

# IBS ADOPTION ON GOVERNMENT AND PRIVATE PROJECTS IN MALAYSIA 2019

CIDB Technical Publication No. : 212





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MALAYSIA

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# PREFACE

The Malaysian construction industry has continuously pushed for the mass adoption of an Industrialised Building System (IBS) as it will reduce reliance on cheap foreign labour while creating skilled jobs for locals. IBS can also reduce construction costs and increase safety while sustaining the quality of construction projects. IBS is not an unfamiliar subject in Malaysia. In 1999, the IBS steering committee was formed, and the IBS Strategic Plan was published by the Construction Industry Development Board Malaysia (CIDB). In 2003, the first roadmap known as the IBS Roadmap 2003-2010 was developed, followed by the IBS Roadmap 2011-2015 and Construction Industry Transformation Programme 2016-2020. CIDB Malaysia has also set up a one-stop reference centre for IBS, which began operations in January 2007.

In 2008, a new circular was issued by the government that mandated the use of IBS in government projects worth RM10 million and above to achieve a minimum IBS score of 70. Since 2018, the Ministry of Housing and Local Government has mandated the adoption of IBS in private projects worth RM 50 million and above to achieve a minimum IBS score of 50. This report identifies the level of IBS adoption in Malaysia for both government and private projects in the year 2019, and the data is analysed using two methods of data analysis – primary data analysis and secondary data analysis.

The primary data in this report was collected using a survey questionnaire, which was distributed to 500 respondents, including building contractors registered with CIDB. The main objective of the primary data analysis is to pinpoint the level of IBS adoption in both government and private sectors. It was found that only 36.1% of government projects and 33.1% of private projects are using IBS. The IBS scores among government projects range from an IBS score of 20 to 70, while private projects have achieved IBS scores that range between 30 and 70.

For the secondary data analysis, the data was collected from the Implementation Coordination Unit (ICU) and the Construction Industry Development Board Malaysia (CIDB). The aim of the secondary data analysis was to identify the level of IBS adoption among government sectors according to states, IBS score and project values. The secondary data analysis only involved building and federal government projects. The government data was analysed from 2008 until 2019, however this report is focusing on year 2019. Overall, from year 2008 until 2019, 82.2% of the IBS projects has achieved more than 70 IBS score while 17.8% achieved less than 70 IBS score with highest percentage on year 2014. Focusing on 2019, 68.0% of the IBS projects has achieved more than 70 IBS score which Melaka has achieved fully percentage. Meanwhile, 32.0% achieved less than 70 IBS score which Sarawak is the highest percentage of 76.7%.

For project value more than RM 10 million, Melaka and Negeri Sembilan achieved fully percentage achieved more than 70 IBS score. Overall, 78.2% has achieved more than 70 IBS score in 2019 with most of the projects has value between RM 450 million to RM 600 million. Surprisingly, for project value less than RM 10 million, 43.1% has achieved more than 70 IBS score.





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# EDITORIAL

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# ABBREVIATIONS

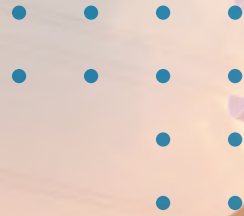
CIDB	Construction Industry Development Board
IBS	Industrialised Building System
ICU	Implementation Coordination Unit
SME	Small Medium Entrepreneur
DOSM	Department of Statistics Malaysia
COVID-19	Coronavirus disease 2019
RM	Ringgit Malaysia
SBG	Segmental Box Girder
R&D	Research & Development
CREAM	Construction Research Institute of Malaysia
JPM	Jabatan Perdana Menteri
CIS	Construction Industry Standard
MS	Malaysian Standard







# INTRODUCTION





# INTRODUCTION



The Malaysian economy recorded 17.1% from a marginal growth of 0.7% in the first quarter of 2020. The performance during this quarter was the lowest recorded since the fourth quarter of 1998 (-11.2%) (DOSM, 2020). This was most likely due to the devastating effects of the COVID-19 pandemic. The construction industry plummeted by a staggering 44.5%, implying that this sector was highly affected during the pandemic.

The construction industry will give a multiplier effect to the material production sector, equipment, and other services sectors. According to Mohammed & Ahmad (2002), the growth of the construction industry can be seen from the following aspects:

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

## IBS Chronicle in Malaysia

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. Due to the often unpleasant working conditions and the availability of cheap foreign workers, the majority of construction companies prefer to hire them over locals. In 2008, as part of the effort to reduce the dependency on foreign workers, the government initiated the implementation of the Industrialised Building System (IBS) to the construction industry. Every government project shall achieve at least 70% of the IBS component (CIDB, 2010). The chronology of IBS implementation is recorded in Figure 1.

The IBS Roadmap 2003 -2010 (CIDB, 2003) highlighted six (6) main IBS systems and components as shown in Table 1.

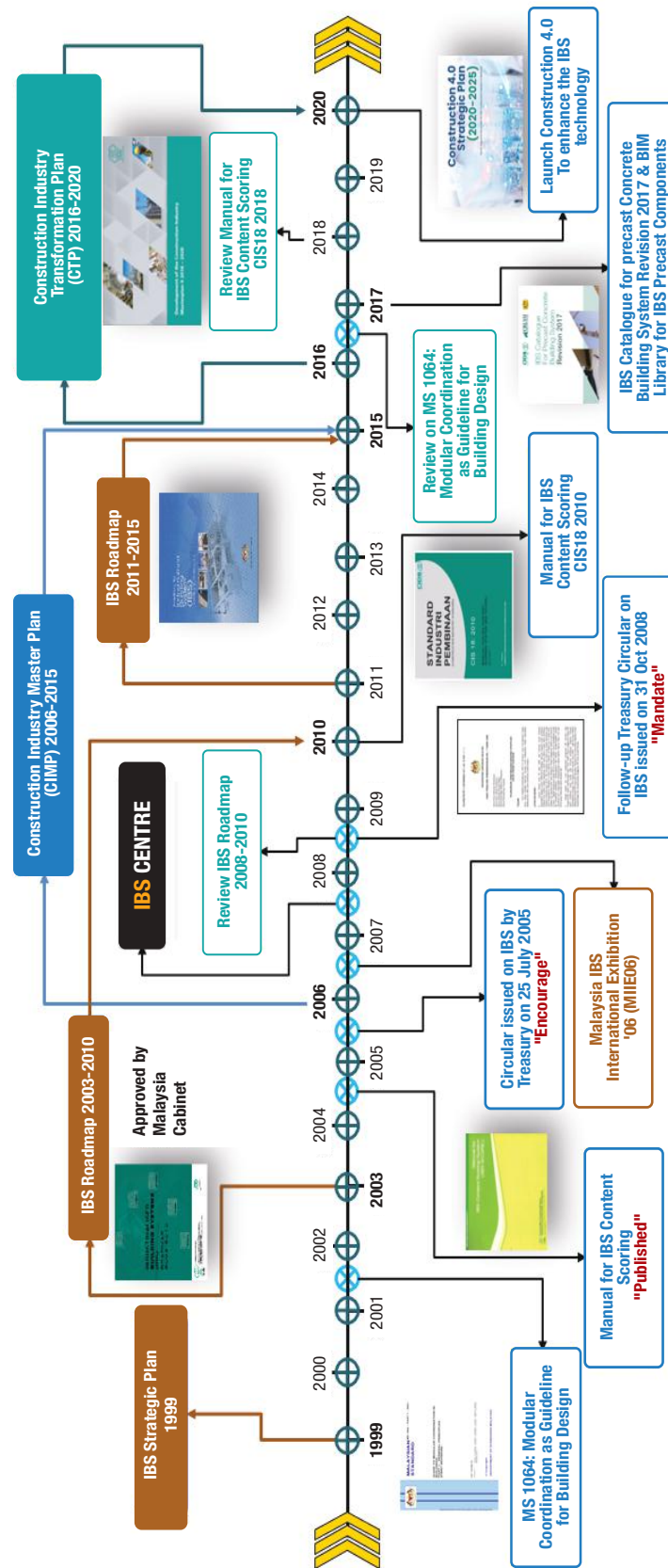


Figure 1: Chronology of IBS Implementation in Malaysia

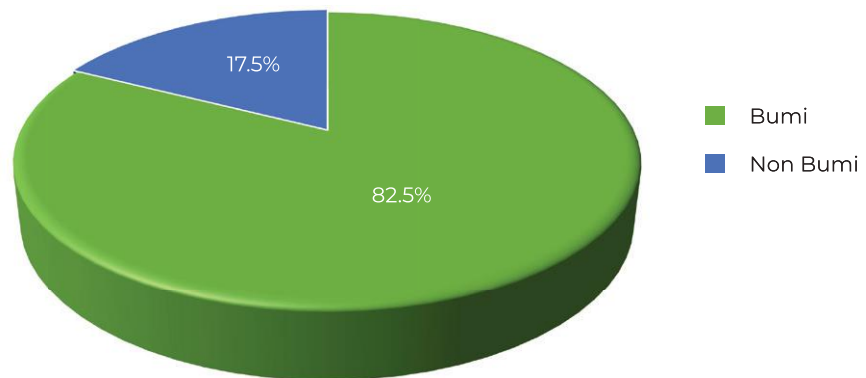
**Table 1:** Categorisation of System and Component of IBS

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.
Formwork	Column Beam Wall Slab	The common IBS used includes precast concrete elements, lightweight precast concrete and permanent concrete formwork.
Metal Framing	Column Beam Roof truss	Commonly used with precast concrete slab, metal 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.
Block Work	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	To classify new systems introduced in the Malaysian construction industry that do not belong in the five main IBS in the CIDB's IBS classifications (2003), CIDB introduced the innovative system to classify new and innovative systems in the IBS approach.



## Statistics of IBS Players in Malaysia

Statistics of IBS Contractors Registered with CIDB According to IBS System



Source: CIDB (October 2020)

**Figure 2:** Percentage of Bumi and Non-Bumi IBS Contractors

Figure 2 shows the percentage of Bumi and Non-Bumi IBS contractors in Malaysia. The majority (82.5%) of IBS contractors are Bumiputera contractors, while 17.5% of IBS contractors are Non-Bumiputera.



**Table 2:** Total Number of Bumi and Non-Bumi IBS Contractors Based on System and State

State	Total	B01: Precast Concrete System		B02: Metal Framing System		B19: Reusable Formwork System		B22: Blockwork System		B23: Timber Framing System	
		Bumi	Non Bumi	Bumi	Non Bumi	Bumi	Non Bumi	Bumi	Non Bumi	Bumi	Non Bumi
Selangor	<b>1,940</b>	340	86	1,024	264	35	18	129	18	19	7
W.P. Kuala Lumpur	<b>1,202</b>	187	70	543	289	20	19	56	10	6	2
Sarawak	<b>952</b>	271	185	266	145	16	8	42	12	7	0
Kelantan	<b>900</b>	353	15	404	27	6	1	86	2	6	0
Johor	<b>877</b>	131	15	556	89	19	1	52	1	13	0
Kedah	<b>701</b>	201	10	406	31	5	0	48	0	0	0
Pulau Pinang	<b>700</b>	110	4	464	85	1	2	29	2	3	0
Sabah	<b>666</b>	150	142	227	92	11	2	22	13	6	1
Pahang	<b>595</b>	85	7	429	42	4	1	24	1	2	0
Perak	<b>567</b>	145	13	275	40	9	2	63	3	16	1
Terengganu	<b>559</b>	89	3	406	30	8	0	10	0	12	1
Negeri Sembilan	<b>550</b>	231	9	221	35	4	0	46	0	4	0
Melaka	<b>387</b>	98	8	171	29	30	2	47	1	1	0
Perlis	<b>257</b>	62	2	164	7	1	0	19	0	2	0
W.P. Labuan	<b>20</b>	8	0	7	2	1	0	1	0	1	0
W.P. Putrajaya	<b>17</b>	8	0	8	1	0	0	0	0	0	0
<b>Total</b>	<b>10,890</b>	<b>2,469</b>	<b>569</b>	<b>5,571</b>	<b>1,208</b>	<b>170</b>	<b>56</b>	<b>674</b>	<b>63</b>	<b>98</b>	<b>12</b>

Source: CIDB (October 2020)

In the table above (Table 2), the total number of Bumi and Non-Bumi IBS contractors based on system and state are shown. Most (5,571) of the IBS projects using the Metal Framing System are by Bumiputera contractors, followed by 2469 IBS projects using the Precast Concrete System. Overall, the total number of IBS projects using these five systems is 10,890. The majority of the projects are implemented by Bumiputera contractors as compared to Non-Bumiputera contractors.

## Total Number of IBS Consultants

Table 3 shows the total number of IBS consultants, which include engineers, architects, and quantity surveyors. Most of the IBS consultants are engineers, followed by architects and quantity surveyors. The majority are based in Selangor, followed by Wilayah Persekutuan Kuala Lumpur. Overall, there are 49 IBS consultants all over the country.

**Table 3:** Total Number of IBS Consultants

State	Engineer	Architect	Quantity Surveyor	Total
Selangor	15	2	1	18
W.P. Kuala Lumpur	8	3	1	12
Sabah	3	0	2	5
Sarawak	4	0	0	4
Kedah	2	0	1	3
Negeri Sembilan	1	1	1	3
Johor	0	1	0	1
Kelantan	1	0	0	1
Terengganu	1	0	0	1
Pahang	1	0	0	1
Perak	0	0	0	0
Pulau Pinang	0	0	0	0
Perlis	0	0	0	0
Melaka	0	0	0	0
W.P. Labuan	0	0	0	0
W. P. Putrajaya	0	0	0	0
<b>Total</b>	<b>36</b>	<b>7</b>	<b>6</b>	<b>49</b>

Source: CIDB (October 2020)

## Statistics of IBS Manufacturer and Supplier

The statistics regarding IBS manufacturers and suppliers according to Bumi and Non-Bumi contractors are stipulated in Table 4 below. Most of the manufacturers and suppliers are Non-Bumi, with a percentage of 71.7% and 85.2% respectively.

