QUALITY AND SATISFACTION OF HOUSE OWNERS FOR INDUSTRIALISED BUILDING SYSTEM AND CONVENTIONAL BUILDING SYSTEM

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ABSTRACT

This research was carried out to identify the relationship between quality and satisfaction of house owners for construction systems. Two construction systems will become the dependant variables which is Industrialised Building System (IBS) and conventional system. Additionally, the differences toward quality across years of existence of selected housing areas are taken into consideration. The aim of this study is to collect data by using sets of questionnaires. Then, the correlation analysis are carried out by using Statistical Package for Social Science (SPSS) software and the difference analysis is by using Independent Samples T-Test. The results shows that house owners for both construction systems is highly satisfied with their houses and there is no significant relationship between quality and house owners’ satisfaction except for the mechanical and electrical aspect for both construction systems. However, there is a significant relationship between quality across years of existence of selected housing areas. Last but not least, findings from this research may benefited to government agencies such as Construction Industry Development Board (CIDB) and other researchers especially on development of low cost housing schemes.
ABSTRAK

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CHAPTER I

INTRODUCTION

1.1 Introduction

One of the contributors of Malaysian economy is the construction sector, it represent 2.5 % of the gross domestic product (GDP) (CIDB, 2007). Although the percentage is quite small, however construction sector act as a stepping-stone to another sectors such as manufacturing, industrial and even educational sector. It is because they initially prepared the infrastructure in setting up premises for others.

In conjunction with housing development in Malaysia, construction plays an important role in order to deliver good quality housing schemes. Currently, there are two common types of construction systems applied in Malaysian construction environment, which is conventional system and Industrialised Building System (IBS). Both of the systems has its own pros and cons, but available literature indicated that IBS is far better in term of construction cost, completion time and also quality of the end products.
1.2 Background of the Research

Recently, many developers of especially involved in constructing housing schemes is focusing on only medium to high cost houses. It is obviously to maximize their profit in term of monetary issue. Thus, Malaysian intention to create adequate and decent shelter to all citizens particularly the low income group (Yuosre. F. Badir et al., 2002) may not be achievable. Furthermore, in order to improve standard of living and quality of life (CIDB, 2007), we should not only looking for an individual that can afford to buy medium to high cost housing unit. Of course the characteristics of the particular houses is far more better than the low cost houses.

Apart from that, there are exists quite a number of low cost housing schemes that utilised both of the construction systems mentioned earlier. Usually, the type of system applied is on conventional construction system, and only several of them is practicing IBS. Although there are no restriction in order to select which systems to apply, the issue that keep on arising is which one is the best in term of quality, money and so on, and which one suited the occupants better.

On the other hand, in line with the Construction Industry Master Plan Malaysia 2006 - 2015, by 2015, the percentage of Industrialised Building System (IBS) used in construction projects should be above 80%. Recently announced, according to Ministry of Finance Malaysia (Surat Pekeliling Perbendaharaan Bil. 7 Tahun 2008), Government decided to use IBS system by not less than 70%. These percentages is not just a numbers, but it is a target that should be achieve accordingly.
1.3 Problem Statement

As stated earlier, government has already set their target regarding the construction industry environment in Malaysia. In order to achieve that target, client's satisfaction must be obtained because they are the ultimate users and their feedback is important to formulate a better conclusion (CIDB, 2007).

Unavoidable, house owner's feedbacks is vital to ensure the growth of IBS construction in our country because most of the IBS projects are on housing schemes. There is no point if we are still developing IBS houses if locals are having unpleasant perceptions about the particular IBS construction.

Beside that, nowadays quality became the most important elements in construction industry. Quality sets out how good is an organization in term of developing particular housing schemes. Faizah Abu Bakar (2008) had shown that quality in construction is very essential nowadays as the owners' concern on the goods delivered to them increased. Thus, CIDB has highlighted several research priority areas including quality development and also industrialisation. Moreover, relationship between quality and satisfaction may give impact on the development of future housing projects.
1.4 Objectives

The following are three main objectives:

(a) To identify the satisfaction of house owners in construction systems,
(b) To identify the relationship between quality and house owner's satisfaction in construction systems,
(c) To identify the differences toward overall quality across year of existence of selected housing areas.

