APPENDIX A

1. Questionnaire Survey for IBS House Occupiers

UNIVERSITI MALAYA
KUALA LUMPUR
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KEPADA SESIAPA YANG BERKENAAN

Tuan,

"The Critical Success Factors to Increase Customer Satisfaction in IBS Building Construction Using QFD"
- Nuzul Azam Haron (BHA060005)

Pelajar Ijazah Doktor Falsafah saya, **Nuzul Azam Haron (BHA060005)** di bidang Teknologi Pembinaan, Fakulti Alam Bina, Universiti Malaya sedang membuat kajian penyelidikan mengenai tajuk ***"The Critical Success Factors to Increase Customer Satisfaction in IBS Building Construction Using QFD".*** Diharap pihak tuan dapat memberi kerjasama kepada beliau bagi mendapatkan segala bantuan dan maklumat yang diperlukan bagi mencapai matlamat kajian tersebut. Hasil penyelidikan ini amat berguna kepada kemajuan industri pembinaan bangunan di Malaysia.

Segala kerjasama daripada pihak tuan saya dahului dengan ribuan terima kasih.

Yang benar,

PROFESOR HAMZAH ABDUL RAHMAN
Dekan

MS ISO 9001: 2000 REG. NO. AR 2760

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KAJIAN PENDAPAT PENGHUNI TENTANG FAKTOR YANG MEMPENGARUHI KUALITI RUMAH PANGSAPURI BERDASARKAN SISTEM BINAAN BERINDUSTRI

LATARBELAKANG BERKENAAN PENGHUNI RUMAH	
Nama Tuan/Puan:	
Alamat:	
No. Tel.	Pejabat:
	Rumah:
Umur	( ) 20 ke bawah
	( ) 21-30
	( ) 31-40
	( ) 41-50
	( ) 51 dan keatas
Jantina	( ) Lelaki
	( ) Perempuan
Keturunan	( ) Melayu
	( ) Cina
	( ) India
	( ) Lain-lain
Kerakyatan	( ) Malaysia
	( ) Warga asing
Pendidikan	( ) Sekolah Rendah
	( ) Sekolah Menengah
	( ) Diploma
	( ) Ijazah Sarjana Muda
	( ) Sarjana
	( ) PhD
Perkahwinan	( ) Bujang
	( ) Berkahwin
	( ) Janda
	( ) Duda
Tangunggan anak	( ) Tiada
	( ) 1-2
	( ) 3-4
	( ) 5 keatas
Pendapatan sebulan	( ) RM1000 kebawah
	( ) RM1001-3000

	( ) RM3001-5000
	( ) RM5000 keatas
Jenis rumah	**( )** Pangsapuri/Kondominium
	( ) Rumah Teres
	( ) Rumah Berkembar
	( ) Bungalow
Keluasan binaan	**( )** < 1000 m2
	( ) 1001-2000 m2
	( ) 2001-3000 m2
	( ) > 3000 m 2
Taraf rumah terkini	**( )** Rumah sendiri
	( ) Rumah sewa
	( ) Rumah majikan
Harga rumah	**( )** <RM25000
	( ) RM25001-100000
	( ) RM100001-200000
	( ) RM200001-300000
	( ) > RM300000
Tujuan membeli rumah	**( )** Harga yang berpatutan
	( ) Rekabentuk rumah
	( ) Pinjaman yang menarik
	( ) Tetangga yang baik
	( ) Peluang untuk peningkatan nilai
	( ) Lokasi yang sesuai
	( ) Berdekatan dengan Kemudahan asas
	( ) Kemudahan Keselamatan
LATARBELAKANG BERKENAAN RUMAH	
Pemaju Perumahan:	
Bilangan Tingkat:	1, 2, 3
Bilangan Bilik Tidur:	1, 2, 3, 4, 5, 6
Adakah anda melakukan apa-apa pengubahsuaian kepada rumah anda?	( ) Ya ( ) Tidak
Apakah masalah utama yang dihadapi dalam rumah Pasangsiap (IBS)?	**( )** Kebocoran **( )** Retak **( )** Struktur Rumah Rosak **( )** Tiada Masalah
Jika ya, sila nyatakan jenis dan kos pengubahsuaian yang telah dilakukan	

Berikut dinyatakan faktor-faktor yang mungkin mempengaruhi kualiti sesebuah rumah yang didiami. Sila nyatakan pendapat Tuan/Puan mengikut kepentingan faktor-faktor tersebut dalam menentukan kualiti rumah dengan skala yang diberikan disini:

1 - Tidak Penting
2 - Agak Penting
3 - Penting
4 - Sangat Penting
5 - Paling Penting Sekali

Seterusnya Tuan/Puan diminta memberi penilaian tahap kepuasan terhadap faktor-faktor ini berdasarkan keadaan yang sediada kini dengan skala berikut:

1 - Tidak Memuaskan
2 - Kurang Memuaskan
3 - Memuaskan
4 – Sangat Memuaskan
5 - Paling Memuaskan

Sila tandakan atau bulatkan nombor yang berkenaan:-

No.	Faktor-faktor yang mempengaruhi kualiti rumah	Darjah Kepentingan (1 hingga 5)	Tahap Kepuasan (1 hingga 5)
1	**Saiz rumah**		
a	**Keluasan Lantai**		
1	**Kurang dari 1000 meter persegi**	1 2 3 4 5	1 2 3 4 5
2	**1001 - 2000 meter persegi**	1 2 3 4 5	1 2 3 4 5
3	**Lebih dari 2001 meter persegi**	1 2 3 4 5	1 2 3 4 5
2	**Harga rumah**	1 2 3 4 5	1 2 3 4 5
3	**Kualiti Mutu Kerja Binaan Rumah**		
a	**Substruktur Lapisan Bawah Tanah**		
1	**Asas**	1 2 3 4 5	1 2 3 4 5
2	**Lantai Bawah**	1 2 3 4 5	1 2 3 4 5
3	**Rasuk Bawah**	1 2 3 4 5	1 2 3 4 5
b	**Struktur Atas**		
1	**Tiang**	1 2 3 4 5	1 2 3 4 5
2	**Lantai Atas**	1 2 3 4 5	1 2 3 4 5
3	**Rasuk Lantai**	1 2 3 4 5	1 2 3 4 5
4	**Rasuk Bumbung**	1 2 3 4 5	1 2 3 4 5
c	**Dinding Luar**	1 2 3 4 5	1 2 3 4 5
d	**Dinding Dalam**	1 2 3 4 5	1 2 3 4 5
e	**Tingkap**	1 2 3 4 5	1 2 3 4 5
f	**Pintu**	1 2 3 4 5	1 2 3 4 5
g	**Kemasan**		
1	**Kemasan Dinding Luar**	1 2 3 4 5	1 2 3 4 5

	2	Kemasan Dinding Dalam	1 2 3 4 5	1 2 3 4 5
	3	Kemasan Lantai Luar	1 2 3 4 5	1 2 3 4 5
	4	Kemasan Lantai Dalam	1 2 3 4 5	1 2 3 4 5
	5	Kemasan Siling	1 2 3 4 5	1 2 3 4 5
	h	Alat-alat Kemudahan Bangunan Rumah		
	1	Kemudahan Tandas	1 2 3 4 5	1 2 3 4 5
	2	Kemudahan Bilik Mandi	1 2 3 4 5	1 2 3 4 5
	3	Sistem Paip	1 2 3 4 5	1 2 3 4 5
	4	Sistem Bekalan Elektrik	1 2 3 4 5	1 2 3 4 5
	i	Hiasan Dalaman		
	1	Perabot Pasang Siap	1 2 3 4 5	1 2 3 4 5
	j	Susunatur Ruang Bangunan Rumah		
	1	Bilik Tidur Utama	1 2 3 4 5	1 2 3 4 5
	2	Bilik Tidur	1 2 3 4 5	1 2 3 4 5
	3	Ruang Tamu	1 2 3 4 5	1 2 3 4 5
	4	Ruang Makan	1 2 3 4 5	1 2 3 4 5
	5	Dapur Kering	1 2 3 4 5	1 2 3 4 5
	6	Dapur Basah	1 2 3 4 5	1 2 3 4 5
	7	Tandas	1 2 3 4 5	1 2 3 4 5
	8	Bilik Mandi	1 2 3 4 5	1 2 3 4 5
	9	Ruang Jemuran	1 2 3 4 5	1 2 3 4 5
	10	Bilik Utiliti (Stor)	1 2 3 4 5	1 2 3 4 5
	11	Balkoni	1 2 3 4 5	1 2 3 4 5
	12	Ruang Letak Kenderaan	1 2 3 4 5	1 2 3 4 5
	k	Kerja Luar		
	1	Sistem Parit	1 2 3 4 5	1 2 3 4 5
	2	Lanskap	1 2 3 4 5	1 2 3 4 5
	3	Pintu Pagar	1 2 3 4 5	1 2 3 4 5
	4	Pagar Kawasan Rumah	1 2 3 4 5	1 2 3 4 5
	5	Jalan Masuk	1 2 3 4 5	1 2 3 4 5
4		Spesifikasi/Kualiti Bahan Binaan		
	a	Substruktur Lapisan Bawah Tanah		
	1	Asas	1 2 3 4 5	1 2 3 4 5
	2	Lantai Bawah	1 2 3 4 5	1 2 3 4 5
	3	Rasuk Bawah	1 2 3 4 5	1 2 3 4 5
	b	Struktur Atas		
	1	Tiang	1 2 3 4 5	1 2 3 4 5
	2	Lantai Atas	1 2 3 4 5	1 2 3 4 5
	3	Rasuk Lantai	1 2 3 4 5	1 2 3 4 5
	4	Rasuk Bumbung	1 2 3 4 5	1 2 3 4 5
	c	Dinding Luar	1 2 3 4 5	1 2 3 4 5
	d	Dinding Dalam	1 2 3 4 5	1 2 3 4 5

