

THE IMPLEMENTATION OF INDUSTRIALISED
BUILDING SYSTEM (IBS) IN MALAYSIA FROM
ARCHITECTS' AND ENGINEERS' PERSPECTIVE

BY

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ABSTRACT

The Industrialised Building System (IBS) was initiated in Malaysia in the 1960s to cope with the increasing demand for housing in Malaysia. Since then, the Malaysian government has put great efforts to increase the usage of Industrialised Building System in Malaysia. As stipulated in Garis Panduandan Peraturan Perancangan Bangunan by UPE (2008) that starting from the year 2008 and above the public building projects must contain at least 70% of Industrialised Building System score. Despite the efforts, the implementation of Industrialised Building System is far from expectations. One of the reasons is found to be the perception of building industry players about Industrialised Building System. There are numerous studies on the perception of manufacturers, clients and contractors, but comparatively less studies on architects and engineers' perspective about Industrialised Building System. Therefore, this study is to evaluate the perception of architects and engineers about the issues and challenges in the implementation of Industrialised Building System at present and future implementation. The methodology used is the triangulation method where two methods qualitative and quantitative are used. The tools used were a questionnaire survey and semi-structured one-to-one interviews. 250 respondents responded the questionnaire survey which included 114 architects and 93 engineers. semi-structured interviews were held with 19 informants. The data gathered was analysed using descriptive and inferential manner. The questionnaire survey and interviews' findings indicate that the building industry players had a positive perception of the Industrialised Building System. They agreed that Industrialised Building System offers many benefits such as reduced labour, reduced construction time, less on-site wastage, reduction of reliance on the traditional construction method, reduction of air and noise pollution, reduction of maintenance cost and reduction of the overall cost. They also expressed positive responses that Industrialised Building System will be a cost-saving construction method in future, there will be faster construction and green development, less wastage, more skilled workforce, advanced technology, less labour, safer construction, and better quality products. Whereas, the stakeholders also agreed that despite these advantages, there are some hindrances which are the cause of less usage of Industrialised Building System, these are: skills shortage, lack of coordination among players, high initial cost, lack of awareness, lack of Research and Development, lack of knowledge, resistance from stakeholders to change, availability of cheap labour, failure in transfer of technology, and resistance from public.

مُلخَصُ البَحْث

أُنشئَ نظامُ المباني الصناعية (IBS) في ماليزيا في ستينيات القرن الماضي؛ لمواجهة الطلب المتزايد على الإسكان في ماليزيا، ومُذَّكَّ بذلت الحكومة الماليزية جهودًا كبيرة لزيادة استخدام هذا النظام، ونصَّ "دليل قواعد تخطيط العمران 2008" أنه بدءًا من 2008 يجب أن تحتوي نظم المباني العامة على 70% من نظام المباني الصناعية، وعلى الرغم من الجهود المبذولة ما زال تطبيق نظام المباني الصناعية بعيدًا عن المأمول، ومن أسباب ذلك ضعفُ إلمام القائمين على الصناعة العمرانية بنظام المباني الصناعية، وأيضًا؛ على الرغم من كثرة الدراسات العمرانية من منظور المصممين والمقاولين؛ تقلُّ الدراسات عن نظام المباني الصناعية، وأكثرها من منظور المهندسين والمعماريين، وعليه؛ يهدف البحث إلى تقييم تصورات المهندسين والمعماريين للقضايا والتحديات في تنفيذ نظام المباني الصناعية اليوم وفي المستقبل، وتوسُّل البحث المزج بين المنهجين الكمي والنوعي، فوُزِّعت استبانة على 250 مشاركًا منهم 93 مهندسًا و114 معماريًا، وأُجريت مقابلات شبه منظمة مع 19 خبيرًا، وجرى تحليل البيانات وصفيًا، وقد أشارت النتائج إلى أن لدى القائمين على الصناعة العمرانية تصورًا إيجابيًا عن نظام المباني الصناعية، فقد اتفقوا على أنه يوفر عددًا من الفوائد، من مثل انخفاض العمالة، واختصار وقت البناء، والحد من الهدر في الموقع، وترك طريقة البناء التقليدية، وخفضُ تلوث الهواء والضوضاء، والتوفير في تكلفة الصيانة والتكلفة الإجمالية، كما أعربوا عن استجابات إيجابية مفادها أن نظام المباني الصناعية سيكون في المستقبل أسرع إنجازًا، وأقل هدرًا وعمالة، وأجود إنتاجًا، وأكثر توفيرًا واستدامةً بيئيةً وتقدمًا تقنيًا وأمانًا، ولكنهم؛ على الرغم من هذه المزايا؛ اتفقوا على أن هناك بعض العوائق التي تؤدي إلى انخفاض استخدام نظام المباني الصناعية، من أهمها نقص المهارات، وضعف التنسيق بين القائمين على العمل، والتكلفة الأولية العالية، وقلة الوعي، وقلة البحث والتطوير وتوفر العمالة الرخيصة، والفشل في نقل التقانة، ومقاومة التغيير من العامة (المستخدمين).

APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion, it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a thesis for the degree of Master of Science (Built Environment).

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This thesis is dedicated to my beloved husband, Tulha Moaiz Yazdani, for encouraging me to achieve my goals in life with his full support.

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TABLE OF CONTENTS

Abstract	ii
Abstract in Arabic	iii
Approval Page	iv
Declaration	v
Copyright	vi
Dedication	vii
Acknowledgements.....	viii
List of Tables	xiii
List of Figures	xiv
CHAPTER ONE: INTRODUCTION	1
1.1 Introduction.....	1
1.2 Background Study	2
1.3 Statement of the Research Problem.....	4
1.4 Research Aim and Objectives.....	5
1.5 Research Questions.....	6
1.6 Research Methodology	6
1.7 Scope and Limitations of Research	9
1.8 Significance of the Study.....	10
1.9 Organisation of the Study	10
1.10 Conclusion	10
CHAPTER TWO: INDUSTRIALISED BUILDING SYSTEM (IBS) IN MALAYSIA.....	12
2.1 Introduction	12
2.2 Industrialised Building System (IBS)	12
2.2.1 History of IBS in Malaysia	12
2.2.1.1 Development in 1964 to 1970s.....	12
2.2.1.2 Development in 1970s to early 1980s	13
2.2.1.3 Development in 1980s to 1990s	14
2.2.1.4 Development in 1990s to 1998	16
2.2.1.5 Development in 1998 to 2008	17
2.2.1.6 Development in 2008 to 2011	19
2.2.2 Definition of Industrialised Building System (IBS)	21
2.2.3 Classifications of IBS	22
2.2.4 Advantages and limitations in the implementation of IBS	26
2.2.5 Present scenario in Malaysia	29
2.2.6 Government’s initiatives for the Promotion of Industrialised Building System in Malaysian construction industry	29
2.2.6.1 Construction industry Standards.....	30
2.2.6.2 IBS Content Scoring System	31
2.2.6.3 70% Mandatory ruling for Government project, 50% for Private projects	31
2.2.6.4 IBS Roadmaps	32

