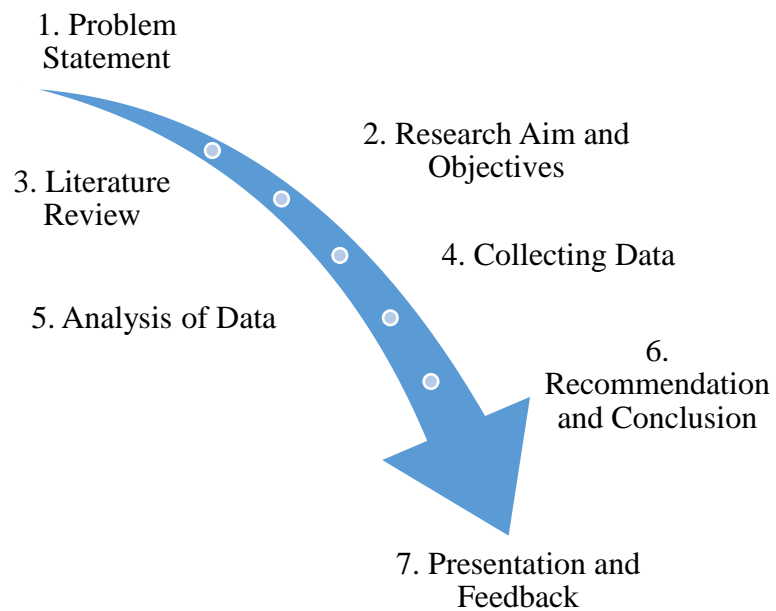


Figure 1.1 Outline of Research Flowchart

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This literature will consist of several significant parts. Firstly would be the background and characteristics of Industrialized Building System (IBS) followed up by characteristics of the Value Management (VM) as well. The similarities arising from both these practices will be compared seemingly to identify how IBS contractors will be relevant in the process of value management approach. Next, the VM methodologies will be discussed after that for latter identification (in Chapter 3) of the most dominant VM method being implemented in the construction industry. Then, we will look into the composition of a Value Management team and see how and why IBS contractors are a necessary fit in the VM approach. Also, it is necessary to understand the necessity of VM in the construction industry. After identifying types of VM methodologies and necessity of IBS contractors in VM process, we can roughly understand where an IBS contractor fit in in a VM process. Finally, we will identify the causes that hinder and encourage VM within the construction industry in the next section which would be used later to pinpoint the types of challenges faced (in Chapter 3). We want to know if the IBS contractor is involved in the VM process or not? If yes, then what encouraged it, and if no, what are the factors that hinder it?

2.2 Information Building System (IBS)

There are many definitions arising to cover the meaning of IBS. According to an early research, IBS is a process whereby sections of a bigger structure are brought together, planned and fabricated at factory, delivered and assembled at site (Junid, 1986). It was followed up by another definition that stated IBS as a system that utilizes industrialized production method in either manufacturing wise or erection wise (Parid, 1997). Seemingly, IBS constructs using prefabricated sections of the same item, as defined by (Rahman and Omar, 2006). Ultimately, the definition of IBS has come down to a fixed term and is defined as a process that employs techniques and building systems that are comprised of prefabricated components which go through on and off site installation (CIDB, 2003).

2.2.1 Background of IBS

The idea of IBS is not new in the construction industry. Its history can be traced back to as far as 1970, when the US government was looking for the best method available to satisfy the housing demands after the settlement of the catastrophic World War II (Jaillon and Poon, 2009). Even before the WWII, minor traces regarding IBS could also be seen when timber panel houses were shipped from England to the new habitation in North America.

The first ever cast-iron bridge construction in England jump-started the IBS practice and transformed how structures were erected. Several big projects using the same method of construction followed up, and these include one of the most historic names ever, that is the Eiffel tower. The idea of steel construction was given much attention thereafter as well, as these steel frames were often combined with the idea of pre-cast erection in building skyscrapers. Although steel structuring of bridges were common approaches in the overseas, Malaysia did not adopt it until much later. In 1966, the government launched two pilot projects namely the Pikeliling Flats in Kuala Lumpur and the Rifle Range Road Flats in Penang. The two low cost pilot projects were constructed using precast concrete method. The result was fascinating

enough that Perbadanan Kemajuan Negeri Selangor (PKNS) took acquisition of precast concrete technology from Germany to build various housing projects that comprises of the low and high cost houses and bungalows, respectively (Hashim, 1998). Ever since the two pilot projects were realized by the government, the blackhole effect continued to bring about many mega projects, which include the Bukit Jalil Sports Complex and the Petronas Twin Towers.

2.2.2 Characteristics of IBS

The characteristics of IBS as summarized by (CIDB, 2003) are as below:

- Better quality, productivity and safety
- More cost-efficient price on IBS components due to participation from Bumiputera populaces
- Reduce wastage
- Minimize the dependency on foreign workers

2.2.3 Types of IBS Structural Classification

i. Precast Concrete Framing, Panel and Box System

- Instead of using conventional concrete block system, precast concrete framing is used here to increase efficiency



Figure 2.1: Precast Concrete System (source: Eastern Pretech (Malaysia) Sdn Bhd)

ii. Steel Formwork Systems

- Usually timber formwork is used, however, in IBS, steel is used. This is to increase the number of repetition in use which increases the value of the formwork.



Figure 2.2: Steel Formwork (source: Dahtec Marketing Sdn. Bhd.)

iii. Steel Framing Systems

- In (i) we mentioned about concrete framing, in another context, there is also another method known as lightweight steel framing system. In layman terms, it is known as portal framing. This method utilizes the light weight and high durability to allow wide span between steel columns.



Figure 2.3: Steel Framing System (source: Superdaya Group)

iv. Prefabricated Timber Framing System

- Instead of using steel and concrete framing, timber is used. The reason is to provide the structure with comparatively esthetic design and affordable price.



Figure 2.4: Prefabricated Timber Roof at Setia Pearl Island (source: Setia - Wood Industries Sdn Bhd)

v. Blockwork Systems

- Interlocking concrete masonry units (CMU) and lightweight concrete blocks are used instead of conventional concrete blocks. This reduces time-consuming traditional brick-laying task.



Figure 2.5: Blockwork System (source: Fast Build Sustain Sdn. Bhd.)

2.2.4 Advantages and Disadvantages of IBS

Industrialized Building System (IBS) surely has many advantages to offer (CIDB, 2003), and the advantages definitely outweighs that of its disadvantages (MohdAbedi et al, 2012). There are more authors that are convinced in its advantages than its disadvantages and the list is as of below:

Table 2.1: Advantages and Disadvantages of IBS

Advantages	Disadvantages
High quality on end product	High initial investment cost
High cost saving	Lack of information regarding IBS
Heightened safety measure	Require skillful workers
Swifter construction	Uncompetitive in construction industry
Reduction of unskilled workers	Prefabrication lacks creativity
Increased cleanliness	
Enhanced social benefits	

Upon finishing the table that identifies the strengths and weaknesses that encourage and hinder respectively the application of IBS, despite having agreed by many that the advantages outweigh the disadvantages, the implementation level is still very low in Malaysia as of 2015. TheStar reported, as of May 12, 2015 the implementation rate is as low as 15 – 20% only. MIDA further stated that the main reason for low implementation is due to the fragmentation in the construction team which disconnects the supply chain. Close control of management in the supply chain is essential to ensure continuous and timely delivery (TheStar, 2015).

Apart from fragmentation issue, other barriers also exist to suppress the implementation of IBS in Malaysia. There are 5 major areas that contribute to this issue (Nawi et al, 2011). Below are the 5 reasons towards low implementation of IBS:

- i. Cost
- ii. Knowledge and skills
- iii. Project delivery and supply chain
- iv. Client and professional team's perception
- v. Government incentives and requirements.

These barriers can affect various stakeholders such as the client, manufacturers, designers, contractors and end users, if not tackled.

2.2.5 Critical Success Factors (CSF) of the Implementation of IBS in Malaysia

Critical Success Factors (CSF) is defined as the factors that, if achieved a satisfactory level, can help improve the performance and ensures the successfulness of an organization. It is the area that should be paid constant attention and be given careful measurements (MindTools.com). The CSF for IBS implementation in Malaysia are as follow (Kamar, 2009):

- ✓ Effective communication channel
 - The supply chain needs to be organized for coordination purpose and also needs to deal with scheduling process, therefore effective communication is essential (Blissmas, 2007).

- ✓ Competency of labour
 - Hoisting and erection of prefabricated materials need a solid education and training. This is to ensure quality off-site job to be accomplished (Thanoon, 2003).

- ✓ Continuous learning and improvement
 - Practice makes perfect, and successful implementation depends on the learning curve from past and present projects. Hence, continuous learning allows development of the methods of IBS and principal behind it (Treadway, 2006).

- ✓ Cost impact
 - The cost impact is another critical barrier towards the implementation of IBS (Pan et al, 2007). Many assumed that implementing IBS would save more cost, however, the outcome is different (Haron et al, 2005). Fierce competition drive many of the construction companies to continue using traditional method of construction to avoid initial IBS cost. Usage of IBS requires cautious cost planning at all stages of construction process (Sanderson, 2003).A good comparison in cost analysis is needed for the selection of IBS over conventional construction method.

- ✓ Team collaboration
 - A good teamwork from all parties especially the client and the architect, can help decrease ambiguity in designs and thus reducing the time to reach construction stage.

- ✓ Site supervision and management
 - Although IBS is an attractive way to reduce construction time and save on material, it still requires a lot of supervision and directives from skilled site managers to minimize defects (Gibb, 2001). Apart from minimizing defects, site management also induces standardization. This leads to reduction in project cost due to simplification of process.

- ✓ Extensive planning and scheduling
 - Planning clarifies the direction of the project and nullifies the ambiguities set upon the project. This leads to a better project performance, coordination and control.

- ✓ Information and communication technology (ICT)
 - ICT helps to improve design rendering, build up work programme, monitoring job performance, tendering, in and out of stocks and also allows comparison of cost.

