DEVELOPMENT OF FINANCIAL MANAGEMENT FRAMEWORK FOR INDUSTRIALISED BUILDING SYSTEM (IBS) PROJECT BY USING ANALYTIC HIERARCHY PROCESS (AHP)

NATASHA BINTI DZULKALNINE

SULTAN IDRIS EDUCATION UNIVERSITY

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ABSTRACT

This study was aimed to develop financial management framework for Industrialised Building System (IBS) project through incorporation criteria which employed Analytic Hierarchy Process (AHP) based on adaptation from Saaty's rule of thumb. The study also analysed the payment issue of IBS project and factors influencing it. The criteria in the new payment method for IBS project was also studied. The research design in this study was survey method. The research instruments were survey questionnaire, interview protocol and focus groups. A sample of 172 respondents from 43 IBS projects in Klang Valley from the year 2008 until 2015 were selected using the cluster sampling. Majority of IBS projects were saturated in Klang Valley. Data were analysed using descriptive statistics which are mean and standard deviation to rank the payment issues and Analytic Hierarchy Process (AHP) to select the criteria for IBS project in the development of financial management framework. Cronbach's alpha had been undertaken to validate the instrument with value of 0.881. Based on weightage of importance, the main criteria for the development of financial framework for IBS project showed that the main key criteria are Material (31.0) followed by Initial Cost (27.4), Contract Document (25.3) and Drawing and Design Matters (25.1) while for the sub-criteria is the advance payment for initial stage (22.9). In conclusion, the most critical criteria to take into consideration in new payment method is in terms of Material and Initial Cost. The implication of the research is the financial management framework proposed can be used by the industry players to resolve the payment issue in IBS project. The study also implicates that tackling the main issues of payment of IBS project may assist the government and relevant parties especially in the early stage of construction due to huge capital investment.

PEMBANGUNAN RANGKA KERJA PENGURUSAN KEWANGAN BAGI PROJEK SISTEM BINAAN BERINDUSTRI (IBS) MENGGUNAKAN ANALISIS PROSES HIERARKI (AHP)

ABSTRAK

Kajian ini bertujuan bagi membangunkan rangka kerja pengurusan kewangan bagi projek IBS melalui gabungan kriteria dengan menggunakan kaedah Analisis Proses Hierarki (AHP) berdasarkan asas yang telah ditentukan oleh Saaty. Kajian ini juga menganalisis isu pembayaran dan faktor mempengaruhi bayaran di dalam projek IBS. Selain itu, kriteria bagi kaedah baru pembayaran juga dikaji. Reka bentuk penyelidikan di dalam kajian ini menggunakan kaedah kaji selidik. Instrumen penyelidikan yang digunakan adalah soalan kaji selidik, protocol temubual dan kumpulan fokus. Seramai 172 sampel responden daripada 43 projek IBS di Lembah Klang dari tahun 2008 sehingga 2015 dipilih melalui di dalam kajian ini menggunakan kaedah pensampelan kluster. Data dianalisis menggunakan statistik deskriptif iaitu min dan sisihan piawai bagi menyusun isu pembayaran dan Analisis Proses Hierarki (AHP) digunakan bagi memilih kriteria kaedah baru pembayaran untuk pembangunan rangka kerja pengurusan kewangan. Cronbach's alpha telah dijalankan untuk mengesahkan instrumen dengan nilai 0.881. Berdasarkan wajaran kepentingan, kriteria utama dalam pembangunan kaedah pembayaran yang baru adalah Material (31.0), Kos Awalan (27.4), Dokumen Kontrak (25.3) dan Lukisan dan Bentuk (25.1) manakala bagi sub-kriteria utama adalah pembayaran awal bagi peringkat awal Pembinaan (22.9). Sebagai kesimpulan, kriteria utama yang kritikal untuk diambil perhatian di dalam pembangunan kaedah baru pembayaran adalah Material dan Kos Awalan. Implikasi kajian adalah rangka kerja pembayaran yang telah dicadangkan dapat membantu industri pembinaan di dalam menyelesaikan masalah pembayaran di dalam projek IBS. Kajian ini juga memberi implikasi untuk menangani masalah yang berkaitan dengan isu bayaran untuk projek IBS dan boleh membantu kerajaan serta pihak berkaitan terutamanya di peringkat awal pembinaan kerana pelaburan yang tinggi.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AHP	Analytic Hierarchy Process
BIM	Building Information Modelling
BNM	Bank Negara Malaysia
CIDB	Construction Industry Development Board
CIMP	Construction Industry Master Plan
CITP	Construction Industry Transformation Programme
CR	Consistency Ratio
CREAM	Construction Research Institute of Malaysia
DOS	Department of Statistics
GDP	Gross Domestic Product
HDB	Housing and Development
IBS	Industrialised Building System
KLCC	Kuala Lumpur Convention Centre
KLIA	Kuala Lumpur International Airport
LRT	Lightweight Railway Transit
MC	Modular Coordination
MCDM	Multi Criteria Decision Making
MMC	Modern Methods of Construction
MOF	Ministry of Finance
MITI	Ministry of International Trade and Industry
MPC	Malaysian Productivity Centre
MRT	My Rapid Transit
OSCT	Off-Site Construction Techniques

OSM	Off - Site Manufacturing
PCA	Portland Cement Association
PPRT	Housing Project for the Hardcore Poor
PPVC	Prefinished Prefabricated Volumetric Construction
PWD	Public Work Department
REHDA	Real Estate and Housing Developers
ROS	Registrar of Societies Malaysia
SKM	Malaysia Co-Operative Societies Commission
SME	Small Medium Enterprise
SSM	Companies Commission of Malaysia
SVC	Social Venture Capital
UBBL	Universal Building by-Law
UK	United Kingdom
USA	United States of America
USD	United States Dollar
VO	Variation Order
VOP	Variation of Price

LIST OF APPENDIX

CHAPTER 1

INTRODUCTION

1.1 Introduction

The value of construction work done in Quarter 2, 2018 grew moderately at 5.3% as compared with Quarter 1, 2018 at 5.9% to record about RM 35.6 billion (DOS, 2018). The expansion in value of construction work done was driven by growth in Civil engineering sub-sector with 23.6% and Special trade activities sub-sector with 12.6%. However, the Residential building and Non-residential building sub-sector declined to 7.6% and 4.8% respectively (DOS, 2018). The private sector continued to drive the construction activity with 56.4% share (RM20.1 billion) as compared to the public sector with 43.6% share (RM 15.5 billion). The construction industry makes up an important part of the Malaysian economy. Although the percentage is relatively small, the construction industry is extensively linked with many other parts of the economy.

The growth of construction industry will give multiplier effect to the material production sector, equipment and other services sector. According to Mohammed and Ahmad (2002), the growth of construction industry can be seen in this aspect:

i. Job opportunities
ii. Physical growth
iii. Construction Technology
iv. Increment of Land Value

Despite a challenging external environment, the Malaysian economy growth in the fourth quarter 2018 (4Q18) has surpassed expectations as the country's GDP grew to 4.7% (BNM, 2018). Table 1.1 shows the Gross Domestic Product (GDP) by kind of economic activity based on 2005. Construction sector shows the lowest percentage of GDP as compared with other sectors. The lowest percentage was recorded in 2014 with 3.9% and slightly increased from 2015 to 2016 but decreased in 2017 and 2018.

Table 1.1

Gross Domestic Product (GDP) by Economic Activity

Sector	2014	2015	2016	2017	2018
Services	55.3	53.5	54.2	54.8	56.0
Manufacturing	24.6	23.0	23.0	22.8	22.8
Mining and quarrying	7.9	8.9	8.8	8.3	7.9
Agriculture	6.9	8.8	8.1	8.2	7.9
Construction	**3.9**	**4.4**	**4.5**	**4.3**	**4.2**

Source: Department of Statistics Malaysia (DOSM) & Bank Negara Malaysia (BNM)

The construction sector is expected to continue to record high growth, although at a more moderate pace in 2015. After several years of robust growth, activity in the residential sub-sector is expected to increase at a more moderate pace due to lower housing approvals and property launches. Nonetheless, growth in the non-residential sub-sector is projected to be sustained, amid higher construction activity for industrial and commercial buildings. New and existing multi-year civil engineering projects, particularly in the transport and utility segments, will continue to provide additional support to the sector (CIDB, 2007).