2.2.6.5 Best Practices in Malaysia	35
2.3 Conclusion	39
CHAPTER THREE: BUILDING INDUSTRY PLAYERS' PERCEPTION ABOUT INDUSTRIALISED BUILDING SYSTEM (IBS)	40
3.1 Introduction	40
3.2 Players Involved in Construction Process/Industry	40
3.3 Perception of Building Industry Players Towards Industrialised Building System (IBS).....	41
3.4 Previous studies	44
3.5 Conclusion	45
CHAPTER FOUR: RESEARCH METHODOLOGY	46
4.1 Introduction.....	46
4.2 Research Design	46
4.3 Research Approach.....	47
4.3.1 Triangulation.....	47
4.3.2 Mixed Methodology.....	49
4.4 Sources of Data Collection	50
4.4.1 Documents	51
4.4.2 Questionnaires Survey	51
4.4.3 Interviews.....	53
4.5 Research Instruments.....	53
4.5.1 Questionnaire	53
4.5.2 Interview	53
4.6 Conclusion	53
CHAPTER FIVE: DATA ANALYSIS AND FINDINGS	54
5.1 Introduction	54
5.2 Quantitative Analysis of Questionnaire Survey	55
5.2.1 Reliability of Data.....	55
5.2.2 Characteristics of the Respondents	56
5.2.3 Current Situation of Industrialised Building System (IBS)	58
5.2.3.1 Familiarity of Industrialised Building System (IBS)	58
5.2.3.2 The Implementation of Industrialised Building System	59
5.2.3.3 Types of Projects Undertaken by Architects and Engineers	61
5.2.4 Experience in IBS Implementation.....	62
5.2.4.1 Issues faced in the Process of Implementing Industrialised Building System.....	62
5.2.4.2 IBS Experience in Years	64
5.2.4.3 Popular Type of Construction among Building Industry Players	65
5.2.4.4 Familiarity with Modular Construction.....	67
5.2.4.5 Experience of Implementing Modular Construction.....	67
5.2.4.6 Challenges Faced When Implementing Modular Construction	68
5.2.4.7 Importance of Coordination Among Building Industry Players in the Implementation of Industrialised Building	

System	70
5.2.4.8 Motivational Factors Considered in Implementing IBS.....	71
5.2.4.9 Benefits of Using Industrialised Building System	73
5.2.4.10 Limitations in the Implementation of Industrialised Building System	75
5.2.5 Implementation of IBS for Housing.....	77
5.2.5.1 IBS – A Suitable Method for Mass Housing.....	77
5.2.5.2 Key Problems When Implementing IBS in Housing Projects	78
5.2.6 Government Policies in the Implementation of Industrialised Building System.....	81
5.2.6.1 Government Policies to be Retained for Implementing Industrialised Building System.....	81
5.2.6.2 Government Policies for Promoting IBS to other Building Industry Players	82
5.2.7 The Way Forward of Industrialised Building System (IBS).....	84
5.2.7.1 The Way Forward for IBS Implementation in Perception of Building Industry Players.....	84
5.2.7.2 Contributions / Benefits When Implementing IBS in Future.....	85
5.2.7.3 Construction Industry Transformation Plan 2016-2020.....	87
5.2.7.4 Difficulties in order to Comply with The Current Mandatory Ruling the 70% of Construction Work Shall be Industrialised Building System.....	88
5.2.7.5 Next Step for Industrialised Building System	91
5.2.7.6 Measures that can be Taken to Increase the Use of Industrialised Building System	93
5.2.7.7 Industrialised Building System Do It Yourself (IBS-DIY).....	95
5.3 Qualitative Analysis of Semi-Structured Interviews	97
5.3.1 Background Information of the Interviewees	99
5.3.1.1 Characteristics of the Interviewees.....	99
5.3.1.2 Work experience of the Interviewees	99
5.3.2 Experience in Industrialised Building System implementation.....	101
5.3.2.1 Issues in the Process of Implementation of Industrialised Building System	101
5.3.2.2 Benefits of Using Industrialised Building System	101
5.3.3 Implementation of Industrialised Building System for Housing	102
5.3.3.1 IBS- A Suitable Method for Mass Housing	102
5.3.3.2 Key Problems faced when implementing Industrialised Building System in Housing	103
5.3.4 Government Policies on implementation of IBS	103
5.3.4.1 Government Policies to be retained for Implementing Industrialised Building System	103
5.3.4.2 Government Policies for Promoting Industrialised Building System to other Building Industry Players	104
5.3.5 The Way Forward for Industrialised Building System	104
5.3.5.1 Difficulties in order to Comply with The Current	