1.5 Hypothesis

The hypothesis of this research are:

(a) $H^1_0 =$ There is no significant relationship between quality and house owner's satisfaction for structural aspect in construction systems,
(b) $H^2_0 =$ There is no significant relationship between quality and house owner's satisfaction for architectural aspect in construction systems,
(c) $H^3_0 =$ There is no significant relationship between quality and house owner's satisfaction for mechanical and electrical aspect in construction systems,
(d) $H^4_0 =$ There is no significant relationship between overall quality across year of existence of selected housing areas.
1.6 Conceptual Diagram

According to the Figure 1.1, there are four variables involved in this study. The independent variables consist of IBS and conventional. When the dependent variables are quality in construction systems and satisfaction of house owners. Regarding to the both construction systems, there are three construct to be access which are structural, architectural, and mechanical and electrical aspects. Figure 1.1 shows the conceptual diagram for the purpose of this study.

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**Figure 1.1:** The Conceptual Diagram
1.7 Significant of the Study

This study intend to find house owners satisfaction level and their relationship with several quality aspects. The outcome may ease better formulation regarding similar housing schemes to government agencies especially.

Beside that, the necessity to educate house owners in term of quality aspect is vital to ensure that future housing development is sustainable and suit their needs. It is important because house is a lifetime investment and should last for a long time. Moreover, house is a starting point in creating better family environment and better quality of life.

Other than that, there are a dire needs in accessing house owners satisfaction because the data available is very much scarce and difficult to find. Literatures related to this topic is also hardly available which especially containing local findings. So, hopefully this study will add some critical information to other peoples and lead to better understanding of the subject matters.

1.8 Scope

This study will concentrate on low cost housing schemes that utilized IBS (fully prefabricated system) construction system and low cost housing schemes that utilized conventional construction system. The reason in focusing on housing projects is to discount the possible variation due to irregular structural layout plan if other types of
projects such as hostels, universities and schools are considered. Moreover, housing projects have typical structural layout plans and are repetitive, even though minor variation might occur. This makes direct comparison between building systems more representative and unbiased (M.R. Abdul Kadir et al., 2006).

On the other hand, the satisfaction of house owners will only discuss on the overall satisfaction of the occupants on both housing systems in term of quality and will be based on the Construction Industry Standard (CIS) 1 - 1998 by CIDB. A study by David Arditi et al. (2000), they are looking on overall satisfaction of occupants from other than occupant's point of view; which means construction practitioners such as manufacturers, contractors and designers. The results may not give exact views on house owner's satisfaction toward their own housing schemes because some of the construction practitioners have their own interests; such as manufacturers' eagerness to project a good image of their products.

Furthermore, to assess the quality of both of construction systems, construction practitioners (professionals, contractors, developers and manufacturers) will be the respondents of the particular survey and will be based on the Construction Industry Standard (CIS) 7 - 2006 by CIDB.
CHAPTER H

LITERATURE REVIEW

2.1 Introduction

Before collecting any data, it is important to understand the overall background of this research. Besides explaining several related terms, this chapter also touched on earlier research that may guide in achieving the stated objectives.

2.2 Housing Scheme

House is a necessity for human being in order to live properly, providing security and also shelter for the rest of the family members (Faizah Abu Bakar, 2008). In Malaysia, government has decided that housing schemes development should include the aspects to improve the standard of living and also the quality of life of the occupants. To ensure that, government is already enforced construction practitioners to follow certain standards and rules such as Construction Industry Standard (CIS) and so on.
Apart from that, commonly found that, housing schemes in Malaysia is divided by several categories such as low cost, medium cost and high cost (Table 2.1). However, government policy stated that each categories of house is meant for certain group of peoples according to their monthly income. It is very important approach in order to improve the standard of living and also the quality of life of the citizens.