The construction projects are divided into two sectors which are government and private sector. Government sector projects are projects granted by the federal and state governments. In contrast, private sector projects are projects awarded by any company, cooperation or organisation registered with the Companies Commission of Malaysia (SSM), Registrar of Societies Malaysia (RoS), Malaysia Co-Operative Societies Commission (SKM) or the local authorities for Sabah and Sarawak (CIDB, 2018).

The government and the private sector contributed 26.0% and 74.0% respectively to the total value of projects awarded. Both the government and private sector suffered a setback, showing a weakening in the value and number of projects awarded. The decline of projects in the private sector was more apparent when compared with the government sector. The private sector recorded a drop of 39.5% in terms of project value of RM 120.8 billion (2016:RM 199.7 billion), compared against government sector which fell by 18.5% to RM 42.3 billion (2016: RM 51.9 billion).

The number of projects, however, experienced a negligible decrease for both the government and private sector which dropped by 0.1% to 2,099 projects (2016: 2,097 projects) and 6.8% to 5,449 projects (2016: 5,489 projects) (CIDB, 2018).

In the Malaysian construction industry, contractors are divided into categories or grades according to specific size brackets ranging from small contractors (G1-G3) to medium-sized contractors (G4-G5), up to the large (G6-G7) contractors. Table 1.2 shows the CIDB Contractors Grades with paid-up capital and tendering capacity for each grade. G7 contractors' grade is the highest grade with paid up capital of RM750,000 and there is no limit for the tendering purposes.

Table 1.2

CIDB Contractors Grades

Grade	Paid-up capital (RM)	Tendering Capacity (RM)
G1	5,000	< 200000
G2	25,000	< 500,000
G3	50,000	< 1,000,000
G4	150,000	< 3,000,000
G5	250,000	< 5, 000,000
G6	500,000	< 10, 000,000
G7	750,000	No limit

Source: CIDB (2015a)

The construction industry is highly fragmented, with subscale SMEs collectively accounting for 90% of total contractors while large contractors make up the remaining 10%. A reason for the high fragmentation in the industry is partly attributable to the low barriers for entry into the construction industry, driven by registration criteria that

are relatively easy to fulfil for small contractors. Table 1.3 shows the definition of SME in construction.

Table 1.3

Definition of SME in construction

Type of Enterprise	Definition	Contractor Category
Microenterprise in services	Enterprise with full-time employees of less than 5 or with annual sales turnover of less than RM 200,000	G1
Small enterprise	Enterprise with full-time employees of between 5 and 19 or with annual sales turnover between RM 200,000 and less than RM 1 million	G1-G3
Medium enterprise	Enterprise with full-time employees of between 20 and 50 or with annual sales turnover of between RM 1 million and RM 5 million	G4-G5

Sources: (CIDB, 2015a)

During the last few decades, the move of Malaysian workforce to jobs with better economic opportunities saw certain sectors such as construction, plantations, forestry and certain services experiencing labour “shortages”. This means inadequate numbers of workers were responding to the wage levels and conditions of employment offered by employers in the respective industries or sectors. This resulted in labour market vacancies being increasingly filled by foreign workers (Marhani, Adnan, Baharuddin, Esa & Hassan, 2012).

Due to unpleasant working conditions and the availability of cheap foreign worker, majority of the construction companies preferred to hire them. Therefore, in 2008, to reduce the dependency on foreign worker, government has initiated the implementation of Industrialised Building System (IBS) to the construction industry. Every government project shall achieve at least 70% of IBS component (CIDB, 2010).

Construction Industry Transformation Programme (CITP) 2016 – 2020 mentioned that IBS assures valuable advantages such as the reduction of unskilled workers, less wastage, less volume of building materials, increased environmental and construction site cleanliness, and better-quality control. Besides, it offers benefit to adopters concerning cost and time certainty, attaining better construction quality and productivity, reducing risk related to occupational safety and health, alleviating issues on skilled workers and dependency on manual foreign labour, and achieving the ultimate goal of reducing the overall cost of construction. Towards this end, the country's construction industry will achieve the state of sustainability through the stimulation brought by the IBS implementation.

The development of IBS in Malaysia was started in early 1960 when the Ministry of Housing and Local Government visited Europe and measured their lodging development plan for IBS construction in Malaysia. During 1964, the first IBS building built was known as Jalan Pekeliling Flats. The buildings consisted of seven blocks of 17 levels comprising 3000 units and 40 store-lot. In 1965, second IBS project was built in Penang which is a flat as at Jalan Rifle Range comprising of three blocks of 18 levels

and six blocks of 17 levels. Another project build using IBS in Penang is 1000 units of five floors walk-up flats. In 1964 until 1974, 20,000 precast homes were built in Penang.

Penang State Government launched 1200 units of prefabricated panel building in 1978. In Lumut, Ministry of Defence adopted panel building of 2800 units for Naval Base 9. During early 80's and 90's, the usage of structural steel increasingly spread widely. Besides that, in 1984, Dayabumi was built consisting of 36 storeys. During 1981 until 1993, Perbadanan Kemajuan Negeri Selangor (PKNS) constructed low-cost houses and high cost cottages for the new township in Selangor. 52,000 units were constructed utilising Praton Haus System. National iconic landmark such as Kuala Lumpur Convention Centre (KLCC), Bukit Jalil Sport Complex, Kuala Lumpur International Airport (KLIA), KL Tower, Lightweight Railway Transit (LRT) and Petronas Twin Tower was built using IBS during 1994 until 1997.

Treasury Circular in 2008 was mandated for government building to achieved at least 70 IBS score for project worth more than RM 10 million. This statement was also mentioned in the Construction Industry Master Plan (CIMP) from 2006 until 2015. In 2016, the Construction Industry Transformation Programme (CITP) from 2016 until 2020 was introduced to increase the adoption of IBS in construction industry under Productivity thrust. In 2017, the government has urged the private sector to implement IBS in their project and plan to mandate at least 70 IBS score in the private project during 2020. Currently, the usage of IBS is widespread in the development of affordable housing in Malaysia especially Klang Valley. Figure 1.1 shows the chronology of IBS implementation in Malaysian construction industry.