Mandatory Ruling the 70% of Construction Work Shall be Industrialised Building System	105
5.3.5.2 The Way Forward for IBS Implementation in Perception of Building Industry Players	105
5.3.5.3 Next Step for Industrialised Building System	107
5.3.5.4 Measures that can be Taken to Increase the Use of Industrialised Building System	108
5.3.5.5 Architects' and Engineers' contribution in Improving the Design and Structural Aspects of IBS in Malaysia	109
5.3.5.6 Suggestions for other Building Industry Players to contribute through IBS to be in-line with the Countries who have Advanced in Industrialised Building System	110
5.3.5.7 Industrialised Building System Implementation in the year 2030 in Perception of Building Industry Players	111
5.3.5.8 Building Industry Players' (Interviewees') Contributions Through Industrialised Building System in future.....	111
5.3.5.9 Industrialised Building System Do It Yourself (IBS-DIY)	111
5.4 Conclusion	112
CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS	114
6.1 Introduction	114
6.2 Summary of the Study	114
6.3 Conclusion	119
6.4 Future Research	121
REFERENCES	122
APPENDIX A: QUESTIONNAIRE SURVEY	130
APPENDIX B: SEMI-STRUCTURED INTERVIEW	136
PUBLICATION	138

LIST OF TABLES

Table 1.1	The Matrix of the Research Framework	7
Table 2.1	Definition of Industrialised Building System	21
Table 2.2	Advantages of Industrialised Building System (IBS)	27
Table 2.3	Limitations in the Implementation of Industrialised Building System	28
Table 2.4	Project Survey Form - KLIA2	36
Table 2.5	Project Survey Form – Taylor’s College	38
Table 3.1	Stakeholders’ Perception For Industrialised Building System	42
Table 3.2	Precedent Studies with Similar Methods	44
Table 4.1	The two methodologies: a comparison (adapted from Naoum, 2004 and Sarantakos, 2013)	50
Table 5.1	Reliability Analysis Scale - Alpha	56
Table 5.2	Reliability Analysis Scale – Alpha, according to classification	56
Table. 5.3	Level of satisfaction	70
Table 5.4	Importance of coordination among the building industry players	71
Table:5.5	Benefits of using IBS in perception of Architects and Engineers	74
Table:5.6	Limitations in the implementation of IBS in perception of Architects and Engineers	76
Table 5.7	<i>t</i> -Test Results on Differences in Respondents between Architects and Engineers (N=204)	78
Table 5.8	Database of the interviewees	98
Table 6.1	Research Objectives and Research Questions	116

LIST OF FIGURES

Figure 1.2	Stages of the Research Process	8
Figure 2.1	Precast Concrete Panel System	23
Figure 2.2	Reusable Formwork System	23
Figure 2.3	Steel Framing System	24
Figure 2.4	Prefabricated Timber Framing System	25
Figure 2.5	Blockwork System	25
Figure 2.6	CITP Progress by Initiative P3 / 2017 / Q4	34
Figure 2.7	CITP Progress by Initiative P3/ 2018 / Q3	35
Figure 2.8	Aerial View of Kuala Lumpur International Airport2 (KLIA2)	37
Figure 2.9	Construction of the Aerobridge, KLIA2	37
Figure 2.10	Taylor’s College, Selangor	39
Figure: 4.1	Methodological Triangulation	48
Figure 5.1	Characteristics of the respondents	57
Figure 5.2	The popularity of Industrialised Building System (IBS) among building industry players in Malaysia	58
Figure 5.3	The usage of Industrialised Building System (IBS) among architects and engineers in Malaysia	59
Figure 5.4	Reasons of not using IBS (Architects and engineers’ responses)	60
Figure 5.5	Types of projects undertaken by architects and engineers in Malaysia	61
Figure 5.6	Did you encounter any problem in the implementation of IBS?	62
Figure 5.7	Problems faced by building industry players in the implementation of Industrialised Building System	63
Figure 5.8	Experience (in years) of using Industrialised Building System	65
Figure 5.9	Popular types of constructions used by architects and engineers	

