PERCEPTION OF INDUSTRIALISED BUILDING SYSTEM (IBS) WITHIN THE MALAYSIAN MARKET

by

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FINAL YEAR PROJECT DISSERTATION

Dissertation submitted in partial fulfillment of
the requirements for the
Bachelor of Engineering (Hons.) Civil Engineering

December 2007

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CERTIFICATION OF APPROVAL

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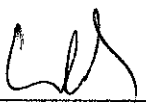
(CIVIL ENGINEERING)

Approved by.



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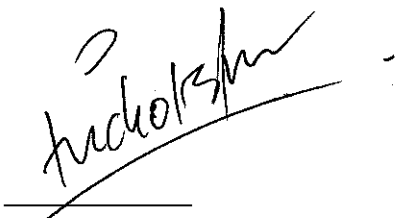
CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.



NICHOLAS FOO KWANG HUI

ABSTRACT

The Industrialised Building Systems (IBS) is a construction process that utilizes techniques, products, components, or building systems which involve prefabricated components and on-site installation. This is because the industrialized building system (IBS) of construction has the known theoretical advantages of speed, safety and quality. However, in Malaysia, wet construction method is still widely accepted as a convention and safe option despite incurring higher cost and slow production rate.

The objective of this final year project is to investigate the underlying reasons for the cold reception and hence for the small market share for industrialized construction in Malaysia (Perak, Penang & Kedah). Only approximately 15% of market share value is being practiced in Malaysian construction industry due to several reasons despite a series of promotion campaign by Construction Industry Development Board (CIDB).

Survey research method (SRM) is being implemented in this project. SRM is done through questionnaire and personal interview method. Fabrication of questionnaire consists of close-ended questions and open-ended questions. Systematic random sampling is being selected as this technique spread the sample more evenly over the population and it is easier to conduct than simple random sample. Questionnaire is distributed through snail mail and follow up is done subsequently to maintain a consistent number of feedbacks by the respondents. Feedback is analyzed by implementing descriptive method and then analytical method.

It can be observed from the feedback that the major reasons of the cold reception of IBS in Malaysia are failure in the transfer of technology, resistance of industry players to change, conventional system is more open and flexible and IBS generally is more costly than conventional system.

ACKNOWLEDGEMENT

I would like to take this opportunity to acknowledge and thank everyone that has given me all the supports and guidance throughout the whole period of completing the final year project. Firstly, many thanks to the university and the Final Year Project coordinators that have coordinated and made the necessary arrangements.

I must also acknowledge the endless help and support received from my main supervisor, Ap. Ir. Dr. Arazi Idrus throughout the whole period of completing the final year project. His guidance and advices are very much appreciated. Apart from that, many thanks to Mdm. Nor Hamiza Zackaria, also my co-supervisor, for assisting me in my research.

I would also like to thank to my tutor, also graduate assistant personnel in UTP, Mr. Christiono, for his endless support in terms of the questionnaire fabrication and feedback analysis of the study. His continuous support and help throughout the whole period are very much appreciated.

Finally, many thanks to my fellow colleagues, especially Mr. Kamaludin Hashim for their help and ideas throughout the completion of this study. Thank you all.

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CHAPTER 1

INTRODUCTION

1.1 Background

The government has put plenty of effort to enhance the current conventional labor intensive activities towards technological methods of construction. This is being done so that Malaysia is capable of producing fast and high quality products, able to compete with the world in construction industry.

The Industrialised Building Systems (IBS) is a construction process that utilizes techniques, products, components, or building systems which involve prefabricated components and on-site installation. [11] From the structural classification, there are five IBS main groups identified as being used in this country, and these are:

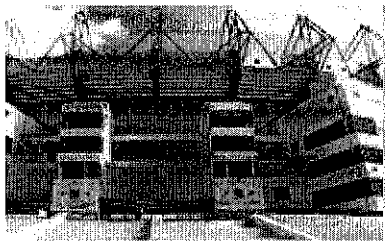


Figure 1: Pre-cast Concrete Framing, Panel and Box Systems

Pre-cast columns, beams, slabs, 3-D components (balconies, staircases, toilets, lift chambers), permanent concrete formwork, etc;

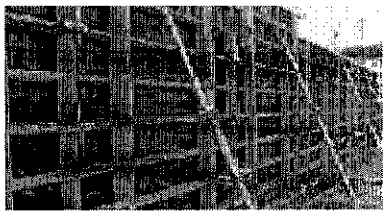


Figure 2: Steel Formwork Systems

Tunnel forms, beams and columns moulding forms, permanent steel formworks (metal decks, etc;

Figure 3: Steel Framing Systems

Steel beams and columns, portal frames, roof trusses, etc;

Figure 4: Prefabricated Timber Framing Systems

Timber frames, roof trusses, etc;

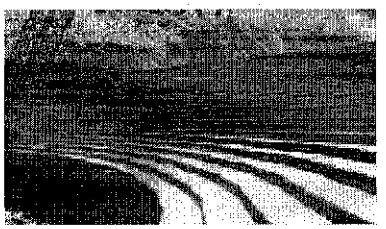


Figure 5: Block Work Systems

Interlocking concrete masonry units (CMU), lightweight concrete blocks, etc.

Industrialized Building System (IBS) promises several advantages such as the reduction of unskilled workers, less wastage of materials which means cost saving, less building materials required, better quality control of construction, and increase in environmental and construction site cleanliness among others. These advantages indirectly ensure a more efficient and organized construction site, and reduction of completion time of construction can be achieved.

With its current levels of quality, productivity, safety and excessive reliance on unskilled foreign workers, the state of the local construction industry is not in line with the future development of Malaysia. Early efforts by the government to promote usage of Industrialized Building Systems (IBS) as an alternative to the conventional and labour intensive construction method has not made a headway.

Therefore CIDB has redesigned its strategies and, with the guidance from the IBS Steering Committee, has formulated a roadmap based on the 5-M strategy (Manpower, Materials-Components-Machines, Management-Processes-Methods, Monetary and Marketing) with the target of having an industrialized construction industry and achieving Open Building by the year 2010. In integrating its efforts from various organizations, targets have been set based on the five Ms in order to ensure the global competitiveness of Malaysian construction players through the usage of IBS.

1.2 Problem Statement

Construction Industry Development Board (CIDB) has taken many efforts over the recent years to achieve industrialization of Malaysian construction industry by promoting the implementation of Industrialized Building Systems (IBS). As an initial pace towards industrialization, CIDB also promotes the utilization of standardized building components and off-site construction. Despite high demand created by Malaysian construction activities which has attracted a massive number of foreign workers to work in this country as cheap unskilled labor, the country is still facing huge problems with construction industry such as low quality outcome, delays, and wastages and so on. According to statistic, it is estimated that approximately 75% of foreigner workers in Malaysia work in the wet trades of construction (Ref. CIDB, 2003), namely about 251,000 foreign workers annually which lead to at least RM 1.3 billion outflow of Ringgit. [3]

The current scenario of conventional construction in Malaysia has other several disadvantages as well. Conventional construction is usually related to messy and unorganized site. The conventional construction involves a variety of complex machineries and material on site. This may also indirectly result in poor safety and health aspect and also increases the safety hazard to construction workers. Despite having intensively labored, most of the conventional construction projects have failed to reach completion in the required time and have high tendency of facing project delay problem due to inadequacy of up-to-date construction technology. Malaysian contractors generally are still practicing out-dated conventional technology when the contract duration for Malaysian is getting shorter relatively. In addition, conventional construction comparatively produces low quality finishing as constructing material such as timber and plywood has the tendency of giving way and human error may involve during the concreting process.

The use of IBS which assures valuable advantages such as the reduction of unskilled workers, less wastage, less volume of building materials, increased environmental and construction site cleanliness and better quality control. These advantages also promote a safer and more organized construction site, and reduce the construction period.

From a survey conducted by CIDB Malaysia, the usage level of IBS in the local construction industry stands at only 15% (IBS Survey 2003). The early efforts of the Government to encourage the use of IBS in the construction sector has yet to garner a good response, and this sector is still practicing conventional construction methods that have proven time and again to be wasteful, dangerous and messy. Relatively, the low labour cost in this country is the root cause of the industry failing to reform and being complacent with the current level of productivity, quality and safety. However, it cannot be disputed that to be competitive at the international level, it is important for the Malaysia construction industry to evolve and be ready for the globalization era where an increase in productivity, quality and safety is a must.

After the distribution of the questionnaire, the author has tried to contact the respondent for follow up purpose. However, some of the respondents are not showing great cooperation, which makes it hard for the author to keep a close rapport with the respondent for the retrieval of feedback.

1.3 Objective

The purpose of this research is to study and investigate the underlying reasons for the cold reception towards IBS and hence for the small market share for industrialized construction in the country. The objectives of this study are:

1) To find the reason on the cold reception of IBS in Malaysian construction industry
2) To identify the effectiveness of the current IBS promotional campaign
3) Suggestions and comments on usage of IBS in the Malaysian construction industry
4) To identify advantages or weaknesses that affect the users of IBS
5) To observe acceptance of construction parties towards IBS in the market
6) Support given by the clients, architects, and engineers towards IBS

1.4 Scope and Limitation of Study

The scope of study is conducting survey on the perception of Malaysian construction industry concerning industrialized building system (IBS). Before conduction survey, reliable source of information is required to conduct reliable interview and set up questionnaires. Study on the literature review can also be done through the internet or journals from the information resource center. The scope of work also includes producing a questionnaire related to the perception of Industrialized Building System (IBS) within the Malaysian market, specifically at Penang, Perak and Kedah.

Questionnaire surveys shall be submitted to limited construction firms located within Penang, Perak and Kedah only because the author is doing the research concerning on the Northern Malaysian states which is relatively low usage in IBS implementation compared to other more industrialized states. A minimum of 180 construction firms shall be selected as the study sample; however the number of construction firms shall be decided through methods of sampling calculation.

CHAPTER 2

LITERATURE REVIEW AND THEORY

Research and development (R&D) activities concerning cheaper and more efficient construction production material, better construction techniques and life-costing estimation of multi-storey housing were undertaken by the universities and the private sector. Under the Eighth Malaysian Plan, the Government has established Malaysian Human Settlement and Urbanization Research Institute (MAHSURI) to conduct R&D issues related to human settlement and urbanization. Therefore, this includes housing design and technology, especially technical research on alternative building materials as well as industrialized systems to create an efficient policy on construction to guarantee sustainable construction industry development.

Present Prime Minister, Datuk Seri Abdullah Ahmad Badawi, also stressed on the importance of affordable and quality housing for Malaysian citizen. Some high-end developers in Malaysia have chosen IBS over the conventional methods for important projects such as the Petronas Twin Towers, Putrajaya, KL Sentral and KLIA due to a variety of backing up reasons. Malaysian contractors were doing quite well abroad and they have been using the IBS technology, in particular, pre-cast concrete box-girder segments and bridge beams for highway projects.

Industrialized Building System (IBS) are expected to be fully implemented in Government building projects by the year 2010. Economical wise, outflow of Ringgit can also be controlled and social problems of illegal workers can be eradicated or minimized with the implementation of the IBS. Industrialization of the construction industry is predicted to be feasible in another way.