- ✓ Including team members in the design stage
 - Putting members in the design stage helps to give a better overview on the direction of the project, time limit and risk assessments. This can promote a safer working environment with machines and also let workers know the flow of their work.

- ✓ Pyramid motivation
 - The top-down motivation approach serves as a tool to ensure right commitment from the whole project team and labor force.

2.3 Value Management

Value is a term used to portray worth. Its term is often confused by people who misunderstand it as cost. Cost is how much exactly the price tag shows on an item, while value is the perceived benefit one can gain through a given price. The lower the price, the higher the value will be, given that the benefit maintains.

In construction wise, if we buy a wooden formwork for RM10, and its life cycle is only 10 days, then its cost of life cycle per day would be RM1. However, if we buy a steel formwork for RM50 but we could use it over and over again, and its life cycle is 90 days, then its cost of life cycle per day would be RM0.55. The benefit (form work usage) it gives is maintained while the price could be reduced from RM1 to RM0.55, hence, the value of using steel formwork is higher. This is value management, the act of figuring out alternatives to acquire a gain in value while maintaining the clients' needs. According to (SAVE, 2007), value is defined as the fair or better in profit for something that has been put to exchange. The formula representing value is as follows:

$$Value = \frac{Function}{Resources} = \frac{Benefits}{Cost} \quad (1)$$

Theoretically, there are four ways to increase the client's value system based on the value calculation equation and are given as follow:

- i. Increase the Function; maintain the Cost.
- ii. Reduce the Cost; maintain the Function.
- iii. Increase the Function; reduce the Cost.
- iv. Increase the Function more than the increment of Cost.

It is the most promising method in coordinating professionals from different disciplines, as well as a method to help clients better achieve their goals. It is a structured team approach to deal with problems and reduce costs that can be applied during the objective setting, concept, design and construction stages (SAVE, 2006). In short, VM is a goal-setting process that aims to satisfy the client's project

requirements as well as concentrating on improving the relationships between value and the client.

In the international stages, VM is a standard focusing on the value provided to the client and is widely accepted as a vital tool in recent management of construction projects (Ellis, Wood, & Keel, 2005). However, in Malaysia, its application is still in its infancy (Jaapar, 2000; Ong, 2004; Abdul Ghani, 2004). The very first established VM stronghold in Malaysia is the Institute of Value Management Malaysia (IVMM) on the 9th of October (The Star, 10 Oct 2001).

2.3.1 Background of Value Management

Value Management history can be traced back to as far as World War II, when there was a shortage in the materials. At that moment, Dr. Lawrence Miles pioneered an approach to look for alternatives to fulfill the demand of materials.

He soon discovered a method known to man that time as Value Analysis, which produces cheaper overall goods while maintaining the quality of the product. The technique was accepted and adopted widely, and this can be seen in many developed countries such as Japan, United Kingdom, Australia and etc. Value Management took a leap into Malaysia when Associate Professor Roy Barton started introducing VM in 1986 to the Quantity Surveying Department at Universiti Teknologi Malaysia (UTM), according to (Value Management Academy, 2013). In 1990, under the funding of Commonwealth Science Council, Dr. Mohd Mazlan visited Australia to get a more detailed look at Value Management. As VM was being pursued and agreed widely in Malaysia, in May 2000, the Institute of Value Management of Malaysia (IVMM) was formed (<http://ivmm.org.my/>).

Value Management subject was educated at some of Malaysia's major public universities namely Universiti Sains Malaysia (USM), Universiti Teknologi Malaysia (UTM), Universiti Malaysia (UM) and etc.

2.3.2 Characteristics of Value Management

The key characteristics of VM according to Department of Housing and Public Works are as follow:

- Focuses on what it must do, rather than what it is
- Focuses on acquiring value-added solutions
- Based on system and systematic approach, which looks at an organization as a whole
- It is a specific methodology that leaves no ambiguity

2.3.3 Value Management Team Structure

As we have discussed regarding the suitable placement of IBS contractors in the VM approach, we have yet to see the appropriateness of an IBS contractor in the VM team. Basically, a VM team will generally have a facilitator that is trained and experienced, and can be within or from outside of an organization. The facilitator will act as a leader of the flow for the VM workshops.

A VM team usually consists of six to eight construction professionals whom may be of different backgrounds (Kelly and Brown, 1990). This being said, the VM team members may have a wide range of expertise and experience. Individuals joining the VM team may be of a civil engineer, architect, quantity surveyor or even a contractor. Individuals of zero knowledge regarding construction are also welcomed nonetheless.

It does not really matter who the individuals are but they are ought to form a multidisciplinary team with wide range of expertise. Hence, *an IBS contractor is certainly most welcomed*, given the fact that his aims are in line with that of a Value Management approach.

The characteristics of a VM team should include:

- Have the passion to improve the project
- Capable of forming a relationship with people outside of comfort zone
- Effective communication skill to pinpoint desired alteration
- Creative in finding alternatives
- Have a great mastery on their field of studies

2.3.4 Methodologies in Value Management Approach

There are several ways in which a project can choose to achieve value for money in the construction industry. These methods include the popular 40-hour Job Plan methodology, the Value Management Audit methodology and finally the Contractor's Change Proposal methodology. All of these methods are to be given consideration regarding the appropriate time of application in the course of a construction project. Below shows how VM approaches can help IBS contractors to benefit from a project.

2.3.4.1 Contractor Change Proposal

Upon tender, a change is made by the contractor in this stage. The client may provide incentives to the contractor for the cost-saving the contractor could incur due to the change he has submitted. If the change is accepted by the design team, 55% of the resulted savings is shared for a fixed contract. For example, in a RM500,000 contract where the contractor estimates a saving of RM200,000 and submits a change proposal which is verified and accepted, the contractor will receive RM110,000.

In IBS system, most of the time, there is a need to redesign IBS components due to lack of cooperation among key players (Jabar I. I., Ismail F. & Mustafa A. A.,

2013). Contractor Change Proposal allows room for this kind of amendments to be made.

2.3.4.2 Value Engineering Audit

Value Management Audit is a service to review expenditure proposals offered to value managers by large corporations or government departments to review on expenditures.

In this particular approach, the value manager will commence a study of the proposal to provide basic functions to the company. The process will usually last about two days (makes it relatively inexpensive to be adopted) and then the procedure for a job plan shall take over. Finally, the value manager will compile and submit a well written report regarding the most cost-effective manner available for the basic functions.

In Malaysia, IBS contractors are still not competent enough. IBS contractors focus only on what they need to do, and not exactly how they need to do it. Hence, a well written report about the basic functions and how to achieve them is very important. The incompetent knowledge and exposure to IBS is one of the prominent factors that lead to improper setup. When difficulty arises during installation, IBS contractors do not know how to deal with it (Rahman & Omar, 2006). So, a concise work method and risks are to be identified by IBS contractors. VE Audit can help to achieve this.

2.3.4.3 Job Plan Methodology

Table 2.2: Value Management Job Plan (SAVE, 2015)

Phase	Activities	Results
Information	<ul style="list-style-type: none"> Define current condition of project Identify goals of the study Visiting the site 	<ul style="list-style-type: none"> Allow team to understand the project at fundamental level, including challenges and constraints
Functional Analysis	<ul style="list-style-type: none"> Categorize primary and secondary project functions FAST diagram modeling Determine functions' benefits per cost 	<ul style="list-style-type: none"> Allow understanding of how a project works and what it does, rather than just knowing what it is.
Creative	<ul style="list-style-type: none"> Generating alternatives 	<ul style="list-style-type: none"> Provides a wide range of ideas to improve project's value
Evaluation	<ul style="list-style-type: none"> Select alternatives that has potential for value improvement Weigh alternatives accordingly based on performance criteria and constraints 	<ul style="list-style-type: none"> Further insight on each alternatives and select which one to be focused most.
Development	<ul style="list-style-type: none"> Validate the alternatives and their authenticity 	<ul style="list-style-type: none"> Narrow down and further eliminate low potential alternatives
Presentation	<ul style="list-style-type: none"> Write a report 	<ul style="list-style-type: none"> Allows stakeholders to understand the rationale of the alternatives and their adequacy

Preparation and Information Stage

The Job Plan method, also known as the 40 hour workshop, is the most widely adopted approach in value management. In that particular workshop week, the sketch design of the project will be reviewed by a second design team. A workshop facilitator is essential to lead the workshop and will be chosen by the client. The fundamental procedure is as follows:

- i. Client informs commencement of workshop
- ii. Client appoints a facilitator.
- iii. The workshop will be held in office or a hotel.

The workshop will run according to the steps enlisted in the Job Plan and ask relevant questions for each respective stage.

Functional Analysis Stage

Functional Analysis is a disciplined approach to meet the needs and required functions of a project. Functional Analysis System Technique (FAST) diagram was first introduced by Mr. Charles W. Bytheway in 1964 at a SAVE conference. It aims to display functions of an item in a diagram to illustrate how each function is graphically arranged to allow for analytical elimination of unwanted process to be made. In this method, the interrelationship between the functions is analyzed as a holistic system to give a much better understanding of the interactions of function and cost. It is with prominent proof that FAST has helped researchers to focus the mind of the VM team to identify items of the project which requires higher cost but has low functionality. Figure 2.4 shows the basic example of a FAST diagram.