e	Tingkap	1 2 3 4 5	1 2 3 4 5
f	Pintu Luar	1 2 3 4 5	1 2 3 4 5
g	Pintu Dalam	1 2 3 4 5	1 2 3 4 5
h	Kemasan		
1	Kemasan Dinding Luar	1 2 3 4 5	1 2 3 4 5
2	Kemasan Dinding Dalam	1 2 3 4 5	1 2 3 4 5
3	Kemasan Lantai Luar	1 2 3 4 5	1 2 3 4 5
4	Kemasan Lantai Dalam	1 2 3 4 5	1 2 3 4 5
5	Kemasan Siling	1 2 3 4 5	1 2 3 4 5
i	Kemudahan Bangunan Rumah		
1	Kemudahan Tandas	1 2 3 4 5	1 2 3 4 5
2	Kemudahan Bilik Mandi	1 2 3 4 5	1 2 3 4 5
3	Sistem Paip	1 2 3 4 5	1 2 3 4 5
4	Sistem Bekalan Air	1 2 3 4 5	1 2 3 4 5
5	Sistem Bekalan Elektrik	1 2 3 4 5	1 2 3 4 5
j	Hiasan Dalaman		
1	Kelengkapan Perabot	1 2 3 4 5	1 2 3 4 5
k	Susunatur Ruang Bangunan Rumah		
1	Bilik Tidur Utama	1 2 3 4 5	1 2 3 4 5
2	Bilik Tidur	1 2 3 4 5	1 2 3 4 5
3	Ruang Tamu	1 2 3 4 5	1 2 3 4 5
4	Ruang Makan	1 2 3 4 5	1 2 3 4 5
5	Dapur Kering	1 2 3 4 5	1 2 3 4 5
6	Dapur Basah	1 2 3 4 5	1 2 3 4 5
7	Tandas	1 2 3 4 5	1 2 3 4 5
8	Bilik Mandi	1 2 3 4 5	1 2 3 4 5
9	Ruang Jemuran	1 2 3 4 5	1 2 3 4 5
10	Bilik Utiliti (Stor)	1 2 3 4 5	1 2 3 4 5
11	Balkoni	1 2 3 4 5	1 2 3 4 5
12	Ruang Letak Kenderaan	1 2 3 4 5	1 2 3 4 5
l	Kerja Luar		
1	Sistem Parit	1 2 3 4 5	1 2 3 4 5
2	Lanskap	1 2 3 4 5	1 2 3 4 5
3	Pintu Pagar	1 2 3 4 5	1 2 3 4 5
4	Pagar Kawasan Rumah	1 2 3 4 5	1 2 3 4 5
5	Jalan Masuk	1 2 3 4 5	1 2 3 4 5
5	Kualiti Rekabentuk/Nilai kecantikan rumah		
a	Substruktur Lapisan Bawah Tanah		
1	Asas	1 2 3 4 5	1 2 3 4 5
2	Lantai Bawah	1 2 3 4 5	1 2 3 4 5
3	Rasuk Bawah	1 2 3 4 5	1 2 3 4 5
b	Struktur Atas		

	1	Tiang	1 2 3 4 5	1 2 3 4 5
	2	Lantai Atas	1 2 3 4 5	1 2 3 4 5
	3	Rasuk Lantai	1 2 3 4 5	1 2 3 4 5
	4	Rasuk Bumbung	1 2 3 4 5	1 2 3 4 5
	c	Dinding Luar	1 2 3 4 5	1 2 3 4 5
	d	Dinding Dalam	1 2 3 4 5	1 2 3 4 5
	e	Tingkap	1 2 3 4 5	1 2 3 4 5
	f	Pintu	1 2 3 4 5	1 2 3 4 5
	g	Kemasan		
	1	Kemasan Dinding Luar	1 2 3 4 5	1 2 3 4 5
	2	Kemasan Dinding Dalam	1 2 3 4 5	1 2 3 4 5
	3	Kemasan Lantai Luar	1 2 3 4 5	1 2 3 4 5
	4	Kemasan Lantai Dalam	1 2 3 4 5	1 2 3 4 5
	5	Kemasan Siling	1 2 3 4 5	1 2 3 4 5
	h	Alat-alat Kemudahan Bangunan Rumah		
	1	Kemudahan Tandas	1 2 3 4 5	1 2 3 4 5
	2	Kemudahan Bilik Mandi	1 2 3 4 5	1 2 3 4 5
	3	Sistem Paip	1 2 3 4 5	1 2 3 4 5
	4	Sistem Bekalan Elektrik	1 2 3 4 5	1 2 3 4 5
	i	Hiasan Dalaman		
	1	Perabot Pasang Siap	1 2 3 4 5	1 2 3 4 5
	j	Susunatur Ruang Bangunan Rumah		
	1	Bilik Tidur Utama	1 2 3 4 5	1 2 3 4 5
	2	Bilik Tidur	1 2 3 4 5	1 2 3 4 5
	3	Ruang Tamu	1 2 3 4 5	1 2 3 4 5
	4	Ruang Makan	1 2 3 4 5	1 2 3 4 5
	5	Dapur Kering	1 2 3 4 5	1 2 3 4 5
	6	Dapur Basah	1 2 3 4 5	1 2 3 4 5
	7	Tandas	1 2 3 4 5	1 2 3 4 5
	8	Bilik Mandi	1 2 3 4 5	1 2 3 4 5
	9	Ruang Jemuran	1 2 3 4 5	1 2 3 4 5
	10	Bilik Utiliti (Stor)	1 2 3 4 5	1 2 3 4 5
	11	Balkoni	1 2 3 4 5	1 2 3 4 5
	12	Ruang Letak Kenderaan	1 2 3 4 5	1 2 3 4 5
	k	Kerja Luar		
	1	Sistem Parit	1 2 3 4 5	1 2 3 4 5
	2	Lanskap	1 2 3 4 5	1 2 3 4 5
	3	Pintu Pagar	1 2 3 4 5	1 2 3 4 5
	4	Pagar Kawasan Rumah	1 2 3 4 5	1 2 3 4 5
	5	Jalan Masuk	1 2 3 4 5	1 2 3 4 5
6		Ketahanan Rumah		
	1	Ketahanan Kekuatan Struktur	1 2 3 4 5	1 2 3 4 5
	2	Kestabilan	1 2 3 4 5	1 2 3 4 5

3	Ketahanan Kepada Cuaca	1 2 3 4 5	1 2 3 4 5
4	Ketahanan Kebakaran	1 2 3 4 5	1 2 3 4 5
5	Keselamatan Daripada Anasir Manusia (spt. Rompakan, Kecurian dll)	1 2 3 4 5	1 2 3 4 5
7	Keselesaan Rumah	1 2 3 4 5	1 2 3 4 5
8	Keadaan Persekitaran Rumah		
1	Sistem Pengudaraan	1 2 3 4 5	1 2 3 4 5
2	Keadaan Pencemaran	1 2 3 4 5	1 2 3 4 5
3	Keadaan Lalulintas	1 2 3 4 5	1 2 3 4 5
9	Kerja Penyenggaraan		
1	Pembaikan Kemudahan Bangunan Rumah	1 2 3 4 5	1 2 3 4 5
2	Pembersihan Kawasan Rumah	1 2 3 4 5	1 2 3 4 5
3	Pengangkutan Sampah	1 2 3 4 5	1 2 3 4 5
10	Secara keseluruhannya, tahap kepuasan saya terhadap kualiti rumah adalah	KOSONG	( )Sangat tidak puas hati, ( )Tidak puas hati, ( )Puas hati, ( )Sangat puas hati.