To further enhance the implementation of IBS utilization, not only CIDB has done their part in promoting the campaign, but the government section also insist in a minimum percentage of IBS utilization requirement in government building projects. By year 2010, it is expected that all government entitled projects are to be fully constructed on IBS basis. In addition, a 50% minimum implementation of IBS utilization in a project will be entitled CIDB levy exemptions to promote IBS.

The government also has implemented a comprehensive national IBS Road Map for the construction industry participants to gradually and systematically involve themselves in the industrialization programme. The IBS Road Map evolves on the policy of phased reduction of dependency on foreign labor and encouragement policy on the investment in technologies, techniques and the methodology of construction. According to the IBS Road Map, foreign workers in construction industry will be decreased to 55% by year 2005, 25% by year 2007 and 15% by year 2010.

The industry needs one fundamental plan that involves all the important aspects in this evolution process. In this respect, the IBS Roadmap 2003-2010 is formulated as a reference for all parties in implementing all programmes towards the modernization of the Malaysian construction sector. The IBS Roadmap 2003-2010 has been discussed and agreed upon at the national level through the IBS Steering Committee and Working Groups organized by CIDB Malaysia where the members are represented by the government sector, developers, manufacturers, contractors, professional bodies, higher learning institutions, associations, and other interested parties in the construction industry. The IBS Steering Committee and Working Groups have produced the IBS Roadmap 2003 - 2010 and will also ensure that its programs are implemented to meet the total industrialization of Malaysia's construction industry by the year 2010. [11]

CIDB has strived to formulate several methods to mitigate and solve the cold reception of IBS in Malaysian construction industry. [11] Based on the IBS Roadmap 2003 - 2010, positive impacts from the fundamental proposal and new Government incentives are:

- The industry will choose IBS which guarantees better quality, productivity and safety;

- The enforcement of using Modular Coordination (MC) through Uniform Building By Laws (UBBL) will encourage standardisation and subsequently increase the usage of IBS components. It also encourages participation from manufacturers and assemblers, especially Bumiputera, to enter the market, thus reducing the price of IBS components. In essence, MC willl facilitate open industrialisation.

- A screening and selection programme based on IBS standard components will ensure that low quality products are not marketed in the country and this prevents the dumping of foreign IBS products in Malaysia. This aspect is important to avoid failures in IBS projects; and

- By reducing wet-trades through IBS, the dependency on foreign workers will also diminish, thus gaining the billions of Ringgit currently being transferred out by the foreign workers to their home countries, and reducing inherent social problems involving these foreign workers.

2.1 Efforts of CIDB

2.1.1 Monetary - Economic & Financial

- Use IBS to construct 30% of the 150,000 units of houses proposed to be built by Syarikat Perumahan Negara Berhad (SPNB) under the 2003 Economy Stimulus Package (New Strategies Towards Enhancing the Country's Economic Growth)
- Continuously collect data for completed and on-going projects including IBS/MC pilot projects programmes.
- Conduct studies every 5 years to forecast the IBS components' needs for the Malaysian construction industry.
- Enforce IBS usage in government (building) projects in phases (from 30%2 in 2004 to 70% in 2008).
- Introduce Buildability3 Programme beginning 2006 for private (building) projects and enforcing it through the Local Authorities in 2008.
- Offer tax reduction incentives for the Bumiputera component manufacturers starting in 2005.
- Offer green lane approval programme for users of the standard building plans designed in compliance to MC and standard building components beginning 2004.
- Offer levy exemptions from 2004 for low cost, low medium cost and medium cost housing projects and reduce 50% levy for other types of houses for the developers using modular dimension in their designs - after end of the enforcement period of the 2003 Economy Stimulus Package.
- Offer training schemes and financial loans for Bumiputera manufacturers and contractors (installers) beginning 2004.

2.1.2 Promotion

- Conduct IBS Lobby Group programmes.
- Demonstrate IBS through IBS Village Showcase.
- Publish IBS product catalogues.
- Promote IBS more aggressively in the mass media.
- Continue IBS / MC road show programmes at the national and international levels.
- Continue seminar programmes at the national and international levels.
- Establish IBS as the main criteria for Malaysian Construction Industry
- Excellence Awards.
- Publish more IBS related books and journals.
- Produce more studies on IBS usage in the industry.
- Continuously conduct industry round table discussions on IBS to address the effectiveness of the programmes.
- Continue industry coordination programs through IBS Steering
- Committee and working groups.
- Introduce concept of Open Building Systems to the industry.

2.1.3 Manpower

- Continue efforts to develop NOSS (National Occupational Skill Standards).
- Continue workers' training and certification programme to include all types of IBS.
- Commence the training programme on mould making for IBS components.
- Commence the industrial expertise awareness programme together with IBS manufacturers through on-job training for trainees.
- Commence the site supervisory training and certification programme which includes knowledge on IBS.

- Introduce Continual Professional Development (CPD) courses regarding IBS / Modular Coordination (MC) for members of Board of Engineers Malaysia and Board of Architects Malaysia.
- Introduce IBS / MC syllabus to diploma and degree level students in private and public higher learning institutions.
- Continue IBS / MC technical training courses.

2.1.4 Materials – Components & Machines

- Enforce the use of Modular Coordination based on MS1064 through Uniformed Building By Laws (UBBL) in 2004 by the local authorities.
- Continue publishing reference books and case study reports regarding IBS.
- Continue writing new Malaysian Standards (MS) covering all types of IBS.
- Continue writing new Construction Industry Standards (CIS).
- Develop a series of standard construction components and pre-approved building plans for the green lane approval programme by the local authorities.
- Develop the Buildability Design Code to encourage the use of standardized IBS components and also help the IBS manufacturers obtain continuous orders.
- Continue Research and Development (R&D) efforts to produce local IBS innovations.
- Generate the IBS Verification Programme and Resource Centre for selection process and certification, to supervise all IBS technologies offered for use by the Malaysian construction industry.

2.1.5 Management – Process & Methods

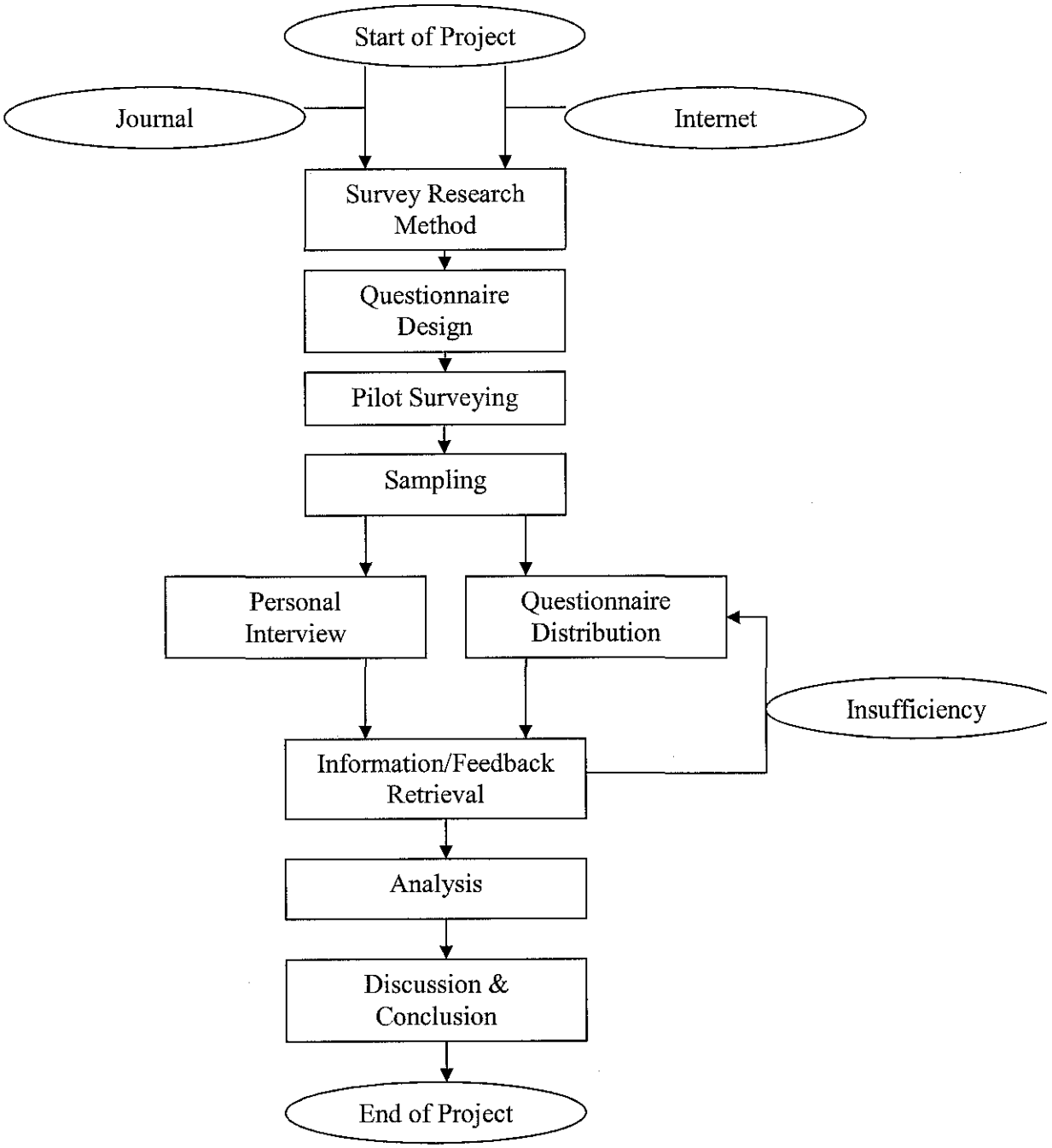
- Include the IBS / MC knowledge into the Standards of Practice and training modules for the training and certification of Project Managers.
- Offer specialized contractors training and certification programmes to cater for IBS related registration codes.
- Develop and run the Quality Assurance programme for each type of IBS.
- Develop Quality Management System (QMS) templates for design, production, and installation.
- Enforce Regulatory Compliance based on the standards for IBS components as the selection tool for IBS products starting from 2005.
- Develop software for MC components and dimensioning.
- Develop database for pre-approved building plans.
- Develop interactive database for components and costs for manufacturer-installers.
- Develop virtual reality software for architectural and structural components.
- Continually update the website to disseminate information on IBS, MC and OBS.

CHAPTER 3

METHODOLOGY & PROJECT WORK

3.1 Procedure identification

This chapter relates the basic work sequence of the project through the use of methodology diagrams shown.



3.2 Literature Review Research

After the commencement of the project, it is necessary to understand and comprehend the project title well. The author has assessed to websites as stated in the reference section to obtain information about IBS. CIDB website proves to be very beneficial as it provides a variety of useful information. All past and on-going events concerning IBS can be identified.

Journal is a very useful source of information to the author because it has stated the previous research done by other researchers about the topic. Furthermore, the references provided in the journal are much important for the author to look for other reliable sources of information

3.3 Questionnaire Fabrication

3.3.1 Personal Interview

An interview is called personal when the Interviewer asks the questions face-to-face with the Interviewee. By conducting personal interview also, the author can also directly find out the reasons of the low reception towards IBS which can be used during the analysis of the feedback during later stage which will be mentioned.