**Table 4:** Statistics of IBS Manufacturers and Suppliers

Manufacturer	Bumi	82 (28.3%)	<b>290</b>
	Non-Bumi	208 (71.7%)	
Supplier	Bumi	4 (14.8%)	<b>27</b>
	Non-Bumi	23 (85.2%)	
<b>TOTAL</b>			<b>317</b>

Source: CIDB (October 2020)



The total number of IBS players based on state, system and Bumiputera status are shown in Table 5. Most of the manufacturers and suppliers are from Selangor, followed by Johor and Sabah. Contrary to the number of IBS contractors, most of the manufacturers and suppliers are Non-Bumi players.

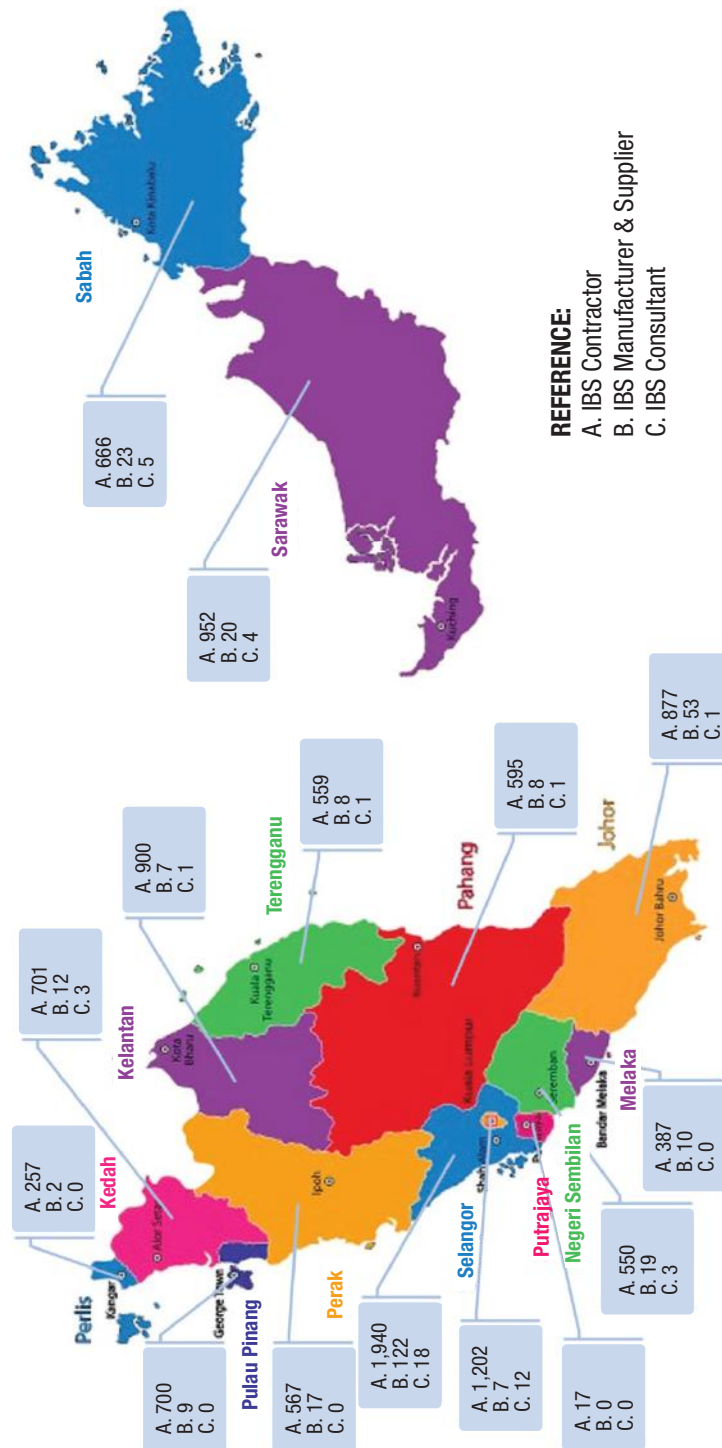
**Table 5:** Total Number of IBS Players Based on State, System and Bumiputera Status

State	Precast Concrete System				Reusable Formwork System				Metal Framing System						Timber Framing System			Blockwork System			Innovative System																			
	Precast		Onsite Precast		Formwork		Steel Structure			Metal Roof Trusses			Timber Frame			Blockwork			Innovative																					
	M	S	JUMLAH	M	S	JUMLAH	M	S	JUMLAH	M	S	JUMLAH	M	S	JUMLAH	M	S	JUMLAH	M	S	JUMLAH																			
SELANGOR	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi																		
	122	5	17	-	-	22	2	5	-	-	7	1	21	-	7	29	3	8	-	-	11	1	6	-	-	7	-	-	4	8	-	1	13	6	17	4	6	33		
	53	1	22	-	-	23	3	1	-	-	4	1	1	-	2	1	4	-	-	5	1	3	-	-	4	-	1	-	1	-	4	-	9	-	1	10				
SABAH	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi																		
	23	3	4	-	-	7	-	-	-	-	-	-	-	-	-	4	-	4	-	3	-	-	-	-	-	-	-	-	2	2	-	1	5	-	3	-	1	4		
	20	3	2	-	-	5	-	1	-	-	1	-	-	-	-	5	1	2	-	-	3	-	1	-	-	1	2	-	-	2	-	-	2	-	3	-	-	3		
NEGERI SEMBILAN	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi																		
	19	4	3	-	-	7	1	1	-	-	2	-	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	3	-	3	-	-	3		
	17	1	2	-	-	3	-	1	-	-	1	-	-	-	1	-	2	-	-	1	-	-	-	-	-	-	-	-	1	-	-	1	3	4	-	2	9			
KEDAH	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi																		
	12	3	1	-	-	4	-	-	-	-	-	1	-	1	2	-	2	-	2	-	1	-	-	-	-	-	-	-	1	-	-	1	1	1	-	-	2			
	10	1	2	-	-	3	-	1	-	-	1	-	-	-	-	1	-	1	-	2	1	-	-	1	-	1	-	1	-	2	-	-	2	-	-	-	-			
P. PINANG	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi																		
	9	-	2	-	-	2	-	-	-	-	-	2	-	2	-	2	-	1	-	1	1	1	-	-	-	-	-	-	-	1	-	1	-	1	-	-	1			
	8	1	1	-	-	2	1	-	-	-	1	-	-	-	-	-	1	1	-	2	-	-	-	-	-	-	-	-	-	1	2	-	3	-	-	-	-			
TERENGGANU	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi																		
	8	2	-	-	-	2	-	1	-	-	1	-	-	-	-	-	2	-	-	2	2	-	-	-	-	-	-	-	2	1	-	-	1	-	-	-	-			
	7	-	-	-	-	1	1	-	-	-	2	-	-	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2	3	-	-		
KELANTAN	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi	Bumi	Non-Bumi																		
	7	1	-	-	-	1	-	-	-	-	-	-	-	-	-	1	2	-	-	3	-	-	-	-	-	-	-	-	1	-	-	1	2	-	-	-	2			
	2	1	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
TOTAL	317	26	57	-	-	83	8	12	-	-	20	2	28	-	8	38	6	25	-	1	32	11	21	-	-	32	2	3	-	5	15	20	-	2	37	12	42	4	12	70

\* M – Manufacturer  
S – Supplier

## IBS Statistics: Contractors, Manufacturers & Suppliers and Consultants

Figure 3 shows the distribution of IBS players in Malaysia comprising contractors, manufacturers & suppliers, and consultants. Most of the IBS players in Malaysia are in Selangor, Kuala Lumpur and Johor Bahru.



**Figure 3:** Map of IBS Player in Malaysia

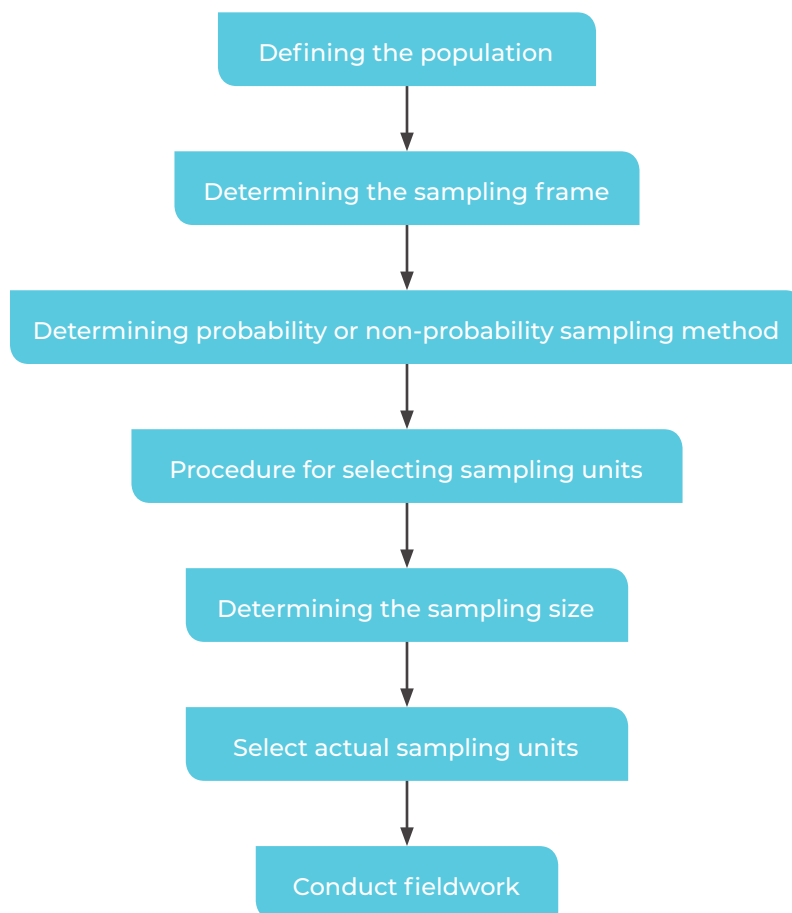




# RESEARCH METHODOLOGY

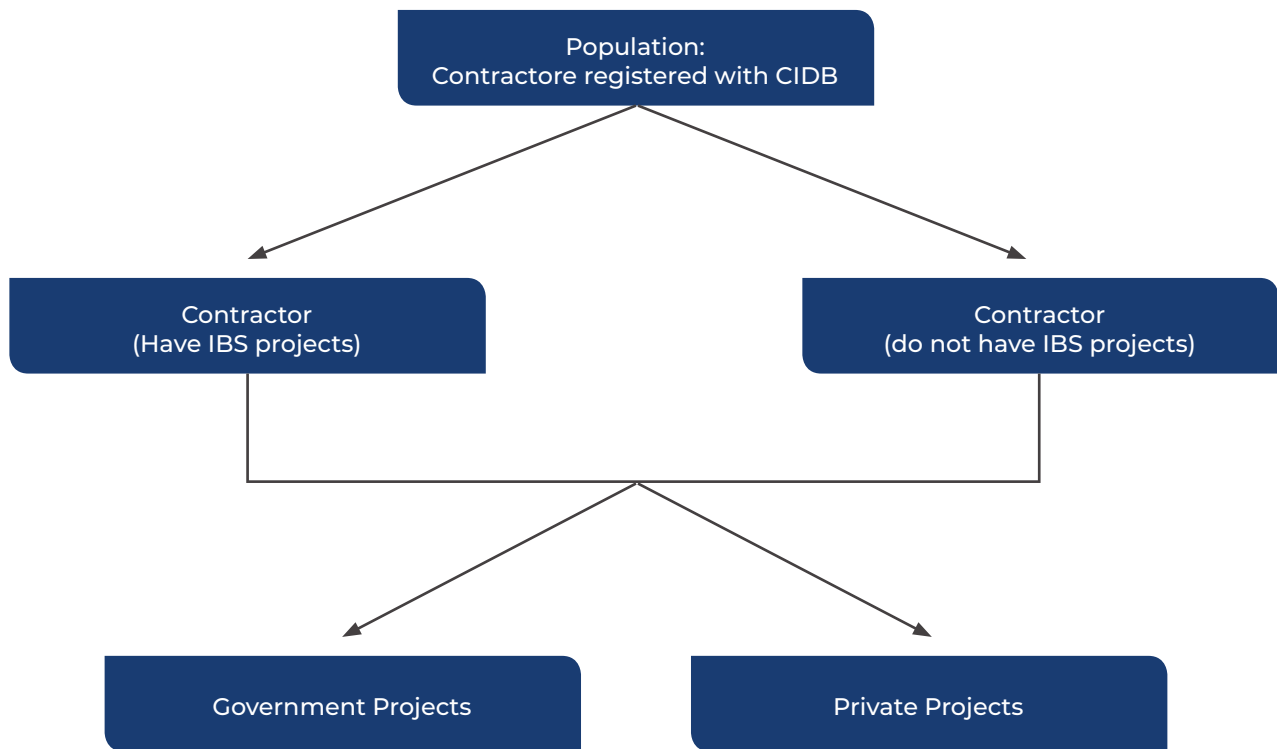
# RESEARCH METHODOLOGY

This research employed quantitative research, which was carried out by survey questionnaire and secondary data. The data was analysed using descriptive statistics including frequency, percentage, mean and cross-tabulation analysis. Simple random sampling was used in this research, where the population comprised the contractors registered with CIDB Malaysia. The flow of sampling is as follows:



**Figure 4:** Flow of Sampling

The population in this research consists of contractors registered with CIDB Malaysia. The respondents are contractors who either have IBS projects or do not have IBS projects. Both types of respondents have either implemented government or private projects or both.