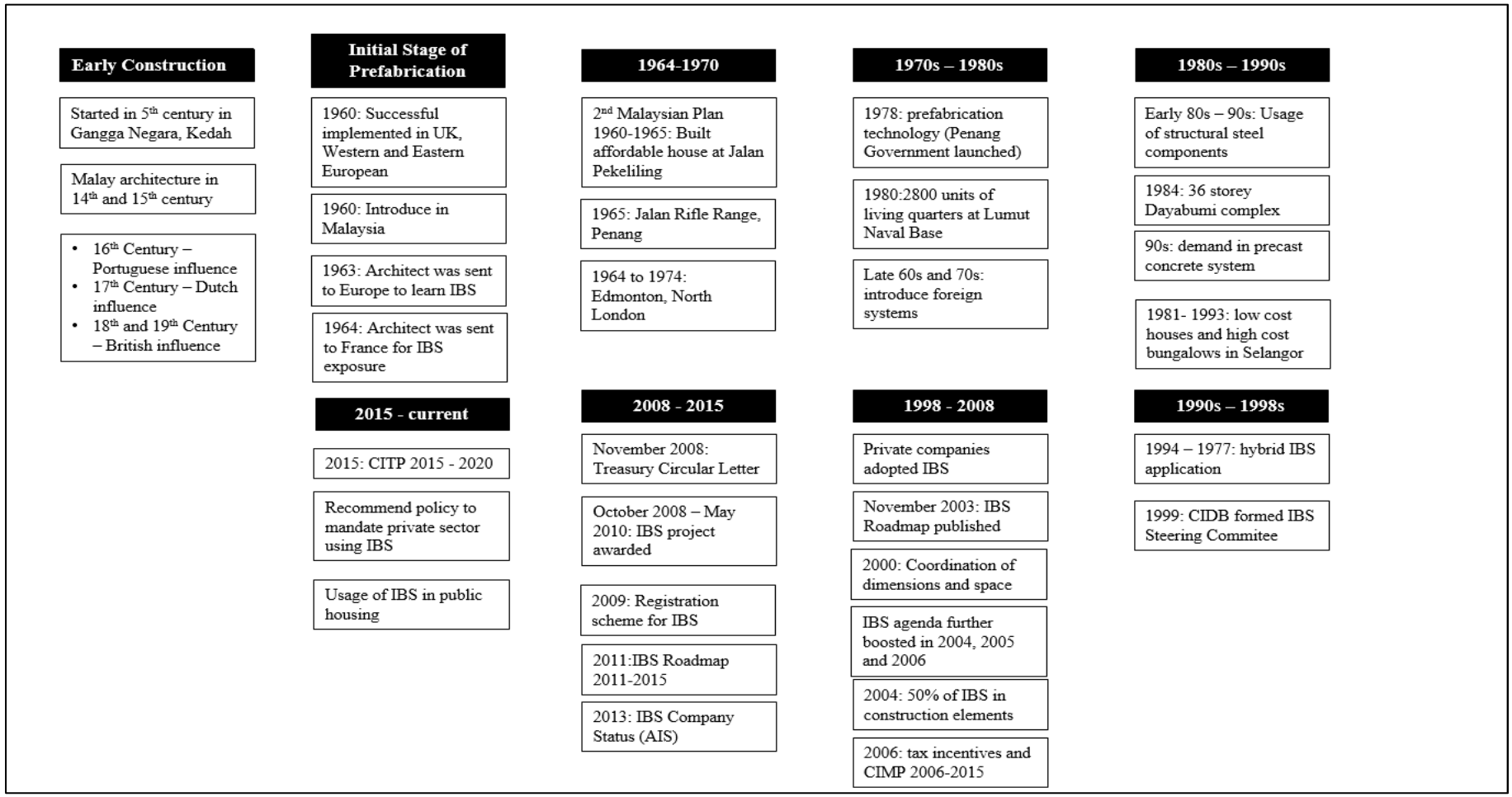

Figure 1.1 History of Industrialised Building System (IBS). Source: Developed by researcher for the study

IBS Roadmap 2003 -2010 (CIDB, 2003) has highlighted six (6) main IBS system which are precast concrete, reusable formwork, steel framing, prefabricated timber framing, blockwork and innovative system. The details on the components and description of IBS system is described in Table 1.4.

Table 1.4

Categorisation of System and Component of IBS

System	Component	Description
Pre-cast Concrete	Column Beam Wall Slab	The common IBS used includes precast concrete elements, lightweight precast concrete and permanent concrete formwork.
Reusable Formwork	Column Beam Wall Slab	The common IBS used includes precast concrete elements, lightweight precast concrete and permanent concrete formwork.
Steel Framing	Column Beam Roof truss	Commonly used with precast concrete slab, steel framing system has always been a popular choice and used extensively in the fast track construction of skyscrapers. The recent development of this IBS includes the usage of light steel trusses consisting of cost efficient profiled cold formed channel and steel portal frame system. These are the alternatives to the heavier traditional hot rolled section.
Prefabricated Timber Framing	Column Beam Roof truss	This system consists of timber building frames and timber roof trusses. Timber building frame system also has their market and demand, offering attractive designs from simple dwelling units to buildings that required high aesthetical values such as resorts and chalets.
Blockwork	Column Beam Wall	The construction method of using traditional bricks has been revolutionised by the developments of interlocking concrete masonry units and lightweight concrete blocks. The tedious and time-consuming traditional bricklaying tasks are vastly simplified by the usage of these practical solutions.
Innovative	Wall	In order to classify new systems introduced in the Malaysian construction industry that are not belong in the five mains IBS in the CIDB's IBS classifications (2003), CIDB introduced innovative system to classify the new and innovative systems in IBS approach.

Sources: CIDB (2010)

CIDB (2014) defined IBS as a construction technique in which components are manufactured in a controlled environment (on or off site), transported, positioned and assembled into a structure with minimal additional site work. According to CIDB (2007), as compared to conventional construction method, the advantages of using IBS are as follows:

i. Fewer site workers due to simplified construction methods
ii. Quality controlled end product through controlled prefabrication process and simplified installations
iii. Reduction of construction materials at site through the usage of prefabricated components
iv. Reduction of construction waste at site with the usage of standardised component and less onsite materials
v. Safer construction site due to reduction of site workers, material and construction waste
vi. Faster completion of construction due to usage of standardised prefabricated components and simplified installation process
vii. Lowered total construction cost

Currently, there are about 9,423 IBS contractors in Malaysia. The distribution of IBS contractors according to state are shown in Table 1.5. From the total of 9423 IBS contractor, there are only 74 IBS contractors doing the project. The rest of the total is the management contractors registered with CIDB.

Table 1.5

Distribution of IBS Contractor by State

State	Number of IBS Contractors
Perlis	195
Kedah	527
Pulau Pinang	711
Perak	442
Selangor	1874
Kuala Lumpur	1286
Negeri Sembilan	452
Melaka	248
Kelantan	577
Terengganu	622
Pahang	677
Johor	896
Sarawak	531
Sabah	385
TOTAL	**9423**

Source: CIDB (2015)

In order to implement IBS to the private sector, the supply and demand of the IBS should be matched. The number of manufacturer and supplier should be enough to cater to the demands of the IBS construction. Figure 1.2 shows that as of October 2018, it was reported that at least 290 manufacturers were actively involved in the dissemination of IBS in Malaysia, of which 84 were Bumiputera players and 206 were non-Bumiputera. Overall, Selangor contributed the most with 109 suppliers and manufacturers. The components involved are precast, onsite precast, formwork, steel structure, metal roof trusses, timber frame, block and innovative systems.

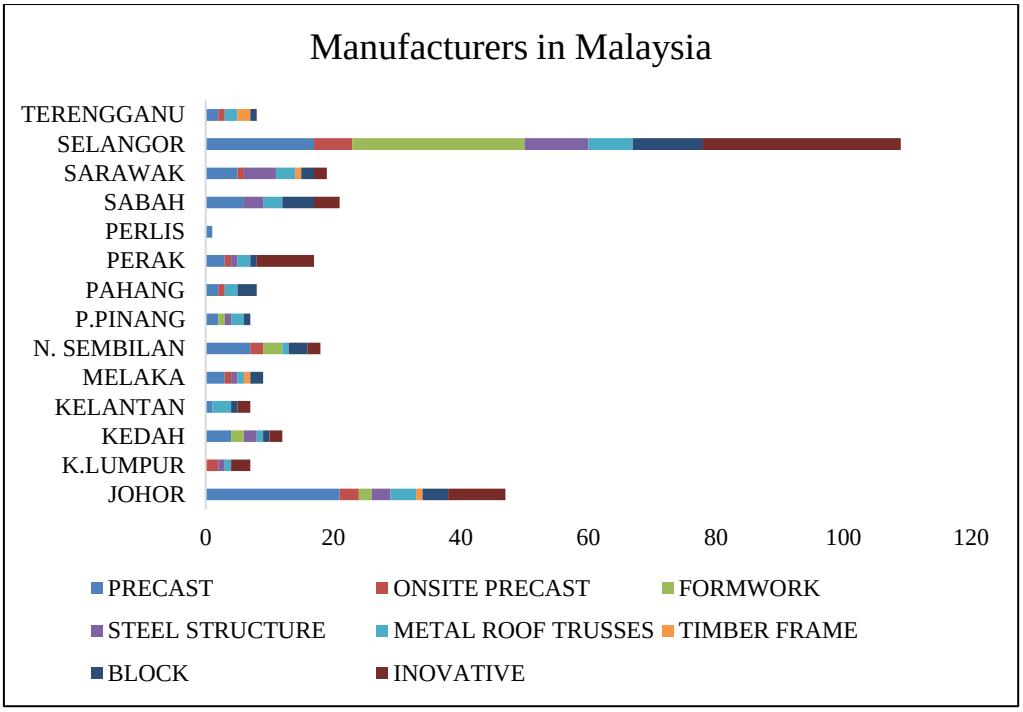

Figure 1.2 Number of Manufacturers in Malaysia. Source: IBS Centre, CIDB (2018)

The detailed number of each system are illustrated in Table 1.6. Precast components recorded are the highest number of IBS components manufactured in Malaysia followed by innovative systems. The least number of IBS components manufactured in Malaysia is timber frame due to the higher price as compared with other systems.