APPENDIX B

2. Questionnaire Survey for Construction Industry Stakeholders

UNIVERSITI MALAYA
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Producing Leaders Since 1905

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TO WHOM IT MAY CONCERN

Dear Sir,

"The Critical Success Factors to Increase Customer Satisfaction in IBS Building Construction Using QFD"
- Nuzul Azam Haron (BHA060005)

My PhD student, **Nuzul Azam Haron** (BHA060005) currently doing his research concerning ***"The Critical Success Factors to Increase Customer Satisfaction in IBS Building Construction Using QFD".*** He would like to get information from your organization, to achieve objectives of his research study. This research finding will be beneficial to the industry particularly for IBS adoption in Malaysian building construction industry.

Thank you very much for your cooperation,

Yours truly,

PROFESSOR HAMZAH ABDUL RAHMAN
Dean

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A. DEMOGRAPHY

1. INTRODUCTION

This is a confidential questionnaire about your opinions on Industrialised Building System (IBS) adoption in the Malaysian building construction industry. Industrialised building system (IBS) refers to a non-conventional system by which components of a building are conceived, planned, fabricated, transported and erected on site.The objectives of the survey are to determine the success factorsand barriers to IBS adoption. The questionnaire consists of three main parts. The first part is to identify the demographics of the respondent's background and project information. The second part is to determine the factors of IBS adoption in the Malaysian building construction industry. The final part is to determine the understanding of the Quality Function Deployment (QFD) in the Malaysian building construction industry.

2. HOW TO COMPLETE

The respondents are asked to select the relevant boxes and select one of number 1 to 5 which reflects quantitative measures. All the individual background and their answers to the questionnaire will be kept strictly confidential and they are only used for the research purpose.

3. PARTICULARS OF RESPONDENT

Please complete your current job affiliation and position below simply by bolding the answer suitable to you.

Job Affiliation:
a) **( )** Client
b) **( )** Designer / Architect
c) **( )** Designer / Engineer
d) **( )** Quantity Surveyor
e) **( )** Project Manager
f) **( )** Principal contractor
g) **( )** Sub contractor
h) **( )** Manufacturer / Supplier
i) **( )** Academician / Researcher
j) **( )** Government official

Position:
a. **( )** Director
b. **( )** Manager
c. **( )** Managing Director
d. **( )** Executive
e. **( )** Project Manager
f. **( )** Technical Officer
g. **( )** Engineer

Working Experience:
a) **( )** < 5 years
b) **( )** 5-10 years

c) **( )** 11-20 years
d) **( )** 21 -30 years
e) **( )** > 30 years

B. PROJECT INFORMATION

1. Project Type

☐ Commercial (Office, Shop, Hotel, etc.)
☐ Residential * (Terrace House, Flat, Apartment, etc.)
☐ Industrial (Factory, Warehouse, etc.)
☐ Institutional Building (Hospital, Library, etc.)
☐ Others *(please specify)* _____

1(a). Residential Building Cost Type

☐ Low Cost
☐ Medium Cost
☐ High Cost

1(b). Height of Building

☐ Single storey
☐ Double storey
☐ Multiple storey

1 (c). Type of residential Building

☐ Single storey terrace
☐ Double storey terrace
☐ Apartment
☐ Condominium
☐ Bungalow
☐ Link House

2 Structural Construction Method used in the selected project (Please select one of the construction method)

☐ Conventional construction method (The traditional construction method using timber formwork and brickwork)
☐ Formwork System (Uses of material made of steel/fiberglass/aluminium as a prefabricated formwork)
☐ Composite Construction Method (Combination of prefabricated and conventional construction method.)
☐ Prefabricated Construction Method (Breaking a whole housing unit into different components such as the floors, the walls, columns, beams,roofs, etc, and having these components separately manufactured in standard dimension in the factory or site and assembled / erected outsite
☐ Others *(please specify)*_____

C. The factors of IBS adoption in the Malaysian building construction industry.

You are requested to assess the level of importance of the following factors based on the following scale:

1 - Extremely unimportant
2 - Unimportant
3 - Important
4 –Very important
5 - Extremely important

You are requested to assess your level of satisfaction based on the existing situation on the following scale:

1 - Extremely dissatisfied
2 - Dissatisfied
3 - Satisfied
4 –Very Satisfied
5 - Extremely satisfied

Please complete the following questionnaire by simply crossing, circling or bolding the answer most suitable to you.

No.	The factors of IBS adoption	The degree of importance 1=None to 5=Very	The degree of satisfaction 1=None to 5=Very
1	IBS provides higher quality than conventional system	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
2	IBS provides higher productivity than conventional method	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
3	Does not consider consumer preferences	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
4	IBS provides a reduction on overall construction cost due to reduction of site works	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
5	IBS provides reduction on overall construction cost due to reduction of construction waste	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
6	IBS provides reduction on overall construction cost due to faster completion of construction project	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
7	IBS contributes to expensive construction cost compared to conventional system due to lower competition in tendering process	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
8	Higher cost due to imported IBS technology or product	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
9	Higher interest rate due to higher capital investment	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
10	Higher capital investment to start producing and using IBS	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5

11	IBS provides faster completion of construction projects due to the usage of standardised prefabricated components and simplified installation process	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
12	IBS provides flexible design	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
13	IBS provides highly aesthetic endproduct through the process of controlled pre-fabrication and simplified installation	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
14	Uncertainties to meet aesthetic design	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
15	IBS design is monotonous and stifles creativity	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
16	Problems with connections and jointing methods	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
17	IBS provides reduction on dependency of foreign workers	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
18	Levy exemptions through IBS execution	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
19	IBS encourages policy on the investment in technologies, techniques and process of construction	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
20	IBS encourages action plans to ensure a successful upgrading of the construction industry	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
21	Not enough incentives from government to adopt IBS	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
22	Not strict enough in terms of IBS policy	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
23	Not enough education training of IBS in universities	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
24	Inadequate R&D undertaken to substantiate the benefits of IBS	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
25	Lack of R&D in the area of novel building systems (IBS) that use local materials	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
26	Abundance of cheap foreign workers to use conventional construction system compared to IBS	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
27	IBS contributes to cleaner site conditions due to less construction waste	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
28	IBS provides safer construction sites due to the reduction of site workers, materials and construction waste	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
29	Limited number of local IBS manufacturers	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
30	Lack of skilled workers to adopt IBS	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
31	Do not know where to start	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5

32	The industry is not ready	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
33	Bumiputera left out	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
34	Construction players still lack of scientific information about the economic benefits of IBS	1 , 2, 3, 4, 5	1 , 2, 3, 4, 5
35	Overall, the level of satisfaction provided by IBS adoption in Malaysian construction industry	**BLANK**	Very satisfied Satisfied Dissatisfied Very dissatisfied

D. The understanding of Quality Function Deployment (QFD) in IBS construction industry

Please complete the following questionnaire by simply crossing, circling or bolding the answer most suitable to you.

1.	"Have you ever heard about "Quality Function Deployment" (QFD) before?"	( ) Yes ( ) No
	Designing Quality into the product	
2.	Quality cannot be inspected out of product, it must be built in. In order to ensure that the elements of quality is built into the product (house), a quality plan must be formulated and implemented right from the design stage	( ) Agree ( ) Disagree
	Comments:	
3.	"What do you understand by "Design Quality" in the context of construction?"	( ) An effective design to serve its intended purpose ( ) A construct able design with the best possible economy and safety ( ) Designed to meet customer needs and expectations ( ) Something you put into design of product through customer feedback ( ) Others (please specify) _____
	Voice of Customers	
4.	Design should also be based on the feedback from customers and not solely on design codes, technical literature, knowledge and experience of designers so as to construct something elegant, useful and	( ) Agree [go to question no. 4] ( ) Disagree [go to question no. 5]

	economical.	
5.	If you agree, what are the possible reasons?	( ) Quality of products is created by people, for people ( ) Designer translates the customer's needs and desires into product ( ) Designer emphasizes technological features rather than actual needs ( ) If customer is unhappy over design, competitors might win over him/her ( ) Doing it right, the first time to avoid delays, rework or changes in design ( ) Others (please specify) _____
6.	If you disagree, what are the possible reasons?	( ) It is not economical to conduct a market survey ( ) Demands of customers are endless and impossible to satisfy them all ( ) Too time-consuming ( ) Traditional method based on knowledge & experience is good enough ( ) Concept not suitable for construction industry ( ) Others (please specify) _____
7.	"What are your suggestions towards IBS adoption in the Malaysian building construction industry using QFD?"	( ) It is not economical to conduct a market survey ( ) Demands of customers are endless and impossible to satisfy them all ( ) Too time-consuming ( ) Traditional method based on knowledge & experience is good enough ( ) Concept not suitable for construction industry ( ) Others (please specify) _____
8.	In the manufacturing industry, producers are striving for continuous quality improvement by incorporating the customers' demands into the product through design. Do you foresee this trend to be adopted by the IBS construction sector in Malaysia	( ) Agree [go to question no. 9] ( ) Disagree [go to question no. 10]
9.	If you agree, what are the possible reasons?	( ) The need to strive for excellence in the construction industry ( ) To uphold the positive reputation of the industry, i.e., quality conscious ( ) To compete with foreign companies who emphasize on Quality ( ) More affluent consumers who choose products designed to their needs