**Figure 5:** Sampling Framework









# SECTION 1:

## SECONDARY DATA ANALYSIS (GOVERNMENT PROJECT)

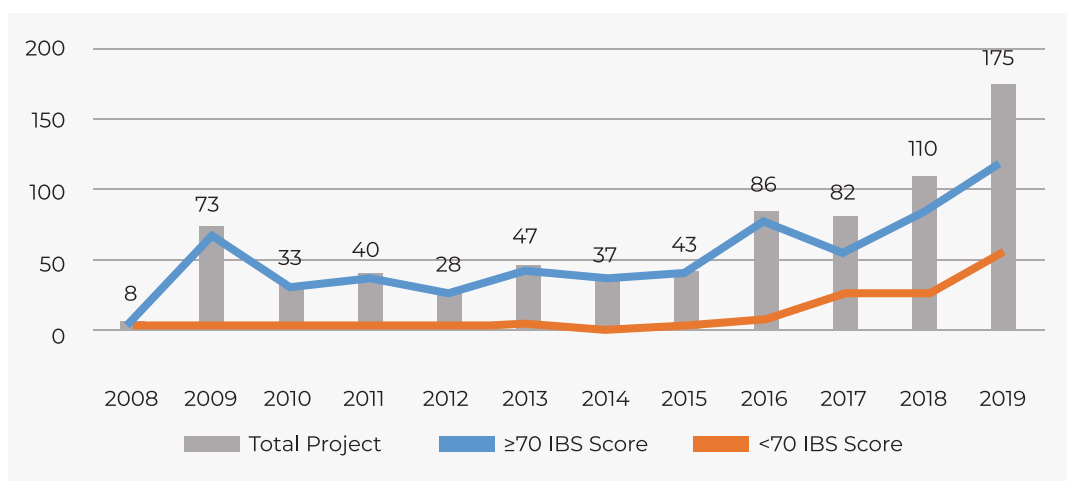


# SECTION 1: SECONDARY DATA ANALYSIS (GOVERNMENT PROJECT)

This section portrays the secondary data analysis gained from the Implementation Coordination Unit (ICU) and Construction Industry Development Board (CIDB) Malaysia. The ICU data are concerned with government projects, while the CIDB data are related to the numbers of contractors, manufacturers, installers, etc. The data was analysed to know the level of IBS adoption among the government sectors according to state, IBS score, project value, etc. The government project data was compiled according to the actual year the project started. The analysed data involved building projects and federal government projects only.

## 1.1 IBS Adoption for Government Projects from 2008 to 2019

### 1.1.1 Overall IBS Adoption from year 2008 to 2019



**Figure 1.1:** Government IBS Projects According to IBS Score from 2008 to 2019 (All Project Value)

Figure 1.1 shows the IBS projects in the government sector from 2008 until 2019 for all project value. The highest number of IBS projects was in 2019 with 175 projects, followed by 2018 with 110 projects.

Table 1.1 shows the total number of IBS projects according to IBS score from year 2008 to 2019. Beginning in 2005, all government projects have achieved an IBS score of more than 70 and with a high percentage, except in 2019. The highest percentage was achieved in 2014 at 100.0%, where 37 IBS projects achieved an IBS score of more than 70.

**Table 1.1:** Total Number of IBS Projects According to Score from 2008 to 2019 (All Project Value)

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
≥70 IBS Score (626)	7	71	31	38	26	42	37	40	77	54	84	119
% ≥70 IBS Score (82.2%)	87.5	97.3	93.9	95.0	92.9	89.4	100	93.0	89.5	65.9	76.4	68.0
<70 IBS Score (136)	1	2	2	2	2	5	0	3	9	28	26	56
% <70 IBS Score (17.8%)	12.5	2.7	6.1	5.0	7.1	10.6	0	7.0	10.5	34.1	23.6	32.0
<b>Total Projects (762)</b>	<b>8</b>	<b>73</b>	<b>33</b>	<b>40</b>	<b>28</b>	<b>47</b>	<b>37</b>	<b>43</b>	<b>86</b>	<b>82</b>	<b>110</b>	<b>175</b>

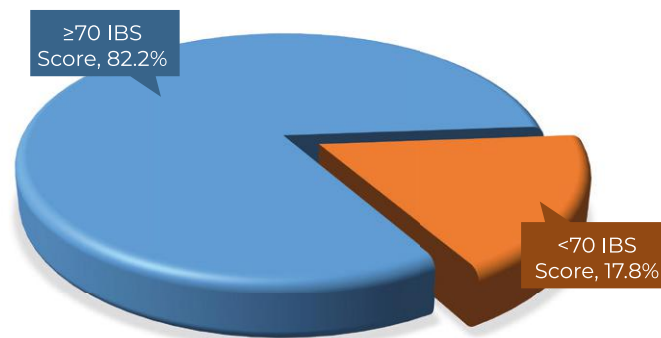
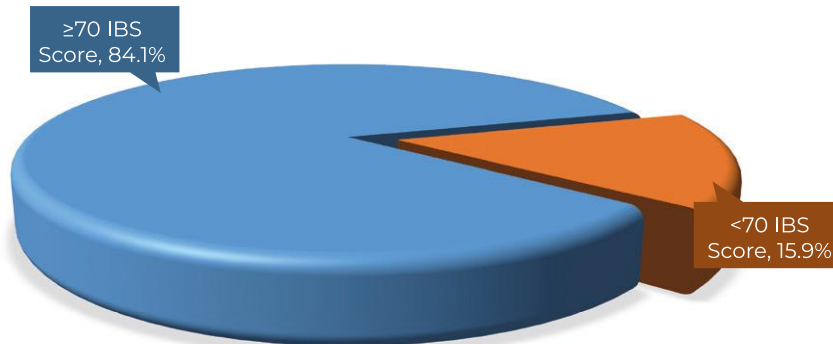
**Figure 1.2:** Overall Percentage of IBS Adoption According to IBS Score (All Project Value 2008-2019)

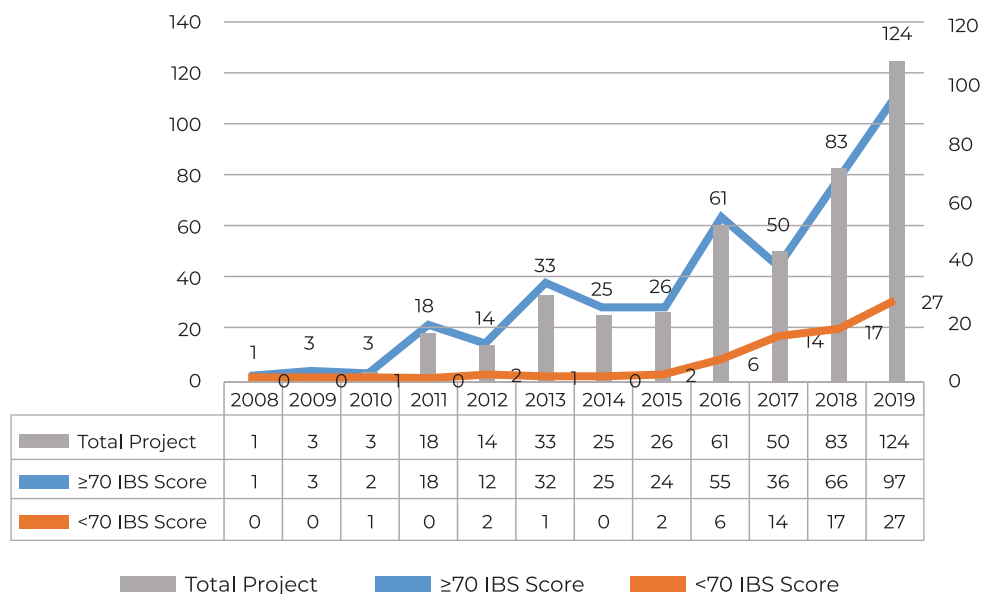
Figure 1.2 shows the percentage of IBS adoption in the government sector according to IBS score. Overall, 82.3% of government projects achieved an IBS score of more than 70, while 17.8% of government projects achieved an IBS score of less than 70.

### 1.1.2 IBS Adoption for Project Value More than RM 10 Million According to IBS Score from 2008 to 2019



**Figure 1.3:** Overall Percentage of IBS Adoption for Project Value More than 10 Million According to IBS Score (2008 – 2019)

Figure 1.3 shows the percentage of IBS projects for project value more than RM 10 Million and above from 2008 to 2019. Overall, 84.1% of the IBS project has achieved 70 and more IBS score while the balance of 15.9% achieved less than 70 IBS score.



**Figure 1.4:** Overall IBS Adoption for Project Value More than 10 Million According to IBS Score (2008 – 2019)

Figure 1.4 illustrates the number of IBS adoption for project value more than RM 10 million according to IBS score from 2008 until 2019. The total number of IBS projects value more than RM 10 Million is 441 from 2008 until 2019. Majority (97) of the projects achieved more than 70 IBS score is in 2019 followed by 66 projects in 2018. Meanwhile, for projects achieved less than 70 IBS score, the greatest number of projects are also in year 2019 and 2018.

Table 1.2 shows the number and percentage of government project for value of project more than RM 10 Million based on state from 2008 until 2019. Overall, most of the IBS projects come from Sabah with 66 projects. However, for projects achieved more than 70 IBS score, it was recorded that Melaka and Kedah is the highest percentage. While for projects achieved less than RM 10 Million, Sarawak recorded the highest projects followed by Sabah.



**Table 1.2:** Total Number of IBS Projects According to State and IBS Score for Project Value More Than 10 Million (2008 – 2019)

Year	Johor		Kedah		Kelantan		Melaka		Negeri Sembilan		Pahang		Perak		Perlis		Pulau Pinang		Sabah		Sarawak		Selangor		Terengganu		Wilayah Persekutuan		Multi-state	
IBS Score	≥70	<70	≥70	<70	≥70	<70	≥70	<70	≥70	<70	≥70	<70	≥70	<70	≥70	<70	≥70	<70	≥70	<70	≥70	<70	≥70	<70	≥70	<70	≥70	<70	≥70	<70
	11	3	5	2	9	4	6	0	6	0	7	1	8	1	4	1	5	1	9	6	4	3	10	3	7	1	5	1	1	0
2018	7	2	4	0	4	2	2	0	1	2	10	3	7	0	1	0	2	0	9	4	5	2	7	0	1	1	5	0	1	1
2017	12	1	0	0	1	2	1	0	1	0	1	0	4	1	0	0	1	2	7	6	2	1	3	0	3	0	0	1	0	0
2016	6	0	4	0	7	0	2	0	5	0	6	3	3	0	0	0	2	0	9	2	1	1	5	0	2	0	2	0	1	0
2015	0	1	3	0	2	0	1	0	1	0	2	0	2	0	0	0	2	0	9	0	0	1	0	0	1	0	1	0	0	0
2014	3	0	4	0	2	0	0	0	2	0	4	0	2	0	0	0	1	0	1	0	1	0	2	0	2	0	1	0	0	0
2013	6	0	4	0	0	0	1	0	0	0	1	0	2	0	1	0	1	0	2	0	4	1	6	0	0	4	0	0	0	0
2012	1	0	3	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	2	1	0	0	0	2	0	0	0	0
2011	3	0	2	0	4	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	1	0	2	0	0	0	1	0	1	0
2010	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
2009	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	49	7	30	2	34	8	13	0	16	2	36	7	29	2	6	1	15	3	48	18	18	12	36	3	16	2	21	2	4	1
%	87.5	12.5	93.8	6.3	81.0	19.0	100	0	88.9	11.1	83.7	16.3	93.5	6.5	85.7	14.3	83.3	16.7	72.7	27.3	60.0	40.0	92.3	7.7	88.9	11.1	91.3	8.7	80.0	20.0
Grand Total	56		32		42		13		18		43		31		7		18		66		30		39		18		23		5	

## 1.2 IBS Adoption for Government Projects in Year 2019

### 1.2.1 Overall IBS Adoption in Year 2019

Table 1.3 shows the total number of IBS projects for all project value according to state and the IBS scores for 2019. From the table, it is seen that Melaka is the highest (100.0%) projects achieved more than 70 IBS score followed by Pahang with 92.3%. Meanwhile, Sarawak shows the highest (76.7%) projects achieved less than 70 IBS score. Overall, 68.0% of the projects achieved more than 70 IBS score and 32.0% achieved less than 70 IBS score.

**Table 1.3:** Total Number of IBS Project According to State (All project Value, 2019)

State	Total Project	≥70 IBS Score	% ≥70 IBS Score	<70 IBS Score	% <70 IBS Score
Sarawak	30	7	23.3%	23	76.7%
Sabah	21	11	52.4%	10	47.6%
Johor	15	11	73.3%	4	26.7%
Kelantan	14	9	64.3%	5	35.7%
Pahang	13	12	92.3%	1	7.7%
Selangor	13	10	76.9%	3	23.1%
Perak	11	10	90.9%	1	9.1%
Kedah	11	9	81.8%	2	18.2%
Pulau Pinang	9	7	77.8%	2	22.2%
Terengganu	9	7	77.8%	2	22.2%
Melaka	8	8	100.0%	0	0.0%
Negeri Sembilan	8	7	87.5%	1	12.5%
Perlis	6	5	83.3%	1	16.7%
Wilayah Persekutuan	6	5	83.3%	1	16.7%
Multi-state	1	1	100.0%	0	0.0%
	<b>175</b>	<b>119</b>	<b>68.0%</b>	<b>56</b>	<b>32.0%</b>

### 1.2.2 IBS Adoption for Project Value More than RM 10 Million According to State

Table 1.4 shows the total number of IBS projects according to state for project value of more than RM 10 Million for the year 2019. On 31<sup>st</sup> October 2008, the government gazetted that all the government projects with a value of more than RM 10 Million must achieve an IBS score that is above 70. Overall, 78.2% of the projects achieved more than 70 IBS score while another 21.8% achieved less than 70 IBS score. Melaka and Negeri Sembilan recorded highest percentage (100.0%) which all the projects achieved more than 70 IBS score. Meanwhile, for projects achieved less than 70 IBS score, it shown that Sarawak and Sabah has the highest percentage with 42.9% and 40.0% respectively.