Before producing a professional questionnaire, the author needs to obtain reliable source of information from dependable sources. The author proceeded to CIDB Sarawak to conduct a face-to-face interview with IBS personnel in charge, Mr. Faizul. The author manages to obtain the information used in an IBS seminar during recent period.

Besides, conducting personal interview with lecturer at the author's University Teknologi PETRONAS (UTP) is most convenient and useful. Lecturers at UTP are most willing to assist undergraduates in conducting their research.

Section B, C & D - Opinion Survey

- The claimed benefits of using IBS.
- IBS knowledge of architects, engineers, clients and government (approving) authorities.
- Acceptance towards IBS usage by the architects, engineers, clients and government (approving) authorities.
- Using IBS in future construction projects.
- Making compulsory IBS usage in construction.
- Respondents' comments on the usage of IBS in construction projects.

Section E - Comments and Suggestions

- Suggestions for enhancement.

*Refer to Appendices to observe questionnaire.

3.4 Pilot surveying

This is essentially a small scale replica of the actual survey and it is carried out before the actual survey is undertaken. It should duplicate, as near as possible, the survey which is to be made because it may reveal snags or flaws in the proposed questions and methods. A pilot survey is very useful when the actual survey is to be on a big scale as it may provide data which will allow costs to be trimmed. Also, a pilot survey will give an estimate of the non-response rate and it will also give a guide as to the adequacy of the sampling frame chosen.

The respondents' population consists of UTP (internal panels) and external panels. Three questionnaire drafts were distinctively distributed to 3 internal panels, namely to the lecturers and external panels, namely contractors. All respondents were chosen based on simple random sampling method.

3.5 Sampling

3.5.1 Target Population

The target population is the respondents of whom the author is interested in; the group about which the author wishes to draw conclusions. The population of the questionnaire consists of contractors, architects and engineers who are in the construction industry.

For the author's selection, a target population of 180 respondents is set, consisting of 90 contractors, 30 developers, 30 architects and 30 engineers. The number of respondents for each category is evenly distributed according to the respective three states.

- Perak, Kedah and Penang (each)
  - 30 contractors,
  - 10 architects,
  - 10 developers,
  - 10 engineers

Contractors stand a higher percentage in the distribution because they are the key players in the industry who handle first hand experience with the IBS components. To obtain a consistent result of the feedback, a minimum of 30 replies are required for analysis.

In random sampling, all items have some chance of selection that can be calculated. [13] Random sampling technique ensures that bias is not introduced regarding who is included in the survey. Five common random sampling techniques are:

- simple random sampling,
- systematic sampling,
- stratified sampling,
- cluster sampling, and
- multi-stage sampling.

I have chosen systematic sampling for the selection of respondents.

Systematic sampling, sometimes called interval sampling, means that there is a gap, or interval, between each selection. Systematic sampling is often used instead of random sampling. It is also called an Nth name selection technique. After the required sample size has been calculated, every Nth record is selected from a list of population members. As long as the list does not contain any hidden order, this sampling method is as good as the random sampling method. Its only advantage over the random sampling technique is simplicity.

Parameters taken into consideration of systematic random sampling are :

- number the units in the population from 1 to N
- decide on the n (sample size) that you want or need
- k = N/n = the interval size
- randomly select an integer between 1 to k
- every kth unit is taken

The advantage of systematic sampling is that it is simpler to select one random number and then every 'Ith' (e.g. 20th) member on the list, than to select as many random numbers as sample size. It also gives a good spread right across the population. A disadvantage is that a list must be required to start with, as of the sample size is required to be known before the sampling interval can be calculated.

3.6 Questionnaire Distribution

3.6.1 Mail Survey

Primarily, mail survey through the snail mail is being selected as the method to distribute the questionnaires to the respondents. After questionnaire fabrication, the questionnaire will be distributed to contractors, consultant, architect, developers and engineers for feedback. Mail surveys are among the least expensive. This is the kind of survey the author can do because the author has the names and addresses of the target population, but not their telephone numbers. The author chooses this method because mail surveys allow the respondent to answer at their leisure, rather than at the often inconvenient

moment they are contacted for a phone or personal interview. For this reason, they are not considered as intrusive as other kinds of interviews.

3.7 Follow Up

After the due date for the questionnaire set has arrived, the author will contact the respondents via electronic mail (e-mail) or telephone. The follow up should be done in around one to two weeks period by reminding the respondents of the due date and the significance of the questionnaire to the respondents. This process is necessary to increase the probability that the respondents will react towards the importance of the questionnaire.

3.8 Analysis

All data obtained will be analyzed by descriptive and analytical methods. Analytical method will be conducted if the feedback received is high in quantity. Descriptive statistical analysis presents data that have been retrieved into tabular and figure form. Data will be analyzed using the Index Average Method (AI-Hammad et. Al. 1996) as follows:

$$\text{Index Average} = (\Sigma\ a_i * x_i) / \Sigma x_i ;$$

Where a_i = constant .

x_i = variables representing respondents' frequency;

3.9 Tool

During the distribution of questionnaire, stationeries, stamps, envelopes are being used. Fax and telephone are utilized to follow up questionnaires and retrieval of feedbacks. Software such as Microsoft Excel and Microsoft Word are being used to input the data from the feedback and to process the descriptive analysis.

Chapter 4

RESULT & DISCUSSION

4.1 Respondent's Information

4.1.1 Data Collections

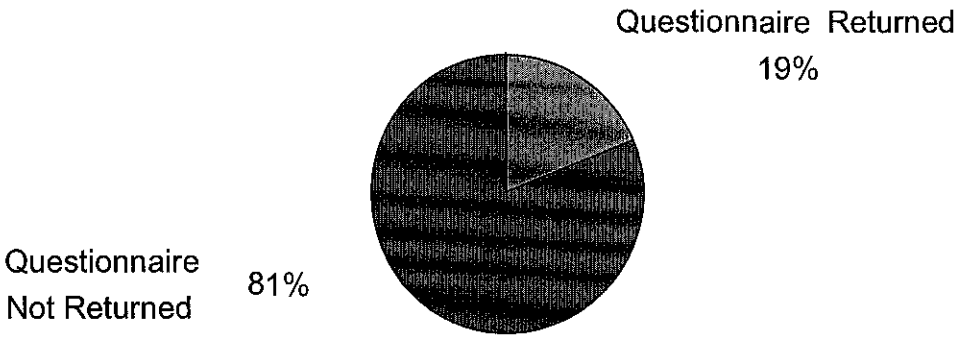


Chart 1 : Data Retrieval

The respondents were given the option of returning the questionnaire forms by mail or fax. A total 35 respondents out of 180 returned the questionnaire. Though only 19.4% of the respondents replied, this low percentage had been expected for a mailed and questionnaire-based survey research.

4.1.2 Respondents' Category

Table 1 : Respondents' Category

Type of Company	Nos.
Contractor	15
Consultant	5
Architect	10
Developer	5

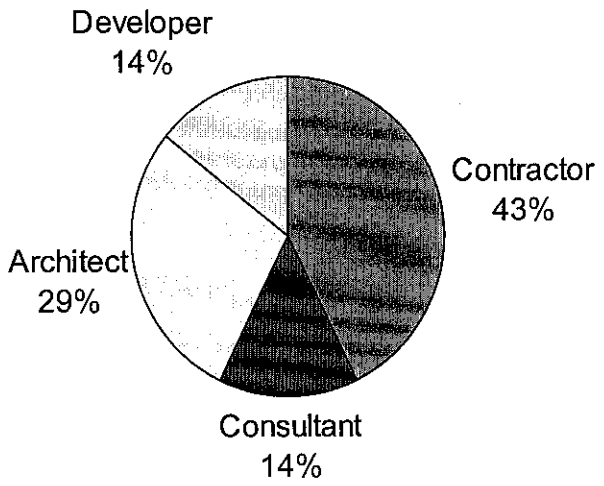


Chart 2 : Respondents' Category

Of the 35 completed forms, contractor registered as the highest number of respondents at 15 companies (42.8%), followed by 10 architect firms (28.6%) and lastly by consultant and developer both respectively at 5 (14.3%).

4.1.3 Contractor's Registration Grade

Table 2:Contractor's Registration Grade

CIBD's Registration Grade	Nos.
G1	-
G2	-
G3	1
G4	-
G5	2
G6	1
G7	5

PKK	Nos.
A	5
B	-
C	2
D	-
E	-
F	-

From the 15 contractors, 5 contractors are CIDB G7-registered contractors, 2 contractors in CIDB G6-registered category and both 1 contractor in CIDB G3 and G6-registered category. Remaining contractors did not state their CIDB registration grade.

In addition, 5 contractors were categorized as PKK Class A and 2 contractors in Class C. Others did not state their PKK grade.

4.1.3 Respondents' Designation

Table 3: Respondents' Designation

Designation	Nos.
Project Manager	5
Construction Manager	3
Project Engineer	7
Quantity Surveyor	6
Director	2
Consultant Architect	10
Other	2

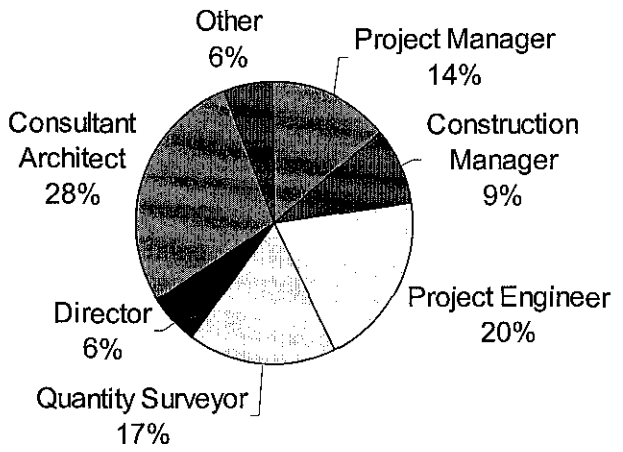


Chart 3 : Respondents' Designation

Most (28%) of the respondents came from the top management level, which is good for a opinion based survey analysis. Consultant architect (28%) and project engineer (20%) who has the highest percentage among other designations. This is good for an opinion survey analysis as the respondents are more likely to portray the actually company direction as they are directly involved with design and construction of IBS.

4.1.4 Respondents' Experience in Building Construction Industry

Table 4: Respondents' Experience in Building Construction Industry

Year Range	Nos.
<5	0
5-10	5
10-20	24
>20	6

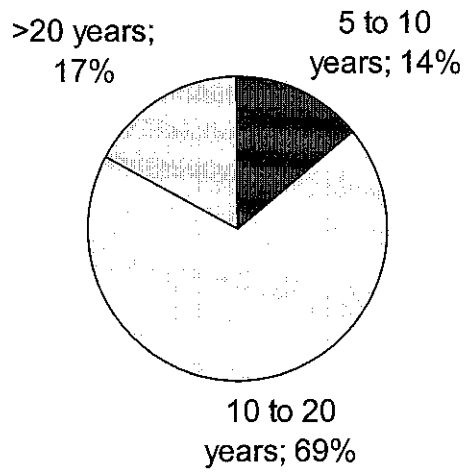


Chart 4: Respondents' Experience

Most of respondents have good experience in IBS at (69%) whereby they have been in the construction industry ranging from 10 years to 20 years. This is followed by respondents who have more than 20 years experience in construction industry at 16%. This is a good statistical result as respondents whose working experience is at least 10 years have had sufficient knowledge concerning conventional system which has been practiced and they are able to compare the advantages and flaws of both systems. This, which, is good for the opinion based survey.