		( ) To improve the current cost, delivery and reliability aspects in this sector ( ) Others (please specify) _____
10.	If you disagree, what are the possible reasons?	( ) Every project is unique with varying customer demands and needs ( ) There are two parties of customer, i.e., developer and purchaser whose requirement may contradict each other ( ) The industry involves many parties with different organizations, priorities and quality policies ( ) Quality in construction is difficult to define or measure ( ) Deploying customer needs into design & construction procedures is too costly and time consuming ( ) Others (please specify) _____
11.	Do you agree that if IBS products development with considering customer satisfaction factor through QFD technique can improve the level of IBS adoption in the Malaysian building construction industry?	( ) Yes ( ) No

Please kindly give your comments / views / suggestions:

……
……
…….....

Thank you for your cooperation and helpful participation.

APPENDIX C

Sample of IBS House Occupiers 1

Project: Apartment Project in Parcel 8, Precinct 9, Putrajaya by IBS Developer A

Figure 1.0: Apartment Project in Parcel 8, Precinct 9, Putrajaya

Sample of IBS House Occupiers 2

Project: Low Cost Apartment Project in Puchong, by IBS Developer A

Figure 2.0: Low Cost Apartment Project in Puchong 2

1.0 Design Stage

For this project and like many others, the original design is based on the conventional method of construction. Therefore, a comprehensive proposal was needed, as precast construction is very different.

2.0 Maintaining Structural Integrity

The most important step is to identify which walls are to be load-bearing. Partition walls are also precast but structurally they serve no function. Wall length is then sized according to these factors:

i. Crane's capacity and reach
ii. Site's contours, access and soil conditions
iii. Erection floor cycle
iv. Stability of panels before slab is functional

Therefore, a balance between the numbers of panels and weight of each panel has to be achieved for an efficient design. The developer has decided to use a 100-ton crawler crane. The heaviest panel is 8.5 tons and 10.3 m wide. A 16-storey building plus 1 floor for the lift motor room. All load bearing walls are designed as a braced slender plain wall. The in-situ floor slab between these walls act as a diaphragm in both directions, and, thus, this combination will behave like a rigid concrete box. The bottom connection of the wall is categorized as a pinned joint while the top connection is fixed. For typical units with precast walls as structural members, all provision for ties are met and these joints are mainly transmitting compression load. Progressive collapse is also taken into consideration.

However, due to economies of scale, the first floor structure and sub-structure are to be built using the usual in-situ column and beams. However, these in-situ works will have to be very precise as the dimension and shape will have to match its precast counterparts of the floors above.

3.0 M & E Services

All M & E services like PVC conduits for electrical and trenches for plumbing installation are incorporated into the precast walls and the location and type of fixing must be confirmed first before the walls are concreted. More stringent checks and coordination is needed at factories because the hacking of precast walls on site is not advisable.

Close attention must be given to sanitary and cold-water services, especially rainwater downpipes as these require big openings both in the slab and precast walls and may

require structural reinforcement. Coordination work must also be done with site personnel and consultants in respect of fixing of doors to the services room, as required by the building authorities.

In addition, lift services and type must also be confirmed much earlier as additional cost can be incurred if the lift shaft is too narrow or big. Opening and support for lift motor must also be confirmed and provided at lift motor room. Lift shop drawing must be submitted much earlier and confirmed by consultant before production.

4.0 Architectural Finishing

So as not to restrict creativity for the architectural design, minimum change is proposed. The layout and external façade remained but a proposal was made for the staircase for cost effective production and erection. In fact, the design was enhanced and improved, as we were able to provide a better and more consistent curve. We were able to give more headroom to units without extra cost because it is column and beam free.

Due to the coordination work and study that was done way before construction, the IBS developer was able to run our sanitary and cold water piping effectively, thus, saving cost and the need to cover up these services with false ceilings.

However, hoods, aluminium windows and door frames must be confirmed earlier before production of precast walls commence. This has always been a problem because decisions are slow and close monitoring is very essential.

5.0 Production

Precast walls are cast using the “tilt up” method. Walls are cast horizontally on a steel bed and later lifted up using gantry cranes. During production, it is very important that levels are correct and side moulds are checked for squareness. All M & E services must be secured tight on the bed to avoid falling off during vibration.

A programmed schedule between site and production must be drawn out and agreed upon to avoid confusion. Walls lifted up are stored using “pin racks”. It is very important that all walls are marked correctly and pass a checklist before dispatch. The production supervisor must liaise closely with the site on which walls are more urgent,

as it can cause damage due to double handling or over-stocking. All rectification work and repairs are done in the factory to avoid additional costs incurred on site.

Panels are dispatched by trailers with “A” frames, which are secured to the trailers. Close coordination is needed between dispatch and erection supervisors to have the correct walls sent to site, on time and inthe right sequence.

6.0 Erection

To achieve a working cycle of 8 days, for example, to complete the 8 units per floor within the 8 working days with 2 units erected per-day, erecting 2 apartment blocks simultaneously.

The corridor, staircase and mid-landing are fully precast to provide a safe working platform for both workers and supervisors. For waterproofing, backer-rods are placed in between gaps and are later sealed with recommended sealants before paintwork. Because of the quality finishing derived from mechanical and hand trowelling, skim-coating is not required for external surfaces. However, minimal touching up is required at the internal surface to cover-up pin holes.

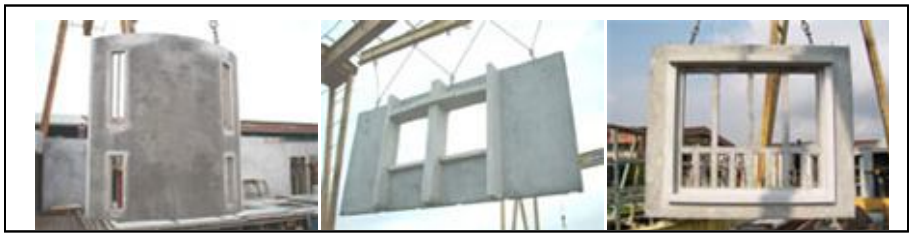

Figure 3.0: Precast products

Figure 4.0: Erecting at site

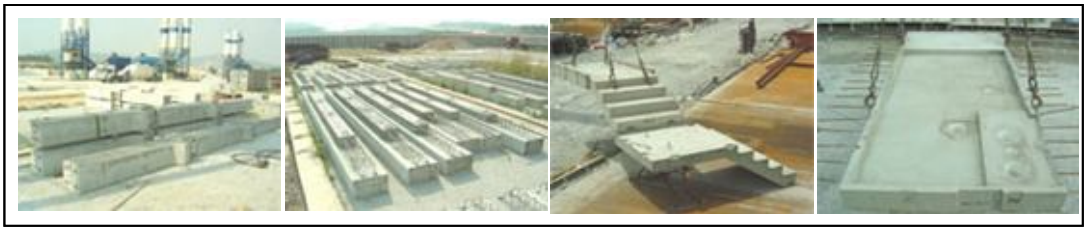

Figure 5.0: Precast parts, production materials ready for erection

7.0 COST ADVANTAGES

7.1 Cost Merits of Precast System of Construction

Precast system construction is more favourable in the construction of apartments in the midst of a labour shortage; this is simply because of better cash flow, speed, quality, consistency and better safety features/measures during construction.

The system used is labour efficient, thus, reducing the use of general labour at the construction stage and splitting the construction sequence into two sections, i.e., site-slab casting and at pc yard wall casting. It was found that the precast method used less labour, for example, 30% less than that of the conventional method.

In view of the labour shortage in the country, the precast method of construction is one of the options to address the labour shortage, especially in this industry.

7.2 Improved Cash-flow Position for developer

Based on the standard SPA, Precast Construction offers a claim of 45% from purchasers within a period of two weeks upon the erection of panels, i.e., RC frames (15%), walls, doors, and window frame (10%), roofing and internal M & E (10%), and internal and external plastering (10%). Whereas, by comparison, conventional construction can only make a similar claim as of month 14, for example, 10 months later.

8.0 Faster

If there is a consistently large volume of apartments to be constructed, the speed of construction is governed by the speed of production. The client's requirement on fast delivery can easily be met by increasing the production capacity of the precast yard.