**Table 1.4:** Total Number of IBS Projects According to State for Project Value over RM 10 million, 2019

State	Total Project	≥70 IBS Score	% ≥70 IBS Score	<70 IBS Score	% <70 IBS Score
Sabah	15	9	60.0%	6	40.0%
Johor	14	11	78.6%	3	21.4%
Kelantan	13	9	69.2%	4	30.8%
Selangor	13	10	76.9%	3	23.1%
Perak	9	8	88.9%	1	11.1%
Pahang	8	7	87.5%	1	12.5%
Terengganu	8	7	87.5%	1	12.5%
Kedah	7	5	71.4%	2	28.6%
Sarawak	7	4	57.1%	3	42.9%
Melaka	6	6	100%	0	0.0%
Negeri Sembilan	6	6	100%	0	0.0%
Pulau Pinang	6	5	83.3%	1	16.7%
Wilayah Persekutuan	6	5	83.3%	1	16.7%
Perlis	5	4	80.0%	1	20.0%
Multi-state	1	1	100%	0	0.0%
	<b>124</b>	<b>97</b>	<b>78.2%</b>	<b>27</b>	<b>21.8%</b>

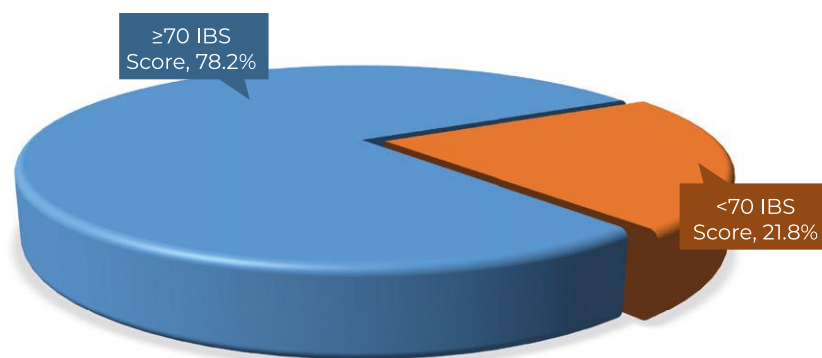
**Figure 1.5:** Percentage of IBS Project Value over RM 10 Million According to IBS Score

Figure 1.5 shows the percentage of IBS project value that is more than RM 10 million according to the IBS score. Overall, 78.2% of IBS projects achieved an IBS score over 70, while 21.8% did not achieve an IBS score over 70.

### 1.2.3 IBS Adoption According to Project Value (Project Value Over RM 10 Million in 2019)

Table 1.5 shows the total number of IBS projects whose value is more than RM 10 Million. From the table, it is shown that the largest IBS project is for value between RM 10 Million until RM 50 Million. Fully percentage for projects achieved more than 70 IBS score is for project value between RM 450 Million until RM 600 Million. However, for projects achieved less than 70 IBS score, the project value is between RM 250 Million until RM 300 Million.

**Table 1.5:** Summary Project Value for Project Over RM 10 million, 2019

Project Value, RM	Total Project	≥70 IBS Score	% ≥70 IBS Score	<70 IBS Score	% <70 IBS Score
10,000,000 - 50,000,000	83	73	88.0%	10	12.0%
50,000,001 - 100,000,000	23	14	60.9%	9	39.1%
100,000,001 - 150,000,000	5	2	40.0%	3	60.0%
150,000,001 - 200,000,000	5	3	60.0%	2	40.0%
200,000,001 - 250,000,000	3	2	66.7%	1	33.3%
250,000,001 - 300,000,000	1	0	0.0%	1	100.0%
300,000,001 - 350,000,000	0	0	0.0%	0	0.0%
350,000,001 - 400,000,000	2	1	50.0%	1	50.0%
400,000,001 - 450,000,000	0	0	0.0%	0	0.0%
450,000,001 - 500,000,000	1	1	100%	0	0.0%
500,000,001 - 550,000,000	0	0	0.0%	0	0.0%
550,000,001 - 600,000,000	1	1	100%	0	0.0%



#### 1.2.4 IBS Adoption According to Project Value (Project Value Less Than RM 10 Million in 2019)

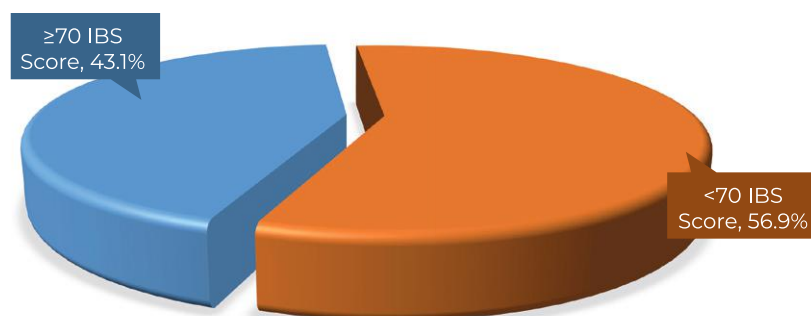
Table 1.6 shows the total number of IBS projects with a value less than RM 10 Million based on the state. Total number of IBS projects is 51 with most (23) of the projects come from Sarawak. Fully percentage of projects achieved more than 70 IBS score are from Pahang, Kedah, Melaka, Perak and Perlis. Johor, Kelantan and Terengganu recorded the highest percentage of projects achieved less than 70 IBS score.

**Table 1.6:** Summary Project Value for Project Less Than RM 10 million, 2019

State	Total Project	≥70 IBS Score	% ≥70 IBS Score	<70 IBS Score	% <70 IBS Score
Sarawak	23	3	13.0%	20	87.0%
Sabah	6	2	33.3%	4	66.7%
Pahang	5	5	100%	0	0.0%
Kedah	4	4	100%	0	0.0%
Pulau Pinang	3	2	66.7%	1	33.0%
Melaka	2	2	100%	0	0.0%
Negeri Sembilan	2	1	50.0%	1	50.0%
Perak	2	2	100%	0	0.0%
Johor	1	0	0.0%	1	100%
Kelantan	1	0	0.0%	1	100%
Perlis	1	1	100%	0	0.0%
Terengganu	1	0	0.0%	1	100%
Selangor	0	0	0.0%	0	0.0%
Wilayah Persekutuan	0	0	0.0%	0	0.0%
Multi-state	0	0	0.0%	0	0.0%
	<b>51</b>	<b>22</b>	<b>43.1%</b>	<b>29</b>	<b>56.9%</b>

### 1.2.5 IBS Adoption According to Project Value (Project Less Than RM 10 Million in 2019)

Figure 1.6 shows the percentage of IBS adoption for project values less than RM 10 Million according to the IBS score. From the chart, 56.9% of the IBS projects have an IBS score under 70, while the balance of 43.1% achieved more than 70 IBS score.



**Figure 1.6:** Percentage of IBS Adoption for Project Value less than RM 10 Million

Table 1.7 shows the total number of IBS projects for project value less than RM 10 Million. Majority (11) of the project value is ranging between RM 7 Million until RM 8 Million. However, for projects achieved more than 70 IBS score, most (100.0%) come from project value ranging from RM 9 Million and above. It is expected that most of the project for value less than RM 10 Million does not achieve 70 IBS score as shown in the table.

**Table 1.7:** Total Number of IBS Projects with Value less than RM 10 Million

Project Value, RM	Total Project	≥70 IBS Score	% ≥70 IBS Score	<70 IBS Score	% <70 IBS Score
< 1,000,000	8	4	50.0%	4	50.0%
1,000,001 - 2,000,000	1	0	0.0%	1	100.0%
2,000,001 - 3,000,000	6	5	83.3%	1	16.7%
3,000,001 - 4,000,000	3	0	0.0%	3	100.0%
4,000,001 - 5,000,000	7	4	57.1%	3	42.9%
5,000,001 - 6,000,000	5	4	80.0%	1	20.0%
6,000,001 - 7,000,000	6	0	0.0%	6	100.0%
7,000,001 - 8,000,000	11	3	27.3%	8	72.7%
8,000,001 - 9,000,000	2	0	0.0%	2	100.0%
9,000,001 - 9,999,999	2	2	100.0%	0	0.0%

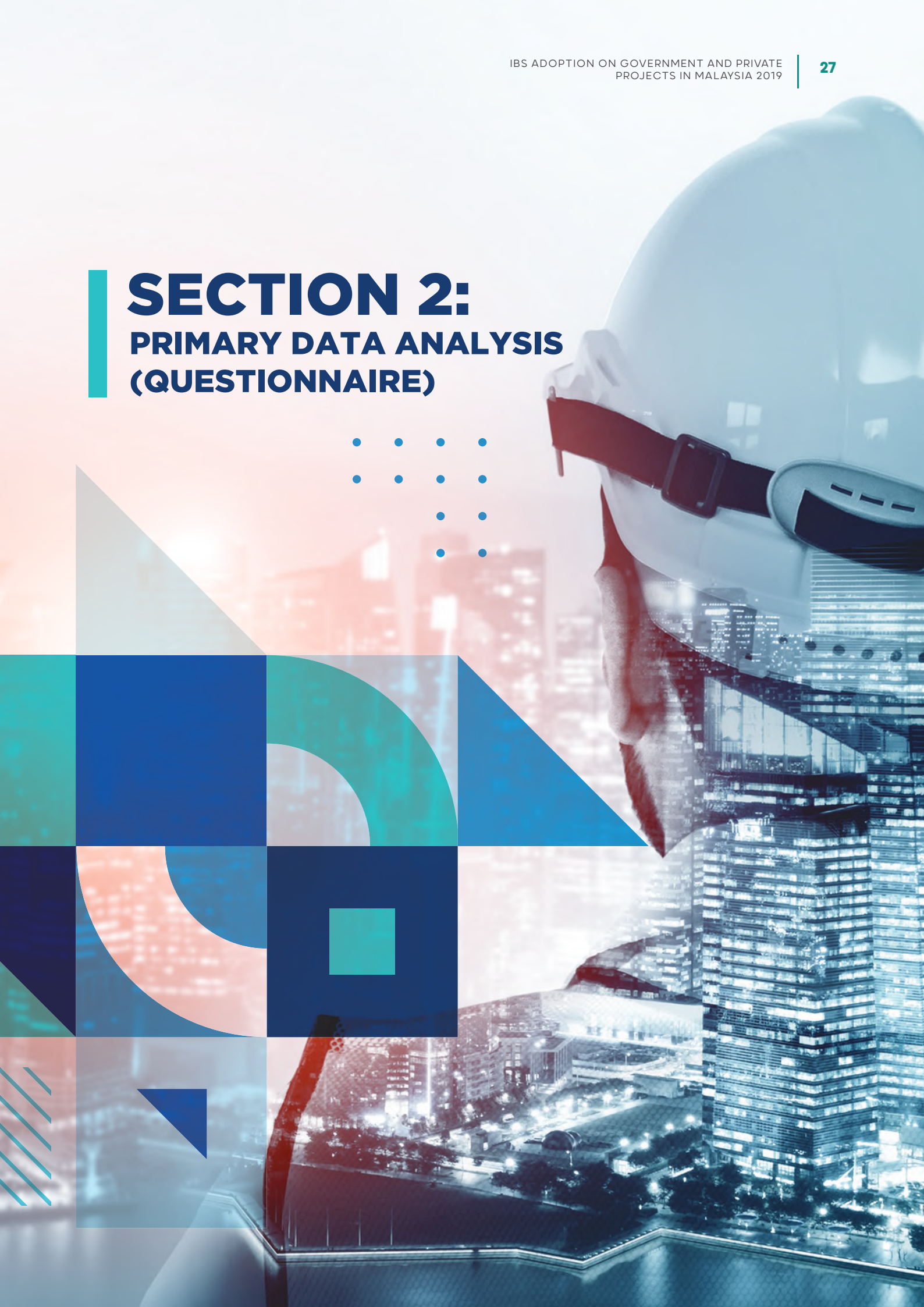








## SECTION 2: PRIMARY DATA ANALYSIS (QUESTIONNAIRE)



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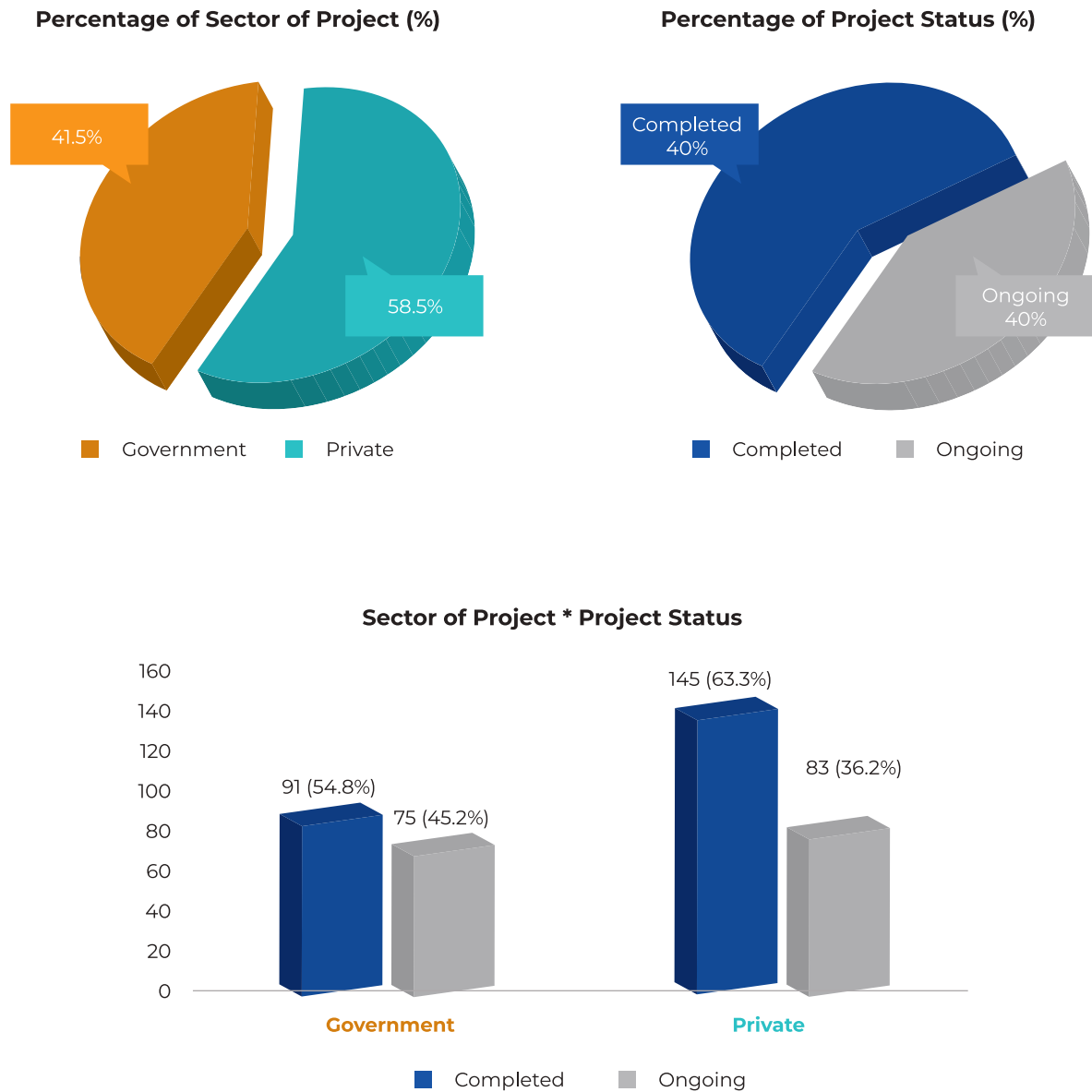
This section involves the analysis of a survey questionnaire for 500 respondents including building contractors registered with the Construction Industry Development Board (CIDB) Malaysia. The questionnaire was distributed to gain responses regarding the IBS adoption in both government and private sectors.