The main benefit of Job Plan is to create the most cost effective approach to achieve core requirements without jeopardizing performance. After a base function is identified, other characteristics can be evaluated to fulfill the “How.” How do we build this column? “Pour concrete” How to pour? “Erect formwork first” How to

erect? “Prepare the system formwork” How to prepare? “Get 4 workers” “Actually no, just 3 will do because the last time we used 4, one person had no work to do”

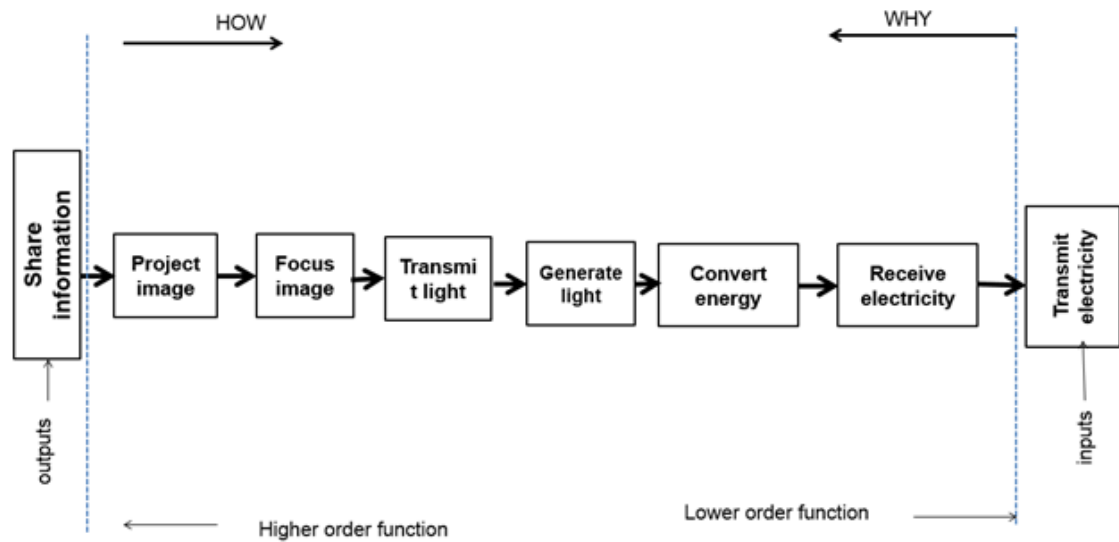


Figure 2.6: Basic Functional Analysis Model (source: UTAR lecture by Dr.Olanrewaju)

Steps to create a FAST diagram:

- i. Establish category
- ii. Break category into sub parts
- iii. Define function using a noun or verb
- iv. Place primary function on the left
- v. To the left, place the WHY question
- vi. Then, think in sequence and move to the right by asking “HOW” for each element
- vii. Test the flow by reading left to right “HOW” and right to left “WHY”

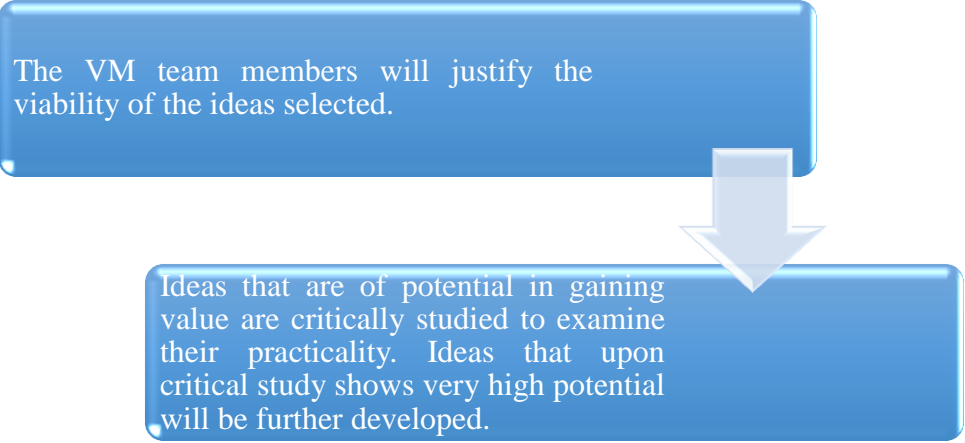
Analytical Stage

At this stage, it is essential to look for the alternatives that can perform the required function. As more alternatives are generated, chances for a unique solution may arise. This stage is also known as the Creativity Stage where the professionals will use past experiences to judge and form new ideas. The alternatives generated are focused mainly on the basic functions determined at the earlier stage.

In a construction project, IBS formworks are limited, and hoisting it up and down from 10 over floors is a waste of time. Hence, many alternatives can be generated through Analytical stage. The best time to hoist, the best method to hoist and best amount of people to hoist are all small parts of an equation that help to achieve a cost effective outcome.

Evaluation Stage

In this stage, firstly, the VM team members will look at the pros and cons of the ideas selected and after that they will shortlist the ideas out. The shortlisted ideas are given critical review in relation to the feasibility and practicality of the project. The final few ideas at the end is carried on into the development stage. Evaluation phase in VM can be carried out in a two-stage approach. The two stages are shown below:



The VM team members will justify the viability of the ideas selected.

Ideas that are of potential in gaining value are critically studied to examine their practicality. Ideas that upon critical study shows very high potential will be further developed.

Back to the topic of hoisting formwork, maybe the most distinctive alternative would be to hoist it during lunch hour, but all workers are eating for that one hour. So, contractors could plan to maybe let 5 workers go for early lunch, then make them hoist the formwork while others have their lunch. This idea of letting 5 workers off for early lunch may slow down the process of other works but increases the productivity overall.

Development Stage

In this stage, the main purpose is to select the alternative that serves the client value system best. The selected top alternatives are then analyzed for the final time before implementation and some analytical steps are as follow:

- i. Start with the best alternative; develop a benefit analysis and the required initial cost, life cycle cost and implementation cost.
- ii. Gather each alternative and show the cost differences and determine how much is gained from every alternative in relation to the original building.
- iii. Analyze final overall deviations and implement accordingly.

Presentation Stage

Visual presentation is used here together with a written report handed over to the client. The presentation will show the differences implemented by the selected alternatives and how it can help to achieve value for money as a result. The presentation will be made such that there will be minimum ambiguity as to what alternatives are going to be implemented and final agreement will be seek from all members.

Again, to the hoisting issue, video presentation allows for clearer view of how and when the hoisting is to be done. Ideas are brought closer to reality and IBS

contractors (higher competency) will be able to understand better on how to carry out his work. A short session of follow-up feedback will be carried out right after the presentation is done.

2.3.4.4 The Charette

The charette is a mixed study that takes place during the strategic, project and concept design briefing stages. It is basically an audit of the project brief and is implemented once the concept design is complete. The primary purpose of the Charette is to ensure the client value system criteria for judging the success of the project is overtly described, understood and accepted by all stakeholders and the design team.

Table 2.3: Advantages of the Charette

Advantages	Explanation
Inexpensive	Only two individuals' expenditure fee is needed; the value manager and cost consultant.
Best briefing way	Even without realizing any big goals, at least the need of client is understood by all stakeholders during this meeting.
Early occurrence	Early participation allows for greater cost saving, as supported by Figure 2.7 and 2.8.
Quick process	The most complex of projects require only two days of meeting.
No boundaries	The exercise cuts through all organization and political boundaries. Design team is not proactive, departmental heads would be reluctant to give up time and finally if it is held, it would be politically structured. Only with presence of a VM this meeting can be realized.

2.3.4.5 The Package Review

- The project team analysis work packages at various stage of the work.
- Suppliers, manufacturers and specialists are invited only when necessary.

2.3.4.6 One-Two Days Workshop

- Shortened version of 40-hour workshop.
- Typically held on Friday and Monday.
- The one-day version could be done on any day.
- Design team present needed information for approximately 20 minutes

2.3.4.7 Two-Three Days Workshop

- 1st day = generate ideas
- 2nd day = limit the number of ideas
- 3rd day = select and incorporate the chosen ideas

2.3.4.8 The Concurrent Study

- Design team is arranged to meet from time to time as design progresses.
- An independent facilitator is present to discuss feasibility of project.
- The number of time they meet depends on the project type and willingness of parties to participate.
- Design team tends to defend their design, and it will be difficult if no open mind is used.

2.4 Why IBS contractors are relevant in Value Management practice?

After out the key characteristics for both IBS and VM, it was discovered that they share a similar goal of acquiring better value for money. In the former, it was stated that minimizing cost through reduction of wastage was essential, while taking into account the quality of the said project. In the latter, it was stated, according to the formula, that value could be achieved through manipulation of functions and costs.

Both IBS and BM aims to achieve a better value for money, hence an IBS contractor is definitely suitable and more significant in the Value Management approach in a project, as compared to a normal contractor who practices conventional cost management approach.

2.5 How Integrating IBS into VM can increase implementation of IBS?

Value Management is defined as a multidisciplinary, team oriented, structural and analytical approach that seeks the best value through design and construction process to meet clients' needs (Jaapar and Torrance, 2007). Since it is a structured analytical and team approach, it can surely address the fundamental issue suppressing the implementation of IBS in Malaysia; the fragmentation issue. Other than that, it can also serve to solve the other barriers stated by Nawi (2011).

- i. Cost
 - o VM gathers many professionals to look interrogatively into the design and seek for opportunities to reuses materials and manage waste on site. VM brings all parties together, and IBS contractors are more able to be integrators and process coordinator in arranging the process from production phase to site installation.

- ii. Knowledge and skill
 - Professionals from various fields are brought together through VM methodologies. These professionals are able to come up with training ideas that work most cost efficiently to boost the skills of the labors in the ‘Creative’ phase of Job Plan.

- iii. Project delivery and supply chain
 - VM is a well-known structured team approach method that enhances the teamwork of individuals related to the construction. By coming together, Architects, Engineers and IBS contractors are able to agree on the standard components to be used. Low standardization increases initial cost because of design cost and inability of mould to be used for other part of the project (Hamid, 2008).

- iv. Client and professional team’s perception
 - The client and professionals usually are not able to see how IBS can help to reduce cost. The cost of IBS usage is assumed to be low; however, without proper implementation the cost may be higher than conventional construction method (Haron et al, 2005). Through VM’s analytical approach, stakeholders are able to use proper implementation which can help in the cost effectiveness of IBS.

- v. Government incentives and requirements
 - IBS has a very in depth knowledge on the types of equipment and materials to be used. Integrating IBS into VM will allow VM to be more effective because VM can advise on the redundancy of any IBS work method. Also, 10th Malaysian Plan call for higher implementation of IBS and also IBS to be used in projects that are RM50 million and above. Effectiveness of IBS can also be highlighted through these projects and government will be more willing to subsidize IBS.