	in Malaysia	66
Figure 5.10	Familiarity with the term Modular construction	67
Figure 5.11	Usage of Modular construction by building industry players	68
Figure 5.12	Did you encounter any problems when implementing Modular construction in your projects?	69
Figure 5.13	Challenges faced when using Modular construction method	70
Figure 5.14	Importance of coordination among the building industry players	72
Figure 5.15	Benefits of using IBS from Architects and Engineers' perspective	74
Figure 5.16	Limitations in the implementation of IBS from Architects and Engineers' perspective	77
Figure 5.17	Problems faced when using IBS for housing	80
Figure 5.18	Government policies to be retained for implementing IBS in Malaysian construction industry	82
Figure 5.19	Government policies in order to promote IBS to other building industry players in future	83
Figure 5.20	The way forward of IBS in Malaysian construction industry in perception of Building industry players	85
Figure 5.21	Benefits when implementing IBS in future	87
Figure 5.22	Opinion on the tagline of CITP being in-line with the CITP policy	88
Figure 5.23	Will you face any difficulty in order to comply with the current mandatory ruling that 70% of the construction work shall be Industrialised Building System?	89
Figure 5.24	What are the difficulties you will face in order to comply with the mandatory ruling 70% of the construction work shall be IBS?	90
Figure 5.25	Next step for IBS in Malaysian construction industry	92
Figure 5.26	Measures that can be taken to increase the use of Industrialised Building System	94
Figure 5.27	Promoting IBS will encourage people to IBS-DIY in future	96
Figure 5.28	Comments on will promoting IBS will encourage people to	

	IBS-DIY	97
Figure 5.29	Characteristics of the informants	99
Figure 5.30	Experience of the informants	100
Figure 5.31	Did you encounter any problem in the process of implementing IBS in your project?	101
Figure 5.32	Benefits of using IBS from building industry players' perspective	102
Figure 5.33	Government policies to promote IBS to other building industry Players	104
Figure 5.34	Would you face any difficulty in order to comply with the mandatory ruling that 70% of the construction work should be IBS for public projects and 50% for private projects?	106
Figure 5.35	The way forward of IBS in Malaysian construction industry	107
Figure 5.36	Next step for IBS in Malaysian construction industry to be in-line with countries who have advanced in using IBS in their construction industry	108
Figure 5.37	Measures that can be taken to increase the use of IBS in Malaysia	109
Figure 5.38	How building industry players can contribute through IBS to be in-line with the countries who have advanced in using Industrialised Building System	110
Figure 5.39	Do you think promoting Industrialised Building System will encourage people to achieve IBS-DIY in future?	112

CHAPTER ONE

OVERVIEW OF THE RESEARCH

1.1 INTRODUCTION

This chapter investigates the need for the study to evaluate the issues and challenges in the perception of building industry players about the Industrialised Building System (IBS). This chapter is intended to give an overview of the study to the readers. This chapter is composed of nine (9) parts. The first part discusses the research background, second part states the problem statement, third part presents the aim and objectives of this research, fourth part creates the research questions to address the objectives, fifth part presents the methodology which is adopted for this study, sixth part provides the scope and limitations of this study, seventh part provides the significance of the study, eighth part presents the organization of thesis, whereas the last part discusses the conclusion of this chapter.

1.2 BACKGROUND STUDY

Industrialised building System was initiated in the Malaysian construction industry in the 1960s. Malaysia's population was 30 million in 2015 and is estimated to grow by 2 million every five years (CIDB, 2016). As the population increases, the demand for housing increases. According to Ismail and Rahim (2009), a system architecture, which takes advantage of new technology could change the entire construction industry. However, the conventional method of construction is not efficient enough to cope with the increasing demand for housing. The construction industry has shifted its attention to mass production and prefabrication construction methods to fulfill the rapidly

growing need for housing. This strategy motivated Malaysian construction industry to analyse the industries from various countries who have achieved the implementation of prefabrication technology such as United Kingdom (UK), United States (US), Australia, Hong Kong and Singapore (According to Tuan Seik, 2001, PATH, 2002, Jaillon and Poon, 2009, Blismas and Wakefield, 2009a, Lovell and Smith, 2010, reported by Mohammad Nor et al, 2011). Prefabrication is not only about mass production but also delivering a unique product using a systematic approach (Gardiner, 2008).