## 2.1 IBS Adoption Survey Analysis

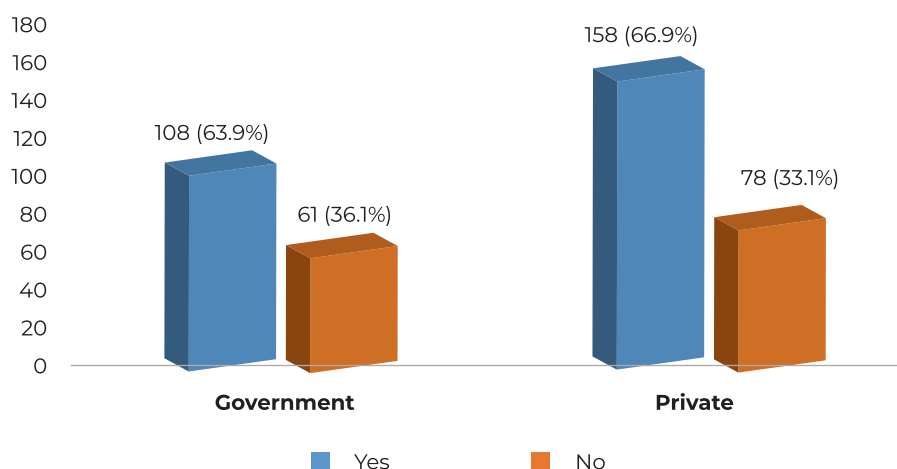
### 2.1.1 Percentage of Sector of Project with Project Status



**Figure 2.1:** Percentage of Projects by Sector with Project Status

Figure 2.1 shows the percentage of projects by sector and the corresponding project status. The project sectors are divided into government and private, while the project status is either completed or ongoing. The results show that most of the projects are private projects, with 63.3% completed projects and 36.2% ongoing projects. For government projects, 54.8% are completed, and 45.2% are ongoing.

### 2.1.2 Project Sector using IBS



**Figure 2.2:** Project Sector Using IBS

Figure 2.2 shows the percentage of project sectors that use IBS. Overall, 36.1% of government projects use IBS, while about 33.1% use IBS in private projects.

### 2.1.3 Project Sector with IBS Score and Project Status

The IBS Score according to project sector and project status is depicted in Table 1. The IBS score for government projects range from IBS scores of 20 to 70. Most of them come from completed projects. Only one project has a 20 IBS score and 40 IBS score in ongoing projects, while most of them scored a 30 IBS score with 9 completed projects and 4 ongoing projects. For the 50 IBS score, 5 projects are completed projects while 2 projects are ongoing. The IBS score of 70 has 5 projects, of which 4 are completed projects and 1 is still ongoing.

The IBS score for private projects ranges from an IBS score of 30 to 70. Only one project achieved an IBS score of 70 for a completed project. 23 projects scored an IBS score of 30, of which 6 of them are completed projects and 17 are ongoing projects. 4 completed projects and 8 ongoing projects scored an IBS score of 50.

**Table 2.1:** Project Sector with IBS Score and Project Status

Sector	IBS Score	Completed	Ongoing	Total
Government	20	0	1	1
	30	9	4	13
	40	0	1	1
	50	5	2	7
	70	4	1	5
<b>Total</b>		<b>18</b>	<b>9</b>	<b>27</b>
Private	30	6	17	23
	50	4	8	12
	70	1	0	1
<b>Total</b>		<b>11</b>	<b>25</b>	<b>36</b>



#### 2.1.4 Project Value According to Project Sector and Project Status

Table 2.2 shows the percentage of project value according to project sector and project status. In the government projects, 20.1% of completed projects have a project value less than RM 1 million. 21.3% completed projects have a project value of more than RM 1 million and less than RM 10 million. For projects of RM 10 million and above, 14.0% are government projects. Ongoing projects show that 11.0% of the government projects have a value less than RM 1 million, 17.1% have a project value of RM 1 million and above and less than RM 10 million, and 16.5% have project value RM 10 million and above in completed projects.

In private projects, 19.6% have a project value of less than RM 1 million of completed projects, 32.0% have a project value of RM 1 million and above, and less than RM 10 million and 12.4% have a project value of RM 10 million and above in completed projects. For ongoing projects, 7.1% have a project value less than RM 1 million, 12.0% have project value of RM 1 million and above and less than RM 10 million and 16.9% have a project value of RM 10 million and above.

**Table 2.2:** Project Value According to Project Sector and Project Status

	Project Value	Government		Private	
		Frequency	Percentage (%)	Frequency	Percentage (%)
<b>Completed</b>	< RM 1 million	33	20.1	44	19.6
	≥ 1 million and < RM 10 million	35	21.3	72	32.0
	≥ RM 10 million	23	14.0	28	12.4
<b>Ongoing</b>	< RM 1 million	18	11.0	16	7.1
	≥ 1 million and < RM 10 million	28	17.1	27	12.0
	≥ RM 10 million	27	16.5	38	16.9
<b>TOTAL</b>		<b>164</b>	<b>100.0</b>	<b>225</b>	<b>100.0</b>

### 2.1.5 Project Value According to Project Sector and IBS Usage

The project value according to project sector and IBS usage is illustrated in Table 2.3 below. Only 31.5% of government projects with a project value of less than RM 1 million used IBS in their project, while 33.3% of the IBS projects have a project value between RM 1 million and RM 10 million. 46.0% of government projects with a value of more than RM 10 million used IBS.

For private projects, 25.8% of the projects that used IBS have a project value of less than RM 1 million. 21.6% of the IBS projects have a project value of RM 1 million and above and less than RM 10 million and 59.1% have a project value above RM 10 million using IBS.

**Table 2.3:** Project Value According to Project Sector and IBS Usage

Project Sector	Project Value	Using IBS		Total
		No	Yes	
Government	< RM 1 million	37 (68.5%)	17 (31.5%)	54
	≥ 1 million and < RM 10 million	42 (66.7%)	21 (33.3%)	63
	≥ RM 10 million	27 (54.0%)	23 (46.0%)	50
Private	< RM 1 million	46 (74.2%)	16 (25.8%)	62
	≥ 1 million and < RM 10 million	80 (78.4%)	22 (21.6%)	102
	≥ RM 10 million	27 (40.9%)	39 (59.1%)	66

### 2.1.6 Project Value with IBS Score

The Table below (Table 2.4) represents the project value with the corresponding IBS Score. For projects with a value less than RM 1 million, 12 projects have an IBS score of less than 70, while only 2 projects have an IBS score of 70. 9 projects have an IBS score less than 70 for project values between RM 1 million and RM 10 million, and only 3 projects have an IBS score of 70. The majority of the projects have a project value of more than RM 10 million at 35 projects, while only 1 project scored an IBS score of 70.

**Table 2.4:** Project Value with IBS Score

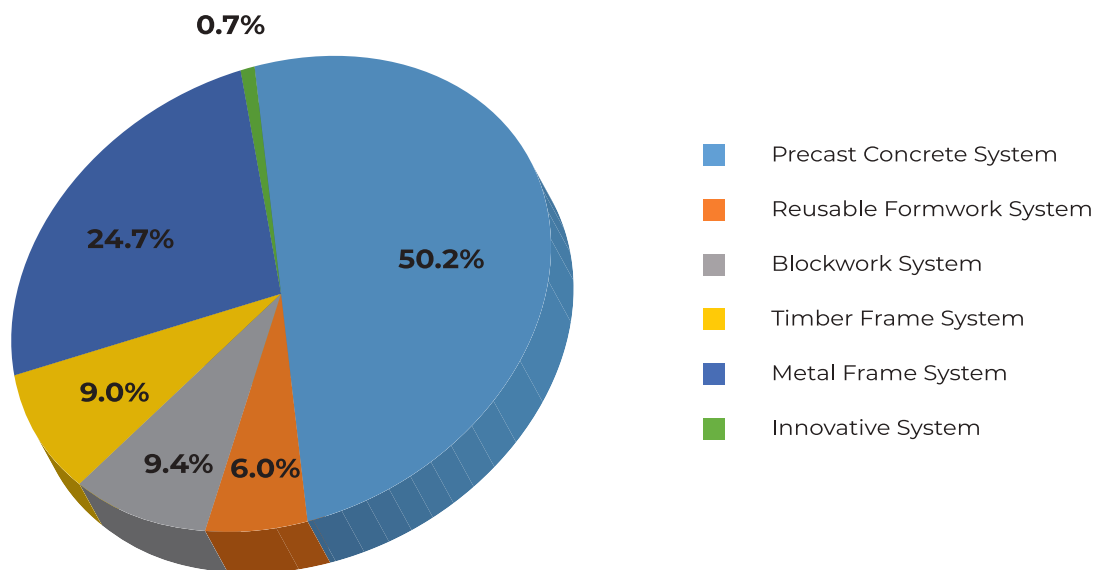
Project Value	IBS Score				
	20	30	40	50	70
< RM 1 million	1	9	1	2	2
≥ 1 million and < RM 10 million	0	5	0	4	3
≥ RM 10 million	0	22	0	13	1

### 2.1.7 Percentage of IBS System Usage

Table 2.5 and Figure 2.3 show the percentage of IBS System usage in the respective projects. Most (50.2%) of the IBS system usage is precast concrete system, followed by the metal framing system (24.7%). 9.4% are from the blockwork system, 9.0% are timber framing system, and 6.0% are from the reusable formwork system. The remaining 0.7% are from the innovative system.

**Table 2.5:** Percentage of IBS System Usage

IBS System	Frequency	Percentage (%)
Precast Concrete System	134	50.2
Reusable Formwork System	16	6.0
Blockwork System	25	9.4
Timber Frame System	24	9.0
Metal Frame System	66	24.7
Innovative System	2	0.7
<b>Total</b>	<b>267</b>	<b>100.0</b>



**Figure 2.3:** Percentage of IBS System Usage

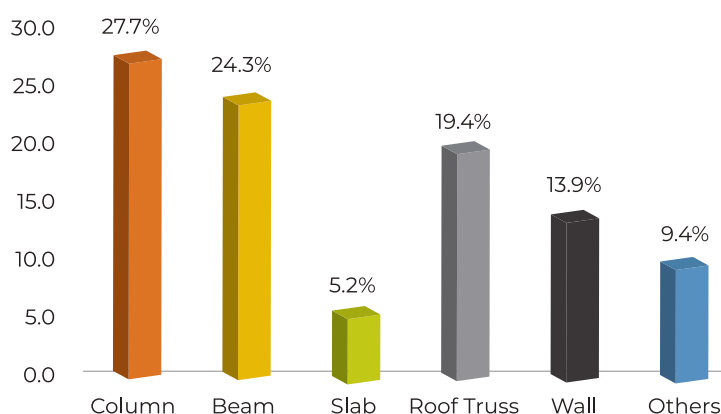
### 2.1.8 Percentage of IBS System Usage According to Project Sector

The percentage of IBS System usage according to project sector is described in Table 2.6 below. In both sectors, most of the IBS system usage is the precast concrete system, followed by the metal framing system.

**Table 2.6:** Percentage of IBS System Usage According to Project Sector

Sector	IBS System						Total
	Precast Concrete System	Reusable Formwork System	Blockwork System	Timber Frame System	Metal Frame System	Innovative System	
Government	67 (57.8%)	9 (7.8%)	11 (9.5%)	9 (7.8%)	19 (16.4%)	1 (0.9%)	116
Private	69 (44.2%)	10 (6.4%)	14 (9.0%)	14 (9.0%)	48 (30.8%)	1 (0.6%)	156
<b>Total</b>	<b>136</b>	<b>19</b>	<b>25</b>	<b>23</b>	<b>67</b>	<b>2</b>	<b>272</b>

### 2.1.9 Percentage of IBS Component Usage



**Figure 2.4:** Percentage of IBS Component Usage

Figure 2.4 shows the percentage of IBS component usage for both sectors. The most common (27.7%) component usage is Column, followed by Beam at 24.3%. Roof truss usage is at 19.4%, followed by wall at 13.9%. The least used component is slab with 5.2%. Others as mentioned in the survey are Beam, drainage system (u-drain & box culvert), frame, modular mobile space, Pier/ Large Diameter column, precast beam & U-beam, precast u-girder, segmental box girder (SBG), staircase, steel structural works, structural system, and wall cladding.



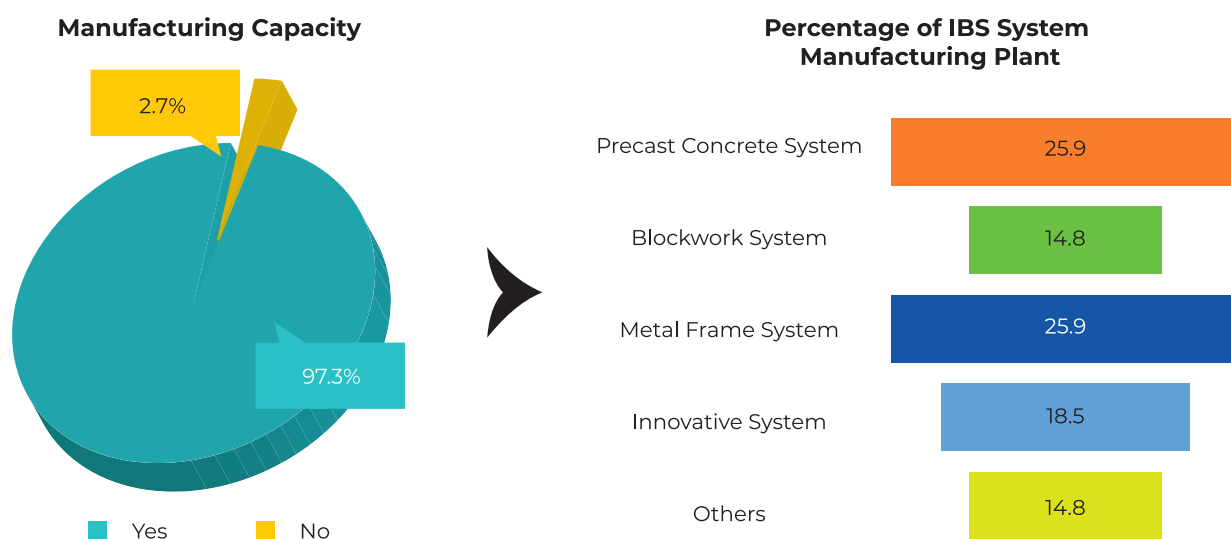
### 2.1.10 IBS Usage According to Number of Projects and Project Status

IBS usage according to number of projects and project status is illustrated in Table 2.7 below. The number of projects range from no project (0) to 10 or more projects. The total number of projects that are not using IBS for both government and private sectors is 258 projects. A total of 61 government sector projects use IBS is 61, where most (27) of them are for 1 to 2 projects. For the private sector, 40 projects are using IBS. The total number of projects using IBS is 139 projects. Overall, 167 projects are government projects, while another 228 projects come from private projects. The Total number of projects is 397.