Table 1.6

Number of Manufacturers and Suppliers Based on System and State

No.	State	Precast	Onsite Precast	Formwork	Steel Structure	Metal Roof Trusses	Timber Frame	Block	Innovative	TOTAL
1	Johor	21	3	2	3	4	1	4	9	47
2	Kuala Lumpur	0	2		1	1	0	0	3	7
3	Kedah	4	0	2	2	1	0	1	2	12
4	Kelantan	1	0	0	0	3	0	1	2	7
5	Melaka	3	1		1	1	1	2	0	9
6	N. Sembilan	7	2	3	0	1	0	3	2	18
7	Pulau Pinang	2	0	1	1	2	0	1	0	7
8	Pahang	2	1	0	0	2	0	3	0	8
9	Perak	3	1	0	1	2	0	1	9	17
10	Perlis	1	0	0	0	0	0	0	0	1
11	Sabah	6	0	0	3	3	0	5	4	21
12	Sarawak	5	1		5	3	1	2	2	19
13	Selangor	17	6	27	10	7	0	11	31	109
14	Terengganu	2	1		0	2	2	1	0	8
TOTAL		**74**	**18**	**35**	**27**	**32**	**5**	**35**	**64**	**290**

Source: IBS Centre, CIDB (2018)

1.2 Background of the Study

Apart from the advantage of using IBS, the construction players especially contractor is suffered in terms of financial management to implement IBS. Melik (2010) stated that an efficient cash management should:

i. Reduce the financial risk of the project, volatility of the company's cash flow and maintain its position by providing enough liquidity.
ii. Control the expense of the project and consider the possible rate of increase in inflation and its pressure onto the project expenses.
iii. Optimize cash collection and improve cash capacity to make the project more profitable.
iv. Plan the company's total credit capacity with banks to supply the foreseeable funding needs.
v. Find necessary funds with lowest possible cost.
vi. Maintain and improve the company's credit control and its credit worthiness to protect against a credit compress from suppliers, banks or from another creditor.

Since 2008, Industrialised Building System (IBS) or known as prefabrication have been seriously implemented in government projects, where 70% of IBS components must be utilized in government projects worth RM10 million above (MOF, 2008). Therefore, there will be changes in the contract and can impose the tendency of late payment by involving the IBS manufacturers in the project.

While approaching 2020, it will be compulsory for private projects to use 50% of IBS components in their construction (Mohamed Nor Azhari Azman, Dzulkalnine, Kamar, Hamid, & Nawi, 2013). Usually, the parties who are involved in contract are client, contractor, architecture and consultant. One of the key challenges expressed by the construction players is securing timely and adequate financing. This situation is especially prevalent amongst the small to medium sized players. Financial institutions, on the other hand, have restrained lending to certain players because of poor credit ratings, incomplete loan application information, etc. Further, they are more conservative when assessing borrowing for foreign projects. The construction sector has suffered a declining share of total loans extended.

Table 1.7 show the data from Bank Negara Malaysia (BNM) in 2018 on the amount of loans applied by construction sector, loans approved for construction sector and percentage of loans approved for construction sector. The financial institutions which provided the loans are commercial banks, Islamic banks and merchant or investment banks. The percentage of approved loans for the construction sector are mostly less than 50% which portray the worst situation for the construction player. As June 2018, the loans applied for construction sector recorded about RM 28,993.3 million. However, the approved loans for the construction sector are only RM 11, 637.2 which depicted only about 40.1% loans were approved.

Table 1.7

Loans Approved for Construction Sector

Year	Loans Applied by Construction Sector (RM million)	Loans Approved for Construction Sector (RM million)	Percentage Approved for Construction Sector (%)
2006	26,620.4	13,496.1	50.7
2007	39,532.8	20,892.2	52.8
2008	35,849.0	20,541.8	57.3
2009	34,353.8	16,612.6	48.4
2010	58,778.9	25,524.1	43.4
2011	66,863.3	32,168.0	48.1
2012	59,067.6	26,306.7	44.5
2013	61,674.9	23,532.0	38.2
2014	64,804.0	24,978.6	38.5
2015	61,957.3	24,381.8	39.4
2016	65,280.0	25,700.2	39.4
2017	67,864.9	30,687.0	45.2
2018 (as June 2018)	28,993.3	11,637.2	40.1

Source: Department of Statistics(DOS), 2014

According to Mohammed and Ahmad (2002), there are two types of cost in the construction industry which are direct cost and indirect cost. Direct cost is also known as primary cost due to the huge investment and cost to producing something. Three cost related to the direct cost are such as manpower cost, material cost and machinery cost. The direct cost is important in the project to ensure the sustainability of the project overall specially to finance building progress, infrastructure, facilities and other related parts. Direct cost is also known as variable cost due to the various cost incurred during the project.

Indirect cost is also known as fixed cost as it is considered constant throughout the construction period. These indirect costs are additional expenses incurred indirectly

for the execution of a project. For example, operating costs, administering costs and controlling projects by staffing at construction sites, water bills, electricity and telephone bills, insurance, fines and other losses required to carry out the project. Figure 1.3 shows the distribution of cost and balancing.

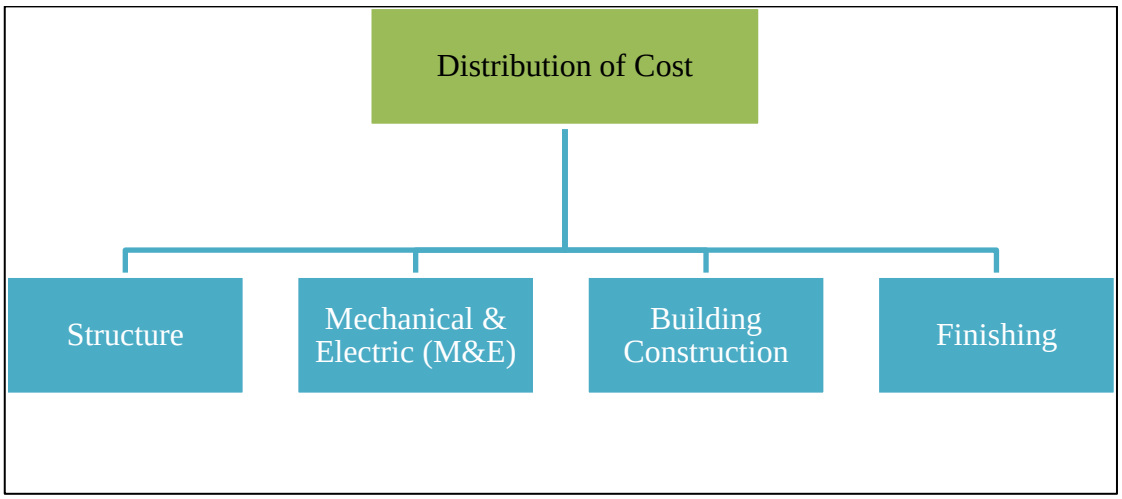

Figure 1.3 Distribution of Cost and Balancing

One of the main challenges faced by the Malaysian construction industry is difficulty in securing timely and adequate financing at the various stages of construction and difficulty in repatriating profits and dividends. Lack of integration at the design stage leads to the additional cost suffered by IBS contractor. IBS component manufacturer currently involved only after the design stage which has resulted in the need for plan redesign and additional cost.

The financing problems encountered in the various stages of construction include pre-bidding stage, bidding stage and execution stage (normal progress payment contracts and “build-operate-transfer” contracts).

The contractor faced difficulties with loan repayments in the initial years because they may have invested substantially in heavy equipment and machinery at the beginning of the project. Such projects will only start to generate returns upon operation of the project. Furthermore, they have to secure more projects in the country in order to fully utilise the capital expenditure invested (CIDB, 2007). Table 1.8 shows the financing problems encountered in the various stages of construction for local and foreign projects. The stages are divided into five (5) stages with the documents required by the clients and problems encountered in each stage.