<table>
<thead>
<tr>
<th>Category</th>
<th>House price per unit</th>
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<td>Low cost</td>
<td>&lt; RM 42 000</td>
</tr>
<tr>
<td>Low medium cost</td>
<td>RM 42 001 – RM 60 000</td>
</tr>
<tr>
<td>Medium cost</td>
<td>RM 60 001 – RM 100 000</td>
</tr>
<tr>
<td>High cost</td>
<td>&gt; RM 100 001</td>
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</tbody>
</table>

(Source: Ministry of Housing and Local Government of Malaysia)

2.2.1 Low Cost House

Development of low cost housing schemes is targeted to cater for population of low income group (below RM 1500) and to ensure that there are adequate unit of houses, government created a policy especially for developers. In the policy, developers need to develop low cost houses along with other category of houses under the same development plan (Faizah Abu Bakar, 2008).

However, the drawback is sometimes the low cost housing area is located very far away from the main housing schemes. The main reason is because
developer is profit oriented, and they are not willing to build low cost houses in the strategically main development area. It is better to build high cost houses in the same plot of land to maximised their profit and build low cost houses in any plot of land that is worthless.

Other than that, the design of low cost house usually consists of two bedrooms, one toilet and not more than two storey high for the price of RM 22 000. However in late 90's, government decided to implement three bedrooms for the same type of house and the price is controlled to a certain level of RM 42 000.

2 J Construction Systems

The construction sector continues to be an essential element of the Malaysian economy, which lends strength and capability to a host of economic sectors and supports the social development of the country through the provision of basic infrastructure (CIDB, 2007).

In Malaysia, generally the construction systems of infrastructures can be classified into two major categories; conventional construction system and industrialized building system (IBS). However, there are three other categories under IBS which is cast in situ formwork system, prefabricated system and composite system as shown in Figure 2.1.
2.3.1 Conventional Construction System

Conventional construction system is defined as components of the building that are prefabricated on site through the processes of timber or plywood formwork installation, steel reinforcement and cast in situ; usually built of reinforced concrete frames (Nuzul Azam Haron et al., 2005).

A quite similar definition by Yuosre F. Badir et al. (2002); in the conventional construction system (reinforced concrete frames and brick as infill), beam, column, wall and roof is cast in situ using timber formwork, while steel reinforcement is fabricated on site.
Further, it is divided into two major components. The first component is the structural system, which includes cast in situ column-beam-slab frames. These frames are constructed through four operations, namely, erection of timber formwork and scaffolding, erection of steel bar, pouring of fresh concrete into form and dismantling of formwork and scaffolding. The second component consists of brick and plaster as the non-structural infill material (M. R. Abdul Kadir et al., 2006).

This method of construction is labor intensive and involves three separate trades, namely, steel bending, formwork fabrication and concreting. Skilled carpenters, plasterers and brick workers are also involved in this system. The process can be hampered by bad weather and unfavorable site conditions (Yuosre F. Badir et al., 2002).

2.3.2 Industrialized Building System (IBS) Construction System

IBS in the construction industry includes the industrialized process by which components of a building are conceived, planned, fabricated, transported and erected on site (M. R. Abdul Kadir et al., 2006). The same goes to Construction Industry Development Board (CIDB) of Malaysia, IBS is a construction process that utilizes techniques, products, components, or building systems which involved prefabricated components and on-site installation (CIDB, 2003).

The system includes a balanced combination between the software and hardware components. The software elements include system design, which is a complex process of studying the requirement of the end user, market analysis, development of standardized components, establishment of manufacturing and assembly layout and process, allocation of resources and materials and definition of
a building designer conceptual framework. The software elements provide a prerequisite to create the favorable environment for industrialization to expand.

On the other hand, the hardware elements are categorized into three major groups. These include frame or post and beam systems, panel system and box system. The frame structures are defined as those structures that carry the loads through their beams and girders to columns and to the ground whilst in panel systems, loads are distributed through large floor and wall panels. The box systems include those systems that employ three dimensional modules (or boxes) for fabrication of habitable units capable of withstanding load from various directions due to their internal stability (M. R. Abdul Kadir et al., 2006).

Available literature indicates that considerable research efforts have been directed toward the "hardware elements" of the IBS technology. However, the hardware elements are concerned with the structure itself - the strength of the concrete and steel, the share forces, the bending moment of the structure members, etc.