**Table 2.7:** IBS Usage According to Number of Project and Project Status

Using IBS	No. of Project	Project Status		Total
		Government	Private	
No	None	41	77	118
	1 to 2 projects	42	36	78
	3 to 5 projects	16	30	46
	6 to 9 projects	6	9	15
	10 or more	1	0	1
	<b>Total</b>	<b>106</b>	<b>152</b>	<b>258</b>
Yes	None	2	1	3
	1 to 2 projects	27	40	68
	3 to 5 projects	22	28	50
	6 to 9 projects	5	5	10
	10 or more	5	2	8
	<b>Total</b>	<b>61</b>	<b>76</b>	<b>139</b>
Total	None	43	78	121
	1 to 2 projects	69	76	146
	3 to 5 projects	38	58	96
	6 to 9 projects	11	14	25
	10 or more	6	2	9
	<b>Total</b>	<b>167</b>	<b>228</b>	<b>397</b>

### 2.1.11 Percentage of Manufacturing Capacity



**Figure 2.5:** Percentage of Manufacturing Capacity with IBS System Usage

As illustrated above, Figure 2.5 represents the percentage of manufacturing capacity with IBS System usage. The majority (97.3%) mentioned that they do not have manufacturing capacity, while the balance of 2.7% has manufacturing capacity. The IBS systems for those having manufacturing capacity mostly (25.9%) come from the precast concrete system and metal framing system. 18.5% are the form innovative system, and the remaining 14.8% are from the blockwork system and other systems, respectively.

### 2.1.12 Readiness to Implement IBS

Table 2.8 shows the percentage of readiness to implement IBS. For the Technical Skill & Expertise part, the majority are not ready in terms of capacity of project manager or engineer, and IBS installation operator in conducting IBS projects. Besides that, most of them do not have enough machinery and equipment at the construction site to conduct IBS projects.

However, in terms of knowledge and experience, most of the respondents have exposure to IBS, understand the system used in IBS projects well, and how it is implemented. They also understand the IBS scoring system.

In terms of commercial drivers, most of the respondents are ready to include IBS in the procurement process, and have intentions to use IBS for future projects. However, one of the items which IBS perceived as a core competency within the company is considered unacceptable for the majority (64.5%) of respondents.

**Table 2.8:** Percentage of Readiness to Implement IBS

	Yes	No
<b>Technical Skills &amp; Expertise</b>		
Does your company have enough project managers or engineers to conduct IBS projects?	33.6%	66.4%
Does your company have enough IBS installation operators to conduct IBS projects?	25.9%	74.1%
Does your company have enough machinery and equipment ( <i>at the construction site</i> ) to conduct IBS projects?	20.6%	79.4%
<b>Knowledge &amp; Experience</b>		
Have members of your staff had any training or exposure to IBS?	68.0%	32.0%
Do you understand each system used in IBS projects well and how it is implemented?	61.1%	38.9%
Do you understand the IBS scoring system?	50.7%	49.3%
<b>Commercial Drivers</b>		
Is IBS perceived as a core competency within your company's business?	35.5%	64.5%
Was IBS considered during the procurement process?	56.5%	43.5%
Does your company intend to use IBS more frequently in future projects?	61.2%	38.8%

### 2.1.13 Benefits of Using IBS

Table 2.9 demonstrates the benefits of using IBS with mean and ranking. The benefits of IBS are divided into six (6) categories, which are time, cleanliness & neatness, better product quality, cost, social benefits, and productivity. In the Time category, the higher mean (4.06) goes to 'off-site production can start while the construction site is under earthworks' and followed by 'Faster completion due to advance off-site production by simplified installation process' (4.01).

There are four items in the category Cleanliness & Neatness. The highest mean (4.08) was scored by safety and health on site assurance, followed by the Just-in-Time concept for material delivery (4.03). Besides that, ranked at number 3 (3.98) is the reduction of waste materials at site, and the lowest mean (3.92) goes to the reduction on construction material at site.

There are 3 items in the Better Product Quality category. The highest mean (3.84) is for 'skilled worker with specific scope of works improves efficiencies and reduces errors during manufacturing process,' followed by 'Unaffected by weather element due to controlled environment of casting area' (3.76). The lowest mean (3.75) is 'High quality-controlled products due to controlled environment in factory with strict quality assurance, better material selection and using high mechanized technology'.

In the Cost category, there are four items, where the highest mean (3.83) is 'Reducing on-site workers significantly reducing labour cost for contractors,' followed by 'Minimizing cost of transferring waste material due to quality control during manufacturing process and reducing waste material' with a mean of 3.70. Third place (3.64) goes to 'Cost efficiency through repetitive usage of moulds for different types of projects,' and the lowest mean (3.49) is 'Reduced maintenance cost for end-users'.

The highest mean (3.89) in the category of Social Benefits is 'Sustainable construction due to parts of construction activity being transferred into factory based within controlled environment,' followed by 'Provide safer working environment' with a mean of 3.86. 'Environmental protection through reduction of waste at construction site' comes in at third place with 3.79, and the lowest mean (3.50) goes to 'less dependency on foreign labour'.

The last category is Productivity, where the highest mean is 4.02, which is 'increase of productivity,' followed by 3.89 in 'Reducing work trade on site'. Third place (3.72) goes to 'Faster overall project completion', and the lowest is 3.50 for 'reduced unskilled labour'.

Overall, the highest ranking is in the category of Cleanliness & Neatness, with 4.08 for the item 'safety and health on site assurance', and the lowest mean is 3.49 in the Cost category for the item 'reduced maintenance cost for end-users'.

**Table 2.9:** Mean and Ranking of Using IBS

Benefits of using IBS	Mean	Ranking
<b>A. Time</b>		
Off-site production can start while the construction site is under earthworks	4.06	1
Faster completion due to advance off-site production by simplified installation process	4.01	2
<b>B. Cleanliness &amp; Neatness</b>		
Safety and health on site assurance	4.08	1
Systematic components storage and timely material delivery (Just - in - Time Concept)	4.03	2
Reduction of waste materials at site	3.98	3
Reduction of construction material at site	3.92	4
<b>C. Better Product Quality</b>		
Skilled worker with specific scope of works improves efficiencies and reduces errors during manufacturing process	3.84	1
Unaffected by weather element due to controlled environment of casting area	3.76	2
High quality-controlled products due to controlled environment in factory with strict quality assurance, better material selection and using high mechanized technology	3.75	3
<b>D. Cost</b>		
Reducing on-site workers significantly reducing labour cost for contractors	3.83	1
Minimizing cost of transferring waste material due to quality control during manufacturing process and reducing waste material	3.70	2
Cost efficiency through repetitive usage of moulds for different types of projects	3.64	3
Reduced maintenance cost for end-users	3.49	4
<b>E. Social Benefits</b>		
Sustainable construction due to parts of construction activity being transferred into factory based within controlled environment	3.89	1
Provide safer working environment	3.86	2
Environmental protection through reduction of waste at construction site	3.79	3
Less dependency on foreign labour	3.50	4



Benefits of using IBS	Mean	Ranking
<b>F. Productivity</b>		
Increase of productivity	4.02	1
Reduce work trade on site (i.e. Welding, carpentry, etc.)	3.89	2
Faster overall project completion	3.72	3
Reduce unskilled labour	3.50	4

### 2.1.14 Challenges of IBS Adoption

Table 2.10 shows the mean and ranking for challenges of IBS adoption. The highest mean (4.24) is high cost of IBS components, followed by difficulty in obtaining financial support from bank for IBS project in second place. The challenge in IBS adoption ranked third is the additional cost in hiring special equipment and machinery in implementing IBS. In fourth place are two items that have the same mean of 3.42, which are lack of on-site specialized skills for assembly and erection of components and lack of standardization on IBS and availability of quality control. Lack of IBS knowledge and awareness among developers and clients is ranked fifth, followed by lack of people with IBS project management skill and knowledge in sixth place. The lowest mean is for the item lack of IBS design knowledge among designers and architects at 3.36.

Other challenges faced by the respondents are the aesthetic faults in the post construction stage. Besides that, the economic issues in Malaysia discourage contractors from getting involved in the IBS Business. Some of the small contractors do not implement IBS because IBS is usually used by a higher grade of contractors (G5-G7). Major challenges in IBS adoption are high cost for initial set up such as land, machinery, skilled works, utilities etc. Moreover, there is a lack of potential joint venture companies to enter a partnership with.

In terms of knowledge, IBS requires technical knowledge from early construction until the end of construction, especially during the installation stage. Some of the respondents also mentioned the lack of raw material supply. The issue of transportation also arises due to the size of precast units.

**Table 2.10:** Challenges of IBS Adoption

No.	Challenges that hold back the adoption of IBS among contractors	Mean	Ranking
1.	High cost of IBS components	4.24	1
2.	Difficulty in obtaining financial support from bank for IBS project	4.17	2
3.	Additional cost in hiring special equipment and machinery in implementing IBS	4.01	3
4.	Lack of on-site specialized skills for assembly and erection of components	3.42	4
5.	Lack of standardization on IBS and availability of quality control	3.42	4
6.	Lack of IBS knowledge and awareness among developers and clients	3.38	5
7.	Lack of people with IBS project management skill and knowledge	3.37	6
8.	Lack of IBS design knowledge among designers and architects	3.36	7

### 2.1.15 Recommendation of IBS Adoption

Table 2.11 shows the recommendation from respondents for IBS adoption. The highest mean (4.02) is to have regular promotion and widespread information about IBS implementation and its benefits through seminars, workshops, awareness programs, etc. Ranked second at a mean of (3.95) is to provide fast approval for IBS projects, followed by provide IBS training to the construction workforce, with a mean of 3.93. In fourth place is to reduce stamp duty for buyers who purchase an IBS house (3.57), followed by a mean of (3.54) in fifth place, which is to mitigate the additional cost of using IBS method of construction with non-cash incentives. The second last mean at 3.49 is to make it compulsory for every building construction plan to adopt IBS, followed by standardising IBS products through the standardisation exercise, with a mean score of 3.46.

**Table 2.11:** Recommendation of IBS Adoption

No.	Effective ways in increasing IBS adoption among contractors	Mean	Ranking
1.	Regular promotion and widespread information about IBS implementation and its benefits through seminars, workshops, awareness programs, etc.	4.02	1
2.	Provide fast approval for IBS project	3.95	2
3.	Provide IBS training to the construction workforce	3.93	3
4.	Reduce stamp duty for buyers who purchase an IBS house	3.57	4
5.	Mitigate the additional cost of using IBS method of construction with non-cash incentives	3.54	5
6.	Compulsory for every building construction plan to adopt IBS	3.49	6
7.	Standardising IBS products through the standardisation exercise	3.46	7

Other recommendations suggested by respondents are described in Table 2.12:

**Table 2.12:** Other Recommendations

Category	Comments
Quantity	<ul style="list-style-type: none"> <li>IBS needs a lot of quantity. No design available and more to customer need.</li> </ul>
Market Price	<ul style="list-style-type: none"> <li>Control market prices of raw materials.</li> </ul>
Enforcement	<ul style="list-style-type: none"> <li>Enforcement by relevant authorities to use IBS System in projects.</li> </ul>
Incentive	<ul style="list-style-type: none"> <li>Give more incentives for contractors who implement IBS system.</li> <li>Introduce special tax exemption for potential buyers for IBS projects.</li> <li>Provide incentives for new IBS Entrepreneurs.</li> </ul>
R&D	<ul style="list-style-type: none"> <li>Improve R&amp;D for ways to simplify method to procure precast components.</li> <li>To promote R&amp;D of IBS to all parties in construction.</li> </ul>
Cost	<ul style="list-style-type: none"> <li>In costing, IBS convenience more than conventional. Lower worker cost. Maintenance is better and more strengthens.</li> </ul>
Financial	<ul style="list-style-type: none"> <li>Increase credit facility products for contractor.</li> <li>Provide financial support for contractors to venture into IBS.</li> <li>Provide monetary support/initiative to indulge contractors.</li> </ul>
Promotion	<ul style="list-style-type: none"> <li>To promote IBS to all parties in construction.</li> </ul>
Transportation	<ul style="list-style-type: none"> <li>Size of precast units to be catered by the transport.</li> </ul>

## 2.2 Conclusion and Recommendations

This study aims to assess the implementation of IBS in Malaysia for both government and private projects in 2019. The objective of the study is to measure the level of IBS adoption and readiness among the contractors in Malaysia. Besides that, this study clarifies the industry players' perception on using IBS in current and future situations. The methodology used in this study is a quantitative method with a combination of primary and secondary data collection. The primary data was obtained from a survey questionnaire to the contractor, while secondary data are collected from ICU and CIDB Malaysia. Data gained from the ICU was solely on IBS projects for the government sector, with focus on the distribution of IBS score.

### 2.2.1 IBS Adoption in Government and Private Projects in Malaysia, 2019 (All Project Value)

Overall, IBS adoption in Malaysia based on the actual data from ICU is that 68% of the government projects achieved an IBS score of more than 70, while only 32% of the IBS projects achieved an IBS score of less than 70.