On the other hand, according to 10th Malaysia Plan, projects undertaken that are priced RM 50 million or more will have to adopt Value Management process (MGCC, 2012). This said plan also stated that there are 52 high impact projects worth RM 63 billion under the hands of Public-Private Partnerships (PPP). Some of these projects include:

- Seven (7) Tolled Highways estimated at RM 19 billion
- Two (2) Coal Electricity Generation Plants at RM 7 billion
- Two (2) Aluminum Smelters in SCORE Sarawak at RM 18 billion
- Malaysian Rubber Board Land Development at RM 10 billion
- Petronas LNG Melaka Plant at RM 3 billion

Thirteen (13) of the above mega projects mentioned average out to exceed RM 50 million, hence they will all adopt VM process as a result of the government's policy. Including IBS contractors in VM process will then indirectly increase the much needed awareness through these mega projects.

Section 2.5 has successfully depicted how VM can help to solve the problems being faced in Section 2.2.4, namely the problems faced by IBS in Malaysian construction industry.

2.6 Can VM process be more helpful if it was applied earlier?

Value Management approach can take place at any time of a development of a project. However, many mega projects especially commercial projects such as high rise office buildings are often a one-time capital cost project and so VM must be implemented as early as possible for a greater return of investment.

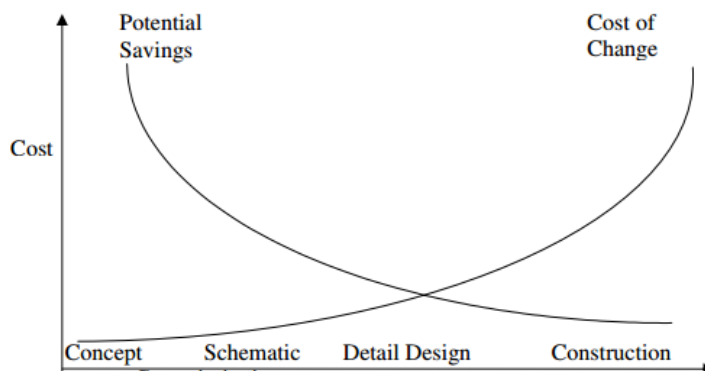


Figure 2.7: Potential Savings vs Cost of Change (John Manning, 2013)

According to Figure 2.2, it is believed that saving declines while cost increases as the project is reaching its end of construction. It is best believed that value management's impact is crucial right when the project starts and diminishes until an equal level with cost when the project reaches detail design stage.

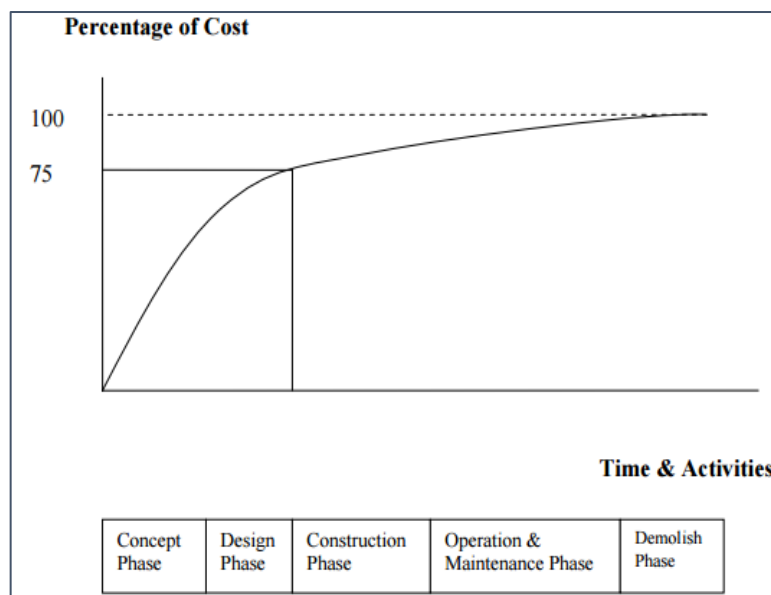


Figure 2.8: Life Cycle Cost in Construction (Rosnah, 2005)

According to Figure 2.3, it shows a similar condition whereby 75% of the total cost is developed before the design stage. The particular figure shows the life cycle cost of a construction project. A life cycle cost of an item includes preliminary

design costs, detailed design costs, operation and maintenance costs and also demolition costs.

Since 75% of costs originate from concept and design phase, fitting VM practice into these stages is significant to address the unnecessary costs to help client achieve value for money. It is important also to include IBS contractors in the VM approach at these stages to further increase the impact of VM, which enhances the value for money even further.

Table 2.4: Summary of VM methodologies

VM Approach	Duration	When to Implement?
Contractor Change Proposal	Any time	During site operation
Value Engineering Audit The Charette	1 – 2 days	During briefing stage
VM Job Plan (40 hour workshop)	40 hours or 5 days	After design
The Charrette	2 – 3 days	During design stage
The Package Review	Any time	During site operation
One – Two Days Workshop	20 minutes each day	After design
Two – Three Days Workshop	20 minutes each day	After design
The Concurrent Study	Any time	During design stage

The figure below shows the simplified timeline in a construction project, and when the VM methodologies are applied

Briefing	Sketching	Work drawing	Site operation
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Figure 2.9: Simplified Timeline of a Construction Project

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

Literature review in the previous chapter provides no more than theoretical ideas and values gathered from reliable first hand sources, and this eventually makes us a second hand receiver. Apart from that, data collected from Chapter 2 is also not up to date. Up-to-date data on implementation level is especially important when we are dealing with implementation of a system and even more important when we are considering a newly integrated idea of IBS contractors' participation in the VM process and this will be further elaborated at the questionnaire methodology section.

Firstly, this chapter will comprise of the way this research was conducted. The discussion on identification of problem to formulation of objectives, until towards overview of the completion literature review will be discussed. Secondly, details of how the questionnaire is formed will be analyzed. Thirdly, results gathered from the questionnaire will also be critically examined.

3.2 Methodology

This research was conducted fairly straightforward. It all started from the identification of a problem statement that then led to the aims and objectives to tackle said problem. This was then followed up by collection of secondary data

(literature review) and primary data (questionnaires), analysis of data, conclusion of research and finally to formulating relevant recommendations. The research ends with a formal presentation and feedback from supervisors and panel judges.

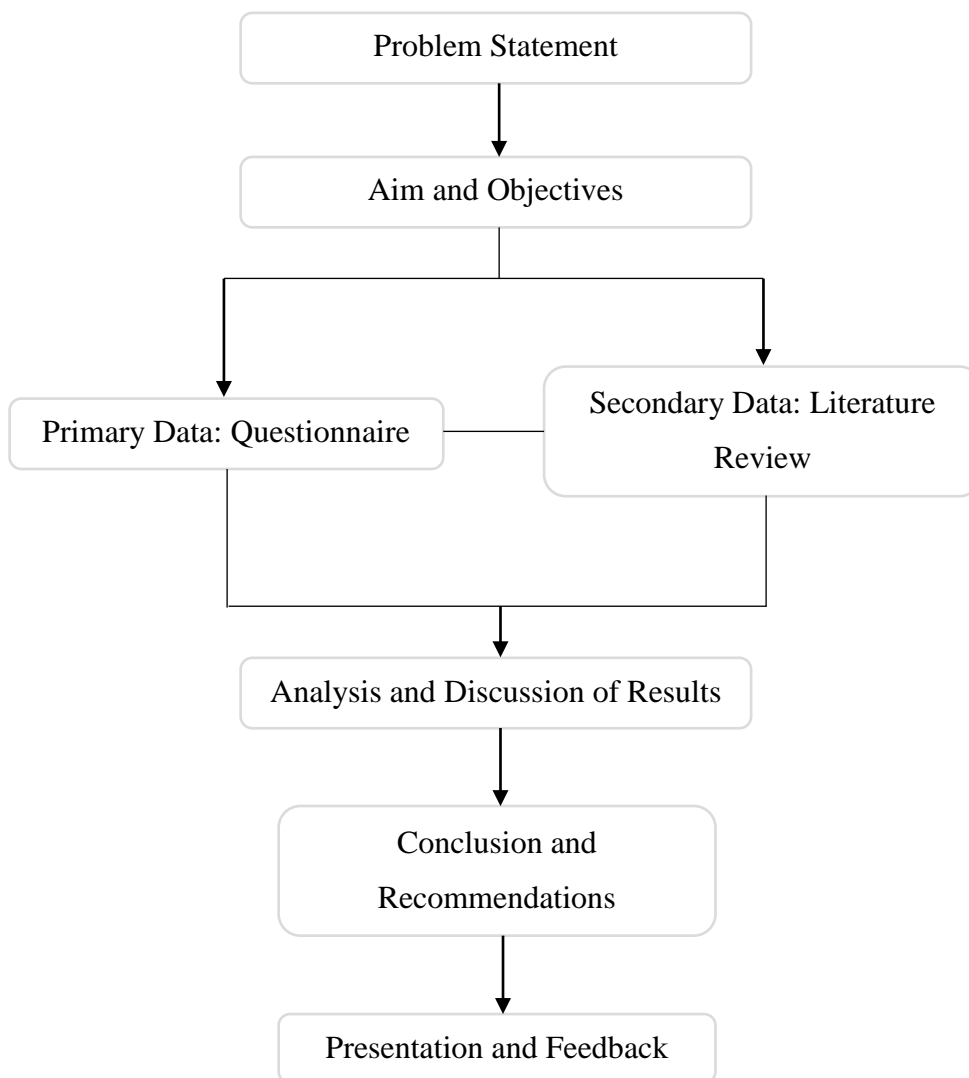


Figure 3.1: Research Flow Chart

3.2.1 Problem Statement

CIMP 2006 – 2015 expected IBS implementation to be 80% by 2015. However, according to the most recent news dated May 12, 2015 by TheStar, MIDA stated that the current adoption of IBS in Malaysian construction industry is still very low with only 15 – 20% IBS application in the overall projects in Malaysia due to fragmentation and disconnection in construction supply chains. According to IBS Survey (2003), the implementation of IBS was as low as 15% as well, but that was in 2003. This means that there has been little to no changes at all in the implementation after 12 years, despite the effort of conducting CIDB Roadmaps 2003-2010. Hence, it is necessary to address this issue. Since fragmentation is the main problem for IBS implementation, Value Management – a process that brings a team together for critical discussion – can help to address such issue. In addition, in the 10th Malaysia Plan the Malaysia government came up with necessities for Value Management to be implemented for all projects of RM 50 million or more. Apart from fragmentation issue, VM could also help to increase the awareness of IBS in the construction industry, and this would increase more in the application of IBS significantly.