9.0 Safety

Safety features and procedures are easily implemented during the construction stage.

i. No perimeter netting is required as the installed wall panel with the window casement built-in acts as a permanent barrier.
ii. Cleaner work area as no brickwork and plastering is required.
iii. Perimeter scaffolding is used for lightweight duty like painting and sealant work only, resulting in a safer work environment.

10.0 Improvement and Current Development

Through experience and input, both from site and market demand, Setia Precast has and will continue to improve further to be the leader in precast construction. The developer has achieved great success in constructing high rise apartments, capitalizing precast systems into other types of building or structures that will not only promote the usage of prefabricated construction in Malaysia but also correcting the misconception often heard about precast systems.

i. One particular item the developer is seriously looking at is pre-casting two-storey link houses at a cost equivalent to the old conventional method. To erase orthodox thinking that precast housing is not flexible in term of renovation works, the developer is introducing a hybrid system that caters for clients who often renovate but at the same time keeps the structure intact. This system will offer much less wastage, and, most importantly, speed to the contractor at no cost. The developer is able to provide extra headroom, a consistent finish and flexibility for renovation.

ii. Buyers have often been heard to complain about the poor quality of the house that they have bought. The limited time given by the developers to the contractor is the main reason behind the poor quality of housing nowadays. Time seems to be the biggest disadvantage for conventional construction; however, pre-cast systems may suit the situation very well. Precast will not only offer a shorter time of construction, but at the same time is capable of providing top class finishing, and, most importantly, the cost is as competitive as the conventional construction.

iii. As buildings become higher, crane capabilities and costs are a concern to us. As in this project a 100-ton crawler crane has to be used for a 16-storey building. For higher buildings, however, it is more cost effective to use tower cranes. This will limit the size of precast components that can be handled. The developer is looking

into a combination of walls, columns, beams and modular half slabs as an alternative and believes this will be the trend in precast construction for super high-rise buildings.

All these will further reduce construction cost and improve quality, thus, benefiting the construction industry as awhole.

Sample of IBS House Occupiers 3

Residential housing at Putrajaya, Precinct 11

Figure 6.0: Precast buildings

Figure 7.0: Completed prefabricated buildings

Figure 8.0: Completed project in Putrajaya

The local case study that uses IBS was selected at the Precinct 11 project consisting of 128 two-storey terrace units at phase 2, area of zone 7B on lot PT 4299-4330, PT 4335-4412 and PT 4467-4484, Pusat Pentadbiran Kerajaan Persekutuan Putrajaya, 62000, Putrajaya Wilayah Persekutuan. Generally, the construction method used partial IBS in which they used a panel and blockwork system, which makes up the construction of the block walls and floor panels using *Aerated Lightweight Concrete (ALC)*, which were all prefabricated by Developer IBS B.

According to the interview with Ismail *et al*., (2010), aerated lightweight concrete is defined as a type of concrete that is injected with gas (expanding agent) to allow diffusion of this gas into the concrete mixture, which increases the volume and produces many voids in the mixture as well as reducing the dead load of the cured concrete as opposed to conventional concrete, which has a high dead load. The dry density of the lightweight concrete is about 300 kg/m^3 up to 1840 kg/m^3, i.e., 87 to 23% lighter than the conventional concrete. Its lightweight characteristics could be attributed to its high void content – up to 80%. In addition, the rate of building/construction is quicker and has lower haulage and handling cost. The advantages are further discussed in respect of the application of this type of concrete in wall blocks and floor panels in the construction of terrace houses in Precinct 11.

Typically, methods of production of aerated lightweight concrete are either done *in-situ* or members of this aerated concrete may be moulded/pre-cast/prefabricated in the factory. In the last method, gas is foamed into the mixture during plastic condition. The mixture generally contains natural fine aggregate, such as lightweight pulverized ash,

ground slag, cement and lime, etc. A chemical reaction results between the mixture of fine aluminium powder and calcium hydroxide (lime) to form hydrogen gas, which diffuses into the mixture and increases the volume. At the end of this foaming process the gas is released into the atmosphere and replaced by air. Subsequently, when the mix in the mould is solid but still soft, it is cut into either blocks or panels as desired. The precast units/members are subsequently autoclaved via high-pressure steam curing for 12 hours to produce units of moderate strength and low drying shrinkage (Ismail *et al.*, 2010).

1.0 CONSTRUCTION DETAILS AND SYSTEMS IN IBS

1.1 Foundation system

The proposed foundation system for the development of the two-storey houses at Precinct 11 is a raft foundation with 125mm thick reinforced concrete slab and thickening at the block wall location. A pad footing of about 1000mm x 1000mm is introduced forthe car porch area to support the car porch column and roof on top. The structural system adopted in the design for this development was lightweight block walls and lightweight floor panel system. The IBS system and the materials are manufactured by IBS B. (Perunding RMZ, 2010).

1.2 Block wall

The block walls were manufactured by CSR through the mixture of sand cement and lime to comply with the requirement of AS 3700 Australian Standard Masonry Code. CSR Autoclaved (curing) block walls must reach a minimum of 2.5MPa and shall have a fire rating of four hours. Various thicknesses of CSR Autoclaved blocks are used in the design, which consists of 100mm thick, 150mm thick and 200mm thick. Thin bed adhesive is used to bond the CSR Autoclaved blocks together in order to achieve the fire rating and strength. The bond lap of CSR Autoclaved blocks shall be at a minimum of 100mm length. Lintels overopening shall have a minimum bearing of 10% of opening size. Chasing on walls for services can be done up to 1/3 of thickness of block walls. Fibremesh is to be located at high stress areas, which is at the ends of lintels over doors and windows. Cross walls are to be keyed or tied in at every second course. DPC slip joint and thick bed mortar are to be incorporated in all walls with a concrete

support. Roof trusses are to be placed on roof bond beam of 150mm thick CSR Autoclaved blocks (Perunding RMZ, 2010).

1.3 Floor Panel

All slab panels are CSR Autoclaved lightweight concrete and have a minimum compressive strength of 3.5MPa. Floor panels should not be cut at site unless it is indicated on the drawings. For panels cut on site, the exposed ends of reinforcing bars are to be corrosion protected. All bearing surfaces for panels are to be level and even. The bearing dimensions noted must not be reduced without approval from CSR. The propping of panels may be required to accommodate minor misalignments until 3 days after the ring grout is poured. No masonry to be built over propped panels except at permanent supports. Reinforcing bars in the ring anchor shall be T10 or T12 in accordance with MS. Ring anchors and joints shall be grout and shall have 28 days minimum strength of 15 MPa, a maximum slump of 150mm and 5mm maximum aggregate size. Fibreglass mesh shall be placed at the soffit of every joint prior to skim coating to prevent cracking (Perunding RMZ, 2010).

1.4 Roof

The roof contractor is from Contractor A. The roof contractor professional engineer is from Consultant A Roof specialist contractor from Liteframes.

2.0 ADVANTAGES AND DISADVANTAGES OF THESE SYSTEMS

Autoclaved aerated concrete (AAC) or, specifically, aerated lightweight concrete (ALC) has many advantages as well as disadvantages. Based on the field trip to Putrajaya Holdings Sdn. Bhd., we were briefed on matters pertaining to the use of ALC's in floor panels and wall block construction of terrace houses in Precinct 11. Some of the advantages noted for the use of the blocks were rapid and relatively easy to construct compared to conventional masonry. This is because the prefabricated blocks are easily placed and hauled due to their light weight. For the precast panels, it is ready for use and can be laid on site exceptionally fast with only the joints between the panels needing to be mortared without formwork or bracing. Previously, we discussed the relative lightness of aerated concrete blocks in comparison to conventional concrete masonry blocks. An ALC block due to the volume expansion process has a wider area

thana single block with dimensions (8''wide x 10" high x 25" long), weighs 27 lb and creates a wall area of 1.3ft^2 while a standard masonry block (8 x 8 x6") weighs more, 34 lb and creates a wall area of only 0.88ft^2. As for the floor panels, the reduction in the usage of concrete is achieved by its extended volume (by aeration). This suggests that the wall and floor construction can be achieved quickly (Taly, 2010).

Generally, lightweight concrete blocks and floor panels have advantages in terms of reduced dead load, which, in turn, reduces the beam, and column sizes that bear other structural members or its own, which has an economical advantage over the conventional masonry concrete or concrete slabs. Furthermore, these blocks and precast panels (require engineer's permission) can easily be cut with a saw to any desired shape and size according to the details before placing them, i.e., it has high workability. The fact that it is light means that it is easily hauled/transported to site besides reducing the generation of CO_2 from vehicles transporting them due to less petrol consumption and energy load on vehicles. In addition, the ALC blocks are fully bedded when laid, and, hence, the load-bearing wall effectively distributes over the full block face making the joints strong. This eliminates the need to reinforce the joints and eliminates the problems of tensile cracks and water penetration, which are common joint problems in conventional masonry blocks (Taly, 2010).