Meanwhile, from the survey questionnaire, only 36.1% of government projects use IBS, and 33.1% of private projects. To make a comparison, a study done in 2013 shows a higher percentage of IBS adoption in government projects with 61%, and a considerably lower amount of IBS adoption in private projects at 14%. Conversely in 2017, only 10.7% of government projects had adopted IBS, whereas adoption of IBS in private projects increased to 21%.

Year	Government	Private
2013	61%	14%
2017	10.7%	21%
2019	36.1%	33.1%

Based on the data from ICU, Sarawak show the lowest percentage of IBS score achievement of 70, while Melaka recorded the highest percentage of achievement of 70 IBS score.

### 2.2.2 Project Value Using IBS

Data from the ICU shows that 78.2% of government projects achieved an IBS score of more than 70 for projects with a value of more than RM 10 million, while 21.8% of government projects did not achieve an IBS score of 70. Meanwhile, for projects valued at less than RM 10 million, only 43.1% of the government projects achieved an IBS score of 70 IBS, while 56.9% did not achieve the targeted IBS score.

The survey questionnaire analysis shows that government projects valued at less than 1 million make up 31.5%, projects with value between RM 1 million and RM 10 million comprise 33.3%, and projects that cost more than RM 10 million make up 46%. In private projects, 25.8% of the projects have project value less than RM 1 Million, 21.6% of the project have a project value between RM 1 million and RM 10 million, and the remaining 59.1% have a project value of more than RM 10 million. Most of the projects adopted the precast concrete system, where the majority of the components are columns. IBS projects range mostly from 1 to 2 projects for each respondent.

### 2.2.3 Manufacturing Capacity

The majority of the respondents still perceive that they do not have enough manufacturing capacity, with only 2.7% of them having manufacturing capacity. Precast concrete system and metal framing seem to be the most favourable system to manufacture.

### 2.2.4 Readiness in IBS

The respondents do not seem ready to implement IBS in terms of technical skills and expertise and commercial value. Companies are not ready to provide the skilled workers for IBS projects such as project manager, operators, installers, and many more positions related to IBS requirements. The same applies to commercial value, where most of them are not ready to involve IBS in the procurement process and core competency for business. However, they intend to use IBS for their next projects, and it seems that most of them have been exposed to knowledge about IBS.

### 2.2.5 Benefits and Challenges of IBS Adoption

The major benefit of IBS has been described by the respondents as the aspect of safety and health on site assurance. From this statement, it demonstrates that the respondents' main concern is on the aspect of safety and health of the worker. Meanwhile, the biggest challenge in IBS adoption is usually about the high cost to implement IBS projects. High costs in IBS projects normally occur in the early stages of construction, which is in the planning stage. At this stage, readiness in terms of capital cost, machinery, training of skilled workers, mould preparation and other related costs is required.

### 2.2.6 Recommendation

The implementation of IBS can be successful if the government enforces all government and private projects to use IBS. To start with, projects valued at more than RM 10 million for private projects and government projects should cover all project value ranges. Besides that, promotion of IBS implementation should be done regularly. Guidelines on the implementation of IBS should be introduced to all industry players to give them an idea of how to start up in the IBS industry. Motivation to use IBS can be done through the injection of incentives to the implementers. Financial support should be provided consistently for all players, especially SME players.

### 2.2.7 Recommendation for Future Research

To improve the research on IBS adoption in the future, it is recommended to include IBS scores for private projects. All the project details submitted to CIDB should include the IBS score for easy tracking of IBS score trends achieved by the projects. Besides that, all data from government and private projects should be integrated through Big Data analytics to ensure that all data is accurate and ensure ease for references purposes.







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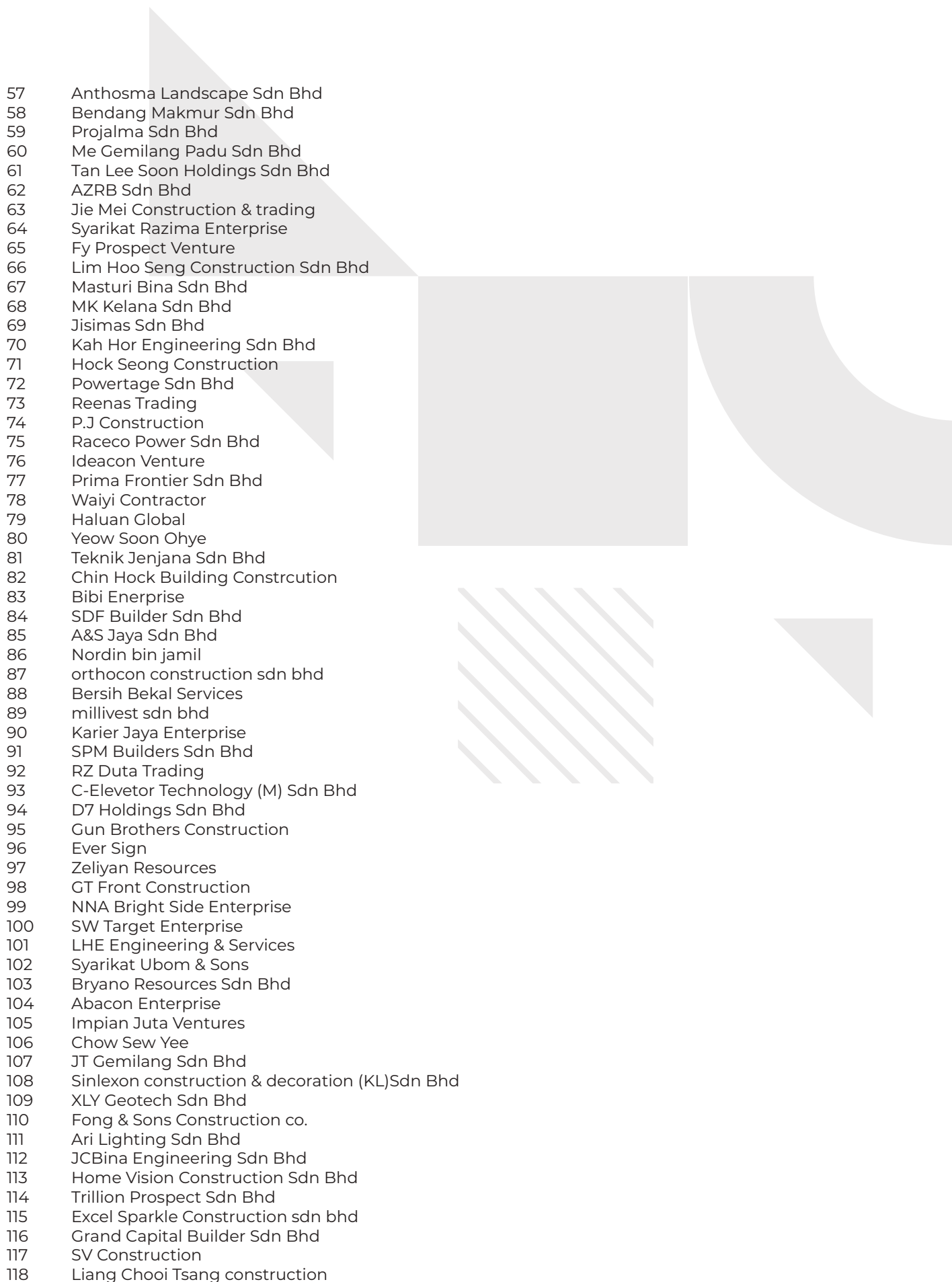




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- 2 Tan Lee Soon Holdings Sdn Bhd
- 3 Crest Builder Sdn Bhd
- 4 Yureez Bahtera Resources
- 5 CWM Group Sdn Bhd
- 6 Qastalani Sdn Bhd.
- 7 Amiso Enterprise Sdn Bhd.
- 8 Chuan Hoe Construction Sdn. Bhd
- 9 CWM Group Sdn Bhd
- 10 Koperasi Peneroka Felda Lok Heng Timur Berhad
- 11 Fanili Trading
- 12 AZRB Sdn Bhd
- 13 Long Stay Construction Sdn Bhd
- 14 Lakarbina Gomogi
- 15 P.A.Jaya Enterprise
- 16 Lim Hoo Seng Construction Sdn Bhd
- 17 SP Puncak Teguh
- 18 MK Kelana Sdn Bhd
- 19 Segmen Efektif Sdn Bhd
- 20 Empayar Interaktif Sdn Bhd
- 21 Haba Stress Engineering
- 22 Hong Hap Construction Sdn Bhd
- 23 LE Renovation & construction
- 24 Vessix (M) Sdn Bhd
- 25 Azz Niaga Resources
- 26 Ideacon Venture
- 27 Milsuy Enterprise
- 28 Mekar Enterprise
- 29 Pemimpin Saujana (m) sdn Bhd
- 30 CA Maju Enterprise
- 31 EPC Pesona Sdn Bhd
- 32 Proma Wahyu Sdn Bhd
- 33 Awada Enterprise
- 34 CWM Group Sdn Bhd
- 35 Vproof Specialist Sdn Bhd
- 36 Alang Seri Enterprise
- 37 Chow Enterprise
- 38 PRR Resources Sdn Bhd
- 39 Pintas Tegas Sdn Bhd
- 40 KSKPS Holdings Sdb Bhd
- 41 Bahagia Interior Sdn Bhd
- 42 Barisan Impian Sdn Bhd
- 43 Afaracop Sdn Bhd
- 44 Suang Lee Hardware Trading Sdn Bhd
- 45 Koperasi Peneroka Felda Nitar Dua Mersing Berhad
- 46 Winpy Construction Sdn Bhd
- 47 N.S. Seng Corporation Sdn Bhd
- 48 MZA Integrated Resources
- 49 Homware Consortium
- 50 Kadok Emas Ventures
- 51 Sankyo Frontier Malaysia Sdn Bhd
- 52 Izin Cergas Sdn Bhd
- 53 Reaplite Industry Sdn Bhd
- 54 Geocon Engineering Sdn Bd
- 55 SN Akmida Holdings Sdn Bhd
- 56 Bahagia Interior Sdn Bhd



57	Anthosma Landscape Sdn Bhd
58	Bendang Makmur Sdn Bhd
59	Projalma Sdn Bhd
60	Me Gemilang Padu Sdn Bhd
61	Tan Lee Soon Holdings Sdn Bhd
62	AZRB Sdn Bhd
63	Jie Mei Construction & trading
64	Syarikat Razima Enterprise
65	Fy Prospect Venture
66	Lim Hoo Seng Construction Sdn Bhd
67	Masturi Bina Sdn Bhd
68	MK Kelana Sdn Bhd
69	Jisimas Sdn Bhd
70	Kah Hor Engineering Sdn Bhd
71	Hock Seong Construction
72	Powerstage Sdn Bhd
73	Reenas Trading
74	P.J Construction
75	Raceco Power Sdn Bhd
76	Ideacon Venture
77	Prima Frontier Sdn Bhd
78	Waiyi Contractor
79	Haluan Global
80	Yeow Soon Ohye
81	Teknik Jenjana Sdn Bhd
82	Chin Hock Building Constrcution
83	Bibi Enerprise
84	SDF Builder Sdn Bhd
85	A&S Jaya Sdn Bhd
86	Nordin bin jamil
87	orthocon construction sdn bhd
88	Bersih Bekal Services
89	millivest sdn bhd
90	Karier Jaya Enterprise
91	SPM Builders Sdn Bhd
92	RZ Duta Trading
93	C-Elevator Technology (M) Sdn Bhd
94	D7 Holdings Sdn Bhd
95	Gun Brothers Construction
96	Ever Sign
97	Zeliyan Resources
98	GT Front Construction
99	NNA Bright Side Enterprise
100	SW Target Enterprise
101	LHE Engineering & Services
102	Syarikat Ubom & Sons
103	Bryano Resources Sdn Bhd
104	Abacon Enterprise
105	Impian Juta Ventures
106	Chow Sew Yee
107	JT Gemilang Sdn Bhd
108	Sinlexon construction & decoration (KL)Sdn Bhd
109	XLY Geotech Sdn Bhd
110	Fong & Sons Construction co.
111	Ari Lighting Sdn Bhd
112	JCBina Engineering Sdn Bhd
113	Home Vision Construction Sdn Bhd
114	Trillion Prospect Sdn Bhd
115	Excel Sparkle Construction sdn bhd
116	Grand Capital Builder Sdn Bhd
117	SV Construction
118	Liang Chooi Tsang construction



119	Bendang Makmur Sdn Bhd
120	TNP Global Enterprise Sdn Bhd
121	SHR Enterprise Sdn Bhd
122	Merco Design Sdn Bhd
123	SQS builder Sdn Bhd
124	Usaha Perkasa Dagangan Sdn bhd
125	MBM Development
126	APT Assets Sdn Bhd
127	Low Ah Lek Enterprise
128	Emaslink(holdings ) Sdn Bhd
129	Harta Bina & Trading
130	Sanmai Services Management Sdn Bhd
131	Arah Teknik Enterprise
132	Tuck Fai Contractor
133	Yi Yang Construction Sdn Bhd
134	Elegance Dynasty sdn bhd
135	SZS Homeland Sdn Bhd
136	Benacon Sdn Bhd
137	Technic-Delta M & E Engineering Sdn Bhd
138	Syarikat Seng Brothers Construction
139	Mudajaya Corporation Berhad
140	Farjuna Construction
141	Sri Aura Prima Resources
142	S E S tiling & Construction Sdn Bhd
143	Chuan Ho Engineering Trading sdn bhd
144	Chong Brothers Construction
145	crest builder sdn bhd
146	Luxury Eight Sdn Bhd
147	TorchEmpire Sdn Bhd
148	Zera Ratio Enterprise
149	BHT Global Construction Sdn Bhd
150	Millimetre Design Sdn Bhd
151	Adil Bina Enterprise
152	Afima Jaya Enterprise
153	AFS Bina Sdn Bhd
154	Ahib Bina Sdn Bhd
155	Ahlan Naubah Enterprise
156	AKS Bina Corporation Sdn Bhd
157	Al Falah Cemerlang Resources
158	Alaf Bina Dagang Sdn Bhd
159	Alam Jitu Bina Sdn Bhd
160	Aquatech Pools Sdn Bhd
161	Arm Construction & Trading
162	Arm Maju Jaya Enterprise
163	Arzek teknik Sdn Bhd
164	Awaja Enterprise
165	Azi Dagang
166	Azmi Bersama Enterprise
167	Baiduri Idaman Bina Sdn Bhd
168	Bentoi resources
169	Bina Conso Sdn Bhd
170	Bina Jaya Mantap Sdn Bhd
171	Bina Puri Sdn Bhd
172	Bina Tamshah Sdn Bhd
173	BK OOI Construction
174	Bumi Kejora Sdn Bhd
175	Bilang Nombor Sdn Bhd
176	Ehsan Bumi Construction Sdn Bhd
177	CBH Heng Enterprise
178	Cendekia Teknik Sdn Bhd
179	CWT Construction Sdn Bhd
180	Deep rocks Sdn Bhd