4.1.5 Respondents' Knowledge in IBS

Table 5: Respondents' Knowledge in IBS

Knowledge Level	Nos.			
	Contractor	Consultant	Architect	Developer
Poor	5	1	1	1
	8			
Good	7	2	7	2
	18			
Excellent	3	1	2	0
	6			

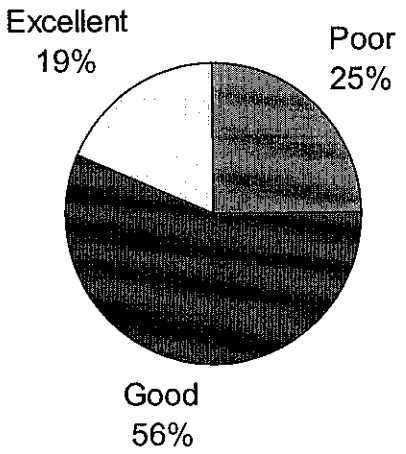


Chart 5: Respondents' IBS Knowledge

Most of the respondents have good knowledge in IBS with 56% of them. Besides, 25% of the respondents were reported to be having poor knowledge in IBS. Minority of the respondents however were having excellent knowledge in IBS. This may because not many people in Malaysian construction industry are well equipped with IBS knowledge. Few respondents did not state anything, which could reflect on their unfamiliarity on IBS knowledge. Having more than 50% of respondents who have good knowledge in IBS, we can observe that the result of the feedback should be fairly reliable.

4.2 Perception of IBS

4.2.1 Advantages of IBS

Table 6: Advantages of IBS

Scale	1 [Don't Agree]				2 [Agree]				3 [Very Much Agree]				**Index Average**	**Category**
Respondents' Category / Criteria	Contractor	Consultant	Architect	Developer	Contractor	Consultant	Architect	Developer	Contractor	Consultant	Architect	Developer		
Cleaner, neater and safer construction sites	0	0	0	0	8	5	5	4	7	0	5	1	2.37	Agree
	0				22				13					
Easy installation	7	0	7	0	8	3	3	2	0	2	0	3	1.86	Agree
	14				16				5					
Open / flexible system	4	1	3	2	11	0	6	3	0	4	1	0	2.06	Agree
	10				20				5					
Labor reduction	2	4	8	1	11	0	2	1	2	1	0	3	1.74	Don't Agree
	15				14				6					
Enhancing quality of finished products	1	2	0	1	12	2	9	2	2	1	1	2	1.74	Agree
	4				25				6					
Faster completions	0	0	1	1	8	3	6	2	7	2	3	3	2.37	Agree
	2				18				15					
Lowering total construction cost	9	2	7	2	6	3	3	3	0	0	0	0	1.43	Agree
	20				15				0					

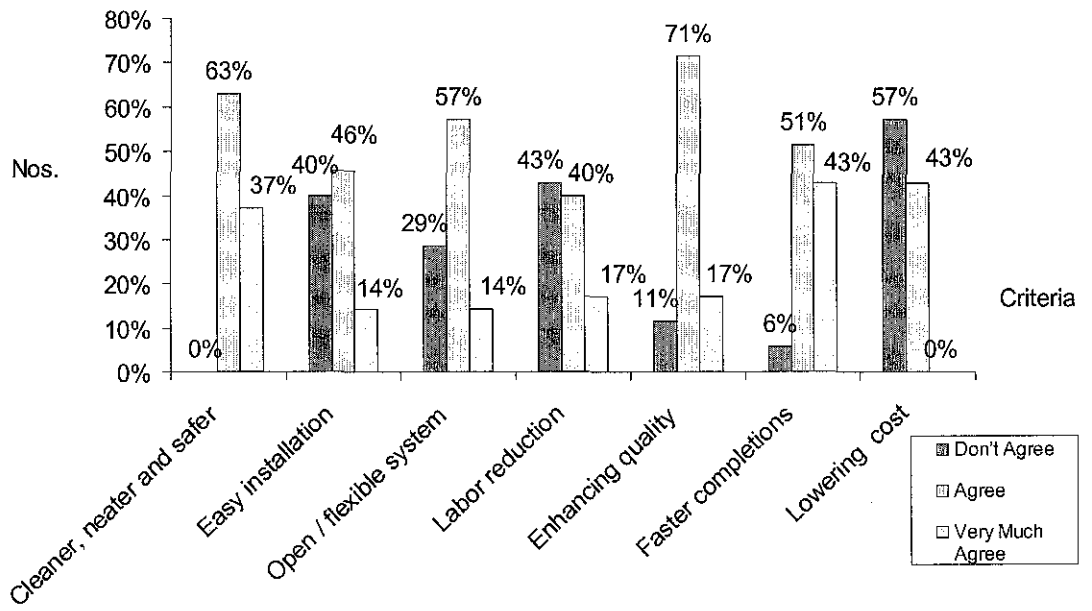


Chart 6: Advantages of IBS

As stated in Chart 6, most of the respondents agreed that IBS enhanced the quality of the finished work of construction (71%). For example, by using the conventional system whereby timber and nails are involved, the probability of the timber bulging is high, causing uneven surface. Also, IBS is believed to provide cleaner, neater, and safer (63%). No nails and timbers which are used in conventional system are possibly hazardous to worker. IBS is proved to be neater as IBS uses systematic method, and can be reused for repeated type of construction.

Also, 57% respondents disagree that IBS is comparatively cheaper than conventional system. This might have occurred due to the low scale of economy. Thus, at the current situation, the cost for IBS system construction may he higher than conventional system, causing most industry players to choose conventional method for their project. 43% of respondents feel that by using IBS, labor force still cannot be reduced. This may because of that, IBS-knowledgeable labor ranging from design; fabrication and installation are still very much needed in IBS. 40% respondents felt that IBS are not easy to installed, which mainly caused by insufficient knowledge of IBS design and installation by skilled worker.

4.2.2 Problems of IBS in Construction Industry

Table 7: Problems of IBS in Construction Industry

Scale	1 [Don't Agree]				2 [Agree]				3 [Very Much Agree]				Index Average	Category
Respondents' Category / Criteria	Contractor	Consultant	Architect	Developer	Contractor	Consultant	Architect	Developer	Contractor	Consultant	Architect	Developer		
Insufficient personnel industry	8	2	4	3	4	3	1	1	3	0	5	1	1.77	Agree
	17				9				9					
Insufficient IBS manufacturer in industry	7	0	6	3	4	5	2	2	4	0	2	0	1.71	Agree
	16				13				6					
Expensive	8	2	5	1	5	3	3	2	2	0	2	2	1.71	Agree
	16				13				6					
Resistance to change (prefer conventional system)	0	1	1	2	14	2	6	1	1	2	3	2	2.11	Agree
	4				23				8					
Failure of technology transfer (i.e. no standards or guidelines)	0	1	2	0	11	2	5	4	4	2	3	1	2.20	Agree
	3				22				10					

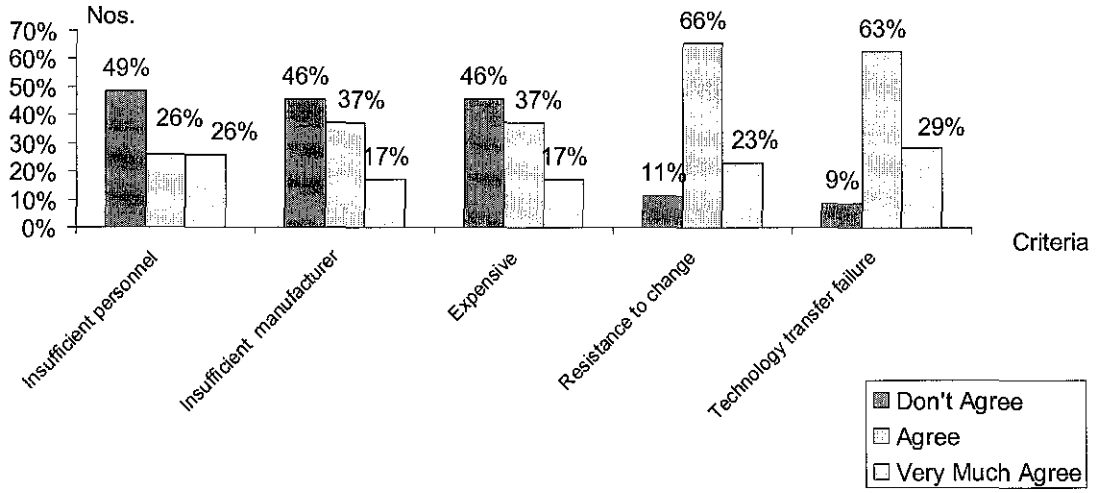


Chart 7 : Problems of IBS in Construction Industry

66% of the respondents, especially from contractors, clarified that they are strongly reluctant and 23% are reluctant of using IBS as they resist changing from their conventional system. They have practiced conventional system from 10 years ago at least and IBS is totally new to them. Most of the contractors' labors too, are also knowledge-blind of IBS. Malaysian foreign construction labors, especially from Indonesia are generally used to conventional construction system as well as IBS is also seldom used in these foreign countries.

In addition, 63% of respondents strongly thought and 29% suggested that there is failure in IBS technology transfer in Malaysia. They suggested that there are insufficient IBS guidelines and standards of IBS in Malaysian industry. This may happen due to 2 reasons; insufficient guidelines and unclear standards, either that the guidelines are adequate but the promotional campaign by the relevant bodies is inefficient. This will be discussed in later result.

However, 49% of respondents denied that there are insufficient IBS knowledgeable personnel in Malaysian industry; simply means that there are Malaysian construction industry players with IBS knowledge but due to other reasons, IBS is not being rapidly used. 46% of respondents also denied that there were insufficient manufacturers in Malaysia. This however contradicts with the fact that there are only 3 IBS manufacturers in the Northern Malaysia.