Furthermore, these AAC or ALC (aerated lightweight concrete blocks) have excellent insulation properties. The fact that its thermal conductivity is only 0.15W/m K means that the tropical heat common to all Malaysians cannot heat up the block easily keeping the house and its occupants cool and comfortable, which also saves energy and offers environmental protection by reducing the need for air-conditioning. In addition, the ALC blocks are acoustically insulating and provide good fire resistance. A 4'' thick wall will provide 3 hours fire protection and 8" up to 6 hours protection. In this case, the CSR ALC blocks have a fire rating of 4 hours.

However, the disadvantages as noted by the supervisor in-charge of the Precinct 11 project far exceed the advantages. This is because this technology is still in its infancy in Malaysia and could not be efficiently implemented due to the lack of skilled workers and minimal exposure to the technology. For the block wall, masons were used to apply acement-based mortar between heavy blocks. They had to adjust to applying thin-set mortar to lightweight blocks, a skill that requires more precision. As for the precast

panels, difficulty in installation of the panels results from inexperience and where reinforcing bars were supposed to be placed in between panels in the grooves in the recess and around the perimeter of the floor to form the ring anchor system and subsequently grouted according to specifications, which could be unfamiliar to the labourers who work with the conventional system.

Hence, the fact that the project could be completed quickly does not hold true in this case. In addition, it was noted that the block walls were used as load-bearing structures, due to the fact its compressive strength is significantly less and low weight, it is susceptible to vibration, and, hence, hairline cracks were observed immediately after construction in certain units causing the contractor incharge to repair the damage by sealing the cracks since it occurred during the Defects Liability Period. The compressive strength was 2.5MPa (block wall) and 3.5MPa (floor panels), as mentioned before, after curing in the autoclave. The structural members, as mentioned before, foundations, columns, beams, were all reduced in size due to the reduced dead load but the need for repairs and slow progress caused the overall project costs to be almost similar to that of conventional masonry blocks withcast in situ floor panels.

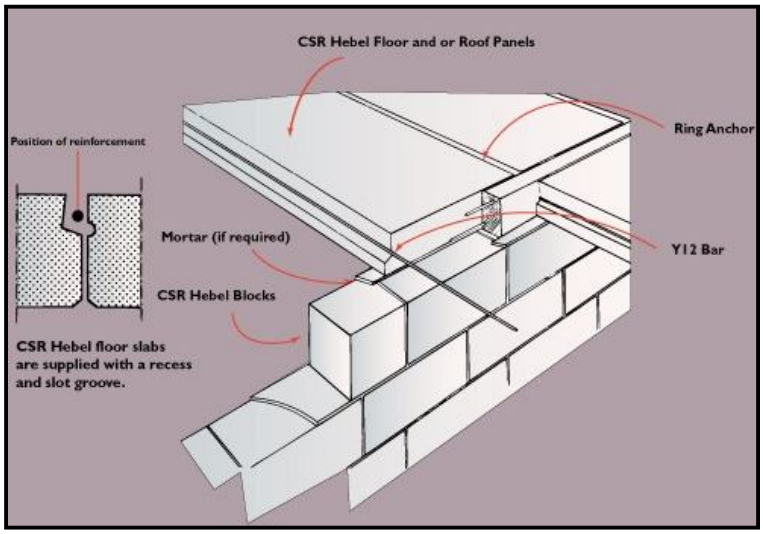

Figure 9.0: Details of Autoclaved lightweight concrete (ALC) panel installation

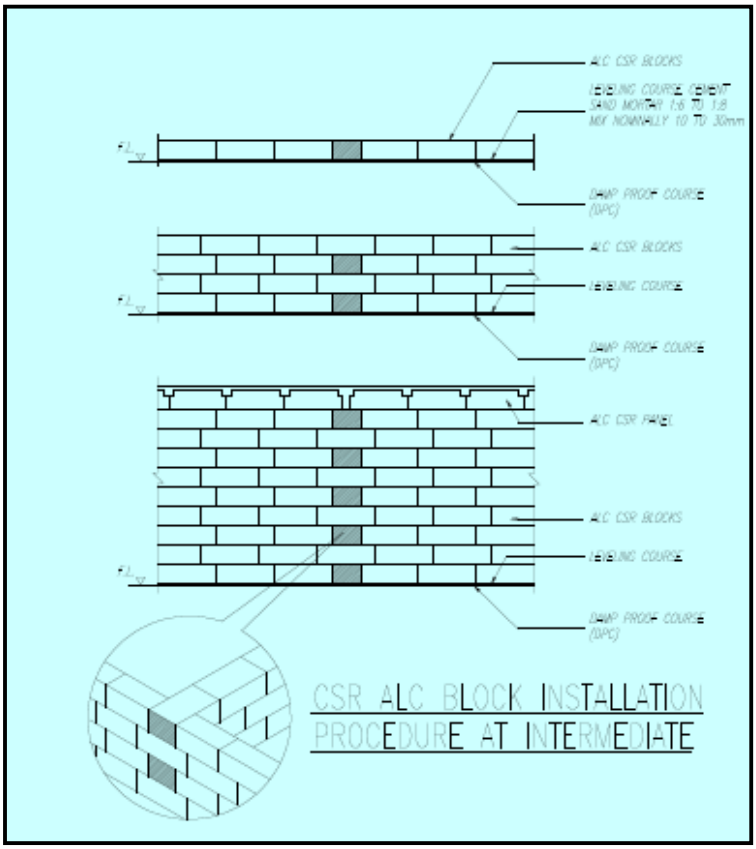

Figure 10.0**:** ALC Block Installation Procedures

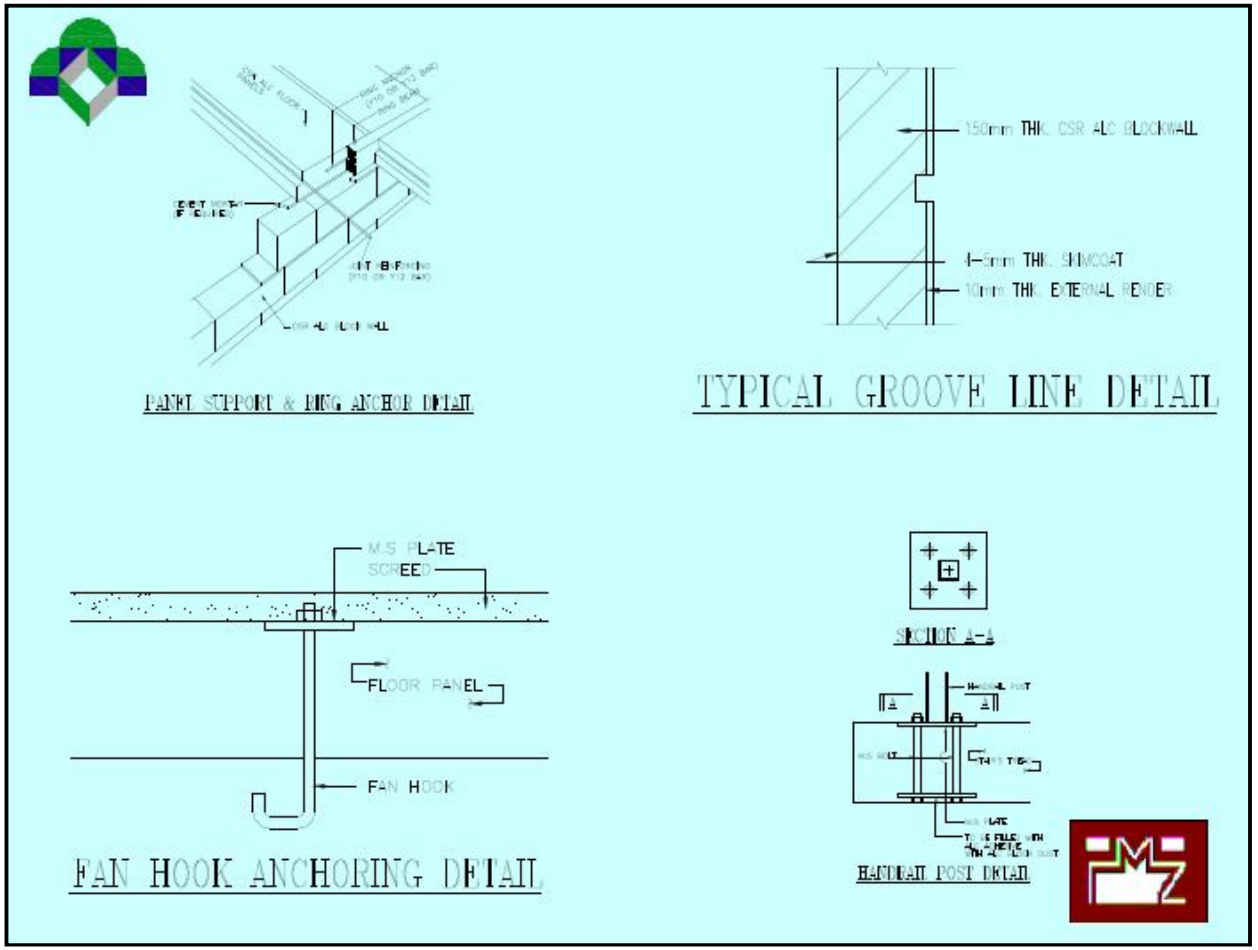

Figure 11.0 **:** Details of Autoclaved lightweight

APPENDIX D

3. Attendance list for the Structured Focus Group Discussion

Venue:Putri Room, Palm Garden Hotel in IOI Resort Putrajaya
Date: 16th August 2009
Time: 2 pm – 7 pm.