One of the second largest economic sectors in many developing countries is the construction industry (Preece et al. 2011). The three broad activities in an industry namely residential building, non-residential building, and engineering construction. The main factors which play important roles in the residential building sector are the Government policies, the availability of skilled labour and building material resources. Mass House Building Projects (MHBPs) and a sustainable building model for developing countries are some of the initiatives which have been introduced within these factors, to provide affordable building structures (Ahadzie et al. 2008).

The Malaysian government has put great efforts to increase the usage of IBS in the Malaysian construction industry. As stipulated in “Garis panduan dan Peraturan Perancangan Bangunan” by UPE, (2008) starting from the year 2008 and above, the public building projects must contain at least 70% of IBS score (reported by Jabar, Ismail, & Abdul Aziz, 2018). Despite this effort and many advantages of IBS, its implementation is still far from the expectation. In line with Hamzah et al., (2010) IBS has not been effectively implemented in Malaysia despite having first introduced in the late 1960s.

A sustainable construction is described as a subset of sustainable development, which includes design, tendering, site planning, and organization, material selection,

recycling, and waste minimization (Langston and Ding, 2001). Whereas, a conventional construction method is the result of many factors which can be technological, social or financial (Rahim et al, 2012). It involves on-site work completely and is an unsustainable method as it always associates with poor quality and productivity, high risk of worker safety and high dependency on labours. Whereas prefabricated construction or IBS (Industrialised Building System) is a construction method which involves the off-site manufacturing of components in a factory-controlled environment which are then transported and assembled into a structure with limited work on construction site.

IBS is a sustainable method as the buildings are constructed in a short time span with significantly reduced on-site activities, which results in tremendous savings to the stakeholders. According to Ismail and Rahim (2009), factory manufactured components are easy to assemble on site, use less labour, faster to construct and are of high quality. This method benefits in cost-saving, minimizing on-site wastage, safety, high-quality work, cleanliness and neatness of on-site work and it also reduces dependency on manual foreign labours (Pan et al, 2012). Even though the uptake of IBS components acknowledged by the construction industry players but the percentage of its application of IBS is still below the national target (Hamid & Anuar Mohamad Kamar, 2012). It was due to several issues which created a barrier to IBS usage among the building industry players. This barrier leads to the less implementation of IBS in Malaysia.

Numerous scholars have highlighted various issues and challenges which are hindrances in the implementation of Industrialised Building System (IBS) in the Malaysian construction industry from contractors, buyers, clients and designers' perspective but there are very few studies on the perception of architects and engineers

about IBS. This study is to investigate the issues and challenges in the implementation of IBS from architects' and engineers' perspective.

1.3 STATEMENT OF THE RESEARCH PROBLEM

The construction industry of any country acts as a leading source of economic growth (Siti Syariazulfa Kamaruddin, Mohammad Fadhil Mohammad & Mahbub, 2016). The phases of a country's success are usually related to a high level of construction activities (Clough, Sears, & Sears, 2000). There are many different stakeholders involved in a construction process involving various processes, work phases and a great concern of participation from both the public and private sectors (Abdul-Aziz & Mohmad, 2010). Despite the potential of IBS, the adoption and uptake on IBS in the Malaysian construction industry are low (Musa, Mohammad, Yusof, & Mahbub, 2015).

Michaels (2000) defined perception (ecologically) as "the detection of information" whereas she defined action as a temporally bounded, observable, goal-directed movement (or non-movement) that entails intention, the detection of information, and a lawful relation between that information and the movement". This forces one to conclude that action and perception cannot be separated (Smeets & Brenner, 2001).

According to Jabar, Ismail, & Abdul Aziz (2018), despite many advantages offered by IBS implementation, the stakeholders still hold negative perceptions towards its applicability. These perceptions are one of the contributing factors to the low adoption of IBS in the Malaysian construction industry.