4.2.3 Perception of Conventional Construction

Table 8: Perception of Conventional Construction

Scale	1 [Don't Agree]				2 [Agree]				3 [Very Much Agree]				**Index Average**	**Category**
Respondents' Category / Criteria	Contractor	Consultant	Architect	Developer	Contractor	Consultant	Architect	Developer	Contractor	Consultant	Architect	Developer		
Cleaner, neater and safer construction sites	14	4	9	4	1	1	1	1	0	0	0	0	2.37	Don't Agree
	31				4				0					
Easy installation	8	1	7	1	7	2	2	4	0	2	1	0	1.86	Agree
	17				15				3					
Open / flexible system	4	1	1	1	6	2	3	2	6	2	6	2	2.06	Agree
	7				13				16					
Labor reduction	13	2	7	4	2	1	1	1	0	2	2	0	1.43	Don't Agree
	26				5				4					
Enhancing quality of finished products	12	3	6	2	2	1	2	3	1	1	2	0	1.74	Don't Agree
	23				8				4					
Faster completions	8	3	6	2	7	2	3	2	0	0	1	2	1.74	Agree
	18				14				3					
Lowering total construction cost	5	1	3	1	9	3	7	1	1	1	0	3	2.37	Agree
	10				20				5					

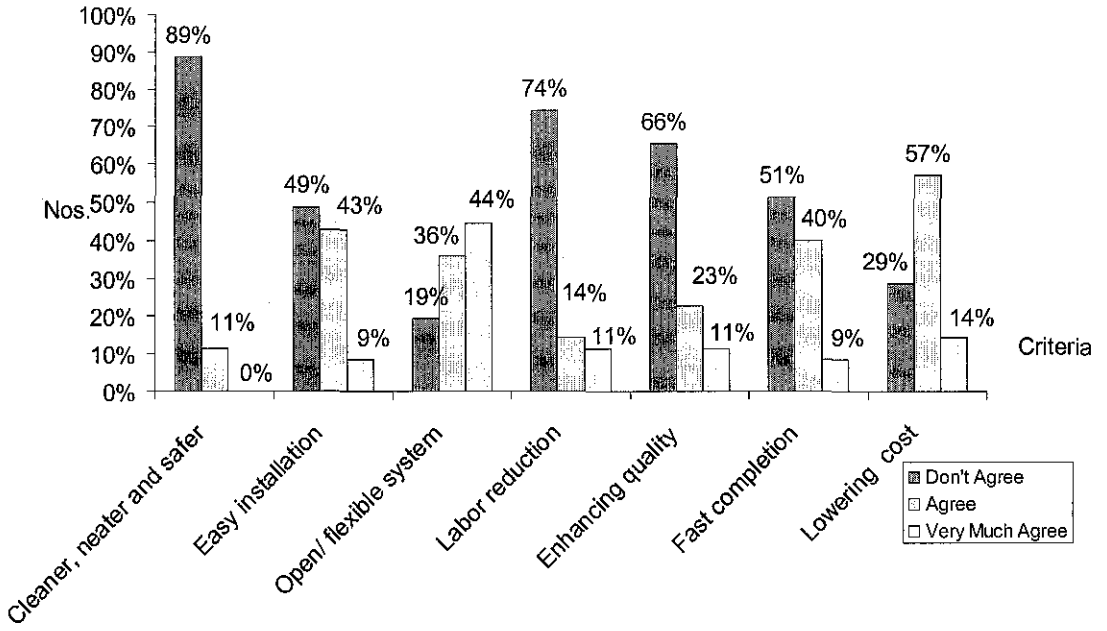


Chart 8: Perception of Conventional Construction

Generally, 57% of the respondents agreed that for the current situation of construction industry in Malaysia, using the conventional system is comparatively cheap compared to IBS system. This might because of the poor scale of economy as mentioned earlier. The number of project in Malaysia utilizing IBS is generally low and therefore, the market for IBS manufacturer and usage is low as well, causing the cost of IBS to be inverse proportionally increasing.

In addition, 44% strongly agree that they preferred conventional system than IBS is because they thought that conventional system is open and flexible system. Open or flexible system here referred is that conventional system is easier to implement whereby mostly timber, steel bar and nails only are required for construction. These items does not need to be custom fabricated and can be fabricated on site as long as the material is on site, which is flexible.

Majority 89% of respondents, especially from the contractors, strongly disagree that conventional method is cleaner, safer and neater. 74% respondents did not think that conventional system will decrease labor, more than those of IBS at 43% (Refer to Chart 6).

4.3 Acceptance towards IBS

Table 9: Current available IBS in Malaysia

Criteria \ Scale	1 [Poor]	2 [Good]	3 [Excellent]	Index Average	Category
How do you feel about the current available IBS technology in Malaysia?	15	14	4	1.67	Good

It shows that respondents feel that the current available IBS in Malaysia is generally good.

Table 10: Acceptance towards IBS usage in Malaysia

Criteria \ Scale	1 [Poor]	2 [Good]	3 [Excellent]	Index Average	Category
What is your opinion on acceptance towards usage of IBS in Malaysia?	13	15	5	1.75	Good

Most respondents also agreed that the current acceptance towards the usage of IBS in Malaysia is still in a good condition. This might happen as they are not aware that only 15% of share market is being involved in Malaysian construction industry.

4.4 CIDB's Involvement

Table 11: CIDB's Involvement

Criteria \ Scale	1 [Poor]	2 [Good]	3 [Excellent]	Index Average	Category
How is the effectiveness of the seminar and promotional campaign by CIDB	18	15	0	1.45	Poor

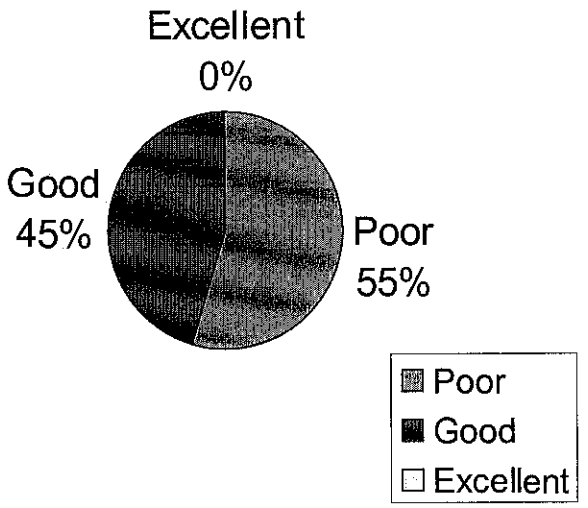


Chart 9: CIDB's Involvement

55% of the respondents clarified that the promotional campaign and seminars done by CIDB is poor. According to some of the reasons given, seminars carried out by CIDB annually are insufficient in numbers. Also, the promotional campaign done by CIDB is not poor, effective and insufficient across Malaysia.

45% of them however thinks that the campaign is good. Perhaps these companies are situated at a more urban area whereby the effectiveness of the campaign is higher.

Table 12: CIDB's Involvement

Section E: 2 **CIDB's Involvement**					
Scale / Criteria	1 [Poor]	2 [Good]	3 [Excellent]	Index Average	Category
How is the government, in particular the CIDB, giving sufficient incentive to attract and promote the usage of IBS	19	10	3	1.48	Poor

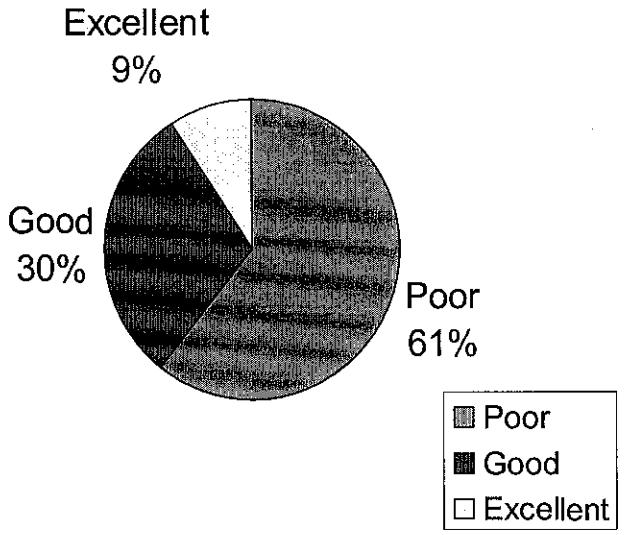


Chart 10 : CIDB's involvement

Majority (61%) of respondents thought that the incentive provided by the government, especially through the CIDB, is poor. Incentive in the sense of monetary, machineries, man power, promotion and material provided by the government have not reached up to the expectation of the Malaysian construction industry players to implement IBS.

4.5 Suggestion and Comments on the Usage of IBS in Malaysia

Table 13: Suggestion and Comments on the Usage of IBS in Malaysia

Section F: Suggestion and Comments on the Usage of IBS in Malaysia					
Scale / Criteria	1 [Don't Agree]	2 [Agree]	3 [Very Much Agree]	Index Average	Category
Promote formation of other suppliers to avoid monopoly	0	9	26	2.74	Very Much Agree
Promote designers to design in IBS	0	10	25	2.71	Very Much Agree
Make IBS compulsory	27	8	0	1.23	Don't Agree
Form R & D centre for IBS	0	28	7	2.20	Agree
Prefer conventional in-situ construction method	10	18	7	1.91	Agree
More efficient education awareness on IBS through courses and seminars	0	26	9	2.26	Agree
Make compulsory for contractor, engineer, developer and architect to attend IBS campaigns and seminars	10	20	5	1.86	Agree
More incentives from Government to lower the costs of using IBS	3	22	10	2.20	Agree
More efficient workers training in IBS knowledge	0	7	28	2.80	Very Much Agree
Standardize sizes and shapes of components	8	18	9	2.03	Agree
Make compulsory architects design in accordance to modular coordination	17	13	5	1.66	Agree
Proof of cost and time savings	5	8	22	2.20	Agree

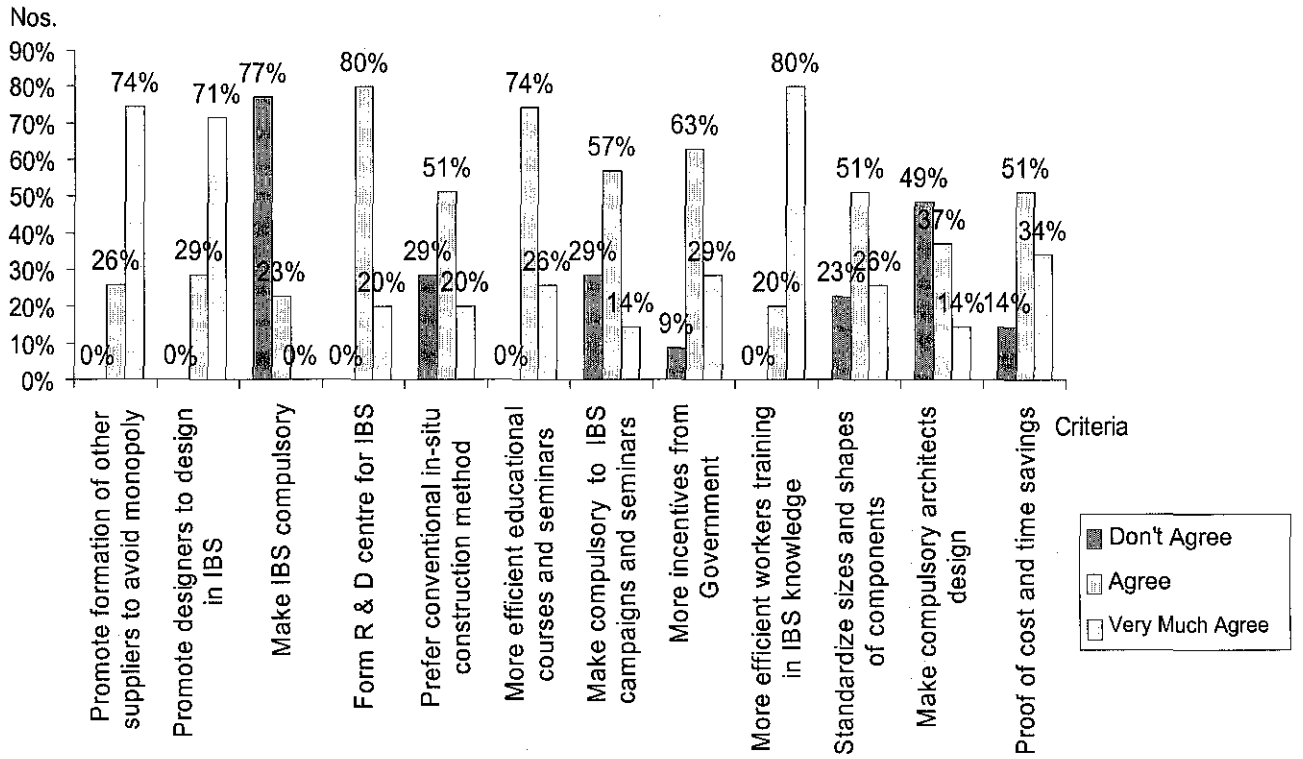


Chart 11: Suggestion and Comments on the Usage of IBS in Malaysia

Quantitatively, 28 respondents (80%) strongly agreed and 7 respondents (20%) of the respondents agreed that more efficient workers should be trained with IBS knowledge. This might due to despite that IBS technology has arrived in Malaysia, due to insufficient personnel and workers who possess IBS knowledge, IBS cannot be implemented as well.