Table C.1: Attendance list for Structured Focus Group Discussion.

No.	Sector	No. of persons
1	Public Works Department representative	2 persons
2	Engineer	2 persons
3	IBS Developer	2 persons
4	House Owner	3 persons
5	Architect	1 person
6	Academician and researcher	2 persons
	Total	12 persons

The researcher started the focus group discussion with an introduction to the agenda for the day, as can be seen in figure 1.0 below.

Figure 1.0: Introducing the agenda for the day

Upon introducing the agenda, the researcher explained the QFD concepts to the participants, as many of them were ignorant of QFD concepts, as shown in figure E 2.0 below.

Figure 2.0: Explaining the QFD concepts to the participants

The researcher proceeded with conducting the focus group discussion with taking notes of the feedback from the participants, as shown in figure E 3.0 below.

Figure 3.0: Discussing issues with the participants

As the discussion progressed the researcher captured all the points raised by the participants, as shown in figure E 4.0 below.

Figure 4.0: Capturing the QFD points raised by the participants

In the course of the discussion a lot of points were raised. This necessitated the cross referencing of all the points raised to ensure no duplication was created in the process.

This is shown in figure 5.0 below.

Figure 5.0: Cross referencing with QFD points noted

There were many issues and doubts raised for which the researcher managed to clear all the doubts in the minds of the participants. The researcher believes that all the questions raised were adequately answered in the session. The activity is captured in figure E 6.0 below.

Figure 6.0: Researcher clearing doubts from the participants

The focus group session was conducted with great enthusiasm by both the researcher and also the participants, as can be seen in E 7.0 below.

Figure 7.0: QFD session in progress

Upon successful completion of the focus group discussion, the researcher concluded the session by summarizing the points raised and discussed during the course of the focus group, as shown in figure 8.0 below.

Figure 8.0: Concluding the QFD session

Towards the end of the focus group session the researcher thanked all the participants for their active participation in the discussion. This is shown in figure E 9.0 below.

Figure 9.0: Thanking the participants for their participation

APPENDIX E

1. Validation of the Entire Study

VALIDATION OF THE ENTIRE STUDY
(STRUCTURED INTERVIEW)

The following structured interview questions are based on the confirmed findings of the entire research study.

I – Strongly Important/Agree

II- Important/Agree

III- Strongly Not Important/Agree

Section A (Customers' Satisfaction)

Q1. What is the level of importance/agreement with the following customer satisfaction factors of IBS house construction?

No.	Customer satisfaction factors of IBS housing project development	Level of Importance/ Agreement
1	Size of houses	I, II, III
2	Price of houses	I, II, III
3	Quality of workmanship	I, II, III
4	Specification/Quality of Building Materials	I, II, III
5	Design Quality/Aesthetic Value	I, II, III
6	Building Strength	I, II, III
7	Comfort	I, II, III
8	Environmental Conditions	I, II, III
9	Maintenance Work	I, II, III

Q2. What is the level of importance/agreement withthe following strategies to improve customer satisfaction factors in IBS housing project development?

No.	Strategies to improve customer satisfaction in IBS housing project development	Level of Importance/ Agreement
1	Policies from authorities	I, II, III
2	Strict supervision	I, II, III
3	Building design	I, II, III
4	Standards requirement	I, II, III
5	Quality Control	I, II, III

Section B (Construction Stakeholders)

Q3. What is the level of importance/agreement withthe following IBS adoption factors in the Malaysian construction industry?

No.	IBS adoption factors housing project development	Level of Importance/ Agreement
1	Construction players still lack scientific information about the economic benefits of IBS.	I, II, III
2	Limited number of local IBS manufacturers.	I, II, III
3	IBS adoption does not attract enough incentives from the government.	I, II, III
4	IBS designs are monotonous and stifle creativity.	I, II, III
5	IBS education and training are not sufficient in universities and institutes of higher education.	I, II, III
6	Bumiputera participation is left out in the IBS adoption.	I, II, III
7	IBS reduces completion time of construction projects due to the usage of standardised prefabricated components and simplified installation process.	I, II, III
8	IBS provides higher quality than conventional system.	I, II, III
9	IBS provides highly aesthetic endproduct through the process of controlled pre-fabrication and simplified installation.	I, II, III

Q4. What is the level of importance/agreement withthe following strategies to improve IBS adoption in the Malaysian construction industry?

No.	Strategies to improve IBS adoption in housing project development	Level of Importance/ Agreement
1	Government Policy	I, II, III
2	Education and Training	I, II, III
3	Publicity and promotion	I, II, III
4	University Education	I, II, III
5	Fiscal Incentive	I, II, III

Q5. What is the level of importance/agreement withthe following strategies for major recommendations to improve the level of customer satisfaction and IBS adoption in the Malaysianconstruction industry?

No.	Recommendations to improve customer satisfaction and IBS adoption in the Malaysian construction industry	Level of Importance/ Agreement
1	Role of Local Authorities	I, II, III
2	Role of Construction Industry Development Board (CIDB)	I, II, III
3	Role of Government Agencies	I, II, III
4	Role of Professional Bodies	I, II, III
5	Role of Ministry of Public Works	I, II, III

APPENDIX F

1. Validation of the research model development

TITLE: STRATEGIES TO IMPROVE CUSTOMER SATISFACTION WITH INDUSTRIALISED BUILDING SYSTEM (IBS) HOUSES AND IBS ADOPTION USING QUALITY FUNCTION DEPLOYMENT (QFD) APPLICATION: A MALAYSIA BASED STUDY

VALIDATION OF THE RESEARCH MODEL DEVELOPMENT

(SEMI STRUCTURED INTERVIEW)

I – Strongly Important/Agree

II- Important/Agree

III- Strongly Not Important/Agree

Q1. What is the level of importance/agreement with the following research model

No.	Model on process to develop new strategies of IBS adoption	Level of Importance/ Agreement
1	Practicality of the model	I, II, III
2	Simplicity of the model	I, II, III
3	Accuracy of the model	I, II, III
4	The model is user friendly	I, II, III
5	Affordable to implement the model	I, II, III
6	Contribution of the model to the industry	I, II, III

Please kindly give your comments / views / suggestions:

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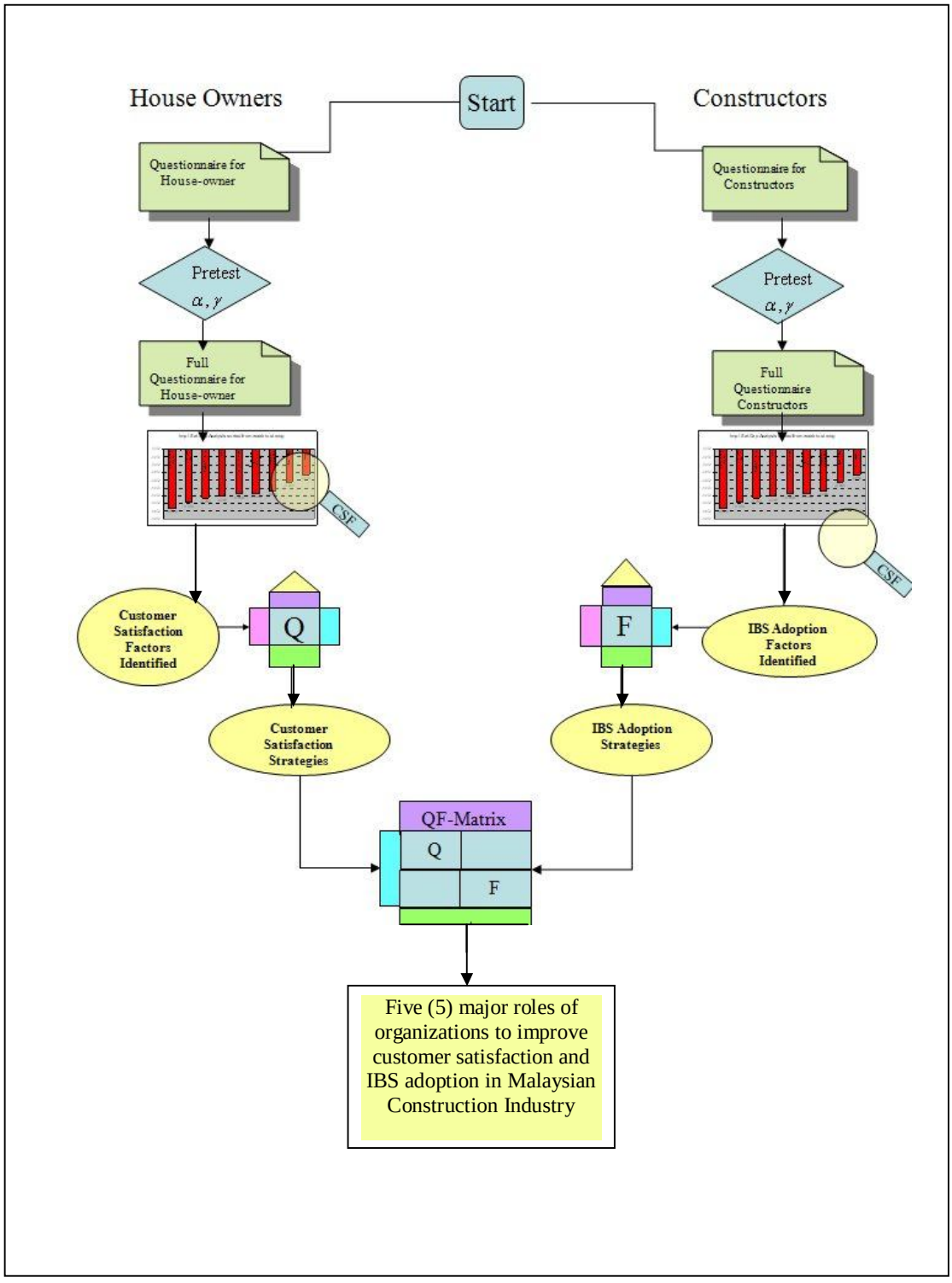

Model 1: Model of process to develop new strategies of customer satisfaction of IBS house occupiers, IBS adoption and determination of organizations to improve IBS adoption.

I – Strongly Important/Agree

II- Important/Agree

III- Strongly Not Important/Agree

Q2. What is the level of importance/agreement with the following research model

No.	Model on strategies to improve customer satisfaction on IBS houses and IBS adoption using QFD Application	Level of Importance/ Agreement
1	Practicality of the model	I, II, III
2	Simplicity of the model	I, II, III
3	Accuracy of the model	I, II, III
4	The model is user friendly	I, II, III
5	Affordable to implement the model	I, II, III
6	Contribution of the model to the industry	I, II, III

Please kindly give your comments / views / suggestions:

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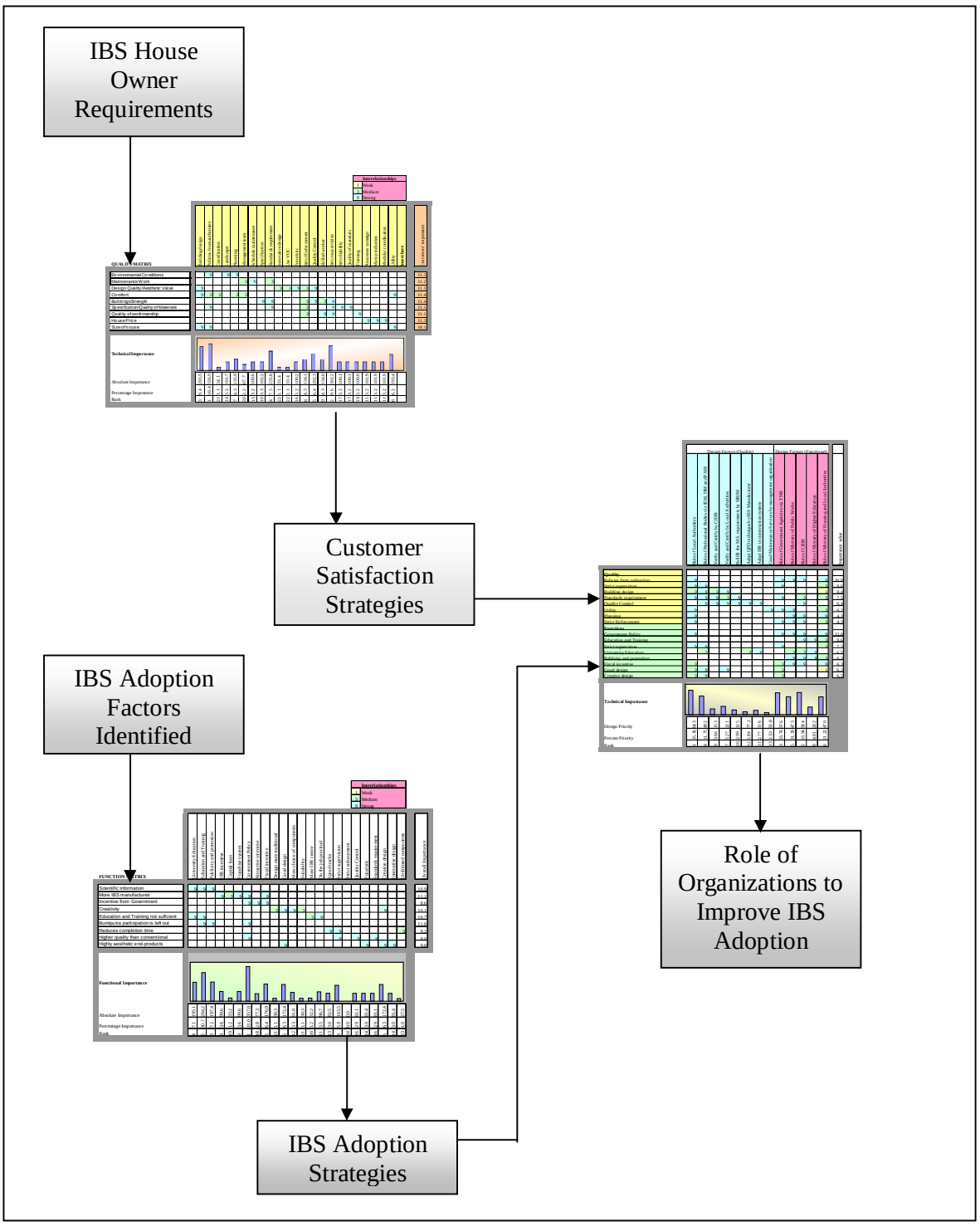

Model 2: Model of strategies to improve customer satisfaction on IBS houses and IBS adoption using QFD Application

APPENDIX G

LIST OF CONFERENCE PROCEEDING AND JOURNAL PUBLICATION

The following are the lists of the conference proceedings submitted produced out of this research:

Conference Proceeding: Papers Presented

1) Haron, N.A., Hamzah, A.R., Mahanim, H. & Asrul, M.R.A. (2006. *The critical success factors for IBS adoption in Malaysian construction industry.* ASEAN Post Graduate Seminar (APGS)

2) Haron, N.A, Hamzah, A.R., Mahanim, H. & Asrul, M.R.A. (2007). *The critical success factors to increase customer satisfaction in IBS building construction using QFD.* 3rd ASEAN Post Graduate Seminar (APGS), 49-55, ISBN 978-983-2085-90-4

3) Haron, N.A, Hamzah, A.R., Mahanim, H. & Asrul, M.R.A. (2007). *Review the success and barriers factors for industrialised building system (IBS) adoption in Malaysian construction industry.* 3rd ASEAN Post Graduate Seminar (APGS), 297-305, ISBN 978-983-2085-90-4

4) Haron, N.A, Hamzah, A.R., Mahanim, H. & Asrul, M.R.A. (2009). *Determination of critical success factors in industrialised building system (IBS) adoption using quality function deployment (QFD) technique.* 4th ASEAN Post Graduate Seminar (APGS), (T3)46-51, ISBN 978-967-5148-31-6

Journal Publication

5) Haron, N.A, Hamzah, A.R., & Mahanim, H. (2009). A literature review of the advantages and barriers to the implementation of industrialised building system (IBS) in construction industry. *Malaysian Construction Research Journal (MCRJ),* 4(1), 10-14, ISSN 1985-3807