But to date, the "software elements" of the IBS which are concerned with the data and information available on the system, users and clients have received little attention. Therefore, there is a dire need to overcome the shortage in the software elements of the building system research, because software elements of the building system will improved its quality, make them less costly to own, make them safer to build and safer to live in (Yuosre F. Badir et al., 2002).

Apart from that, according to CIDB, there are commonly five IBS groups as summarized in Table 2.2. Besides that, additionally IBS offers numerous benefits including quality of products, reduce construction material wastages, fewer site workers, increase safety, faster completion time and also reducing total construction costs (CIDB, 2007). However, some of the literatures indicated that the aesthetical
appeal of precast buildings is rather dull than conventional buildings because their inability to accommodate certain architectural shapes and to use the desired surface finish in a cost-effective manner.

Despite many advantages by using IBS construction system, the usage of IBS is still relatively low in Malaysia. According to a survey conducted by CIDB, the usage level of IBS in Malaysian construction industry is only 15%. In order to overcome this problem, government has highlighted several initiatives and promotions which including (CIDB, 2007):

a) Use IBS to construct 30% of the 150 000 units of houses proposed to be built by Syarikat Perumahan Negara Berhad under the 2003 Economic Stimulus Package.

b) Continuously collect data for completed and on-going IBS projects.

c) Conduct studies every five years to forecast the IBS components' needs for the Malaysian construction industry.

d) Enforce IBS usage in government (building) projects in phases (from 30% in 2004 to 70% in 2008).

e) Offer tax reduction incentives for Bumiputera component manufacturers starting from 2005.

f) Offer levy exemptions from 2004 onwards for low cost, low medium cost, and medium cost housing projects and reduce 50% levy for other types of houses for the developers using IBS and modular dimension in their designs.

g) Offer training schemes and financial loans for Bumiputera manufacturers and contractors (IBS installer) beginning 2004.

h) Provide an additional 100 000 units of affordable homes to be implemented through the IBS (2005 Budget).

i) The usage of IBS components in government building projects will be increased from 30% to 50% commencing 2005 (2005 Budget). However, recently announced in late 2008, the percentage will be increased to 70%.

j) Housing developers who utilize IBS components exceeding 50% will be given full exemption on levy imposed by CIDB (2005 Budget).
k) Publish IBS product catalogues.
l) Promote IBS more aggressively in the mass media.
m) Continue IBS road show programmes at the national and international levels.
n) Continue seminar programmes at the national and international levels.
o) Publish more IBS related books and journals.
p) Produce more studies on IBS usage in the industry.

### Table 2.2: Five IBS Groups

<table>
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<tr>
<th>IBS Groups</th>
<th>Description</th>
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<tr>
<td>1. Precast concrete</td>
<td>a) The most common group of IBS products is the precast concrete elements.</td>
</tr>
<tr>
<td>framing, panel, and box systems</td>
<td>b) E.g. precast columns, beams, slabs, 3D components (balconies, staircases, toilets, lift chambers), permanent concrete framework, etc.</td>
</tr>
<tr>
<td>2. Steel formwork systems</td>
<td>a) Considered as one of the “least prefabricated” IBS.</td>
</tr>
<tr>
<td></td>
<td>b) E.g. tunnel forms, beams and columns moulding forms, permanent formwork systems, etc.</td>
</tr>
<tr>
<td>3. Steel framing systems</td>
<td>a) It is a popular choice and used extensively in the fast track construction of skyscrapers.</td>
</tr>
<tr>
<td></td>
<td>b) E.g. steel beams and columns, portal frames, roof trusses, etc.</td>
</tr>
<tr>
<td>4. Prefabricated timber</td>
<td>a) Timber roof trusses are more popular, and timber frames have its niche market, offering designs with high aesthetic value.</td>
</tr>
<tr>
<td>framing systems</td>
<td>b) E.g. timber frames, roof trusses, etc.</td>
</tr>
<tr>
<td>5. Block work systems</td>
<td>a) Alternative method to the traditional brick laying tasks.</td>
</tr>
<tr>
<td></td>
<td>b) E.g. interlocking concrete masonry units, lightweight concrete blocks, etc.</td>
</tr>
</tbody>
</table>

(Source: CIDB, 2007)
2.4 Construction Industry Standard

Construction Industry Standard (CIS) is developed by CIDB Malaysia for the purposes of specifying uniformity in designs and quality and planning requirements for several types of houses. There are total of eight standards consists of CIS 1, CIS 2, CIS 3, CIS 4, CIS 5, CIS 6, CIS 7 and CIS 8. However, for the purpose of this study, only CIS 1 and CIS 7 will be discussed thoroughly.