Then, 26 (74%) respondents strongly suggested and 9 respondents (24%) by quantitative suggested that the government body should promote formation of the other suppliers by teaching the technology to them. This can indirectly avoid monopoly of IBS manufacturers in Malaysia, which already has a very small population in Malaysian construction industry. Due to small population of IBS Manufacturer in Malaysian industry, thus, some manufacturers also took this chance to increase the cost of the system.

Thirdly, 25 respondents (71%) firmly suggested and 10 (29%) agreed that CIDB with collaboration with the Malaysian Architect Board (MAB) and Board of Engineer Malaysia (BEM) to promote designers ranging from architect to engineer to design in IBS.

However, more than half of total respondents, at 27 respondents (77%) strongly opposed that IBS should be made compulsory in Malaysia. None agreed that to make IBS compulsory in Malaysian construction project. Obviously, all construction parties disagree to make IBS compulsory so as they might be able to have a variety of choice to decide, on which will be more economical and beneficial for respective project.

In addition, almost half of respondents' population, 17 respondents (49%) strongly disagreed that making compulsory for architects design in accordance to modular coordination. Most of the respondents consist of architects who personally think that architectural designs are not the prime solution to solve low reception of IBS in Malaysia and other major reasons should be considered.

Still generally, the respondents agreed that Research and Development (R&D) centre should be formed just to enhance IBS technology in Malaysia so that standardization of IBS component can be effectively carried out. Also, more effective seminars and promotional campaigns should be carried out. More incentives should be provided by government through relevant body. Proof of cost and time saving by using IBS should be researched and publish publicly so that more parties will get to know IBS better.

4.6 IBS prospect in the future project

Table 14: IBS prospect in the future project

Willingness to Recommend the implementation of IBS on the next project	
	Nos.
Yes	8
No	18
No opinion	9

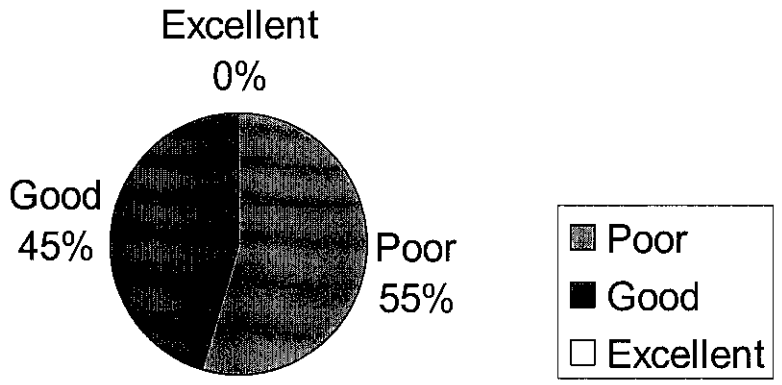


Chart 12: Willingness to recommend the implementation of IBS for next project

According to chart 12, more than half of the respondents at 18 respondents (51%) suggested that they will not recommend their respective companies to implement IBS in their next project.

Only a minority of 8 respondents (23%) supported the usage of IBS in their next project. They believed that IBS has the potential to be a trustable system in this short term of period.

Whereby 9 respondents (26%) had no opinion on whether they will suggest their companies to implement IBS. This might happen as they were still unsure of the usage of IBS in Malaysia.

CHAPTER 5

DISCUSSION & CONCLUSION

5.1 Discussion

During the interviews, the author has gathered beneficial information concerning the IBS and also general overview of the current situation in Malaysia. Manufacturer of IBS components in Malaysia are comparatively low, recording only 50 companies registered in Malaysia, with only three companies based at Northern Malaysia at the present moment, all three situated at Perak. At Kedah itself, only 2 projects are implemented in IBS, one governmental project under CIDB supervision and another non-governmental. Statistically only 27 housing projects throughout Malaysia have implemented IBS.

The main reason that consultant, contractors, developers and especially the client priorities choose conventional construction is because of relatively cheap and abundant supply of neighboring foreign labours from Indonesia, Bangladesh and Pakistan. It is comparatively cheap as rate of labours in Malaysia is ten times as low as the rate at Finland (Ref. Gardiner & Theobald, 2002).

Besides, implementing IBS at this stage whereby the scale of economies is poor is very expensive for contractor, especially for class F contractors as they do not have sufficient capital funding to afford IBS. Besides, due to the failure of past "Closed System", they do not want to endanger their respective company by implementing a comparatively new system especially when they are still new and unfamiliar with the systems.

Furthermore, the failure of technology transfer also results in the low reception of IBS in Malaysian Market. For instance, before the proper guidelines set up by CIDB, there was no standard for contractors or consultants to follow and abide. Thus, the outline of IBS is uncertain. Also contributing to this scenario is poor industry practice which includes poor planning and manufacturer driven.

Assistant director of Jabatan Kerja Raya Perak (JKR) commented that IBS is not favorable for the current industry because of the new technology implied. Contractors inclusive of engineers and technical personnel do not possess adequate knowledge of the technology, especially at the critical jointing area between of the precast where leakages often occur if not installed with the right method, especially at the bathroom area whereby the joint must be sealed and waterproof.

Most contractors are still practicing conventional construction because they have been used to the system before the introduction of IBS. They resist IBS and cannot adopt themselves to the new technology as they do not possess IBS installation knowledge.

CIDB has sponsored and conducted several seminars concerning IBS throughout the year. However, the seminar has not received positive feedback from consultants, contractors and engineer. Due to that, CIDB organizes IBS seminar once in a year.

During the fabrication of questionnaire, the author has met up with the author's supervisor, AP. Ir. Dr. Arazi Idruz to discuss about the content of the questionnaire. Initially, it was commented on being too subjective and lengthy, reaching 5 pages of open questions which is not suitable for a professional questionnaire. Thus, the author edited the questionnaires into a more objective manner and yet still inclusive of few open-ended questions. The Semantic Differential Scale is being selected to achieve this objective. The semantic differential scale requires answers based upon a three-point rating scale that has two bi-polar adjectives at each end.

Data compilation was done after the feedback from the respondents have been received. Descriptive data collection is being implemented where by each question answers by the respondents are being summed up through cumulative method. However, there are certain questions that does not sum up to the total number as there are questions that the respondents are having a conservative stand and choose not to answer them. After data compilation, the analyses can commence.

5.1.1 Limitations

As the survey research method is being conduction, this study has its own limitations that have affected the results of the findings :

i) The respondents

The 35 respondents only represented 19% of the target sample of 180 respondents. This might be caused by the questionnaires failing to reach the respondents desired address which the registration list of the population sample may have not been updated correctly in term of address.

ii) Non-stated answers

There is minor percentage in the questionnaire whereby the questionnaire are not answered. This might have slightly affected the results and the actual scenario of the construction market.

iii) IBS knowledge

Level of IBS knowledge of the respondents cannot be assured of. Respondents may be knowledgeable and experience in pre-cast concrete but unfamiliar with steel formwork system despite assuming IBS as general.

iv) Population sample

Due to time constraints, small sample size of 180 samples from a possible approximate 20,000 respondents around Northern Malaysia was being selected for the questionnaire research. Thus, the result might not portray the actual situation happening in the market.

5.2 Conclusion

Generally, local parties felt that the current IBS available in Malaysia is good. They also agreed that the current acceptance towards the usage of IBS in Malaysia is still in a good condition. This might happen as they are not aware that only 15% of share market is being involved in Malaysian construction industry.

55% of the respondents clarified that the promotional campaign and seminars done by CIDB is poor. According to some of the reasons given, seminars carried out by CIDB annually are insufficient in numbers, namely one once a year for seminar for example. Also, the promotional campaign done by CIDB is informed to be poor, ineffective and insufficient across Malaysia.

Majority (61%) of respondents thought that the incentive provided by the government, especially through the CIDB, is poor. Incentive in the sense of monetary, machineries, man power, promotion and material provided by the government have not reached up to the expectation of the Malaysian construction industry players to implement IBS

5.2.1 Main Factors of the Low Receptions of IBS in Malaysia:

i) Failure in Technology Transfer

In addition, 63% of respondents strongly thought and 29% suggested that there is failure in IBS technology transfer in Malaysia. They suggested that there are insufficient IBS guidelines and standards of IBS in Malaysian industry. This may happen due to 2 reasons; insufficient guidelines and unclear standards, either that the guidelines are adequate but the promotional campaign by the relevant bodies is inefficient which is proven at Table 11 and Table 12.

ii) Resistance to change

23% of the respondents, especially from contractors, strongly clarified and 66% respondents clarified that they are reluctant of using IBS as they resist changing from their conventional system.

iii) Conventional system is open and flexible

44% of respondent strongly agreed and 36% respondents agreed that they preferred conventional system than IBS is because they thought that conventional system is open and flexible system. Open or flexible system here referred is that conventional system is easier to implement whereby mostly timber, steel bar and nails only are required for construction. These items does not need to be custom fabricated and can be fabricated on site as long as the material is on site, which is flexible.

iv) High Cost

57% of the respondents agreed that for the current situation of construction industry in Malaysia, using the conventional system is comparatively cheap compared to IBS system due to poor scale of economy. The number of project in Malaysia utilizing IBS is low and therefore, the market for IBS manufacturer and usage is low as well, causing the cost of IBS to be inverse proportionally increasing.

