APPLICATION O[illegible] SYSTEM IN SCHOOL PROJECT IN MALAYSIA: THE CHALLENGE

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ABSTRACT

Industrialised Building System (IBS) is a system that used prefabricated components manufactured in the factory using highly skilled workers and heavy machinery. This method is effective to reduce the number of unskilled workers at construction sites as well as to solve some of the problems associated with construction projects such as lowering the cost of construction projects, shorten the construction time, creating a construction site clean and safe. There are five types of IBS used in this country which is pre-cast concrete framing, panel and box systems, steel formwork, steel framing, prefabricated timber framing and block work systems. Undoubtedly, IBS will provide many advantages compared to conventional method which is still widely used at present time, the IBS can drive construction industry towards global competitiveness of the country in line with productivity, quality and safety. This study focus to review the usage of IBS in the construction industry among the practitioners and its implementation in school construction projects in this country. Research is carried out by performing surveys using questionnaire and interview methods to obtain all the information. The study involved 10 construction companies in the area of Kuala Lumpur and Kuantan. In addition, information is also available from Journals, reading books and pamphlets. The findings indicate majority of professionals involved in the industry recognize that IBS is able to provide many advantages compared to conventional methods but they do not apply in their work. However, the level of acceptance of this product is very good in IBS.

ABSTRAK

Sistem pembinaan bahan berindustri (IBS) merupakan suatu sistem yang menggunakan komponen pasang siap yang dihasilkan di kilang menggunakan para pekerja yang mahir dan penggunaan jentera – jentera berat. Kaedah ini ternyata berkesan untuk mengurangkan jumlah pekerja tidak mahir di tapak pembinaan di samping dapat menyelesaikan beberapa masalah berkaitan dengan projek pembinaan seperti pengurangan kos projek pembinaan, menyingkatkan masa pembinaan, mewujudkan tapak pembinaan yang bersih dan selamat. Terdapat lima jenis IBS yang digunapakai di negara ini iaitu kaedah pasang siap, kaedah acuan keluli, kaedah kerangka keluli, kaedah kerangka kayu dan kaedah kerja blok. Tidak dinafikan, IBS akan memberikan banyak kelebihan berbanding kaedah konvensional yang masih digunakan secara meluas ketika ini untuk memacu industri pembinaan negara seiring kearah persaingan globalisasi dengan produktiviti, kualiti dan keselamatan yang terbaik. Projek sarjana muda ini di lakukan untuk menkaji penggunaan kaedah IBS di kalangan pengamal industri pembinaan dalam perlaksaannya di dalam projek pembinaan sekolah di dalam negara. Penyelidikan ini dijalankan dengan melakukan kajian soal selidik menggunakan kaedah bancian dan kaedah temuduga untuk mendapatkan semua maklumat. Kajian ini melibatkan 10 buah syarikat pembinaan di kawasan Kuala Lumpur dan kuantan. Di samping itu, maklumat juga diperolehi daripada pembacaan jornal, buku – buku rujukan dan risalah. Hasil kajian menunjukkan majoriti golongan profesional yang terlibat dalam industri ini mengiktiraf bahawa kaedah IBS mampu memberikan banyak kelebihan berbanding dengan kaedah konvensional tetapi mereka tidak mengaplikasikan di dalam kerja mereka. Walaubagaimanapun, tahap penerimaan mereka terhadap produk IBS ini adalah sangat baik.

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A.I.	Average Index
CIDB	Construction Development Board Malaysia
IBS	Industrialised Building System
PKK	Pusat Khidmat Kontraktor
PKNS	Perbadanan Khidmat Kontraktor
R.I.	Relative Index

CHAPTER 1

INTRODUCTION

1.1 Background Study

Industrialised building system (IBS) is not new method to the construction industry. In Malaysia, IBS has been introduced by the government since early 1960 when Ministry of Housing and Local Government of Malaysia visited several European countries and evaluate their housing development program (Thanoo et al, 2003). For a long period, the use of IBS has grown in tandem with the modernity of the country when this method have been applied to build national landmarks such as Bukit Jalil Sports Complex, Kuala Lumpur Sentral, Kuala Lumpur International Airport and Petronas Twin Tower. Malaysia government has committed to expand the use of IBS by stating that by year 2020 approximately seventy (70%) percent of the government projects need to adopt this method.