3.2.2 Aim and Objectives

The aim is to solve the issues being faced in this research. In this research the problem is about low implementation of IBS in Malaysia. To address it, it is essential to know how low the implementation of IBS is. Then, it is important to know what is causing this low implementation. Seeing that the VM is a window of opportunity for IBS to partake and increase its implementation, we would want to know how VM can help IBS to achieve the aim and so we need to know the condition of VM in the construction? How the integration between them is useful?

3.2.3 Secondary Data

Problem statement was further elaborated here. All information regarding IBS and its low implementation were gathered through literature review. Several VM methodologies were studied to seek for the right time to implement IBS in VM. This step was carried out to justify how VM could help IBS to gain awareness in the construction industry. Then, all factors that encourage and hinder IBS and VM were identified for the purpose of providing suitable recommendations later on.

3.2.4 Primary Data

There are three (3) usual quantitative data collection methods, namely observation, survey and interview methods. Survey method is chosen for this research because the targeted population is of two different areas, Selangor and Kuala Lumpur. Survey questionnaire by hand/postage/online does not require the researcher to travel, which saves on cost, and also does not require the researcher to maneuver from place to place, and thus saves on time as well.

3.2.4.1 Targeted Respondents

G7 contractors from Selangor and Wilayah Persekutuan are selected as targeted respondents. This is because these contractors are working in the big cities and are definitely more exposed to higher level of construction related methods and are more competent overall.

The sample size calculation is given as follows:

n = sample size

N = number of population = Selangor + Wilayah Persekutuan = 347 + 343 = 690

e = margin of error (%) = 10% = 0.10

$$n = \frac{N}{[1 + (N \cdot e^2)]} = \frac{690}{[1 + (690 \cdot (0.10)^2)]} = 87$$

(Tejada & Punzalan, 2012)

3.2.4.2 Questionnaire

Online survey questionnaires will be sent out for the purpose of gathering first-hand data regarding the level of awareness of VM, level of application VM and barriers toward VM implementation in Malaysia's construction industry. These questionnaires will be sent to G7 IBS contractors. These contractors are to be searched from CIDB Malaysia's website. Firstly, respondents will be prompted for their details to avoid incomplete return of questionnaires. There will be two sessions in the questionnaire, namely Part I and Part II. Part I will require respondents to give information regarding their involvement in VM practices, while Part II will require respondents to answer on their perception of VM in construction industry.

In some of the questions, Likert Scale of 5-point is used to assess respondents' overview on a statement. The meaning of each rating is as follows:

1	-	Strongly disagree
2	-	Disagree
3	-	Somewhat agree
4	-	Agree
5	-	Strongly agree

The reason why (3) is not termed as Average like usual is to avoid ambiguity and opportunity to select lazy answers (Garland R., 1991).

There will also be some multiple choice question to know which is the dominant method adopted by IBS contractors to investigate how early these IBS contractors participate in VM process. Since it is evident that earlier participation gives more benefit in cost savings.

3.2.4.3 Validity and Reliability Tests

Factor Analysis and Cronbach Internal Consistency Test are used to access the validity and reliability of the results respectively.

Validity test is conducted to ensure there is a good covariance between each item. There are three (3) basic types of analysis for validity. Firstly is the Kaiser-Meyer-Olkin (KMO) test, Communalities and Principal Component Analysis, where KMO is the most dominantly looked at analysis. KMO must pass the value of 0.6 to be accepted.

In every survey, it is important to ensure that the answers given are reliable. Everyone has different perception towards a question which affects their answers. We want to ask “How sure are we to get the same result if we were to give out the same questionnaire again?” Hence, a reliability test needs to be adopted.

Reliability test is conducted for the purpose of measuring internal consistency between all items regardless of how big or small the sample size is. Cronbach’s Alpha is used here, and it must maintain a value of 0.6 and above to be accepted (MacCallumet. *al.*, 2001).

Cronbach’s Coefficient Alpha

$$CC\ Alpha = \left[1 - \frac{\sum(positive\%)_i(negative\%)_i}{Variance} \right] \left[\frac{k}{k-1} \right] \quad (2)$$

The measurement of the alpha value should be between 0.6 and 0.9 for a good reliability (Nunnally, 1978).

3.2.5 Analysis and Discussion of Results

The collected data will be stored and analyzed using Statistical Package for Social Science (SPSS) and also Weighted Average method. Then, discussions will be carried out to justify the data collected.

3.2.6 Conclusion and Recommendations

Upon finishing the analysis and discussion, a summary of the findings are made. List of recommendations to tackle the low implementation of VM in construction projects are also made here nonetheless.

3.2.7 Presentation and Feedback

Finally, a short presentation will be held where panel judges will give their critics to stimulate improvements on the current research.

CHAPTER 4

DATA ANALYSIS

4.1 Introduction

This chapter serves to present the results taken from the survey questionnaires and also to discuss the findings arising out of them. Scopes included in this section are the overview of the respondents, analysis of data and also relevant tests, such as reliability and validity tests, and also ranking of factors.

4.2 Overview of the Respondents

Targeted to only G7 IBS contractors, a total of 700 survey questionnaires were sent out, for the purpose of achieving a sample size of 87 respondents. The questionnaires were sent out online, or handed out and collected back on the spot. Data collection was conducted based on random sampling. At the end of this research, only 47 questionnaires were collected back, which gives approximately a 6% response rate. Four (4) questionnaires were incomplete, hence were omitted.

Table 4.1: Response Rate

Subject	Quantity	Percentage
Questionnaires given out	700	100.00%
Questionnaires collected	47	6.71%
Total questionnaires usable	43	6.14%

4.2.1 Qualification of Respondents

In order to get an accurate data on the survey questionnaire, the qualification of respondents must first be accessed. Different level of qualification imposes different mindset and what we want is to have respondents coming mostly from one particular level. This is to facilitate higher data accuracy.

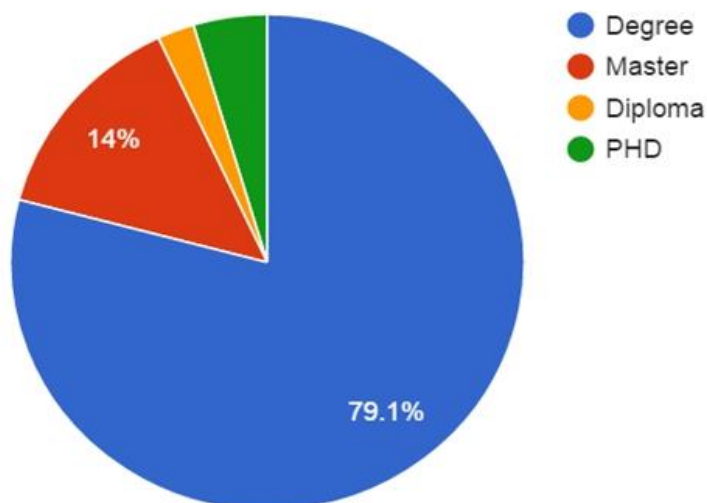


Figure 4.1: Academic Qualifications of Respondents

Figure 4.1 above shows that majority of respondents are Bachelor Degree holder, which accounts to 80% of total respondents. This is followed by Master Degree holder, accounting to 14% and the rest are PHD and Diploma holders, which account to just 6% of the total response.

4.2.2 Years of Working Experience

Out of all the respondents, 55.8% have 6 – 10 years of experience, followed by 25.6% that have 1 – 5 years of experience, then by 16.3% that holds 11 – 15 years of experience and finally by 2.3% from the category of 15 – 20 years of experience.

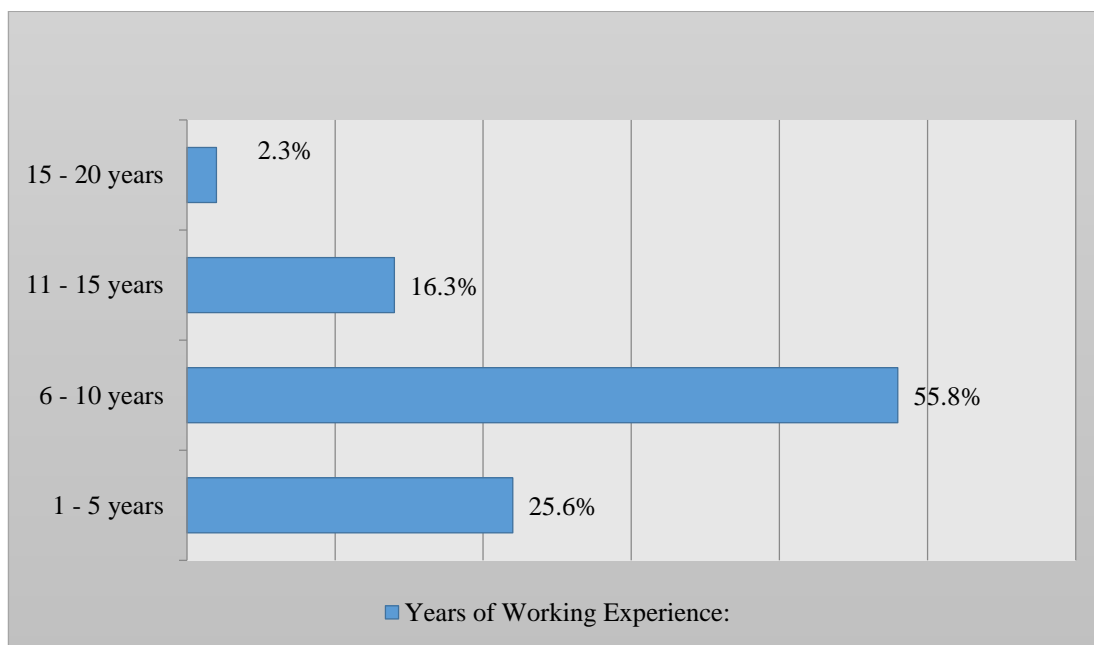


Figure 4.2: Years of Working Experience

Approximately 80% have less than 10 years of working experience. This suggests that the Industrialized Building System (IBS) industry is still very active with new comers coming in. It is no wonder that there is teamwork problem and fragmentation issue for IBS in Malaysia according to a report, as discussed in Chapter 2. When a contractor has been working for long, given the time and experience, he will definitely know how to address fragmentation issue. However, since Malaysia consists of mostly young generation workers, fragmentation issue will still prevail. Table 4.3 and 4.5 further supports this finding as the respondents think that communication channel is a major problem for IBS.