2.4.1 Construction Industry Standard 1: 1998 (CIS 1)

CIS 1 is a standard to cater the needs for single and double storey low cost houses. The aim of CIS 1 is to ensure perfect and comprehensive development of low cost houses. This standard is also designed to give positive effects in order to improve the quality of life and sustainability of environment especially for low cost housing schemes. Furthermore, CIS 1 can be applied throughout government and private housing projects in Malaysia.

The contents of this standard is designed according to four parameters which are; safety (individual and property safety), comprehensive facility infrastructure (particularly for proposed development of low cost houses such as adequate access roads, electrical, sewerage and so on), mental and physical health (indoor design, circulation of air, illumination, floor area and so on) and lastly is society health (social facilities such as shops, recreational area and so on).
2.4.2 Construction Industry Standard 7: 2006 (CIS 7)

CIS 7 is a standard to cater the needs for quality assessment system for building construction work (QLASSIC). The aims of this method is to access and evaluate the quality of workmanship of a building projects.

Furthermore, there are four components in this standard, namely; structural aspect (to access the structural integrity of a building), architectural aspect (deal mainly with the building finishes, a most visible parts), mechanical and electrical aspect (covers electrical works, air conditioning, fire protection, plumbing and so on) and external aspect (covers general elements of a building such as drain, road works, car parks, playgrounds and so on).

2.5 Satisfaction

This study relates owners satisfaction with quality from construction practitioners point of view. Hence, it is important to understand the concept of satisfaction in order to obtain reliable data. The following paragraphs will be discussed on satisfaction based on several literatures.

Most of the literatures available stated that customer/owner satisfaction is an important elements and become enormously popular in the last decade (Faizah Abu Bakar, 2008; Robert B. Woodruff, 1996). American Marketing Association and the American Society for Quality Control already conducting an annual conference on customer satisfaction and its measurement starting from 1980s. The participants is increased year after year, and it is an indication that more and more people gained
interest to know more about customer satisfaction and how to measure it correctly (Robert B. Woodruff, 1996).

2.5.1 Definition of Customer Satisfaction

Customer satisfaction is a representation of the customer's reaction to the value received from a particular product offering – a comparison between the actual performance of the product and a performance standard (Robert B. Woodruff, 1996), in this case is houses. Moreover, it is a judgment formed during or after product/service use or consumption.

![Customer Satisfaction Theory Diagram](image-url)

Figure 2.2: The Customer Satisfaction Theory (Source: Robert B. Woodruff, 1996)

Apart from that, there are exist a theory called The Expectancy-Disconfirmation model (Figure 2.2), which is the most dominant theory of customer satisfaction available (Robert B. Woodruff, 1996). Determining satisfaction is an evaluation process and satisfaction is totally tied to the customer's perception of product performance. Then, perceived product performance will be compared with a standard that the customer expected. The comparison between perceived
performance and comparison of standard results in disconfirmation (difference between what was expected and what was received). The results from disconfirmation process creates a satisfaction feeling that may influenced customer's decisions.

2.5.2 Measuring Customer Satisfaction

Satisfaction is a very subjective item to measure. However, there are two available method namely:

a) Direct Methods:
   - On-site customer comment cards
   - Verbal complaints/compliments
   - Written complaints/compliments
   - Follow-up complaint/compliment calls
   - Surveys of known customers
   - Personal interviews with customers
   - Trade association studies
   - Surveys of potential customers

b) Indirect Methods/Indicators:
   - The number of repeat customers
   - Sales trends

Usually researcher will go for a surveys, and customer satisfaction measurement through surveys is an application of survey research. The survey need to consider several things such as the number of segments to survey, the sample size and composition, the method of questionnaire delivery, the incentives used to get
respondents to fill out a questionnaire, the questionnaire format and so on (Robert B. Woodruff, 1996). Importantly, researchers need to be prepared both physical and mental in order to get reliable data.