Industrialised building system (IBS) can be defined as a construction process that utilises techniques, products, components, or building systems which involve prefabricated components and on-site installation (CIDB, 2003). Generally there are five (5) types of IBS used in Malaysia which are (i) Pre-cast Concrete Framing Panel and Box Systems, (ii) Steel Formwork Systems, (iii) Frame system, (iv) Prefabricated Timber Framing Systems and (v) Block Work System. Some benefits of using the IBS method is reduction of building time, labour reduction, solving the skilled labour shortage, improvement in construction quality, clean site conditions, increasing the construction building rate, waste reduction and potential cost financial advantages.

An abandoned project is a huge problem for the construction industry, regardless whether private or government projects. One of the government projects that faced this problem is the school project. The implementation of IBS method can serve potential to solve this problem and can reduce loss to the government. Nowadays a construction project which requires a long period of time and high cost expenditure is considered not comply with professional standards for a well-established organisation. The conventional method is one of the options in the construction industry other than the IBS however this method has several disadvantages. The major problems in adopting the conventional method are the overwhelming inclusion of the unskilled workers and the long period of construction is causing the method a major setback adapting in the modern world of the construction industry. Construction projects using IBS have been shown to have many advantages as mentioned before. If seen in the positive impact, IBS promises many advantages compared to the conventional methods.

1.2 Problem Statement

The Malaysia construction industries have faced the unstable economic factors these days. The construction output is estimated to be approximately fifty (50) billion this represented three (3) to five (5) percent of Gross Domestic Product per annum (CIDB, 2007). Simultaneously, the industry also provides job opportunities for 800,000 people that represent eight percent (8%) of total workforce (CIDB, 2007). The report stated that the demand on the construction industry is more than other sectors. For these factors, it shows the important of the efficient solution to overcome the problems related to the construction industry losses in form of cost and manpower in order to ensure the maximise the benefits gain from this sectors.

The construction industry has long been suffering from the influx of foreign workers, construction delays, construction waste unregulated, poor quality building and construction sites that are not safe (Nawi, 2011). These factors can affect the developments of the Malaysia Economic since its target to achieve the developed nation by year 2020. IBS can provide the solutions to overcome these problems, in which it can save the cost by using the repetitive use of system formwork which can provides

considerable cost savings (Bing, 2001) and also can reduced the numbers of workers when the structural components are prefabricated at factory (Warszawski, 1999).

The problems in adopting IBS is that not all of the parties involved in construction industry apply this method. Based on IBS Roadmap 2003-2010 (2003) and IBS Survey (2003) indicate that only fifteen percent (15%) of overall construction projects in Malaysia used IBS. The problems related are not all practitioners would accept it implementation especially company and personnel with less experiences in handling IBS project (Rahman & Omar, 2006). Furthermore the construction industry had poor investment in providing training and education programme for IBS (Ball, 1996) which leads to the shortage of the expert workers in the IBS method. These factors will affect the acceptance and the knowledge of the IBS in the future and will become a barrier to development of the domestic construction technology.

With the less implementation on IBS methods, the government has suffered huge losses on the money when a lot of abandoned projects scattered around the country. One of these projects is school projects, based on the article on Utusan Malaysia dated 29 December 2009 written by (Ardyhansah Amat, 2009) the article narrate about the abandoned school project in Jalan Bellamy. This also shows that this problem also affects the community as this project is one of the obligations of the government to the people. School construction project costing millions of ringgit in Malaysia is one of the crucial projects that have to be executed very smoothly because it has a social responsibility to the community.

Although there are some obstacles in the implementations, government have conducted several efforts to promote IBS method widely over the past years to overcome these problems. Introduction of the Industrialised Building System (IBS) Roadmap 2003 – 2010 published by the Construction Development Board (CIDB, 2003) outlines several well-thought strategies in order to promote the use of IBS in Malaysia. Furthermore, in order to implement the method of IBS broadly, government has use set a total of seventy percent (70%) of government project that will apply IBS.