Table 1.8

Financing Problems Encountered in the Various Stage of Construction (Local or Foreign Projects)

Stages	Requirements by Clients	Problems Encountered
Pre – Bidding Stage	• Letter of support from banks	• Difficulty in securing clean letter of support during the bidding stage • Slow processing time • Require feasibility studies
Bidding Stage	• Cashable tender bonds in country of bid	• Time to obtain tender bonds is short • The Malaysian banks may not have a branch in the country of bid or have correspondent relationship with a local bank* • High costs due to double charge*
Execution Stage (Normal Progress Payment Contracts)	• Performance bonds • Advance payment guarantee • Design guarantee bond • Term loans / leasing for purchase of equipment • Working capital	• High security requirements, such as back-to-back agreements, collateral and feasibility studies • Banks not willing to issue long-dated guarantees • Cash flow mismatch

(continue)

Table 1.8: *(continued)*

Stages	Requirements by Clients	Problems Encountered
Execution Stage ("Build-Operate-Transfer" Contracts)	• Equity funding • Debt funding	• Cash flow mismatch • Country risk issues* • Unavailability of local currency debt, suitable long tenure, and non-recourse debt funding* • Require appointing independent consultant to verify project economics
Remittance Stage		• Difficulty in repatriating profits / dividends due to restrictions in some countries*

Source: Industry Participant (CIDB, 2007)
*Note. *foreign project*

i. Pre-bidding and Bidding Stage

Contractors feel that financing problems are most severe at the bidding stage. Inability to secure financing at this stage will preclude contractors from participating in overseas bids. During the bidding process, a contractor is required to estimate the project financing costs. In some situations, it is a requirement to submit a tender bid bond. Banks, however are reluctant to lend because insufficient information is given on projects for the banks to comfortably assess the level of risks involved. They find it difficult to adequately assess the three Cs of credit (Character, Capacity and Collateral) for construction companies within the timeframe desired. Banks have highlighted that information provided by credit applicants in the construction industry are typically not sufficient to satisfy review requirements and that no structured framework exists to reference the past performance of credit applications.

While feasibility studies to support the loan proposals would facilitate loan approvals, the high cost of such studies makes it impractical for most construction companies to provide them.

Slow processing time has also been identified as a major challenge: inefficient processing time leads to a stale tender bid. Based on survey on problems faced by contractor in raising finance, approximately 32% of respondents to a financing problem survey rated this issue as very critical (CIDB, 2002).

ii. Execution Stage

The same financing problem survey revealed that the industry is highly concerned with the security requirements outlined by financial institution. Approximately 61% of the respondents rated the problem of too much collateral requested by financial institution as very critical. Some banks have asked for construction companies to deposit sinking funds equivalent to the amount of loan requested as a prerequisite for loan approval. The impracticality of these requirements lies in the fact that access to such funds would negate the need for a loan in the first place.

For overseas projects normally, the initial working capital required for the kick start of the construction project is estimated to be in the range of 10% to 12% of the contract value. At present, there are limited Malaysian bank representatives in the overseas markets. As a result, contractors operating in some markets have found raising banking facilities in foreign currencies difficult and costly.

The norm for the contractors is to either set-up banking lines with foreign-controlled banks based in Malaysia which have extensive global networks or with the larger Malaysian banks which have relationships with foreign banks based in the countries where the contracts are being pursued. Through these arrangements, the costs are much higher as the contractors have to pay the charges of more than one bank. Only the larger construction companies are able to raise the facilities due to their financial capacity and track records with the banks. In addition, for those companies that need to seek funding in the target markets, there may be a need to put in place a suitable equity structure.

There is also a mismatch in the duration of the loan vis-a-vis the project duration, especially for "build-operate-transfer" projects. The contractors may face difficulties in loan repayment in the initial years because they may have invested substantially in heavy equipment and machinery at the beginning of the project. Such project will only start to generate returns upon operation of project. Further, they have to secure more projects in that country in order to fully utilise the capital expenditure invested.

Although EXIM Bank also extends overseas project financing facilities to the Malaysian construction companies, it imposes limits on the country as well as the company. Companies can also seek funding from the Labuan International Offshore Financial Centre. Currently, funding from Labuan remains relatively low. In 2003, a total loan value of RM 547.2 million was extended to the construction sector which the amount is less than 8% of construction sector output in Malaysia.

iii. Remittance Stage

The local economy will derive financial benefits from the efforts of the contractors who have gone overseas when they repatriate profits and dividends. Due to capital control restrictions in some countries, contractors have encountered difficulties in repatriating profits and dividends.

Based on the foregoing opportunities and challenges in both local and international markets, the Malaysian construction industry needs to continuously enhance its value chain efficiency and effectiveness to be a total solution provider in the globalised environment. Ultimately, the industry needs to streamline its structure and ensure that entry requirements and performance of contractors are stringent enough to assess only those players capable of contributing value to the industry.

IBS contractor face difficulties to get loans from banks due to different method of payment to conventional construction. Conventional construction applied progress-based mechanism method of payment which are the payment will be made based on physical progress at site.

It will also be a challenge in the financial management of the projects in view of the increasing cost of diesel and raw materials, especially cement. This will affect in the production of precast concrete panels, floor slabs and the transportation of material and modules.

1.3 Problem Statement

The issue of payment in the construction sectors exist in five (5) stages which are Pre-Bidding, Bidding, Execution, Execution and Remittance. The problem encountered in the pre-bidding stage in terms of the difficulty in securing the letter of support from banks and it requires the feasibility studies while in the bidding stage the contractor facing the problem regarding timeframe to obtain the tender bonds.

During the execution stage which involve normal progress payment contracts, the problem encountered are in high security requirements such as back to back agreements, collateral and feasibility studies. Besides that, banks are not willing to issue long-dated guarantees which caused a cash flow mismatch. The execution stage for Build-Operate-Transfer contracts, it requires to appoint independent consultants to verify project economics and difficulty in repatriating profits / dividends due to restriction in some countries for foreign project in the remittance stage.

There are a lot of barriers of the implementation of IBS in Malaysia including high cost of entry, requirement for fully front-loaded supplier engagement and lack of confidence in the product quality and certification. The construction delivery methods used today are still mainly based on the traditional approach and procurement relationship. IBS construction typically follows the traditional approach start from client to consultant (architect and engineer) and to contractor contractual path, where the consultant and contractor remains distinct. Thus, the construction design is really only

tested for the buildability once teams are onsite rather than to start at the early stage and leads to the cost of rectifying mistakes. If the design changes, as well as the construction quality has defects, it can affect most favourable project delivery success. According to Love (2002), design-induced rework is purported to contribute to 70% of the total amount of rework on construction projects, with the total cost of rework amounting to 5% of total project costs.

The previous research has been made on IBS projects, but their focus is mostly related to product and process implementation from the perspective of IBS Manufacturers and Contractors. The research areas that have been covered among others are the barriers and implementation of IBS adoption (Kamar, Hamid, & Alshawi, 2009), critical success factors (Nawi, Lee, Kamar, & Hamid, 2012), supply chain (Kamar & Hamid, 2011) and IBS awareness and acceptance level among contractors. However, there is lack of research on procurement aspects in IBS projects.

As for now, there is no documented evidence for the solution of payment issue for IBS industry. Many of the past research did mentioned about the payment issue for the IBS industry, but there are no details about the payment issue related to procurement system and contract document. Ariffin et al. (2018) mentioned that in the construction project, the main parties involved with the process of construction are clients or developer, design consultants, contractors and manufacturers and suppliers. Each of the party involves have different involvement and responsibilities at different stages along the construction process. The parties involved in the payment flow are starting from client and appoint architect as the principal party. The architect will be working with Quantity

Surveyor and engineer. Architect will be prepared design and project specification. Then, architect will be preparing tender document to choose main contractor and sub-contractor to begin the construction at site. The flow of party's relationship in the construction project is explained as in the Figure 1.4.

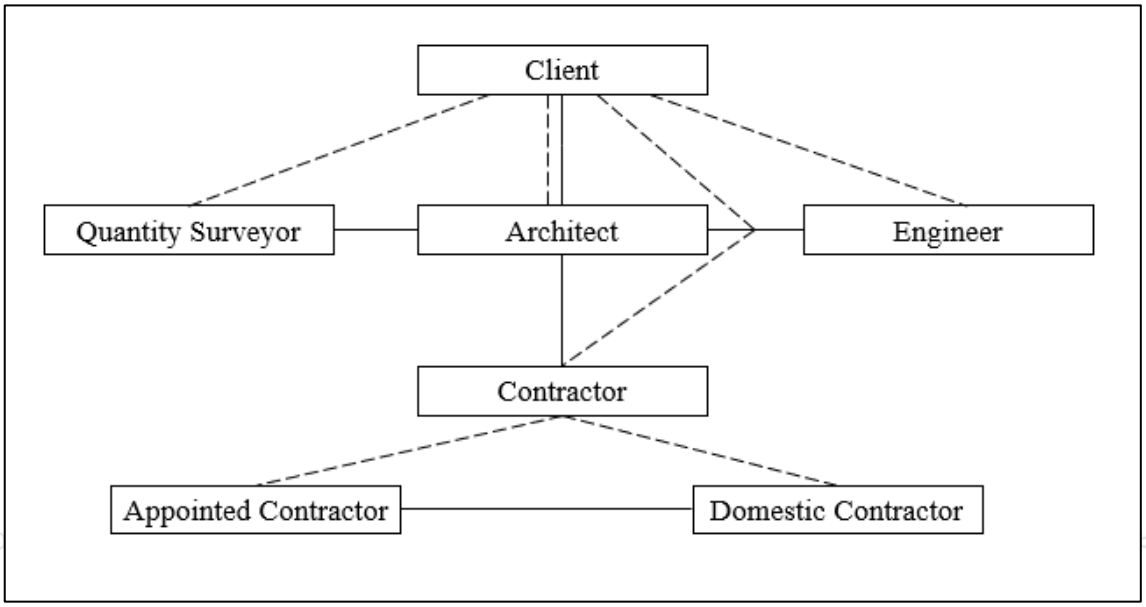

Figure 1.4 Relationship Between Client, Consultant and Contractor in Construction Project. Source: The Institute of Building (1979)

Since the current procurement method for the IBS construction follows the traditional construction, it brings an issue to the payment method for the IBS players. Through the usage of IBS, the construction at the site work are being completed simultaneously with the manufacturing process which led as to the overall time savings between 25% to 50%. The process between traditional and IBS construction is totally different and the time consumption is also different. Thus, the payment for the IBS should be revised and could not be according to progress since the manufacturing process has begun at the early phase of construction. CUP (1993) have argued that the allocation of

risk is central to the contract and procurement strategy. The amount of risk that each party will bear is largely attributed to the procurement strategy. This is illustrated in Figure 1.5. The procurement strategy and allocation of risk that has been developed has been used by many researchers in contract and procurement areas.

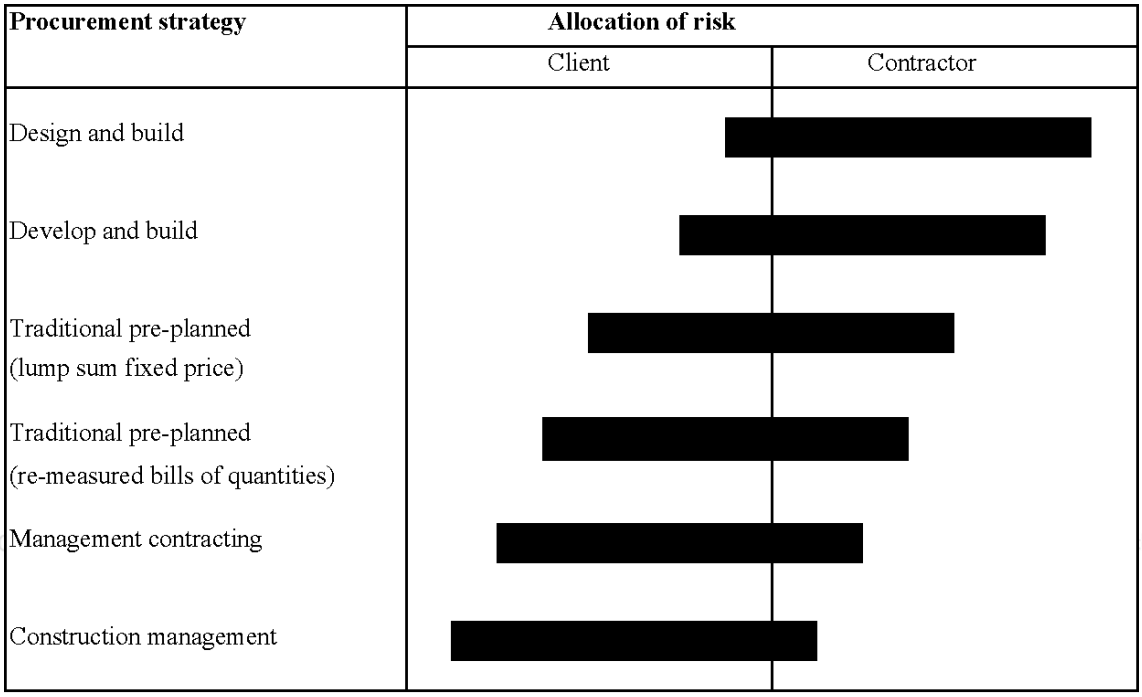

Figure 1.5 Procurement Strategy and Allocation of Risk. Source: CUP (1993)

The payment process for IBS project is still lacking because the current procurement and process is still following the traditional payment method which is based on the progress of the construction. The payment issue will cause delay to the project because of the initial cost to start the IBS project. Most of the local companies went bankrupt because of the payment issue. There is also an issue on re-design drawing which involves high cost in the project. Thus, with the new payment method introduced to the construction sector, to some extent can help in reducing the issue of payment for IBS project. This statement is also agreed by Jaafar and Radzi (2013) that the changes in

construction method should change the current procurement method. The unsuitable procurement method in IBS construction will not only affect the progress of the project but also affect the construction team in terms of understanding and interpretation of the regulation. Therefore, to resolve the payment issue of IBS industry especially between client and main contractor, this research investigated the payment issue of IBS contractor and provided the framework of new payment method through the analysis of Analytic Hierarchy Process (AHP) which would taking into consideration each weightage of the parameters.

AHP is the precise way to understand the influences over a period. The fundamental of AHP is using the pairwise comparison judgement in the scale matrix. The results of AHP application brings the mean of priority vector. AHP helps to have a rational for the critical and crucial decision making. As compared to other multi criteria decision making (MCDM), AHP is fundamentally a way to measure intangible factors by using pairwise comparison with judgements that represents the dominance of one element over another with respect to a property that they share (Whitaker, 2007). Zala and Bhatt (2011) was outlined some reasons of using AHP in the study as follows:

a. The ability of AHP to incorporate tangible and intangible factors in a systematic way.
b. It able to solve constructed problems in a variety of decision-making situation, ranging from the simple personal decisions to the complex capital-intensive decision.
c. The problem is broken down in a logical fashion from the large elements to smaller elements.

d. It works by examining judgments made by decision makers and measure the consistently of those judgments.

e. It does not require numerical judgment from the decision maker.

1.4 Aim and Research conclusion

The aim of the research is to provide the necessary information and model of the procurement system for Industrialised Building System (IBS) construction method. To achieve the above aim, the following objectives have been identified:

1) To identify and rank the payment issue for IBS project and factors influencing it.
2) To identify the criteria in the development of new payment procurement method for IBS project.
3) To incorporate criteria with decision maker preferences in deriving financial management framework for IBS project.

1.5 Research Questions

The main questions that would be answered in this research are as follows:

1) What are the payment issues for IBS project and factors influencing it according to ranking?
2) What are the criteria in the development of new payment procurement method for IBS project?
3) How the criteria in the development of new payment procurement method will derive into financial management framework for IBS project?

1.6 Theoretical Framework

In the supply chain management, there are eight (8) theories involved. The theories are Transaction Cost Economics, Network Perspective, Social Network Theory, Resource Based View, Principle-Agent Theory, Game Theory, System Theory and Strategic Choice Theory. Three theories related to this study are Game theory, system theory and strategic choice theory. After taking all the consideration related to the parameters in the study, the Game theory is chosen as the main theory used in this study.

First, transaction cost economics explains the objective of the firm's existence in the supply chain management context. It aims to reduce the costs associated with carrying out a transaction when deciding whether to make or buy. Three (3) attributes which influence a firm's decision to make or buy, frequency of transaction, asset specificity and degree of uncertainty associated with a transaction. In general, transaction cost economics theory argues that different control and governance mechanism should be employed to mitigate the risk of opportunities behaviour of supply chain firms when outsourcing. Second, network perspective theory argues that firms rely not only on their relationship with direct partners but with the extended network of relationships with the supply chain firms. It argues that competitive advantage can only be achieved efficiently and effectively through orchestrated network of supply chains. Therefore, the focus of the network perspective is to develop long term, trust-based relationship between supply chain firms in the supply networks.

Third, the social network theory looks at the behavioural and social aspects of many different relationship types, including firm to firm, individual to firm and individual to individual relationship. It helps to analyse these relationships from different perspectives such as technical, financial and social elements. Fourth, resource-based view theory believes that a firm's resources and capabilities are its most important assets. The primary concern of resource-based view is about obtaining access to another firm's core competencies to gain competitive advantage. Fifth, principle agent theory is concerned with the governance and control mechanism structure of firms to mitigate the chances of opportunism, conflicting interests and information asymmetry between the Principle (delegating authority) and the Agent. Contracts are used as governance and control mechanism whilst incentives are provided for meeting the minimum expected standards of principle.

Sixth, game theory is a strategic decision-making theory which looks at the conflicting and cooperative behaviours of two intelligent and rational decision makers for different scenario to help with the strategic decision making. Seventh, System theory brings together various components of a complex supply chain which are human, capital, information, materials and financial resources to form subsystem which is then part of a larger of supply chain or network. The theory argues that for a holistic perspective, system theory must be employed to understand the internal and external factors that shape an organisation's supply chain performance. The last theory, strategic choice theory relatively less explored theory due to difficulty and limitations in implementation. The focus of the strategic choice theory is to address strategic issues and political forces related to supply chain in contrast to functional approach regarding individual supply chain firms.

1.6.1 Game Theory

Game theory is theory under supply chain management system and under economics area. There are three (3) theories used in the industry's application which are Principle-Agent theory, Transaction Cost Analysis theory and Game theory. In this study, the most related theory is Game theory. Game theory is a strategic decision-making theory which looks at the conflicting and of cooperative behaviours of two intelligent and rational decision makers for different scenarios to help with the strategic decision making (Arnt Buvik, 2001). The game theory was established by mathematician John von Neumann & Oskar Morgenstern in 1944. The game theory is expanded applied in the social science and mainly used in the economics, political science and psychology. The theoretical framework is explained in Figure 1.6.

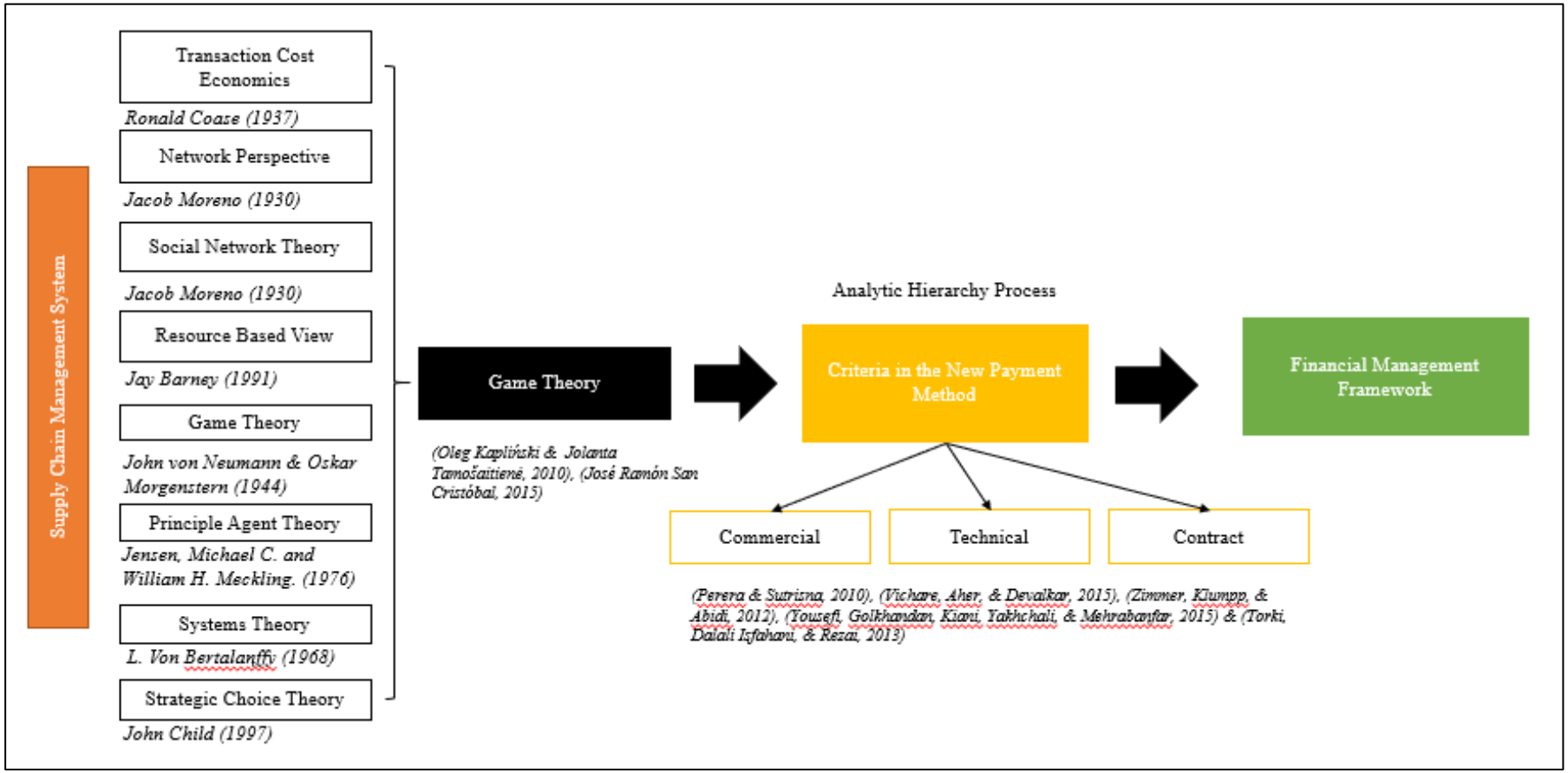

Figure 1.6 Theoretical Framework of the Study

1.7 Conceptual Framework

Figure 1.7 shows the conceptual framework of the study incorporated from the theory of game theory. The parameters involved in this study are generated from the literature review and validated in the focus group in the pilot study stage. The issues of payment in the IBS industry are divided into three categories which are Commercial, Technical and Contract. The criteria in developing the new payment method is derived from the payment issues in the IBS industry.

The new payment method is expected to solve the issue of project delay and technical argument. Besides that, it will also avoid hidden cost and to minimise the impact of variation order (VO). Most importantly, the objective to resolve these issues is sustain the IBS adoption in Malaysia.

The final output in this study is to develop the financial management framework from the criteria of new payment method. The financial management framework will have ranked from the most important criteria until the least important criteria. The financial management framework is validated by the industry player and decision maker. The variable from the conceptual framework is same with the actual study to strengthen the literature review from the previous researcher.

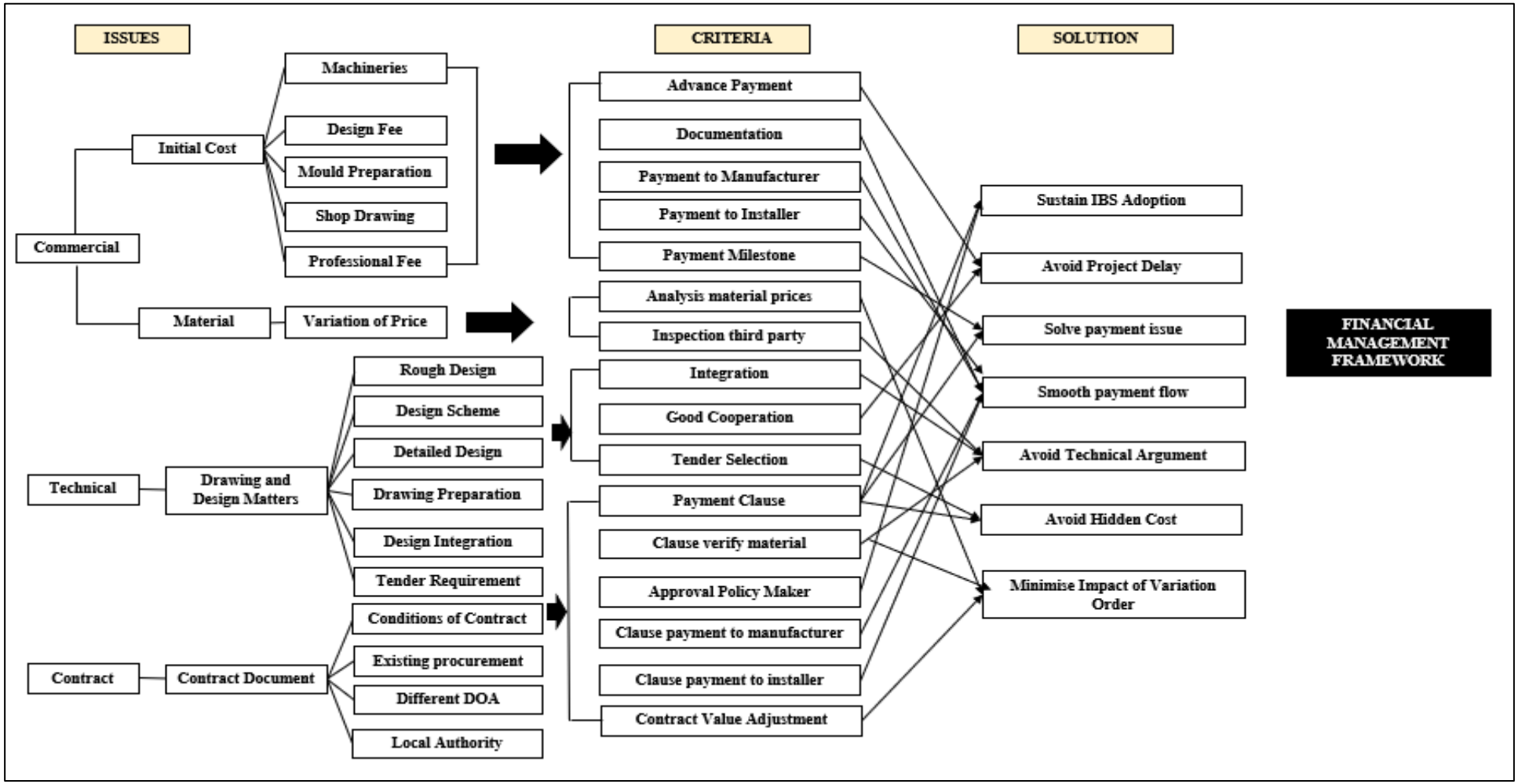

Figure 1.7 Conceptual Framework of the Study

1.8 Scope and Limitation of the Research

This research is focusing on the respondents involved in the IBS project which are project contractor, architect, manufacturer and consulting engineer. This research will be based on the IBS project within the Klang Valley area for year 2008 until 2013.

This research will be focusing on IBS project which including architect, contractor, consulting engineer and manufacturer. The respondents are chosen because they know the real situation and problem happen at site. The answer from the respondents will portray the results of this study through main method survey questionnaire followed by interview and focus group method data collection.

1.9 Significance of the Research

This study is expected to help the construction player especially who are involved in the IBS project to maintain their business with especially at the early stage of construction which involved huge capital investment for the IBS project. Besides that, this study might educate the client or policy maker to mention about IBS project in the construction contract. Therefore, in order to achieve the integration between policy maker and IBS construction player, it is crucial for CIDB and government to collaborate together to provide information and reference needed for the improvement of IBS project payment.

The findings will contribute to knowledge suited to financial management and construction industry management. The framework generated from this study will provide better solutions in terms of financial management for IBS player especially contractor towards the development of Malaysian construction industry. Therefore, a comprehensive study should be undertaken to propose a new strategy of payment method for IBS project. The framework generated from this study will provide a new method of payment of IBS project.

The main method used in this study is quantitative method through survey and supported by qualitative approach through interview and focus group. New criteria are developed from this study resulted from the literature review and data collection from the quantitative and qualitative approaches.

Financial management framework generated in this study could be applied to all IBS player especially contractors. This study enhances game theory which applied strategic decision making for different scenario. In this study, the parameters are divided into three (3) categories which are commercial, technical and contract. The Analytic Hierarchy Process (AHP) contains four (4) key criteria which are Initial Cost, Material, Drawing and Design Matters and Contract while the sub-criteria contains sixteen (16) sub-criteria developed through the focus group. The ranking of priorities to develop the new payment method is analysed through Analytic Hierarchy Process (AHP).

1.10 Operational Definition

1.10.1 Industrialised Building System (IBS)

CIDB defines IBS as a construction technique in which components are manufactured in a controlled environment (on or off site), transported, positioned and assembled into a structure with minimal additional site works. The IBS included precast concrete system, formwork system, steel framing, timber framing, block work and innovative system. IBS construction in this study involved the payment process between client to the related parties such as contractor, consultant, engineer and manufacturer.

1.10.2 Procurement

Procurement is the act of acquiring, buying goods, services or works from an external source. It is favourable that the goods, services or works are appropriate and that they are procured at the best possible cost to meet the needs of the acquirer in terms of quality and quantity, time, and location. Procurement is the process encompassing all activities associated with acquiring and managing the organisation's supply inputs. Supply chain management is the subset of procurement activities concerned particularly with the monitoring, management and development of ongoing supplier relationships and the associated flows of supply inputs.

Rogan, Lawson, and Bates-Brkljac (2000) defined procurement as the process by which the design is realised through a series of manufactured products before they are delivered to site, and assembled to create a functioning unit.

1.10.3 IBS Contractor

Contractor can be referred to as an organisation or individual that signs contracts with another organization or individual (the owner) for the construction of a building, road or other facility. IBS contractor referred in this study are the contractor who implement IBS in their project in Klang Valley from year 2008 until 2013.

1.10.4 Sub-contractor

Sub-contractor is an individual or business that signs a contract to perform part or all of the obligations of another's contract. The sub-contractor is normally appointed by the main contractor to doing work based on written contract.

1.10.5 Manufacturer

Manufacturer is a person, group, or company that owns or runs a manufacturing plant. In this study, the manufacturer stated is the IBS manufacturer registered with Construction Industry Development Board (CIDB).

1.10.6 Financial Institution

Institution which collects funds from the public and places them in financial assets, such as deposits, loans, and bonds, rather than tangible property.

1.10.7 Business

Firms and companies that have something in common in term of the products they make or sell, types of services they provide, types of customers they service, and the marketplace in which they compete. In this study, business is focuses on the IBS business in the IBS industry.

1.10.8 Supply chain

Supply chain in this study involved IBS contractors, IBS manufacturers, architects and consulting engineers. The supply chain in the IBS industry is the main party to execute the IBS project.

1.10.9 Financial Management

The traditional form of contracting is where the client appoints an architect or other professional to produce the design, select the contractor and to supervise the work through to completion (Franks & Harlow, 1984). The financial management in this study will focuses on the financial management to the IBS industry.

1.10.10 Analytic Hierarchy Process (AHP)

Analytic Hierarchy Process (AHP) is decision-aiding tools considering the large number of selection factors and alternatives. The selection factors in this study is the new payment method factors and alternatives for the IBS contractor, IBS manufacturer, architect and consulting engineer.

1.11 Summary

This chapter summarise the introduction of the whole research. This study aims to identify the payment issue for IBS player which are IBS contractor, IBS manufacturer, architect and consulting engineer. Besides that, critical criteria in the development of new payment method in procurement systems for IBS project are also identified in this study and to propose financial management model for IBS player. This study will help the construction player especially who are involved in IBS project to sustain their business through better new method of payment. This study will involve five chapters. Chapter 1 describes about the introduction of the study including the objectives to achieve in the study. Chapter 2 is Literature Review which includes previous research about the subject matter. Chapter 3 is Research Methodology which explains the methodology used in the research. Chapter 4 is the data analysis of the collected information from the survey method, interview and focus group. The final chapter of Chapter 5 is the main conclusion and recommendation of the study.