4.3 Factors Affecting the Adoption of IBS in Malaysia

There are total of *10 factors* as discussed in Chapter 2 that affects the adoption of IBS in Malaysia. These critical success factors (CSF) are asked to be given a scale from 1 to 10, where 1 is the most important factor while 10 is the least important factor.

Table 4.2: Validity for Factors Affecting Adoption of IBS in Malaysia

KMO and Bartlett's Test^a

Item		Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.623
Bartlett's Test of Sphericity	Approx. Chi-Square	271.530
	df	45
	Sig.	0.000

Table 4.3: Communalities for Factors Affecting Adoption of IBS in Malaysia

Elements	Mean	Std. Deviation	N	Extraction
Effective Communication Channel	2.1860	1.23935	43	0.766
Competency of Labor	5.3488	1.25136	43	0.505
Continuous Learning and Improvement	8.0465	1.29014	43	0.830
Cost Impact	1.4186	0.58686	43	0.500
Teamwork	6.0465	1.29014	43	0.799
Site Supervision and Management	4.0233	0.77116	43	0.558
Extensive Planning and Scheduling	3.2791	1.07627	43	0.750
Information and Communication Tech	6.5581	2.16358	43	0.977
Include Workers in Design Stage	9.2326	0.89542	43	0.366
Worker Motivation	8.8605	0.96563	43	0.578

Table 4.4: Reliability for Factors Affecting Adoption of IBS in Malaysia
Reliability Statistics

Cronbach's Alpha	N of Items
0.658	10

According to this research, cost impact is the culprit behind the low adoption of IBS in Malaysia, followed by effective communication channel, and finally by extensive planning and scheduling, as shown in Table 4.5.

4.3.1 Cost

In any construction, the client aims to minimize input while maximizing his output. Therefore, any unwanted costs should be avoided. This applies to the adoption of IBS as well. It is without doubt that IBS method initial cost is higher than the conventional building method and is preventing most clients from using it. These costs may include establishing a factory for the prefabricated materials, buying machineries or even hiring skilled factory workers (Olewi, 2015).

Table 4.5: Ranking of Critical Success Factors (CSF) by Respondents

Variables	Ranking
Cost impact	1
Effective communication channel	2
Extensive planning and scheduling	3
Site supervision and management	4
Competency of labor	5
Teamwork	6
Information and Communication Technology	7
Continuous learning and improvement	8
Workers' motivation	9
Including workers in the design stage	10

There is a need to look ahead of what we are spending now. A building is there for the purpose of accommodation and will be there for a very long time, so to access the cost factor, one must first access the life cycle cost to be accurate. Instead, contractors choose to overlook this, and often look at the initial cost of what IBS has on a project. Long term usage of IBS is beneficial socially and economically (Badaruzzaman, 2008).

4.3.2 Effective Communication Channel

Topping the reasons for barriers towards adoption of IBS in Malaysia, effective communication channel needs to be present to facilitate the process and to critically schedule work from the beginning of the project until the end. In 2015, Malaysian Investment Development Authority (MIDA) stated IBS implementation is still very low in Malaysia as of 2015 (only 15 to 20%), and one of the crucial reason is the fragmentation in the IBS process. As an extension towards section 4.1.2, it is also not surprising that fragmentation issue is still prevailing because of the new generation coming into this industry. About 80% of respondents are of 6 – 10 years of working experience, and this come to show that mostly are not too experienced yet in managing teamwork. Also, this is where the thought of integrating IBS with Value Management arose. To investigate further on this integration, in this research, it was asked if the respondents know about Value Management.

OBJECTIVE NO.1:

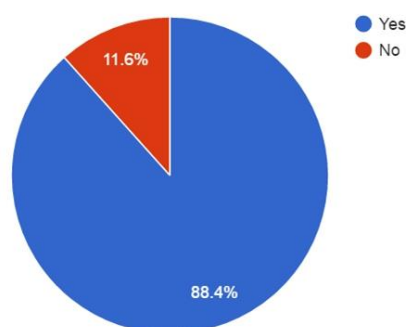


Figure 4.3: Awareness of VM by IBS Contractors

It was not surprising that 88.4% of respondents knew about Value Management as they are from younger generations, while the remaining 11.6% may not know because they are from the older generation. The number of awareness of people who know about VM has risen from 78% in 2009, to 88.4% in 2016. These 88.4% also understood well on what VM is as compared to only 16% who understood well in 2009 (Jaapar A., 2009). However, the adoption of Value Management is still very low in Malaysia, according to this research as well.

OBJECTIVE NO.2:

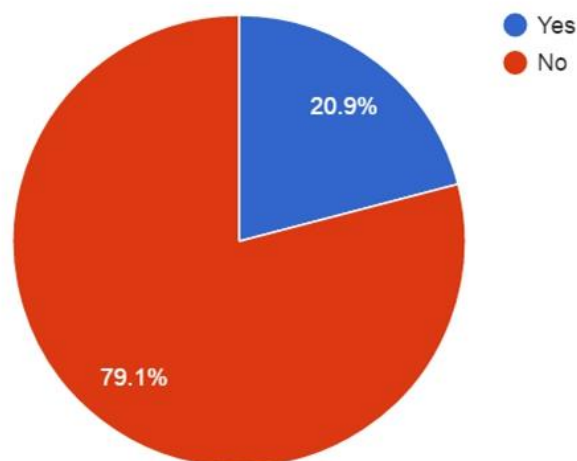


Figure 4.4: Adoption of Value Management in Malaysia

From the figure above, only a low 20.9% of respondents are adopting VM in their current project, as compared to 49% who did adopt it in 2009. This is mainly due to the fact that the coverage of participants is not enough, at least not as high as what Jaapar did in 2009, where he got 1,582 respondents. The adoption of VM in Malaysia may not be as low as it seemed in this case.

Accordingly, despite the low adoption of VM, 90.5% respondents agreed that VM is applicable to Malaysian construction industry, but respondents who knew about VM all agreed that VM is helpful towards improving a project and helping client to achieve value. It was found that on average VM is 7.5/10 in facilitating a project's effectiveness. Adopting VM is not solely up to the decision of the

contractor however, the adoption of VM by IBS projects needs to be decided by the client. In 10th Malaysia Plan where it is deemed necessary to apply VM into the project if the project surpasses RM50 million, the integration of IBS into VM process may work out.

OBJECTIVE NO.3:

4.3.2.1 How VM is helpful towards IBS adoption in Malaysia?

In deciding this matter, five (5) factors were put into the survey questionnaire in Likert scale format and required respondents to answer accordingly.

**Table 4.6: Validity for VM Helpfulness towards IBS Adoption in Malaysia
KMO and Bartlett's Test^a**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.614
Bartlett's Test of Sphericity	Approx. Chi-Square	44.521
	df	10
	Sig.	0.000

**Table 4.7: Communalities & Ranking for VM Helpfulness towards IBS
Adoption in Malaysia**

	Rescaled		Mean	Ranking
	Initial	Extraction		
Cost	1.000	0.817	4.0000	5
Knowledge_and_Skill	1.000	0.519	4.1316	4
Project_Supply_Chain	1.000	0.792	4.4737	1
Client_and_Consultant_Perception	1.000	0.720	4.3158	2
Government_Incentives	1.000	0.748	4.2632	3

Table 4.8: Reliability for VM Helpfulness towards IBS Adoption in Malaysia**Reliability Statistics**

Cronbach's Alpha	N of Items
0.611	5

Table 4.9: Mean of VM Helpfulness Towards IBS

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Cost	17.1842	5.073	.265	.670
Knowledge and Skill	17.0526	5.294	.278	.659
Project Supply Chain	16.7105	4.427	.455	.585
Client and Consultant Perception	16.8684	4.334	.475	.575
Government_Incentives	16.9211	3.750	.592	.507

The KMO and also Cronbach Alpha both passed the values intended, although knowledge and skill barely passed the 0.5 requirement. Hence the five factors are readily acceptable to be discussed.

In accessing the helpfulness of VM for IBS projects, the five factors were ranked accordingly in Table 4.7. The result suggests that VM can help IBS projects in terms of communication skills. Indeed, this supports the initial intention of this research; that is, to integrate IBS into VM so that VM can help address the fragmentation problem in IBS projects.

Respondents do however, view cost as the most significant barrier for Malaysia to adopt IBS. However, this issue cannot be addressed by VM

methodologies, according to this research. VM's helpfulness in tackling cost issue is ranked the last. Implementing IBS means there is a need to have a continual budget, allocate time for special training and specialized equipment and machineries. Lack of these advanced equipment and machineries can lead to major problem that hinders work in IBS-based projects (Kamar et al., 2009; Nawi et al., 2005). With VM being an additional cost in a construction project combined with the additional cost of what IBS has to offer, there will be two additional initial costs that, although will be beneficial in the long run, cannot be accepted mostly by any client. This is why it is ranked number five (5) in this research.