The reviewed literature identifies that there is numerous literature on the perception of Industrialised Building System from contractors's perception (Idrus. A, et al, 2008; Sadafi et al, 2011; Hassim, 2009; Pan et al., 2007; Nadim & Goulding, 2011;

Hamid et al., 2008; Kamar et al, 2012), buyers' perception (Edge et al, 2002; Pan et al., 2004; Hussein, 2007; Kamar et al, 2009; Sadafi et al, 2011), clients's perspective (Nawi et al, 2011; Boyd, et al., 2012; Idrus, A, et al, 2008; Kamar et. Al, 2009), and from designers' perspective (Rahman & Omar, 2006; Onyeizu et al, 2011; Sadafi et. Al, 2011; Nadim & Goulding, 2011; Madigan, 2012). Whereas, there is comparatively less research on the perception of architects and engineers particularly. Therefore, this study focused on the issues and challenges in implementing the Industrialised Building System from architects and engineers' perspective.

1.4 RESEARCH AIM AND OBJECTIVES

This research highlights issues and challenges in the perception of building industry players for the future application of Industrialised Building System (IBS) and Modular system in the Malaysian construction industry. To address this aim, the research explores the benefits and limitations of IBS, the perception of building industry players for IBS, their reaction to the mandatory rules of IBS score and the factors to be considered in order to promote and develop Industrialised Building System (IBS) in the Malaysian construction industry. In line with the research aim, the following objectives are outlined:

- To evaluate the perception of architects and engineers about the Industrialised Building System (IBS) in Malaysia.
- To identify the issues and challenges in the implementation of Industrialised Building System (IBS) and Modular construction (as part of IBS) in Malaysia from architects and engineers' perspective.

- To identify the measures that can be considered from architects and engineers' perspective in order to promote IBS in the Malaysian construction industry.

1.5 RESEARCH QUESTIONS

The following research questions are created as a guide to accomplish the research objectives:

- What is the perception of architects and engineers about IBS and its future in Malaysia?
- What are the issues and challenges faced by the architects and engineers in the implementation of IBS and Modular construction (as part of IBS) in their projects?
- How can architects and engineers be encouraged to use the Industrialised Building System in their future constructions?

1.6 RESEARCH METHODOLOGY

This study is based on qualitative and quantitative methods. A questionnaires survey and semi-structured interviews were conducted to identify the issues and challenges faced by building industry players (architects and engineers) in the implementation of IBS and to gather the experiences and thoughts of building industry players involved in the implementation of IBS in Malaysia. Interviews were also conducted to identify the contribution and recommendations of building industry players to promote IBS in Malaysia.

The questionnaires deal with the written comments from the respondents, whereas interviews allow informal communication between interviewer and the

interviewee whereby the respondents are able to express their opinions and provide information freely. Later the data was analysed using descriptive and inferential analysis to represent the findings. In the end, this research came up with relative findings and recommendations on the implementation of IBS in Malaysia. Table 1.1 shows the matrix of the research framework.

Table 1.1 The Matrix of the Research Framework

Research Aim	Research Objectives	Research Questions	Instruments	Method of Analysis
To highlight the issues and challenges in the perception of architects and engineers for future application of IBS in the Malaysian construction industry.	To evaluate the perception of architects and engineers about IBS.	What is the perception of architects and engineers about IBS and its future application in Malaysia?	Questionnaire and semi-structured interviews	Descriptive Analysis + Inferential Analysis
	To identify the issues and challenges in the implementation of IBS and Modular construction (as part of IBS) in Malaysia from architects and engineers' perspective.	What are the issues and challenges faced by architects and engineers in the implementation of IBS and Modular Construction (as part of IBS) in their projects?	Questionnaire and semi-structured interviews	Descriptive Analysis + Inferential Analysis
	To highlight the measures that can be considered from architects' and engineers' perspective in order to promote IBS in the Malaysian construction industry	How can architects and engineers be encouraged to use the Industrialised Building System in their future constructions?	Questionnaire and semi-structured interviews	Descriptive Analysis + Inferential Analysis

The research process is divided into 5 stages which are a research proposal, literature review, problem identification, data collection, data analysis and findings, and conclusion and recommendations (Figure 1.2). The literature is divided into 2 areas, such as, Industrialised Building System and building industry players' (architects and engineers) perception about Industrialised Building System (IBS).

The research process is divided into five stages

Figure 1.2 Stages of the Research Process