5.2.2 Suggestions on the Usage of IBS

i) IBS personnel and worker training

80% respondents strongly agreed and 20% of the respondents agreed that more efficient workers should be trained with IBS knowledge.

ii) Promote formation of more suppliers

74% respondents strongly suggested and 24% respondents by quantitative suggested that the government body should promote formation of the other suppliers by teaching the technology to them.

iii) Promote designers to design in IBS

71% respondents firmly suggested and 29% respondents agreed that CIDB with collaboration with the Malaysian Architect Board (MAB) and Board of Engineer Malaysia (BEM) to promote designers ranging from architect to engineer to design in IBS. This can be achieved by constantly organizing promotional campaign.

iv) More efficient educational courses and seminars

26% respondents strongly suggested and 74% suggested that more efficient educational courses and seminars concerning IBS should be constantly carried out compared to the current situation whereby seminar are rarely being organized.

Last but not least, more than half of the respondents (51%) suggested that they will not recommend their respective companies to implement IBS in their next project. Minority of 23% respondents will support the usage of IBS in their next project which they believed to have the potential in the modern world construction technology. Remaining 26% respondents had no opinion on whether they will suggest their companies to implement IBS.

CHAPTER 6

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CHAPTER 7

APPENDICES

Appendix A: 1st Draft Questionnaire
Appendix B: 2nd Draft Questionnaire
Appendix C: Final Questionnaire
Appendix D: Tabular Result

Appendix A: 1st Draft Questionnaire

Perceptions of Industrialised Building System (IBS) within the Malaysian Market (Penang, Kedah & Perak)

The reception and attitude towards Industrialised Building System (IBS) are still relatively low, approximately 15% despite even after a series of promotion campaigns by the CIDB recently. The objective of this final year project is to investigate the underlying reasons for the cold reception and hence for the small market share for industrialized construction in Malaysia (Perak, Penang & Kedah).

The questionnaire is divided into 3 sections which are A, B and C. Please answer the questionnaire by referring to every section's instructions. To simplify and save time, point forms are encouraged.

Section A : General / Background Information
Please fill in the blanks and tick in [ ] provided.

I. Company:

1. Name of Company: _____

2. CIDB Registration grade of the company: _____

3. Company's experience in building construction? _____ Years

II. Respondents

1. What is your designation with the company?

[ ] Project Manager [ ] Construction Manager

[ ] Project Engineer

[ ] Others: _____

2. Respondent's experience in building construction? _____ Years

Section B:
How many projects have your company completed? _____
How many projects were completed using IBS? _____
Percentage of IBS usage in completed project? _____%

If conventional system, kindly proceed to section C. Otherwise, proceed to section D

Section C:

What are the advantages of conventional system compared to IBS?

-

-

-

What problem are you currently facing with conventional system?

-

-

-

Do your engineers, supervisors or technical personnel possess the knowledge of IBS, including the critical part of jointing or IBS scoring system? _____

If not, Why? _____

Why choose conventional method when IBS having theoretical advantages of speed, safety and quality?

-

-

-

Section D:

Which IBS component are you using?

[ ] Precast Concrete [ ] Steel Formwork [ ] Steel Frames

[ ] Timber Frames [ ] Blockworks [ ] Others: _____

What are the advantages IBS compared to conventional system?

[ ] Cleaner, neater and safe construction sites [ ] Easy installation

[ ] Open / flexible system [ ] Labour reduction

[ ] Enhancing quality of finished products [ ] Fast completion

[ ] Lowering total construction cost

What are the problems of IBS?

-

-

-

How much knowledge you possessed about pre-cast and pre-stressed?

[ ] Excellent [ ] Average [ ] None

Where is the closest IBS manufacturer from project site? Is it difficult to obtain construction components?

-

Section E: Additional Information

How frequent does CIDB organize IBS promotional campaign such as IBS workshop or seminar? _____

Is representative sent to attend the seminar or workshop upon invitation? _____

Is the campaign effective and sufficient? Justify.

-

-

-

Is the government, which is represented by CIDB, giving sufficient incentive to attract and promote the usage of IBS? _____

As highly experienced and qualified personnel, do you prefer conventional construction or IBS construction base on feasibility, duration, speed and economy wise?

-

-

-

How do you feel about the current available IBS in Malaysia?

[ ] Good [ ] Poor [ ] Not Sure

Will you recommend or implement IBS on your following project?

[ ] Yes [ ] No [ ] Not Sure

Recommendation to promote the implementation of IBS in Malaysian construction.

-

-

-

Thank you for your precious time and cooperation in completing the questionnaire. It would be highly appreciated if you could send back the questionnaire by **** 2007.

Appendix B: 2nd Draft Questionnaire

Perceptions of Industrialised Building System (IBS) within the Malaysian Market (Penang, Kedah & Perak)

The reception and attitude towards Industrialised Building System (IBS) are still relatively low, approximately 15% despite even after a series of promotion campaigns by the CIDB recently. The objective of this final year project is to investigate the underlying reasons for the cold reception and hence for the small market share for industrialized construction in Malaysia (Perak, Penang & Kedah).

The questionnaire is divided into 3 sections which are A, B and C. Please answer the questionnaire by referring to every section's instructions. To simplify and save time, point forms are encouraged.

Section A : General / Background Information
Please fill in the blanks and tick in [ ] provided.

I. Company:

1. Name of Company: _____

2. CIDB Registration grade of the company: _____

3. Company's experience in building construction? _____ Years

II. Respondents

1. What is your designation with the company?

[ ] Project Manager [ ] Construction Manager

[ ] Project Engineer

[ ] Others: _____

2. Respondent's experience in building construction? _____ Years

Section B:

How many projects have your company completed? _____

How many projects were completed using IBS? _____

Percentage of IBS usage in completed project? _____%

Section C:

Why conventional method is still being implemented despite IBS having theoretical advantages of speed, safety and quality? (In short answers)

-

-

-

-

Section D:

Which IBS component are you using?

[ ] Precast Concrete [ ] Steel Formwork [ ] Steel Frames
[ ] Timber Frames [ ] Blockworks [ ] Others: _____

Advantages of IBS: Tick the following

i) Cleaner, neater and safe construction sites
[ ] Agree [ ] Don't Agree [ ] Undecided

ii) Easy installation
[ ] Agree [ ] Don't Agree [ ] Undecided

iii) Open / flexible system
[ ] Agree [ ] Don't Agree [ ] Undecided

iv) Labour reduction
[ ] Agree [ ] Don't Agree [ ] Undecided

v) Enhancing quality of finished products
[ ] Agree [ ] Don't Agree [ ] Undecided

vi) Fast completion
[ ] Agree [ ] Don't Agree [ ] Undecided

vii) Lowering total construction cost
[ ] Agree [ ] Don't Agree [ ] Undecided

What are the problems of IBS? (In short answers)

-

-

How much knowledge you possessed about IBS?

[ ] Excellent [ ] Average [ ] None

Is the IBS manufacturer in Malaysia sufficient?

[ ] Good [ ] Poor [ ] Not Sure

Section E: Additional Information

How frequent does CIDB organize IBS promotional campaign such as IBS workshop or seminar annually? _____

Is representative sent to attend the seminar or workshop upon invitation? _____

How is the efficiency of the promotional campaign.

[ ] Excellent [ ] Good [ ] Average
[ ] Okay [ ] Poor

Is the government, which is represented by CIDB, giving sufficient incentive to attract and promote the usage of IBS?

[ ] Good [ ] Poor [ ] Not Sure

How do you feel about the current available IBS in Malaysia?

[ ] Good [ ] Poor [ ] Not Sure

What is your opinion on acceptance towards usage of IBS in Malaysia?

[ ] Good [ ] Poor [ ] Not Sure

Will you recommend or implement IBS on your following project?

[ ] Yes [ ] No [ ] Not Sure

What is your opinion on compulsory IBS usage in Malaysian project?

[ ] Yes, totally [ ] Yes, Certain percentage
[ ] No [ ] Not Sure

Suggestion and comments on the usage of IBS in Malaysian construction: Rank 6 most important points, 1 = least important and 6 = most important.

[ ] Promote Formation of Other Suppliers to Avoid Monopoly
[ ] Promote Designers to Design in IBS
[ ] Make IBS Compulsory
[ ] Form R & D Centre
[ ] Still Prefer Conventional In-Situ Construction Method
[ ] More Efficient Education Awareness on IBS through Courses and Seminars
[ ] Make Compulsory for Contractor, Engineer, Developer and Architect to Attend IBS Promotional Campaign and Seminar
[ ] More Incentives from Government to Lower Costs of Using IBS
[ ] More Efficient Workers Training in IBS Knowledge
[ ] Standardize Sizes and Shapes of Components
[ ] Make Compulsory Architects Design in Accordance to Modular Coordination
[ ] Proof of Cost and Time Savings

Thank you for your precious time and cooperation in completing the questionnaire. It would be highly appreciated if you could send back the questionnaire by **** 2007.

Appendix C: Final Questionnaire

Perceptions of Industrialised Building System (IBS) within the Malaysian Market

The Industrialised Building Systems (IBS) is a construction process that utilizes techniques, products, components, or building systems which involve prefabricated components and on-site installation. In this country, the reception and attitude towards Industrialised Building System (IBS) are still relatively low, approximately 15% despite even after a series of promotion campaigns by the CIDB recently. The objective of this final year project is to investigate the underlying reasons for the cold reception and hence for the small market share for industrialized construction in.

The questionnaire is divided into 3 sections which are A, B and C. Please answer the questionnaire by referring to every section's instructions. To simplify and save time, point forms are encouraged.

Section A: General / Background Information

Please fill in the blanks and tick in [ ] provided.

I. Company:

1. Name of Company: _____
2. Type of Company: [ ] Contractor [ ] Consultant [ ] Architect
2. Class (if applicable, for contractor):

a. PKK A [ ] B [ ] B [ ] C [ ] D [ ] E [ ] F [ ]
b. CIDB G1 [ ] G2 [ ] G3 [ ] G4 [ ] G5 [ ] G6 [ ] G7 [ ]

3. Company's experience in building construction? (Years)

<5 [ ] 5-10 [ ] 10-20 [ ] >20 [ ]

II. Respondents' Information and Nature of Project Completed

1. What is your designation with the company?

[ ] Project Manager [ ] Construction Manager
[ ] Project Engineer
[ ] Other: _____

2. Respondent's experience in building construction? _____ Years
3. How many projects have your company completed? _____
4. How many projects were completed using IBS? _____
5. Percentage of IBS usage in completed project? _____%
6. How much knowledge you possessed about IBS? Please tick.

[ ] None [ ] Average [ ] Excellent

Instruction for section B and C: Please give your comments by ticking the appropriate number according to scale given:

[1] Don't Agree **[2] Agree** **[3] Very Much Agree**

Section B: Perception of IBS.