With the government initiative to use this method widely, the implementation of 138 school building projects using the IBS is being conducted throughout the country at a cost of 1.4 billion ringgit Malaysia. IBS method is the preferred method because it is one of the best method to solve the problem involve in abandoned school project due to delayed and not completed on time before the handover. Practitioners still have lack motivation to use IBS and study is to investigate the problems related to the implementation of IBS and its barriers in school constructions projects.

1.3 Objective of Study

The aim of this study is to investigate the application of IBS in school projects in Malaysia. In order to achieve this aim several objective are set as given below:

i. To investigate the awareness of the personal such as project manager, engineer, quantity surveyor and site supervisor in construction industry in Malaysia on implementation of industrialised building system.

ii. To study the advantages and disadvantages of industrialised building system compare to the conventional method based on the personal respondents opinions.

iii. To study and analyse the problems and challenges faced by the practitioners such as consultant and contractor in order to implement the use of IBS in Malaysia.

1.4 Scope of Study

The research will focus around the Kuala Lumpur and Kuantan area. The study will be done based on the scope limited to pre-cast concrete project for the government school project. This research will be conducted using questionnaire survey and interview on the parties involved in IBS method. The study will focus on the following projects:

i. Government school projects, abandon or under construction.
ii. Government school projects using some of the pre-cast concrete part.

1.5 Expected Outcomes

Based on the data collected, some reasonable suggestions and recommendations can be provided to overcome the problem faced by the construction industry in order to widen the application of the IBS in school project in Malaysia:

i. Lack of knowledge and training among the professionals involved in construction industry are one of the major problems and barrier to widen the implementation the IBS in Malaysia

ii. Lack of facilities, machineries and equipment is one of the major problems in implementing IBS in Malaysia.