Above it is knowledge and skill being number 4, which is also not quite a favorable item in helping IBS adoption in Malaysia. Moving up to number 3 would be government incentives. In the recent years, as 10th Malaysia Plan is being implemented, these IBS contractors know that for every RM50 million projects and over, VM is compulsory. With this in mind, respondents think that including IBS in these VM process in a project can help IBS to be more recognized in the industry and with the incentives given to VM, IBS contractors can gain a free training through VM that eventually adds to more skilled IBS contractors in the future, and this will lead to higher clients and consultants satisfactory level. 35 out of 43 respondents think that VM is a systematic and team oriented approach to achieve value for the client, and will help bring IBS together with clients to achieve value for money. This in turn will increase client and consultant's positive view towards IBS.

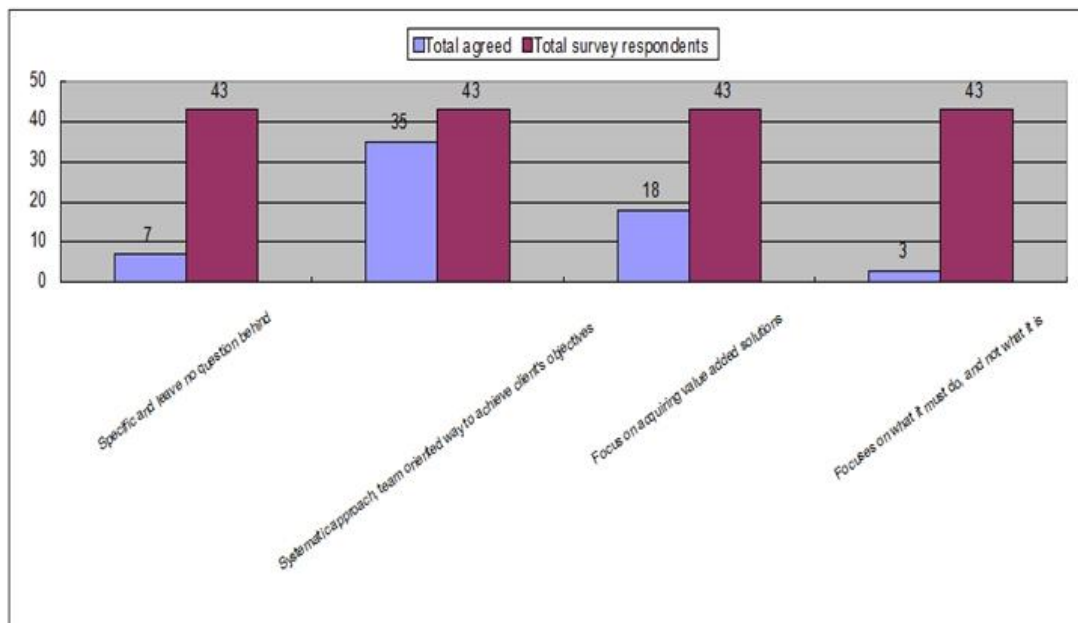


Figure 4.5: Characteristic of Value Management

4.3.3 Extensive Planning and Scheduling

Extensive planning and scheduling is the third important critical success factor (CSF) according to this research. This requires the skill and knowledge of IBS contractors. Through this research, it is observed that there are respondents who think that VM is helpful in enhancing the skill and knowledge of IBS contractors. Although skill and knowledge is ranked the 4th in what VM can help, it should be reminded that this is ordinal data and the gap between each rank is not definite. Difference between 4th (knowledge and skill) and 1st (cost) place is very ambiguous and one should not assume that VM cannot be helpful towards knowledge and skill just because it is at the 4th place.

OBJECTIVE NO.4:

4.4 At Which VM Stage These IBS Contractors are in?

There are two stages during which IBS contractors can be included in the VM process – before construction and during construction. With reference to Figure 2.9

and Figure 2.10, 75% of cost lies within before construction phase. If IBS contractors are included during this stage, then good. But according to this research, **70% IBS contractors from projects that applied VM said that they are included during the construction phase (Contractor's Change Proposal)**. As a result, it is no wonder most respondents in this research viewed that VM is not a helpful tool in optimizing cost factor in IBS. According to Table 4.7, VM is the least helpful in helping IBS adoption in terms of costs.

Most contractors are implementing Contractor's Change Proposal, and also Kaizen. Both are similar, except Kaizen is a Japanese value management tool. It is a continuous improvement tool that is new in construction industry. Only 1/9 respondent uses Kaizen in this research.

4.5 Facilitator's Presence in VM Process

VM facilitator plays a significant role in stimulating the team to participate and positively contribute in VM phases, for example in the creative phase where VM members are to brainstorm for alternatives without the fear of criticism (Thomas, 2005). Out of 9 respondents whose project is practicing VM, 8 have facilitator while the remaining 1 does not. Out of the 8 projects with facilitators, 6 VM projects prefer to go with in-house facilitators, while the remaining 2 VM projects prefer external facilitators. Refer to figures 4.6 and 4.7.

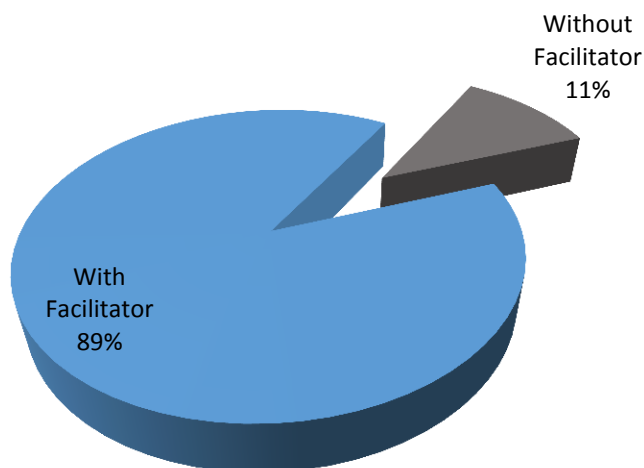


Figure 4.6: Presence of Facilitator in VM Process

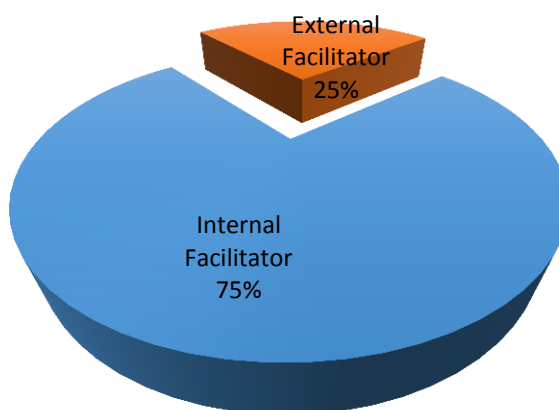


Figure 4.7: Internal vs. External Facilitators

4.6 Sources of VM

It was discovered after these research that majority of the respondents who knew about VM, got to know it from mostly workplace and during their university times. Workplace took 36.8%, while workplace and university overlap took 34.2%. This is followed by university or college that took 26.3%, and the remaining are from friends.

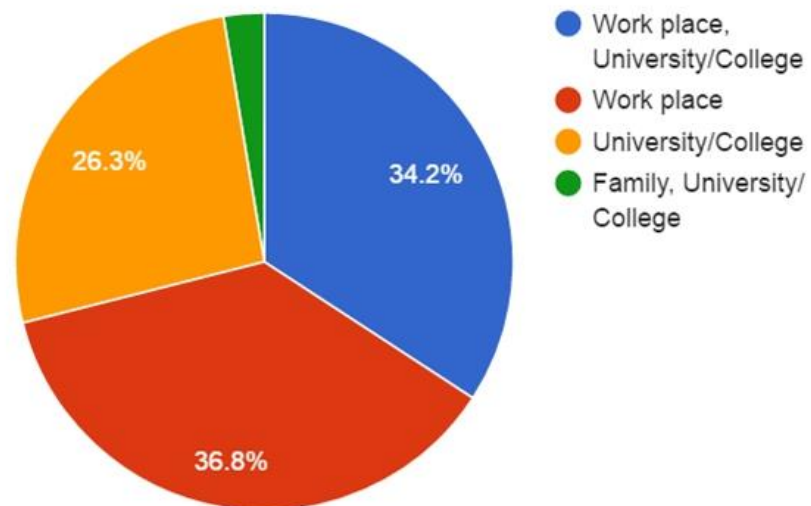


Figure 4.8: Sources of Value Management

4.7 Types of IBS used mostly

In this research, it is suggested that most IBS projects are using steel formwork system, followed by steel framing system. Precast concrete framing and prefabricated block system are almost leveled while prefabricated timber frame is the lowest in usage.

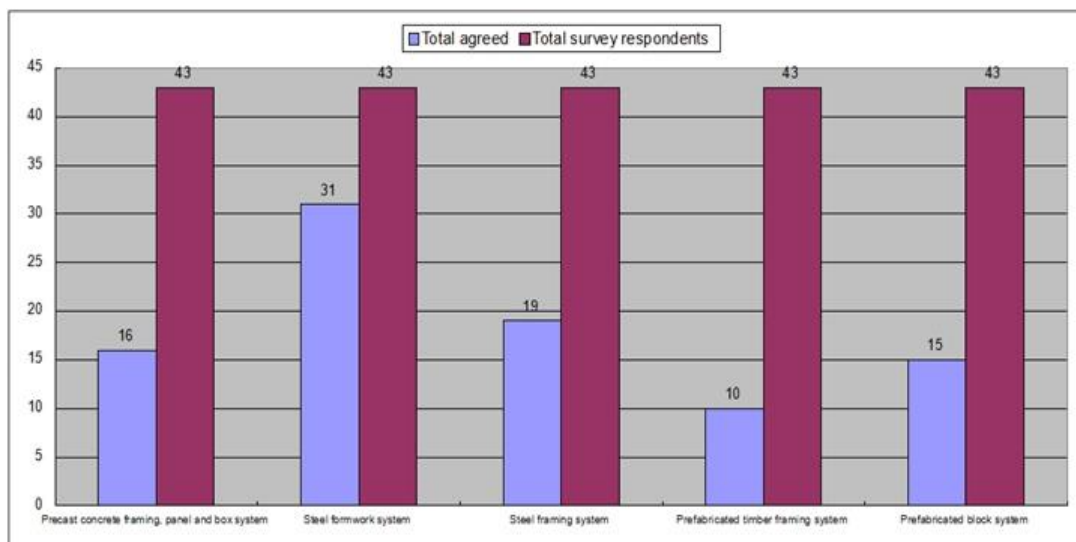


Figure 4.9: Types of IBS used in Malaysia Construction Industry

The reason behind steel formwork being the highest usage is because clients are mostly not ready for prefabrication yet. Clients lean more towards the idea of casting in-situ. Also, prefabrication is usually for low cost housing, and is often not properly maintained, and this gives bad impression towards many clients (Nawi et al, 2011). Partly conventional and partly modern method is what most clients seek after as of now.