2.6 Quality

"Improving quality has received considerable attention in recent years as there is an increasing customer demand in the global environment for higher quality construction." (CIDB, 2007). Those sentence indicated that nowadays quality is an important aspect to customers particularly in construction environment. Thus, many construction companies strive very hard in order to improve their quality of product and trying to achieve recognition from international bodies such as ISO 9001 through implementing quality management. However, until 2004, only 0.23% of the total registered construction companies certified with ISO 9001 (CIDB, 2007).

Parallel to this, government bodies are already produced a number of standardisation in order to enhance quality in local construction environment such as Construction Industry Standard (CIS) through CIDB. For example, CIS 7 is created specifically for quality assessment system in construction (QLASSIC). The objective among others is to have a standard quality assessment system for quality of workmanship of building projects.

Apart from that, QLASSIC divided quality of workmanship of a building into four main categories which are structural, architectural, mechanical & electrical and external component. Structural component deals with structural integrity of a building such as steel reinforcement and precast elements during construction. Meanwhile, architectural component deal mainly with the finishes of work of a building such as floors, internal walls, ceiling, door and window. It is a part where
the quality and standard of workmanship are most visible. The third component is mechanical and electrical, which covers electrical works, air conditioning, fire protection, plumbing and so on. However, external component stressed on the general external work elements in building constructions such as drains, road works, car parks, footpath and so on.

2.7 Summary

According to earlier literatures, several conclusions can be made, which are:

(a) Low cost housing schemes in Malaysia is still arguable in order to serve the occupants better,

(b) Other researchers mostly concentrating on "hardware elements" of IBS technology, resulting in fewer literatures that discussed on the "software elements" of IBS houses,

(c) There are needs to obtain feedback from occupier of IBS houses in order to fit their needs, increase safety, and make IBS houses as a preferable type of house, and

(d) The appropriate approach in measuring satisfaction is by using survey method and the tool is questionnaire.
CHAPTER IN

RESEARCH METHODOLOGY

3.1 Introduction

This research was carried out to identify the relationship between quality and satisfaction of house buyers between two construction systems (IBS and Conventional). Therefore, it is important to highlight the methodological aspect of this research to ensure valid and reliable outcomes. This chapter also discussed on related methods from the beginning till the end of this particular research. The main body of this chapter is divided into 4 stages to ease understanding processes throughout this study.

3.2 Research Methodology Chart

The flow of this study is summarized in the following figure (Figure 3.1). Concisely, this study begins with the selection of appropriate problem statements. It will be followed by objectives determination and proper scope of study. After that,
collecting of data using questionnaires will take place. Lastly, before summarizing the outcome, all data will go through the analyzing processes.

Figure 3.1: Research Methodology Chart
3.3 First Stage (Research Identification)

At this stage, it involves the identification and further understanding of the research topic, which consists of problem statement, study objectives, conceptual diagram and scope of studies. Literature review has been done on several references, either from electronic journals, books, magazines, articles and so on to further enhance the understanding on the research topic. Based on the objectives and scopes of the study, the study will be focused on the ways to solve and to achieve the objectives of this study.

3.3.1 Research Design

This study is using quantitative design and the method use is survey method which is inferential statistics. The instruments are questionnaires. Data obtained will be analyse by using Statistical Package for Social Science (SPSS) Ver. 13.0 software.

The major approach was using questionnaire, considering such factors on sample size, time, cost and efforts. Questionnaire method was chosen as the appropriate approach for this study since it can reach a large number of respondents in different locations of the state at a relatively lower cost, shorter time and less effort as compared to other data collection methods (Nuzul Azam Haron et al., 2005).

In order to achieve the first objective (identifying the satisfaction of house owners in construction systems) of this study, mean value obtained from the analysis will be use. The value then will be compared to Likert Scales' conversion table
REFERENCES