1.6 Methodology

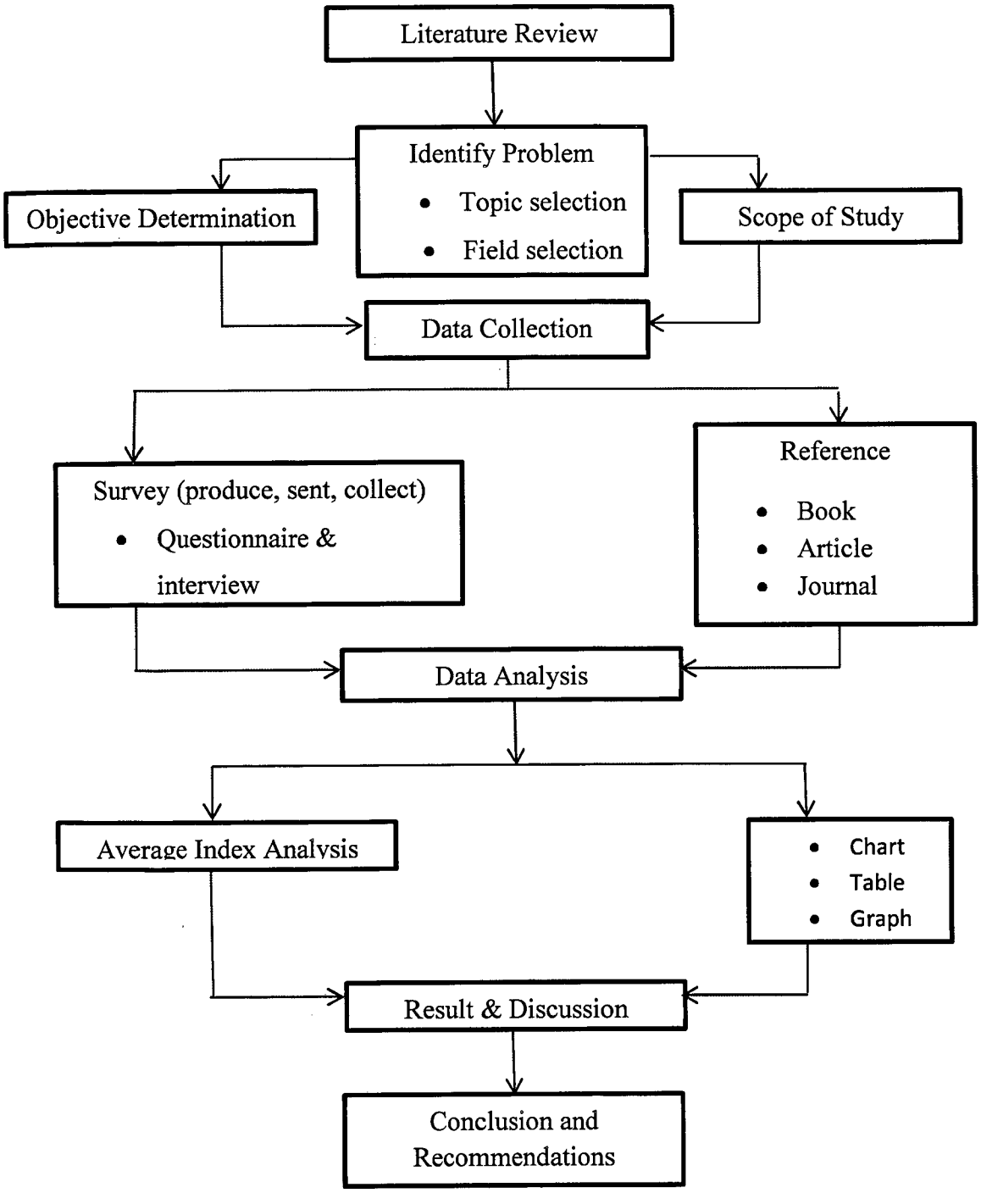

Figure 1.1: Flowchart of methodology

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Construction industry in Malaysia has greatly changed from the conventional method to a method that requires a solution to the problems related to the unregulated construction problems. Industrialised building system (IBS) is one of the solutions to various problems faced by construction industry practitioners (Kamar, 2009). In line with the robust growth of the construction industry is the acceptance of the construction industry practitioners to IBS. This is important to the construction industry in our country because it is time to transform our economy to generate higher income while encouraging change towards domestic and global competition. IBS is a modern method that can provide many advantages to building construction. This system has been proven to increase productivity and high quality of construction as well as to reduce the number of low-skilled foreign workers, thus helping to prevent the outflow of money abroad (CIDB, 2003).

2.2 Definition of industrialized building system (IBS)

Industrialised building system (IBS) has many terms, but here it will be described according to the parties involved in the construction industry such as Industry Development Board Malaysia, CIDB. In general, IBS is a construction process that uses components ready mixed concrete at the plant by using the mould according to the specifications designed by the engineers. These components include wall panels, beams, column and slab. It will be delivered to the construction site and assembled on site by setting out that has been made previously. This component is designed with a closed

condition at the factory and its production meets the requirements of designers and the quality of construction is higher (IBS, 2003). IBS has five (5) common classifications as used in Malaysia. This will be explained in more detail in the next section.

2.3 Classification of the Industrialised Building System (IBS)

Industrialised building system (IBS) has five parts in which each of these methods have differences in terms of components and construction purposes. These classifications are set by (CIDB, 2003) Construction Industry Development Board Malaysia.

2.3.1 Pre-cast Concrete Framing Panel and Box Systems.

This system is often used by construction industry practitioners. Components consist of pre-cast concrete for columns, beams, floors and slabs. Besides, it is also consist of 3D components such as balconies, staircase, and toilets, lift chamber, refuse chambers and etc.