4.8 Conclusion

Value Management in Malaysia is improving in terms of awareness, where 78% knew about it in 2009, and 88.4% knew about it in 2016. *This answers objective number one of this research.* However, the adoption of VM has declined dramatically, from 49% in 2009 to 20.9% in 2016. This may be due to insufficient sample size of only 43, as compared to 1,582 sample size for the research done in 2009. *This answers objective number three in this research.* Despite the low adoption, all 43 respondents agreed that VM should be put to practice more in the future. It is believed by these respondents that VM and IBS are interrelated in the sense that VM is a multidisciplinary team oriented approach that can help address the communication problem in IBS work. And they believe that through VM, clients and

consultants would view more favorably towards IBS. Finally, the respondents do believe that government's implementation for 10th Malaysia Plan would benefit further in the adoption of IBS. Mega projects with RM50 million and over are mandatory to apply VM, hence including IBS in VM will help promote its state. *This answers for objective number two.* Finally, it was discovered that 70% of the IBS projects that apply VM practices Contractor's Change Proposal. These 70% IBS contractors are included during the construction phase, which is not too helpful in saving cost with reference to Figure 2.9 and Figure 2.10. How is it not too helpful? In Table 4.7, the respondents come to think that VM is helpful towards IBS to address the communication problem, clients and consultants perspective, but IBS cannot address the issue of cost mainly because these IBS projects are being included during construction phase in VM process, rather than being included earlier. *This answers for objective number four.* Needless to say, there are numerous improvements that can be made for VM to facilitate for higher adoption of IBS in the construction industry in Malaysia, and this will be further discussed in Chapter 5.

CHAPTER 5

RECOMMENDATIONS & CONCLUSION

5.1 Introduction

In Chapter 4, data gathered were analyzed, and to finalize this research, suitable recommendations are put forward in this chapter. This is followed by a final summary of this research as a whole.

5.2 Problems and Recommendations

Previously, in Chapter 4, it is believed that new comers into the construction industry are one of the reasons fragmentation issue is still prevailing. The best explanation behind this is the poor command of English of fresh graduates. English is the most looked after language in every sector of job in Malaysia, but many job seekers in Malaysia often only possess English to the very basic level (TheStar, 2013). Hence, focusing on improving the English language in construction can work wonder in minimizing the communication problem that give rise to fragmentation issue in Malaysia's construction industry. More often than not, English proficiency starts at the primary school level. The foundation of any language is built mostly before entering university. So, the government should focus on recruiting only skilled teachers in carrying out this duty. More than 15,000 teachers in Malaysia are found to be ill-equipped with English proficiency and are sent for training (TheStar, 2016). More of such action should be implemented to get the country's English running

better, so that those who are managing construction industry development can tackle said communication problem, and lessen the fragmentation.

Next, cost impact is ranked as the most significant issue as to why IBS is still not being implemented much in Malaysia's construction industry. It is believed that through VM, IBS cost can be reduced, if and only if the IBS contractors are involved early in the VM process. Figure 2.9 and 2.10 suggests that the cost reduction falls as the construction phase continues. Most IBS contractors in this research are included during the erection phase. The project manager should request for earlier IBS contractors participation to facilitate higher cost reduction in a project.

Finally, for the third factor namely extensive planning and scheduling, the usage of IBS would call for further planning as to what and how part of a building is to be erected. If we include them into the VM process, there will be a stage in 40-hour Job Plan that is called Creative Stage. Here, VM members are gathered to brainstorm for alternatives on how to achieve the goal for IBS contractors. In addition, VM members can also further think of any repeatable ways to carry out a work. This allows planning to be less intense.

5.2 Future Researches

This research mainly focuses on two major places, namely Selangor and Wilayah Persekutuan. So, the result on adoption of IBS is observed to have fluctuated from 49% in 2009 to 20.9% in 2016. It is with hopes that future researches on IBS adoption will have a wider coverage on all states in Malaysia. Also, it is ambiguous as to whether cost is actually a problem or not, because in previous studies the cost is said to have decreased while this research suggests that cost is still a problem. A thorough interview can be adopted to research further on this. Finally, one can investigate further on the cost saving VM can implement on IBS process in a project. Maybe the future research can include actual costs before and after including IBS in VM processes, how IBS and VM are interrelated in cost saving and how also VM can help IBS to raise its adoption.

5.3 Conclusion

The condition of IBS in Malaysia is still experiencing a rather low adoption, and VM can step in to address this issue. The problem regarding IBS low adoption lies within the fragmentation issue. VM can facilitate better communication and teamwork as per finding in this research. Also, it is believed that VM can also help in terms of clients and consultants perspective if IBS is included in the VM stages. If this is done early, Figure 2.9 and 2.10 also further suggests that VM can help in terms of cost. It is because IBS is not included enough in the early VM stages, which is why respondents find that VM is not helpful in terms of cost saving, even though it is. The government plays an important role in addressing such issue of IBS as well. Providing incentives and also setting a penalty for not using IBS can help significantly, but the government is not doing so. In all IBS Roadmaps or what not, it is said that the Government “wants” to achieve 80% IBS usage in CIMP 2006 – 2015, however, “want” and “must” are two different things. So, the government should take initiative to make changes in the construction industry to lean against IBS, for IBS can provide not only swift and timely, but also more cost-efficient and effective way to construct a building.

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APPENDICES

Appendix: Questionnaire

Value Management by IBS Contractors in Malaysia (G7 IBS Contractors)

1. Academic qualification:

- Diploma
- Degree
- Master
- PHD
- Others (please state): _____

2. Years of Experience:

- 1 to 5
- 6 to 10
- 11 to 15
- 16 to 20
- More than 20

3. Characteristics of Industrialized Building System (IBS):

~More than one (1) answer is allowed~

- Better quality
- More cost efficient
- Reduce wastage
- Minimize dependency on foreign workers
- Increases productivity of constructions

4. Types of IBS used in current construction project?

~More than one (1) answer is allowed~

- Precast concrete framing, panel and box system
- Steel formwork system
- Steel framing system
- Prefabricated timber framing system
- Prefabricated block system

5. Advantages & disadvantages of using IBS:

~More than one (1) answer is allowed~

Advantages:

- High quality end product
- High cost saving
- Safer construction
- Shorter construction time
- Cleaner construction

Disadvantages:

- High initial investment
- Lack of information on IBS
- Requires skilled workers
- Not competitive enough
- Prefabrication lacks creativity

6. Below are the factors that affect the adoption of IBS in construction projects. *Kindly give score to them from the most important (1) to least important (10) factor.*

- Effective communication channel
- Competency of labor
- Continuous learning and improvement
- Cost impact
- Teamwork
- Site supervision & management
- Extensive planning & scheduling
- Information & Communication Technology (IC
- Including workers in the design stage (head of each division)
- Workers' motivation

7. Are you aware of Value Management (VM) technique in construction projects?

- Yes
- No

13. At which stage are you included in the VM methodology?

- Briefing
- Sketching
- Work drawing
- Site operation

14. What type of VM methodology are you adopting?

- Value Engineering Audit
- 40 Hour Workshop
- Contractor's Change Proposal
- Others (please state): _____

15. Does your Value Management methodology have a facilitator?

- Yes
- No

16. If yes, is the facilitator within the organization or invited from outside the organization?

- In-house
- Outsider

17. Characteristics of Value Management team:

~More than one (1) answer is allowed~

- Have passion to improve project
- Capable of forming relationship with everyone
- Effective communication skill to propose any changes
- Creative in finding alternatives
- Have a great mastery on their field of studies

18. In your opinion, is your facilitator doing good in achieving the above characteristics?

- Yes
 No

19. In your opinion, which area can VM most likely help to improve the implementation of IBS in Malaysia? Kindly rearrange them from the *most significant (1)* to the *least significant (5)* factors.

Cost: Can including IBS in VM help reduce cost?

1 Strongly Disagree	2 Disagree	3 Slightly Agree	4 Agree	5 Strongly Agree
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Knowledge and skill: Can putting IBS contractors into VM help enhance knowledge?

1 Strongly Disagree	2 Disagree	3 Slightly Agree	4 Agree	5 Strongly Agree
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Project delivery & supply chain: Can VM help bring supplier and contractors together?

1 Strongly Disagree	2 Disagree	3 Slightly Agree	4 Agree	5 Strongly Agree
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Client and consultant team perception: If we include IBS into VM processes more, can it change client and consultant perception and make IBS more favorable?

1 Strongly Disagree	2 Disagree	3 Slightly Agree	4 Agree	5 Strongly Agree
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Government incentives and requirements: Government wants projects above RM50 million to apply VM, can including IBS in VM help to increase IBS usage in Malaysia?

1 Strongly Disagree	2 Disagree	3 Slightly Agree	4 Agree	5 Strongly Agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. In your opinion, do you think that VM should be applied and practiced more in the future?

- Yes
- No