1. Advantages of IBS

i)	Cleaner, neater and safe construction sites	[ ] 1	[ ] 2	[ ] 3
ii)	Easy installation	[ ] 1	[ ] 2	[ ] 3
iii)	Open / flexible system	[ ] 1	[ ] 2	[ ] 3
iv)	Labour reduction	[ ] 1	[ ] 2	[ ] 3
v)	Enhancing quality of finished products	[ ] 1	[ ] 2	[ ] 3
vi)	Fast completion	[ ] 1	[ ] 2	[ ] 3
vii)	Lowering total construction cost	[ ] 1	[ ] 2	[ ] 3

Other advantages, if any: _____

_____

2. Problems of IBS in Construction Industry

i)	Insufficient personnel concerning knowledge of IBS in industry	[ ] 1	[ ] 2	[ ] 3
ii)	Insufficient IBS manufacturer in industry	[ ] 1	[ ] 2	[ ] 3
iii)	Expensive	[ ] 1	[ ] 2	[ ] 3
iv)	Resistance to change (prefer conventional system)	[ ] 1	[ ] 2	[ ] 3
v)	Failure of technology transfer (i.e. no standards, guidelines etc.)	[ ] 1	[ ] 2	[ ] 3

Other problems, if any (**Very important**): _____

_____

_____

Section C: Perception of Conventional Construction

1. Why conventional method is still being implemented despite IBS having theoretical advantages of speed, safety and quality? Please comment.

i)	Cleaner, neater and safe construction sites	[ ] 1	[ ] 2	[ ] 3
ii)	Easy installation	[ ] 1	[ ] 2	[ ] 3
iii)	Open / flexible system	[ ] 1	[ ] 2	[ ] 3
iv)	Labour reduction	[ ] 1	[ ] 2	[ ] 3
v)	Enhancing quality of finished products	[ ] 1	[ ] 2	[ ] 3
vi)	Fast completion	[ ] 1	[ ] 2	[ ] 3
vii)	Lowering total construction cost	[ ] 1	[ ] 2	[ ] 3

Other perceptions, if any (**Very important**):_____

_____

Instruction for section D and E: Please tick the numbers for the respective questions according to scale below:
[1] Poor [2] Good [3] Excellent

Section D: Acceptance towards IBS. Please comment.

1.	How do you feel about the current available IBS in Malaysia?	[ ] 1	[ ] 2	[ ] 3
2.	What is your opinion on acceptance towards usage of IBS in Malaysia?	[ ] 1	[ ] 2	[ ] 3

Section E: CIDB's Involvement. Please comment.

1.	How is the effectiveness of the promotional campaign by CIDB?.	[ ] 1	[ ] 2	[ ] 3
2.	Is the government, in particular the CIDB, giving sufficient incentive to attract and promote the usage of IBS?	[ ] 1	[ ] 2	[ ] 3

Instruction for section F: Please tick the numbers for your comments concerning the respective questions in section F according to scale below:
[1] Don't Agree [2] Agree [3] Very Much Agree

Section F: Suggestions and Comments on the Usage of IBS in Malaysia

i)	Promote Formation of Other Suppliers to Avoid Monopoly	[ ] 1	[ ] 2	[ ] 3
ii)	Promote Designers to Design in IBS	[ ] 1	[ ] 2	[ ] 3
iii)	Make IBS Compulsory	[ ] 1	[ ] 2	[ ] 3
iv)	Form R & D Centre for IBS	[ ] 1	[ ] 2	[ ] 3
v)	Still Prefer Conventional In-Situ Construction Method	[ ] 1	[ ] 2	[ ] 3
vi)	More Efficient Education Awareness on IBS through Courses and Seminars	[ ] 1	[ ] 2	[ ] 3
vii)	Make Compulsory for Contractor, Engineer, Developer and Architect to Attend IBS Promotional Campaign and Seminar	[ ] 1	[ ] 2	[ ] 3
viii)	More Incentives from Government to Lower Costs of Using IBS	[ ] 1	[ ] 2	[ ] 3
ix)	More Efficient Workers Training in IBS Knowledge	[ ] 1	[ ] 2	[ ] 3
x)	Standardize Sizes and Shapes of Components	[ ] 1	[ ] 2	[ ] 3
xi)	Make Compulsory Architects Design in Accordance to Modular Coordination	[ ] 1	[ ] 2	[ ] 3
xii)	Proof of Cost and Time Savings	[ ] 1	[ ] 2	[ ] 3

3. Will you recommend the implementation of IBS on your following project? Why?

Thank you for your precious time and cooperation in completing the questionnaire. It would be highly appreciated if you could send back the questionnaire by **10 September 2007 or alternatively fax it to 05-3656716 (Attn: AP. Ir. Dr. Arazi Idruz).**

Appendix D: Tabular Result

Respondents' Category:

Table 15 : Respondents' Category

Type of Company	Nos.
Contractor	15
Consultant	5
Architect	10
Developer	5

Contractor's Registration Grade

Table 16:Contractor's Registration Grade

CIBD's Registration Grade	Nos.
G1	-
G2	-
G3	1
G4	-
G5	2
G6	1
G7	5

PKK	Nos.
A	5
B	-
C	2
D	-
E	-
F	-

Respondents' Designation

Table 17: Respondents' Designation

Designation	Nos.
Project Manager	5
Construction Manager	3
Project Engineer	7
Quantity Surveyor	6
Director	2
Consultant Architect	10
Other	2

Respondents' Experience in Building Construction Industry

Table 18: Respondents' Experience in Building Construction Industry

Year Range	Nos.
<5	0
5-10	5
10-20	24
>20	6

Respondents' Knowledge in IBS

Table 19: Respondents' Knowledge in IBS

Knowledge Level	Nos.			
	Contractor	Consultant	Architect	Developer
Poor	5	1	1	1
	8			
Good	7	2	7	2
	18			
Excellent	3	1	2	0
	6			

Perception of IBS

Advantages of IBS

Table 20: Advantages of IBS

Scale	1 [Don't Agree]				2 [Agree]				3 [Very Much Agree]				**Index Average**	**Category**
Respondents' Category / Criteria	Contractor	Consultant	Architect	Developer	Contractor	Consultant	Architect	Developer	Contractor	Consultant	Architect	Developer		
Cleaner, neater and safer construction sites	0	0	0	0	8	5	5	4	7	0	5	1	2.37	Agree
	0				22				13					
Easy installation	7	0	7	0	8	3	3	2	0	2	0	3	1.86	Agree
	14				16				5					
Open / flexible system	4	1	3	2	11	0	6	3	0	4	1	0	2.06	Agree
	10				20				5					
Labor reduction	2	4	8	1	11	0	2	1	2	1	0	3	1.74	Don't Agree
	15				14				6					
Enhancing quality of finished products	1	2	0	1	12	2	9	2	2	1	1	2	1.74	Agree
	4				25				6					
Faster completions	0	0	1	1	8	3	6	2	7	2	3	3	2.37	Agree
	2				18				15					
Lowering total construction cost	9	2	7	2	6	3	3	3	0	0	0	0	1.43	Agree
	20				15				0					

Problems of IBS in Construction Industry

Table 21: Problems of IBS in Construction Industry

Scale	1 [Don't Agree]				2 [Agree]				3 [Very Much Agree]				Index Average	Category
Respondents' Category / Criteria	Contractor	Consultant	Architect	Developer	Contractor	Consultant	Architect	Developer	Contractor	Consultant	Architect	Developer		
Insufficient personnel industry	8	2	4	3	4	3	1	1	3	0	5	1	1.77	Agree
	17				9				9					
Insufficient IBS manufacturer in industry	7	0	6	3	4	5	2	2	4	0	2	0	1.71	Agree
	16				13				6					
Expensive	8	2	5	1	5	3	3	2	2	0	2	2	1.71	Agree
	16				13				6					
Resistance to change (prefer conventional system)	0	1	1	2	14	2	6	1	1	2	3	2	2.11	Agree
	4				23				8					
Failure of technology transfer (i.e. no standards or guidelines)	0	1	2	0	11	2	5	4	4	2	3	1	2.20	Agree
	3				22				10					

Perception of Conventional Construction

Table 22: Perception of Conventional Construction

Scale	1 [Don't Agree]				2 [Agree]				3 [Very Much Agree]				**Index Average**	**Category**
Respondents' Category / Criteria	Contractor	Consultant	Architect	Developer	Contractor	Consultant	Architect	Developer	Contractor	Consultant	Architect	Developer		
Cleaner, neater and safer construction sites	14	4	9	4	1	1	1	1	0	0	0	0	2.37	Don't Agree
	31				4				0					
Easy installation	8	1	7	1	7	2	2	4	0	2	1	0	1.86	Agree
	17				15				3					
Open / flexible system	4	1	1	1	6	2	3	2	6	2	6	2	2.06	Agree
	7				13				16					
Labor reduction	13	2	7	4	2	1	1	1	0	2	2	0	1.43	Don't Agree
	26				5				4					
Enhancing quality of finished products	12	3	6	2	2	1	2	3	1	1	2	0	1.74	Don't Agree
	23				8				4					
Faster completions	8	3	6	2	7	2	3	2	0	0	1	2	1.74	Agree
	18				14				3					
Lowering total construction cost	5	1	3	1	9	3	7	1	1	1	0	3	2.37	Agree
	10				20				5					

Acceptance towards IBS

Table 23: Current available IBS in Malaysia

Scale / Criteria	1 [Poor]	2 [Good]	3 [Excellent]	Index Average	Category
How do you feel about the current available IBS technology in Malaysia?	15	14	4	1.67	Good

Table 24: Acceptance towards IBS usage in Malaysia

Scale / Criteria	1 [Poor]	2 [Good]	3 [Excellent]	Index Average	Category
What is your opinion on acceptance towards usage of IBS in Malaysia?	13	15	5	1.75	Good

CIDB's Involvement

Table 25: CIDB's Involvement

Criteria \ Scale	1 [Poor]	2 [Good]	3 [Excellent]	Index Average	Category
How is the effectiveness of the seminar and promotional campaign by CIDB	18	15	0	1.45	Poor

4.4.0 CIDB's Involvement

Table 26: CIDB's Involvement

Section E: 2 **CIDB's Involvement**					
Criteria \ Scale	1 [Poor]	2 [Good]	3 [Excellent]	Index Average	Category
How is the government, in particular the CIDB, giving sufficient incentive to attract and promote the usage of IBS	19	10	3	1.48	Poor

4.5.0 Suggestion and Comments on the Usage of IBS in Malaysia

Table 27: Suggestion and Comments on the Usage of IBS in Malaysia

Section F: Suggestion and Comments on the Usage of IBS in Malaysia					
Scale / Criteria	1 [Don't Agree]	2 [Agree]	3 [Very Much Agree]	Index Average	Category
Promote formation of other suppliers to avoid monopoly	0	9	26	2.74	Very Much Agree
Promote designers to design in IBS	0	10	25	2.71	Very Much Agree
Make IBS compulsory	27	8	0	1.23	Don't Agree
Form R & D centre for IBS	0	28	7	2.20	Agree
Prefer conventional in-situ construction method	10	18	7	1.91	Agree
More efficient education awareness on IBS through courses and seminars	0	26	9	2.26	Agree
Make compulsory for contractor, engineer, developer and architect to attend IBS campaigns and seminars	10	20	5	1.86	Agree
More incentives from Government to lower the costs of using IBS	3	22	10	2.20	Agree
More efficient workers training in IBS knowledge	0	7	28	2.80	Very Much Agree
Standardize sizes and shapes of components	8	18	9	2.03	Agree
Make compulsory architects design in accordance to modular coordination	17	13	5	1.66	Agree
Proof of cost and time savings	5	8	22	2.20	Agree