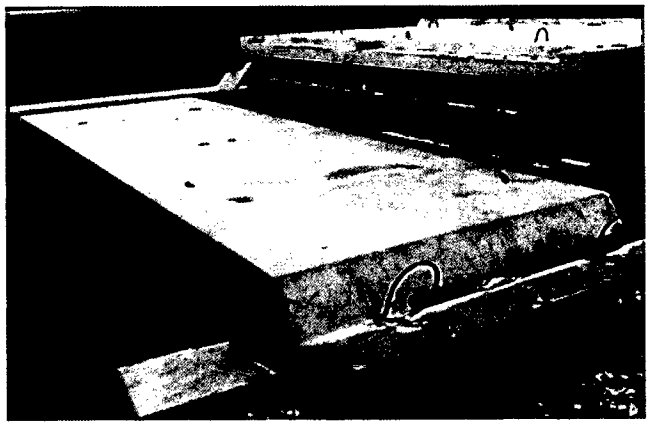

Figure 2.1 Pre-cast Concrete Framing Panel and Box Systems

Source: Aizad Johari 2013

2.3.2 Steel Formwork Systems

This system is the least used compared to other IBS system because of its production on the construction site. However, this system does offer high quality finishes and fast construction with less site labour and material requirement. These components consist of tunnel form, tilt up system, casts and metal beams and columns Decks.

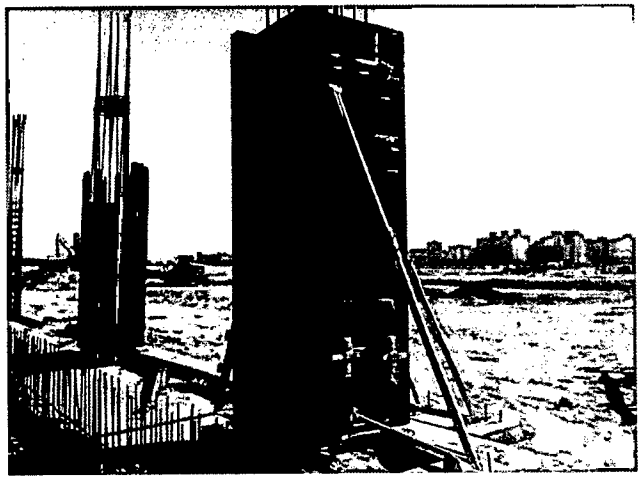

Figure 2.2 Steel Formwork Systems

Source: Aizad Johari 2013

2.3.3 Frame system

This method consists of steel beams and columns, portal frames and roof trusses. This method is also often used in conjunction with pre-cast concrete to produce strong and lightweight structure. These systems are preferred for the fast-track construction of huge buildings and the construction of the skyscrapers.

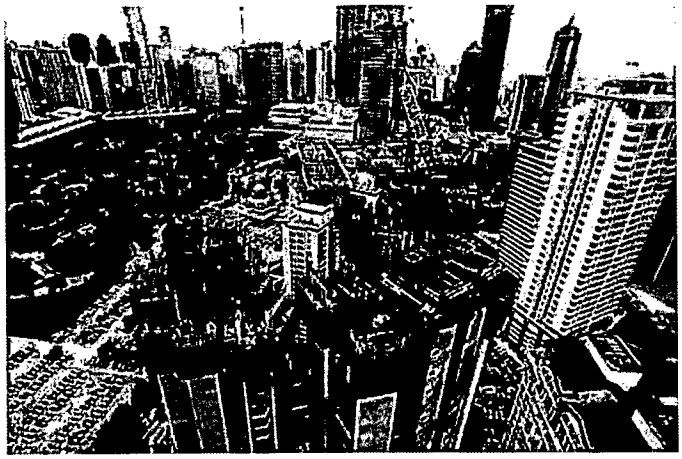

Figure 2.3 Frame Systems

Source: IBS 2003

2.3.4 Prefabricated Timber Framing Systems

This method used wood as the main material production components. Product from this method is the timber building frame and roof trusses. This system provides a high aesthetical value for the building on its applications. The examples for the timber framing system are the construction of the chalets for the resorts and the decorative for the garden.

Figure 2.4 Prefabricated Timber Framing Systems

Source: IBS 2003

2.3.5 Block Work System

This method is the latest in the construction industry. It can speed up the time pace of construction and high quality of its components. It can replace the usage of the traditional brick-laying. This method produces interlocking concrete masonry units (CMU) and lightweight concrete blocks.