181	E Dern Construction Sdn Bhd
182	Fajar Bina Resources
183	Fazda Cekap Enterprise
184	First Star Engineering Sdn bhd
185	Gemilang Piling Sdn Bhd
186	Golden Pasific Construction
187	Gs Buil Art Sdn BHD
188	Hasrat Teknik (M) Sdn Bhd
189	Heap Seng Utara Enterprise
190	HEC Building Construction
191	Heng Ho Engineering Sdn Bhd
192	HFM Daya Bina Sdn BHd
193	HS Builders Sdn Bhd
194	IBZ Bina Sdn Bhd
195	Ideacon Ventures
196	Ilmar engineering
197	Infinity Decoration Sdn Bhd
198	Inno Maju
199	Intan Saujana Construction
200	Intra Reka Land Sdn Bhd
201	Ismalegacy Enterprise
202	Java Ikhlas Sdn Bhd
203	K.E.P Teknikal Sdn Bhd
204	Kejuruteraan RI
205	Khalisya Maju Jaya Sdn Bhd
206	KKC Teknik Enterprise
207	KSKPS Holdings Sdn Bhd
208	L&L Renovation Work
209	Lebuh Maju Sdn Bhd
210	Liang Chooi Tsang Construction
211	Line Utama Enterprise
212	LY Mentari Enterprise
213	Juta Ribuan Sdn Bhd
214	Misuy Enterprise
215	MSR Supply & Trading (M) Sdn Bhd
216	MT Maju Construction
217	Munniz Corporation Sdn Bhd
218	Nazrine Maju Sdn Bhd
219	Nurhas Sdn Bhd
220	Nusa Murni Electrical & Trading
221	OCS Construction Sdn Bhd
222	Onn Tat Construction
223	Pan-Millennium Dotcom Sdn Bhd
224	Pasir Raja Gemilang Enterprise
225	Pembinaan Alam Setia
226	Pembinaan Voon & Rakan-Rakan Sdn Bhd
227	Perangsang urus Sdn Bhd
228	Perniagaan Naem
229	Perniagaan Razo Maju Sdn Bhd
230	PFI Bina Sdn Bhd
231	Pintas Tegas Sdn Bhd
232	Prismagro Enterprise
233	Qul Trading & Transportation resources
234	Rafta Bina Sdn bhd
235	Rimba Warisan SDn Bhd
236	S&N Teguh Bina
237	Safaris Maju Sdn Bhd
238	Santun tegas Sdn Bhd
239	Sbar Bina Sdn Bhd
240	SeniBina Jaya Sdn Bhd
241	Seri Bumi Makmur sdn Bhd
242	SHRM Enterprise

243	SI Bina
244	Silang Bina Sdn Bhd
245	SM Construction Sdn Bhd
246	Soon Lian Enterprise
247	Sp Bina Jaya Sdn Bhd
248	Summit Kinabalu Sdn Bhd
249	SZS Homeland Sdn Bhd
250	T.S. Fong Buiders Sdn Bhd
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252	Tan Lee Soon Holdings Sdn Bhd
253	TBA Arc Engineering
254	Teguh Kaya Sdn Bhd
255	Tenaga Ramadhan sdn Bhd
256	Teras Khidmat Niaga Sdn Bhd
257	Thursina Langkasuka Enterprise
258	Tuah Bina Niaga Sdn Bhd
259	Tuchong Naning Sdn Bhd
260	U Sheng Construction Sdn Bhd
261	Uni Bina Enterprise
262	Uni Bina Maju (M) Sdn Bhd
263	Urus Kirim Enterprise
264	Utara Technologies Services
265	Viatech Sdn Bhd
266	Vibrant Vista Sdn Bhd
267	Wadiaz Bina Sdn Bhd
268	Waiyi Contactor
269	Weng Keat Huat Construction & Engineering Sdn Bhd
270	Wincomm Sdn Bhd
271	WMI Utara Enterprise
272	Yat Sing Construction
273	YCP Engineering Services (M) Sdn Bhd
274	Yi Yang Construction Sdn Bhd
275	Zafa Bina Sdn Bhd
276	Zaludin b Ali
277	Zana Bina Sdn Bhd
278	Zara Tech Enterprise
279	Zika Enterprise Sdn Bhd
280	Bumi Damai Costruction
281	Afsribina Enterprise
282	AKS Wibawa Enterprise
283	Alunan Asas Sdn bhd
284	Awada Enterprise
285	Awal indah Enterprise
286	Awang Karim Enterprise
287	Bestview ENTERprise
288	BJ Construction & Enterprise
289	Bumi Maju Enterprise
290	BYT Construction Sdn Bhd
291	Akrimiqur Nur Enterprise
292	Cason Design
293	Ceria Abadi Enterprise & COstruction
294	CHB Construction
295	Chuan Huat Contractor
296	Cicet (malaysia) Corporation SDn Bhd
297	City Piping Construction
298	D RA Multi Enterprise
299	Emmy Daya ENterprise
300	Erniliza Enterprise
301	Excel Sparkle Construction Sdn Bhd
302	Exuan Construction & Trading Sdn Bhd
303	Dayang Ruthanna ENterprise
304	Faiz Niaga Enterprise



305	Fook Yu Electrical & Building Contractor Sdn Bhd
306	Ganda Tekad Sdn Bhd
307	Geamin Construction Sdn Bhd
308	Great Formwork Sdn Bhd
309	Hani enterprise
310	Harta Bina & Trading
311	HN Abadi Enterprise
312	Hoong Fong Seong Construction
313	Ichi Ban Unggul Enterprise
314	Iddin Wawasan Enterprise
315	Impian Utara Enterprise
316	Infra Segi Sdn Bhd
317	Inkay Utama
318	Inteleque Enterprise
319	Izat Bina Enterprise
320	Jasakon Sdn Bhd
321	Jebat Millenium Enterprise
322	Karib engineering Sdn Bhd
323	Karier Jaya Enterprise
324	Kerjaya Prospek (M) Sdn Bhd
325	Kimlun Sdn Bhd
326	Kinamedia Enterprise
327	Klimax Builder Sdn Bhd
328	Koperasi Peneroka Felda Keratong Tujuh Rompin Berhad
329	Kuda Mas ENterprise
330	Landasan Kapital (M)sdnBhd
331	Lanter Hijau Enterprise
332	LKM engineering & Construction Works
333	LMW Development Sdn Bhd
334	Low Kuang fat
335	M.H Kayangan Enterprise
336	Magong Enterprise
337	master Coordinates Sdn Bhd
338	MB World Builders Sdn Bhd
339	MF Multi Tech Enterprise
340	Milsuy Enterprise
341	Mj Top Builders Sdn Bhd
342	Mok Kim Loy Holdings Sdn Bhd
343	MRN Enterprse
344	Musthofa Enterprise
345	MZ Enterprise
346	Nanga Kemalih Enterprise
347	Olkendu Enterprise
348	Panca Delima Enterprise
349	pan-Millennium Dotcom Sdn Bhd
350	Pembinaan LNS Sdn Bhd
351	Pembinaan Titis Jaya Sdn Bhd
352	Permai Ihsan Sdn Bhd
353	Proasia Construction
354	Q Global Resources
355	Rafza Maju Enterprise
356	Renovare construction Sdn Bhd
357	Rezky Q
358	Rifqi Jaya Enterprise
359	Right Leap Sdn Bhd
360	Rimba Warisan Sdn Bhd
361	Rumpun Damai Nursery
362	Sasaran Teguh Enterprise
363	Seri Wajamas Aset Sdn Bhd
364	Serita Maju Sdn Bhd
365	Shai Maju Enterprise
366	Sinar Impian Construction Sdn Bhd

367	Sinlele Enterprise Sdn Bhd
368	SNZ Flre Entrepriase
369	Sri Cahaya Enterprise
370	Summerville Landscape sdn bhd
371	Sure Intergroup Sdn Bhd
372	SW Target Enterprise
373	Syarikat Bintang Jaya
374	Syarikat Katilina Enterprise
375	Syarikat Razima Enterprise
376	Syarikat Sinaran Enterprise
377	T & Civil Construction Sdn Bhd
378	Temasek Land Sdn Bhd
379	Tenaga Utama Enterprise
380	Tiew Beng Sun Construction
381	Tuck Fai Contractor
382	Turntech Construction
383	WCT Berhad
384	Wong Hook Choon
385	Wong & Sons
386	Yida Construction & Hardware Enterprise
387	Zek Utama Enterprise
388	Zuraha S Enterprise
389	Bandar Rimbayu Sdn Bhd
390	Bangi Heights Development Sdn Bhd
391	Benway Development Sdn Bhd
392	Berkeley SDn BHD
393	Perbadanan Kemajuan Pertanian Negeri Pahang
394	Core Precious Development Sdn Bhd
395	Cosmowearth Housing Development Sdn Bhd
396	Eco Ardence Sdn Bhd
397	GLM Emerland west (rawang) Sdn Bhd
398	GProperty Construction Sdn Bhd
399	Harta Ceria Bhd
400	Hartawan Megajaya Sdn Bhd
401	Hillpark Resources Sdn Bhd
402	Ivory Gleanearly Sdn Bhd
403	Kampar Lakeside Sdn Bhd
404	Kemajuan Tong Tor Sdn Bhd
405	Knowledge Vision Sdn Bhd
406	Lifetime Property Sdn Bhd
407	Luster Venture Sdn Bhd
408	Majestine Development sdn bhd
409	MTT Shipping Sdn BHD
410	Must Ehsan Development Sdn Bhd
411	N Kay Enterprise
412	Nursajaya Greens Sdn Bhd
413	Peck Seong Realty Sdn bHd
414	Paragon Pinnacle Sdn Bhd
415	Paramount Property (Sepang) Sdbn Bhd
416	Parkland City sdn Bhd
417	PB Realty Sdn Bhd
418	PDMC Property Sdn Bhd
419	Pembinaan KA Dinamik Sdn Bhd
420	Pembinaan Tetap Teguh Sdn Bhd
421	Perumahan Kinrara Berhad
422	Renofajar Sdn Bhd
423	Segar wangi Sdn Bhd
424	Setia Fontaines Sdn Bdh
425	Setia Ecohill 2 Sdn Bhd
426	Shinyou Elevator MFG Sdn Bhd
427	Soonsiang Sdn Bhd
428	Starwatt Realty Sdn Bhd





429	Sunrise MCL Land Sdn Bhd
430	Sunway PKNS Sdn Bhd
431	Taman Gunong Hijau Sdn Bhd
432	TT Dotcom sdn bhd
433	Tunas Land Sdn Bhd
434	Wahon Construction Sdn Bhd
435	Wisdom Infinity Sdn Bhd
436	Worldwide property management Sdn Bhd
437	SYT Rasmart Enterprise
438	Yat Seng Construction Sdn Bhd
439	Mofa Jaya Enterprise
440	MN Power Services
441	Ekuiti Hemat Sdn Bhd
442	Majlis Perbandaran Seberang Perai
443	Tenaga Nasional Berhad
444	Federal Oat Mills Sdn bhd
445	Genting Malaysia Berhad
446	Majlis Perbandaran Subang Jaya
447	Puncak Mega Bina
448	Paragon Pinnacle Sdn Bhd
449	Majlis Bandaraya Johor Bahru
450	Aliena Sya Enterprise
451	Syarikat Tenaga Emas Jaya
452	Majlis Perbandaran Subang Jaya
453	Sasaran Teguh Global (M) Sdn Bhd
454	Builder Sdn Bhd
455	Kock Chin Electrical Works
456	Amsteel Mills Sdn Bhd
457	Badan Pengurusan Bersama Monterey, Eco Santuari
458	Pelabuhan tanjung Pelepas Sdn Bhd
459	Perbadanan Pahang
460	Malaysia Airports Sdn Bhd
461	Felda Palm INdustries Sdn Bhd
462	Webest Sdn Bhd
463	Majlis Perbandaran Seremban
464	Paduwan Realty Sdn Bhd
465	Johor Corporation
466	Savillls (KL) Sdn Bhd
467	Majlis Perbandaran Klang
468	Jabatan Kerja Raya Melaka
469	Milure Solution
470	Sri Manjung Specialist Centre Sdn Bhd
471	Majlis Perbandaran Pasir Gudang
472	JKR Negeri Sembilan
473	Majlis Bandaraya Johor Bahru
474	Dewan Bandaraya Kuala Lumpur
475	Malaysia Airport Sdn Bhd
476	Jabatan Pengairan dan Saliran sarawak
477	MAjlis Bandaraya Petaling Jaya
478	perbadanan Bekalan air pulau pinang sdn bhd
479	Syarikat Air Melaka Berhad
480	Karthi Electrical Engineering Sdn Bhd
481	Majlis Perbandaran Perak
482	Ibu Pejabat Kerja Raya
483	Jabatan Kerja Raya Pulau Pinang
484	Dewan Bandaraya Kuala Lumpur
485	Pejabat Daerah Segamat
486	Alliance Builder Sdn Bhd
487	Majlis Bandaraya Iskandar Puteri
488	Webest Sdn Bhd
489	Azi Dagang
490	Awang Bin Bajar

491	Exec Strategy Engineering Sdn Bhd
492	YC Building Material
493	Trek Development Sdn Bhd
494	Awal Indah Enterprise
495	Soon Lian enterprise
496	Zoo bee Garden Bonsai Centre
497	Kota Jauhar Enterprise
498	Hamdan Enterprise
499	Fossan Development Sdn Bhd
500	Samin Bina Sdn Bhd







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