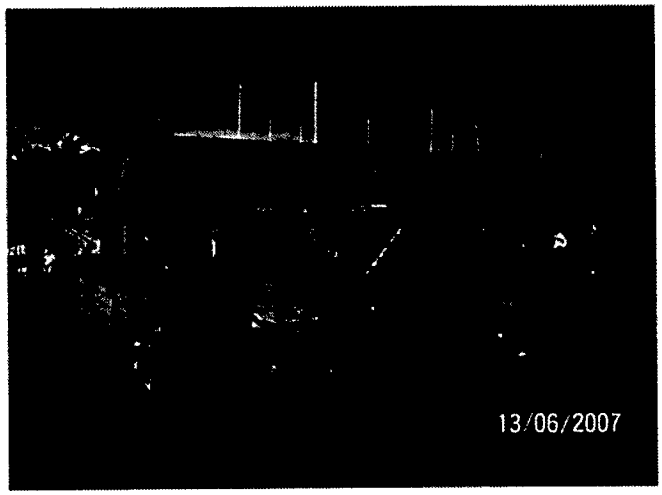

Figure 2.5 Block Work System

Source: IBS 2003

2.4 Advantages of Industrialised Building Systems (IBS)

The Industrialised Building system (IBS) provides many advantages to the construction industry and the economy. Research done by (Bing, 2001) shows these following advantages of IBS:

i. Minimised materials usage
ii. Shorten the construction time and increase work rate
iii. Reduced the amount of unskilled workers
iv. Produced a high quality product
v. Organized and clean construction site
vi. Increase the level of safety on construction sites

vii. Attract new entrepreneurs and interest in the research on IBS

The IBS method can reduce construction cost by reducing the amount of unskilled workers and minimised materials usage. First, a lot of manpower is needed in the construction industry. But the influx of unskilled foreign workers has result the loss of money on the human resources only to train these unskilled workers (IBS, 2003). Even worst are the flow out of the domestic money will give the negative impact and huge losses to the economy and country. IBS is only solution of these problems because it requires only a small number of the employees to run the construction and generating the IBS components in the factory. The skilled workers will be taken among the local people and this will created a huge opportunity to them and reduced the unemployment people (Thanoon, 2003).

Second Industrialised building system has been proven to reduce the amount of materials used in construction sites. Production of pre-cast concrete components at the factory has resulted in consumption building materials such as concrete and brick is not used extensively to build a building. Even the lesser use of building materials also can give positive impact such as a cleaner environment due to reduction of producing waste materials (Bing, 2001). Reduction of materials used will create better and green environmental because IBS pre-cast concrete components are cast in the factory in a closed and controlled condition. This will make the IBS plant become clean and orderly. Any concrete waste and rubbish will be gathered and will be taken out from the construction site make the factory plant become clean and tidy. This is different compared to the construction site of the conventional method because the surplus of the concrete cast in-situ will be scattered on the ground and this will contribute to a dirty environment work place (Shaari and Ismail, 2003).

The clean and organised construction site can reduced the number of accidents among workers in the construction site. It is because the installation of the IBS does not require the struts to hold the wet concrete during the pouring works and after the casting, the struts are made from the wood and nailed between the connections to form the struts. The sticking out nail will caused the hazard conditions at site construction. The unskilled workers also will be minimizing (Shaari and Ismail, 2003).

Furthermore, IBS components are produced at the factory under controlled and safe conditions. After the completion of the IBS components it will be transferred to the construction site using the lorry and other transportation. This will shorten the time period in construct the structural elements compared with the conventional method (IBS, 2003). The use of in-situ concrete cast is influenced by the weather and other factor that can make delay on the construction progress. Time management is the critical factor in the construction project; it will affect the cost of whole project if there are any delays in the construction progress. Before the installation of the IBS component, setting out work will be executed by the skilled workers in the organised condition with the help of the heavy machinery such as crane. This will reduce the amount of work on the construction site (Shaari and Ismail, 2003).

All these factors can reduce the total cost of IBS projects, another factor that can reduced the construction cost is the usage of the aluminium and steel moulds in pre-cast concrete production in the industries. These type of mould can be reused by the time without consider the capabilities of its expectancy. This minimize the expenditures cost to produce the formwork. Moreover these aluminium and steel mould can be modified in size and dimensions to produce the IBS components. The conventional method use the wood for main material in formwork and this are very inefficient due to the cost (IBS, 2003). Other advantages of IBS are produced a high quality product because these IBS products have a very high quality and perfection on dimension with minimise defects. It is because the components are cast according to the special design specifications in accordance with Malaysia Standard. The components are cast in the closed and proper condition and any external factor such as weather is can be dealt. The completed product will be stored in an orderly and safe area. This will help to improve the quality of the product and make the factory plant production be some more efficient (Nawi, 2007).

Finally, IBS method can attract new entrepreneurs and interest in the research on IBS. The practitioners on the construction industry will focus on research related to the design and construct a new solution or technology of the IBS method for more efficient and innovative. New entrepreneurs who want to foothold in the construction industry will take all of the advantages of the IBS and become a contender to the existing

construction company (Eka Kusmawati, 2008). With a lot of advantages, this will give the IBS practitioners a solution to overcome the common problems related to the construction industries.

2.5 Disadvantages of industrialised building system (IBS)

Despite many advantages, industrialised building systems (IBS) also have several disadvantages. Some of the disadvantages are listed and discussed here:

i. High initial capital
ii. Need of skilled workers
iii. Site accessibility
iv. Large working area

The IBS method require a high initial capital cost, this is because it need to hire a skilled workers, site accessibility and large working area. First, IBS relies heavily on sophisticated plants and machine. It is require a lot of skilled worker to operate it with the fast and safe as possible. At construction site, the installation of the IBS components needs to be precision in connecting the components to become the whole structure and make sure the connections in the marking scheme as in the drawing. The skilled worker play a big role in the workplace which they needs to coordinated and maintained the installation of the components very well. Any breakdown will hold-up the entire progress works. It is different with the conventional methods which the construction work are driven by the effort of the labour (Eka Kusmawati, 2008).

Second, IBS need site accessibility because the plant or the factories in producing the IBS component are usually centred at the certain location. These plant or factories need the proper and easy site accessibility to provide the efficiency of the IBS characteristic to the implementation of the IBS. It is also the one of the most important factors of the implementation of the IBS method. IBS requires adequate sit accessibility to transport the IBS components from factory to the site. Third, IBS need large working area because building construction using the IBS requires a large area for working area. The machinery and the mobile transport are the factor in the success of the IBS

installation beside the skilled workers. The trailers, mobile crane and the tower crane needs to be on site to be used during the constructions, and these will needs the large working area to prevent the crowded situations.

Furthermore the construction site applying the IBS needs the quite large store to place the IBS components after the transportation of the component and this will affect to the insufficient of the working space and this will become the problems to the construction project delivery. Besides, most construction site especially in cities are often congested and unable to provide the area required. But the IBS will be inefficient if it use on the small scale of project because the cost required. Finally, with the uncertain market demand for houses, high interest rate and cheap labour cost are several factors for the contractors not choosing the IBS as the main method to be used for construction. It is because for these contractors and other practitioners needs a large capital investment to overcome these factors and the same time making a profit to round their business. These contractor and the others practitioners prefer to use labour intensive conventional methods because it is far easier to lay off workers during difficult time (Din, 1984).

2.6 IBS roadmap 2003 – 2010

A long term plan to facilitate the transformation of Malaysian construction sector to become modern and reference to all parties involved in the construction sector. It has been formulated with inputs from industry like the government sector, developers, manufacturers, contractors, professional bodies, and others interest parties and the IBS roadmap was endorsed by the cabinet back in October 2003. This IBS Roadmap is based on the 5-M Strategy which is manpower, materials-components-machines, management-processes-methods, monetary and marketing. The target of the IBS roadmap is to implement the industrialised construction industry as well as achieving Open Building by the year 2010 (IBS Roadmap, 2003). Based on the IBS Roadmap 2003-2010, positive impacts from the fundamental proposal and new Government incentives are: