THE RELATIONSHIP BETWEEN THE LEVEL OF DEFECTS AND HOUSE-BUYERS' SATISFACTION IN BUILD-THEN-SELL (BTS) HOUSING DELIVERY SYSTEM

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2011

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by

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Thesis submitted in fulfillment of the
Requirements for the degree
of Master of Science (Project Management)

FEBRUARY 2011

ACKNOWLEDGEMENTS

No one walks alone and when I was walking on the journey to complete this thesis, I feel the need to thank those that never failed to walk beside me and helped me along the way. First and foremost, I would like to thank my main supervisor, Associate Professor Dr Nor' Aini Yusof for her support and valuable guidance. She has patiently guided me along the way although the entire research-writing process which was new to me. She always motivated me when I was down and inspired me greatly in the completion of this thesis.

My appreciation also goes to my co-supervisor Dr Nazirah Zainul Abidin for the advice she offers. Other than that, I would like to dedicate my special thanks to Dr Nordin Abdul Razak for guiding me on various aspects of data analysis. My thanks also go to the whole staff of the school of Housing, Building and Planning for their help and support.

I also wish to express my love and gratitude to my beloved parents Mr. Mohd Fauzi Abdullah and Mdm. Haminah Mahmood, and siblings Nur Fahimah, Mohd Azinuddin, Nur Faizah and Nur Farhana for their understanding and undivided concern and love throughout the duration of my study. Also to my friends Ms. Ulyani, Ms. Siti Aisyah, Ms. Siti Zaleha, Mr Wong Sing Sing, Mr. Fazdliel Aswad and Mr. Mohd NurFadzli for their encouragements and endless support in completing this thesis.

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HUBUNGAN ANTARA TAHAP KECACATAN DAN KEPUASAN PEMBELI BAGI RUMAH YANG DIBINA MELALUI SISTEM BINA-KEMUDIAN-JUAL (BKJ)

ABSTRAK

Bina-Kemudian-Jual (BKJ) merupakan sistem baru yang dilaksanakan di Malaysia setelah pelbagai aduan diterima daripada pembeli terhadap sistem Jual-Kemudian-Bina (JKB). Pada 2007, apabila kerajaan mengumumkan pelaksanaan BKJ, pihak-pihak pelaksana BKJ menegaskan bahawa sistem baru akan menyediakan rumah yang rendah tahap kecacatannya. Walaubagaimanapun, kenyataan mereka tidak disokong oleh sebarang data empirik. Maka, penyelidikan ini dijalankan bertujuan untuk menilai kecacatan yang terdapat pada rumah BKJ. Terdapat empat objektif yang perlu dicapai dalam kajian ini. Pertama, kajian ini menilai kecacatan bagi rumah BKJ. Kedua, mengenalpasti kemungkinan sebab-sebab berlakunya kecacatan. Ketiga, kajian ini menilai tahap kepuasan penghuni rumah BKJ. Keempat, mengetahui sama ada kepuasan penghuni yang tinggal di rumah BKJ mempunyai kaitan dengan faktor kecacatan. Untuk mencapai objektif yang ditetapkan, satu tinjauan telah dilakukan ke atas penghuni yang tinggal di rumah BKJ. Skim perumahan BKJ telah dikenalpasti melalui media dan oleh kerana populasi yang terhad, semua rumah yang dikenalpasti telah dituju untuk mengumpul data. Borang soal selidik digunakan sebagai alat untuk pengumpulan data dan ianya disokong oleh soalan terbuka untuk mengenalpasti jenis dan kemungkinan sebab berlakunya kecacatan. Data yang dikumpul daripada borang soal selidik dianalisis menggunakan ujian frekuensi dan ujian *rentas-penjadualan* di dalam analisis deskriptif. Manakala data yang dikumpul daripada soalan terbuka dianalisis secara manual. Penemuan bagi objektif pertama menunjukkan tahap kecacatan bagi rumah BKJ ialah rendah dan penemuan penyelidikan menunjukkan sekurang-kurangnya terdapat satu jenis

kecacatan pada setiap elemen rumah yang dipilih. Bagi objektif kedua sebab-sebab yang mungkin bagi berlakunya kecacatan adalah disebabkan oleh kemahiran pekerja dan bahan yang digunakan oleh pemaju. Penemuan bagi objektif ketiga menunjukkan kebanyakan daripada penghuni di rumah BKJ berpuas hati dengan rumah BKJ dan penemuan bagi objektif keempat menunjukkan kepuasan bagi penghuni yang tinggal di rumah BKJ mempunyai hubungan dengan faktor kecacatan. Kesimpulan yang dapat dibuat daripada kajian ini ialah sistem BKJ berjaya menyediakan rumah yang rendah dari segi kecacatan dan memuaskan hati kebanyakan daripada penghuni yang membuat keputusan untuk membeli rumah bersistem BKJ.

THE RELATIONSHIP BETWEEN THE LEVEL OF DEFECTS AND HOUSE-BUYERS' SATISFACTION IN BUILD-THEN-SELL (BTS) HOUSING DELIVERY SYSTEM

ABSTRACT

Build-Then-Sell (BTS) is a new system implemented in Malaysia after a number of complaints have been received from buyers in the Sell-Then-Build (STB) system. When the government announced the implementation of BTS in 2007, proponents of BTS have asserted that the new system will provide low defects' level. Their argument however was not supported by any empirical data. Hence, this study is conducted to measure the housing defects that can be found in BTS houses. The objectives of this study are manifold. First, it evaluates the housing defects in BTS houses. Secondly, it identifies the possible causes of those defects. Thirdly, it assesses the occupiers' satisfaction living in BTS houses. Finally, it examines the relationship between the occupiers' satisfaction and the defects factor. A survey is conducted to the occupiers in BTS houses in order to achieve all the objectives. The BTS housing scheme has been identified through the media and because of the small number of population, all housing scheme was approached to collect the data. Questionnaire is employed as the data collection instrument and it is supported by the open ended responses to identify the types and the possible causes of defects' occurrence. The data gathered from questionnaires is analyzed using the frequency test and cross-tabulation test in a descriptive analysis. The data obtained from open ended response is analyzed manually. The finding for the first objective reveals that the level of defects in BTS houses is low and the finding indicates that for each building elements measured, at least one type of defects has been noted. While For the second objective, the possible causes of occurrence are because of the workmanship and material used by developers. The finding for the third objective

shows that most of the occupiers are satisfied with the BTS house and the finding for the fourth objectives indicates that the occupiers' satisfaction is significantly related to the defects factor. The conclusion that can be drawn from the present study is the fact that the BTS system is successful in providing less defective houses and is able to satisfy most of the occupiers who choose to purchase houses.

CHAPTER 1

INTRODUCTION

1.0 Introduction

Housing is universally acknowledged as the second most essential human need after food and is a major economic asset in every nation (Oladapo, 2006). The most important function of a house is to provide shelter. It also provides living space for a few families (Agustin, 1990). As such, it offers people protection from bad weather and danger. It is also a place where people live their lives, keep their belongings and rest after work or school. Because of these functions, people spent considerable sum of their money to buy or rent a house. In Malaysia, after 1960, the demand on housing grows from time to time due to the rapid urbanization process (Yusof, 2007). With this housing market booming, it is easy for quality to be neglected in the rush to complete the final product (Sommerville, et al., 2004). House buyers are consequently forced to accept the substandard product (house) with a lot of defects (ibid).

One may view that defects are unavoidable in any housing construction, but a house full of defects will have negative impact on the occupiers. Consequently defects may cause hardship in terms of physical or mental health problems to the occupiers and even result in the house not deemed safe to live in. For the last two decades, there have been a lot of studies about defects in housing. Most studies focus on the cause of housing defects, either because of human error that can be prevented or because of nature such as ground movement and land slides which could not be avoided. Very

few studies focus on specific housing delivery system which can influence the level of defects.

This chapter will discuss the motivation to conduct a study about the level of housing defects in a new housing delivery system in Malaysia that is commonly known as the Build-Then-Sell system. The chapter starts by identifying the issues which lead to this study, followed by the objectives that the study seeks to achieve at the end of this study. Subsequently, the significant of this study will be elaborated and at the end of this chapter, the organization of this thesis will be provided.

1.1 Problem Statement

In Malaysia, the conventional delivery system of Sell-then-Build (STB) is argued to contribute to defects as houses are sold before completion (Yusof, et al., 2010a). The STB system allows developers to sell houses and collect progress payments while housing is being built and as such the selling is made when the unit is not yet fit for habitation (ibid). The STB system is more common in Asian countries such as Hong Kong, Indonesia and Malaysia. Chau, et al. (2007) exert that it is not surprising for a dwelling in Hong Kong to be completely sold although the construction has not yet started. Similarly in their review of the housing delivery system in Malaysia, Yusof, et al. (2007) reveal that the STB system is widely implemented since the early of 1980s, when more roles were given to the private developers through mass housing production to help to overcome the problem of housing backlog. Although the developers claimed that the STB system has been successful in achieving the housing target, the system is argued to cause other problems as well (Yusof, et al., 2010a). A

typical Sale and Purchase (S&P) agreement signed between developers and house buyers requires that the developer adhering to good, fair construction standards seems to have had little impact on the actual quality of completed houses (ibid).

Every year from 2000 to 2006, House Buyers Association (HBA) of the Malaysian statistics showed that there were not less than 7% of the house buyer's complaint which aired concern on shoddy workmanship and defects (HBA, 2006). In 2007, the Ministry of Housing and Local Government (MHLG) reported that there are 192 complaints on defects. Figure 1.1 shows the graph of house-buyers' complaints in 2007.

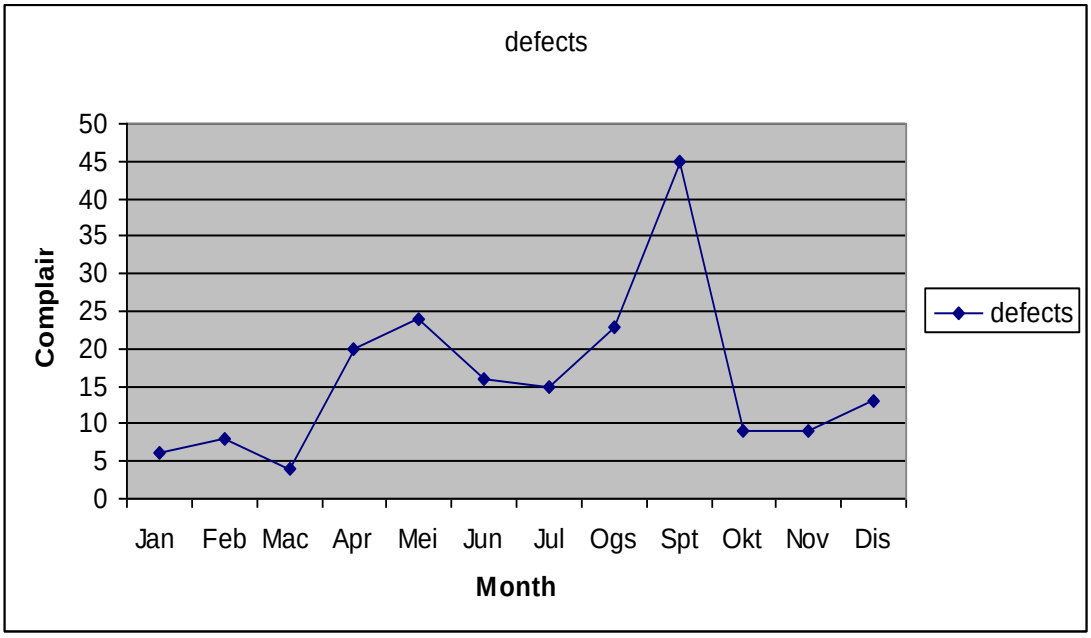

Figure 1.1: Occupiers complaint on defects in 2007

In other countries such as China, Singapore and Taiwan which implement the STB, they also faced the problem of poor quality houses (Leung, et al., 2007a; b; Ong, 1997). In Singapore, Ong (1997) reports that the number of house defects in the post-occupancy stage is increasing. The buyers are not protected and the house is

defective with poor design and inadequate supervision of the construction process. The case in China is not different from the other countries mentioned. Sub-standard material used is the cause of the occurrence of housing defects other than the practice of certain irresponsible developers (Yang, 2001). For instance, Leung (2010) states that among the defects occurred in STB houses are uneven flooring and poor plastering, window with more than 50 cracks and water leaking in the bathroom.

There are many possible causes for the defects, however the characteristics of STB system which is based on forward selling delivery system, has encouraged what Chau, et al. (2007) have coined as a moral hazard problem. According to Chau, et al. (2007) moral hazard problems arise because there are less incentives for the developers to provide quality house since the house has already been paid for, although it is not yet built. This opinion is also shared by Ong (1997) who argues that pre-completion selling introduces disincentives to developers to provide optimal level of effort of building quality housing. Moreover, the STB system is argued to result in less monitoring effort in each housing project because the developers have received payment for the incomplete houses (Yusof, et al., 2010b). The use of model house by some developers to give an indication to house buyers of how the actual house would look like when completed, has often been a poor indicator of the quality of actual unit purchased and built (HBA, 2005). The House Buyers Association has lamented that the quality of the workmanship, the finish, and the fittings provided in the completed housing units often differ than the show unit (HBA, 2005).

In an attempt to address the above problems, in April 2007 the government had introduced a new housing delivery system, popularly known as the Build-Then-Sell

(BTS) (Yusof, et al., 2010a). The new BTS system will run in parallel with the conventional system STB for a trial period of two years. The proposed solution is a move towards a system that allows houses to be sold only after completion and aims to promote better quality housing and to provide greater protection for house buyers (Yusof, et al., 2010a). There are two models of BTS system; first is the 100 percent BTS and second, is the 10:90 BTS model. In the 100 percent BTS, houses are sold only after construction is completed and a Certificate of Completion and Compliance (CCC) is issued (Yusof, et al., 2010b). Whereas in the 10:90 model, house buyers must pay a deposit of 10 percent upon signing their S&P agreement, with the remaining 90 percent payable upon completion of the house and the issuance of a CCC (Akbal, 2006). The 10 percent deposit will be temporarily held by the developer's lawyer and it is further protected by the way of the Fidelity Fund pursuant to the Legal Practice Act (Yusof, et al., 2007).

The major advantage of the new BTS system is that the house buyers may view the house first before they decide to buy the house. If the house has lower quality than expected, house buyers may refuse to purchase it. The opinion of Ong (1997) has noted that if the STB system is implemented, the developers' intention to provide quality houses will decrease. Conversely, proponents of the BTS system argue that the new system will increase housing developers' motivational level to provide quality houses with less, or free of defects. In addition, it is argued that the new BTS system will encourage housing developers to be more cautious about the project's completion time, better organized and improve working practices (Yusof, et al., 2010b). The practice of partial BTS might result in higher quality as developers want the buyers to complete their purchases (Yusof, et al., 2007). If the houses are not up

to house buyers' expectations, they may break the agreement and get the deposit back. Hence, the developers will be more diligent in providing low-defects houses in order to secure their profit. The BTS system has been the norm in the developed countries such as Australia, United Kingdom, Netherlands and the United States of America. However, this system is still a foreign idea and uncommon in some Asian cities especially in Malaysia, Indonesia, Singapore and Hong Kong.

However it is still debatable whether the practice of BTS may result in houses that are less or free from defects. According to Sufian and Ab. Rahman (2008) many authors and practitioners alike seem to accept the argument that BTS will result in better quality housing. Nevertheless there is lack of empirical studies to prove the argument. Ong (1997) develops a model of effort aversion in an attempt to explain defects in the housing development. But no data were presented as it provides little value to the present study. The work by Malaysian authors; Sufian and Ab. Rahman (2008) and Yusof, et al. (2010b) do not provide any clue on the issue either. In Hong Kong, Chau, et al. (2007) work which utilizes the sales data of the real estate market to explain that despite of the housing quality problem, Sell-Then-Build houses are still popular among house-buyers in Hong Kong. They have found that even though housing quality was not observable during presales, house-buyers are able to capitalize developers' reputations into the house prices they pay accurately. Nevertheless it is not the case in Malaysia as some parties with establish reputation are also involved in defective house, delayed of house completion and abandoned project (Yi, 2010; Achariam, 2010; Sipalan, 2008; Yeow, 2008). Sommerville and McCosh, (2006) challenge the argument that BTS houses have low-defects level. Since defect is only visible after several years of occupying the house, they contend

that it is difficult for the buyers to detect defect at the buying stage. Nevertheless their study does not give any indication on the level of defects of the BTS houses. This brings us to the first research question; do BTS houses have a low level of defect? The discussion, thus far, justifies the need for an empirical study which helps to testify which of the above arguments is true.

Housing defects can be defined as the failure in function, performance, statutory or user requirements at the house whether it is in terms of structure, fabric, services or other facilities in the house (Pheng and Wee, 2001). The measurement for the level of defects can be done by the building elements as suggested in Pedro (2008) study. As an extension, Chew, et al. (2004a, b) and Chew and Silva (2004) study the types of defects and the causes of occurrence other than the level of defects. There are many types of defects occurring in a house such as crack (Chew, et al., 2004a; Ilozor, et al., 2004; Chew and Silva, 2004; Georgiou, et al., 1999), leakage (Chew, et al., 2004a; Georgiou, et al., 1999; Mills, et al., 2009; HADD, 2004), water penetration (Ilozor, et al., 2004, Chew, et al., 2004b) and staining of ceiling board (Chew, et al., 2004a; Chew and Silva, 2004). The possible causes of defect can be human error such as shoddy workmanship (Atkinson, 1999; Josephson and Hammarlund, 1999; Kangwa and Olubodun, 2006) and the poor selection of materials (Page and Murray, 1996; Pheng and Wee, 2001; Chong and Low, 2006) or simply being the results of the force of nature such as earthquake (Lu and Ren, 2008; Alani and Khosrowshahi, 2007). This gives rise to the second research question: what are the types of defects that have occurred in BTS houses and what are the possible causes of those defects?

Defects reflect the quality of the houses. The quality measurement as stated in Hyun, et al. (2008) study is in terms of the number of defects occurrences. As such studies tend to relate the level of defect with occupiers' or house buyers' satisfaction. The higher level of defect is assumed to be suggestive of low quality houses and will cause dissatisfaction to the occupiers (Ng, et al., 2011). Karna (2004) states that buyers are dissatisfied when the house is falling short of standard. Besides, buyers' satisfaction occurs when the performance is greater than the standard. Sommerville and McCosh (2006) also have the same idea as they discover that the defects detract from buyers' satisfaction. Sommerville (2007) states that there has been an increasing number of house buyers who are unhappy with their new houses as the increasing levels of defects. Aforementioned statement has also shown the relation between the defects and satisfaction.

A number of studies have been done on residential satisfaction in relation to the housing defects in general for example as in Ng, et al. (2011), Torbica and Stroh (2001), Djebani and Al-Abed (2000) and Liu (1999) – Ng, et al. (2011) study on occupiers' satisfaction based on the defects' occurrences before and after the implementation of the ISO9000 while Trobica and Stroh (2001) focus on occupiers' satisfaction in design, house and service in order to examine the builders' performance. Djebani and Al-Abed (2000) examine the effectiveness of three housing schemes by the housing quality and occupiers' satisfaction and Liu (1999) measures the influence of physical and social levels to the occupiers' satisfaction. These studies do not mention whether the houses under study are under forward sale or BTS systems. As such, not much is known whether BTS houses have low defects. In the case of BTS system, it is important to assess the satisfaction of occupiers

based on the defect occurrence in order to measure the performance of the new system. This brings us to the next two questions of the study; are occupiers of BTS houses satisfied with their houses and is there a relationship between the level of defect in BTS houses and occupiers' satisfaction?

Apart from limited empirical studies on the level of house defects, most studies on the BTS housing delivery system, focus on developers as the research subject: Nazihan (2005) focuses on the perceptions and expectations of BTS from both developers and financiers, Ng (2007) studies the determinant factors of BTS from developers' point of view and Yusof, et al. (2010b) goes on to examine the readiness of developers in implementing the new system, to name but a few. Very few research focus on the occupiers' point of view, either in terms of their perception on the level of defects or their satisfaction towards BTS houses. This is rather disappointing, since the fact remains that occupiers are the end-user of the house and their perception will add value to the house (Fernandes, 2007).

Hence, in order to fill in the gap this study is done to evaluate the defects level in BTS houses from the occupiers' point of view. As an addition, other than the level of defects, the type and the causes of defects that occur also will be included in the present study. Furthermore, this study will examine whether the level of defect in BTS houses has a relationship with the occupiers' satisfaction.

1.2 Objectives of Study

This study is mainly about evaluating defects from the occupiers' perspectives and assessing the occupiers' satisfaction when accommodating houses which are built according to the Build-Then-Sell (BTS) system. It highlights the level of defects as well as the types and causes of the defects occurring in BTS houses. As an addition, the satisfaction and its correlation with the level of house defects also are included in this study. In short, this study aims to fulfill the following objectives:

Objective 1: to evaluate defects in BTS houses

Objective 2: to identify the possible causes of occurrence.

Objective 3: to assess occupiers' satisfaction in BTS houses.

Objective 4: to examine whether the occupiers' satisfaction is correlated with the defects' level.

1.3 Significance of Study

BTS provides a number of advantages to the buyers as they may view the actual house instead of taking the risk of buying a house that has not been built yet. One of the benefits for the buyers is, they are able to inspect the house first before deciding to purchase (Yusof, et al., 2007). The level of defects in the occupancy stage however, at this point, is still questionable. The study about the defect in the BTS system also is very scant. Therefore, this study will attempt to extend the limited knowledge on defect issues in the BTS system. The result of this study will offer a number of benefits to the stakeholders namely developers, the policy maker

(Ministry of Housing and Local Government) and of course, the potential house buyers.

Firstly, regarding defects as an issue of concern, developers may place an emphasis on the certain building elements which are found in this study to have higher propensity for defects, and find the solution to eliminate these flaws in future housing development. Secondly, the policy maker may use the result of this study to evaluate the entire BTS system. The results may come in handy in measuring the success of the BTS system in the context of house quality. As an addition, the finding may serve as a guideline to the policy maker before deciding to make the BTS system compulsory to all housing developers. The findings may also provide evidence so as to boost the confidence of housing developers to embark into the BTS system. Finally, the findings will also supply the house buyers with more detailed and extensive information regarding the defects as a growing issue in the BTS system.

1.4 Scope of Study

The subjects of interest in this study are defects, housing delivery system and satisfaction. This study is measuring defects and satisfaction in occupiers' perceptions. The rational of appointing the occupiers as respondents is because they are the end-users of the 'product', in this case the house. Professionals will focus more on the technical aspects whereas the buyers have their own perceptions about the quality of their house (Fernandes, et al., 2007). The occupiers as respondents can

be male or female as long as he/she stays or lives in the BTS houses. The respondent must not be a minor therefore, is decided to have to be 18 years of age and above.

To avoid biasness, only occupiers in landed-property were included in this study. High-rise buildings were excluded as they may have higher defects than the landed-property we set to study. Another possible reason is that, high-rise buildings have higher density and occupied by many people and thus the possibility of defects is more apparent. The defect measured is only the patent defect which can be seen by the occupiers from the time they occupied the house until the present time the study was being done. It is because the housing starts to deteriorate from the moment they are completed (Arditi, et al., 1999). This studies only concern on one type of BTS houses labeled as 100% BTS. This is because all the projects only involve the 100% BTS.

The BTS projects that are considered in this study are only the projects that have been accommodated within 3 years, considering the patent defects will normally appear within that time (Mohamad Zainordin, 2006; Mann, n.d). Data collection stage took 3 months to be completed. There is no specific geographical area for this research as the researcher went to all places where there were projects under the BTS scheme. The list of BTS projects was obtained from the media such as newspapers, banners and brochures. The researcher has to rely solely on the media because there is no list of developers who apply the BTS system from the authorities who handled housing development; local authority, state government or the Ministry of housing and local government.

1.5 Organization of the Thesis

Chapter one opens the discussion with the introduction to this study. The problem of housing defects in the BTS system which leads to this research is explained and the objectives that are to be met are stated. The importance of this study to the government, developers and house buyers are elaborated in this chapter. This chapter ends with the discussion of the scope of this study.

Chapter two highlights the issues related to defects, the housing delivery system and satisfaction. The defects are explained in terms of type, causes and how the measurement of defects is done in the previous studies. For the housing delivery system, both conventional (Sell-Then-Build) and new (Build-Then-Sell) systems are elaborated. As for satisfaction, the discussion of how to measure and its correlation with defects are described. At the end of this chapter, the hypothesis and framework for this study are presented and developed.

Chapter three presents the details of the methodology employed in this study. This chapter explains the research process of the present study and the method used in this study. The survey technique, as well as how the data is collected to fulfill the objectives are also elaborated in this chapter. Finally, the types of analysis used will be outlined at the end of this chapter.

Chapter four details and elaborates the findings and discussion about the results obtained from this study. The data collected in the survey is analyzed using the descriptive analysis available in the Statistical Packages for Social Science (SPSS)

software. The analyses performed are showed in this chapter. The results obtained with regards to the defects; level of defect, types of the defects occurring in BTS houses, the possible causes of occurrence and the result for occupiers' satisfaction are presented in this chapter. After that, the results are discussed and related to the previous studies.

Chapter five summarizes all the chapters and concludes the findings of this study. Whether the hypothesis is accepted or rejected is explained in this chapter. Implications and limitations for this study will also be given exclusive emphasis. At the end, the recommendations for the future study are provided and at the same time, mark the end of this study.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter highlights the issue of defects, housing delivery system and occupiers' satisfaction. It begins with an explanation about the very definition of defects, types, aspects and causes of defects; followed by the discussion about conventional housing delivery system (Sell-Then-Build), the new housing delivery system (Build-Then-Sell) and the inter-play of defect in both systems. Subsequently, this chapter will review past studies about house buyers' satisfaction in relation to the housing defects. In order to choose the best method in measuring defects, several methods used in previous studies will be given the limelight and the best method is finally chosen. The assessment of occupiers' satisfaction is also mentioned. Finally, the conceptual framework as well as the research hypothesis will be presented at the end of this chapter.

2.1 Defects

There are various terms to refer to defects such as fault, quality failure, quality deviation and non-conformance. A study in Australia by Sommerville and McCosh (2006) associate defects to snags which will reduce the quality of the house or building. There are several definitions that describe defects, some of which come from established dictionaries as seen below.

New Oxford dictionary defines defects as “something that is wrong with or missing from something” (New Oxford English Dictionary, 2009). In turn, a business dictionary defines defects generally as “frailty or shortcoming that prevents an item from being complete, desirable, effective, safe or of merit, or makes it to malfunction or fail in its purpose” (Business dictionary, n.d). Webster's Dictionary defines defects as “an imperfection that impairs worth or utility, a lacking of something necessary for completeness, adequacy, or perfection. In real estate, this definition is elaborated and expanded to include a condition that may impair the health or safety of building occupants (Webster’s dictionary, n.d). Oxford advanced learner’s dictionary states that the meaning of defects is “a fault in something or in the way it has been made which means that it is not perfect” (Oxford Advance learner, 2001). In short, the dictionaries generally define ‘defects’ as a shortcoming in an item whether it is not complete, inadequate or not perfect.

In each study done about defects, scholars have defined defects in rather multifarious terms. The defects from previous studies can be looked at from three perspectives that are complaints from user, non compliance and from technical descriptions. The first definition by Olubodun (2000) defines defects according to the complaints lodged by user. He suggests that components are judged to have failed if sufficient complaints are received about their conditions. The second definition from Karim, et al. (2006) describes the defect with the statutory. They believed that defects occur as a non-conformance with the contractual documentation. In technical terms, the defects can be described as deficiency in the performance at any time in the life of an element or a dwelling in which it occurs (Stephenson, et al., 2002). A study by Pheng and Wee (2001) gives a holistic definition about defects which covers the failure or

shortcoming in the function, performance, statutory or user requirements of the structure, fabric, services or other facilities. In the present study, defects can be described as a failure in appearance, performance and function of a building that impairs its value and prevents the building from being perfect.

2.1.1 Types of Defects

According to Atkinson (1999), there are two types of defects which are active and latent. Active or patent defect is defects that can be easily recognized. These kinds of defects are very clear and obvious to see, such as the crack on the wall and missing plaster.

Hidden or latent defects can be described as any flaws or defects resulting from inferior design, deterioration, or unobservable construction mistakes made prior to sale (Atkinson, 1999). Defects are considered to be latent when it is not apparent and when it cannot be detected by ordinary examination. Some examples of latent defects might include: inadequate brickwork that leaks water into the house, a cracked concrete slab, a rotting roof and crumbling foundations.

Most latent defects appear only during the occupancy stage and getting access into occupied buildings to acquire information on these defects can be difficult. It is difficult to detect latent defects due to the time frame in which these defects appear. Unless such defects are serious enough to cause occupants to complain to the authorities, most of these defects rarely surfaced to the public (Chong and Low, 2006).

2.1.2 Aspects of Defect

Basically, there are three common aspects of defects suggested by Georgiou et al., (1999) involving technical, Aesthetic and functional aspects. The first aspect that is technical aspect is when the workmanship or material of an element reduces its capability to fulfill the functional performance of a structure. A serious defect in this category can affect the health and safety of occupants as well as having significant economic ramifications. Pheng and Wee (2001) include this technical aspect to the technical sub-system which is caused by defective materials, inappropriate designs and poor site practices and supervision. As technical aspect was due to the workmanship and material, it can be prevented by better design detailing, thoroughly and carefully laid out specifications and using more appropriate materials as suggested by Chong and Low (2006).

The second aspect of defects is the aesthetic aspect. It is called Aesthetic aspect when the appearance of a material or building element is adversely affected (Georgiou, et al., 1999; Sommerville and McCosh, 2006). It is suggested that a serious defect in the aesthetic category is likely to have economic ramifications only, and possibly showing less serious psychological consequences than affecting health and safety. Freeman (1978) defines aesthetic defect as the defects that only affect the building's superficiality. As an example, Chong and Low (2006) quote the 204 cases of peeling and blistering paint in 74 buildings found in their study. An aesthetic defect does not affect the health and poses any risk but it will reduce customers' satisfaction. The last aspect to be discussed is the functional aspect. Defects are grouped into the functional aspect when a dwelling fails to function in its intended manner. Not like

technical and aesthetic aspect that can be objectively measured, the functional aspect is largely a design factor and may come in various forms, according to circumstances of the occupier (Georgiou, et al., 1999).

2.1.3 Causes of Defects

Josephson and Hammarlund, (1999) in their study about causes and cost of defects in seven (7) building projects define causes as a proven reason for the existence of a defect. According to Pheng and Wee (2001), there are two reasons for the occurrence of defects which are from human and nature. Defects from nature develop when the buildings are exposed to the degrading effects of nature. Human factor such as the maintenance of the building may slow down the process of natural causes of defects, but sometimes human too can be the cause of defects.

2.1.3 (a) Human Causes

At the design stage, Developers firstly discuss with architects what they want for the project. The design team comprising of the drafter, structural, mechanical and electrical engineers will be involved in this stage (Huth, 1996). Architects combine their knowledge of construction with aesthetic knowledge and the ability to fulfill developers' demands, while engineers assists with the design of the structural elements of building, calculating load and stress, and help with the amount of electricity required to serve a building (Cadman and Austin-crowne, 1978). After that, they give the design to the contractor to run the project whether it is an office building, house or roadway. Sometimes when the project is huge, the contractor

would hire the sub-contractor to help them with the project. The part of home construction most often sub-contracted are plumbing, electrical, painting and decorating, and landscaping. Other than the subcontractor, individuals involved in the site construction are site engineers, site supervisors and construction workers. After the projects are completed, contractors will hand over the projects to the developers. Figure 2.1 illustrated the stages in construction and parties involved in a house project.

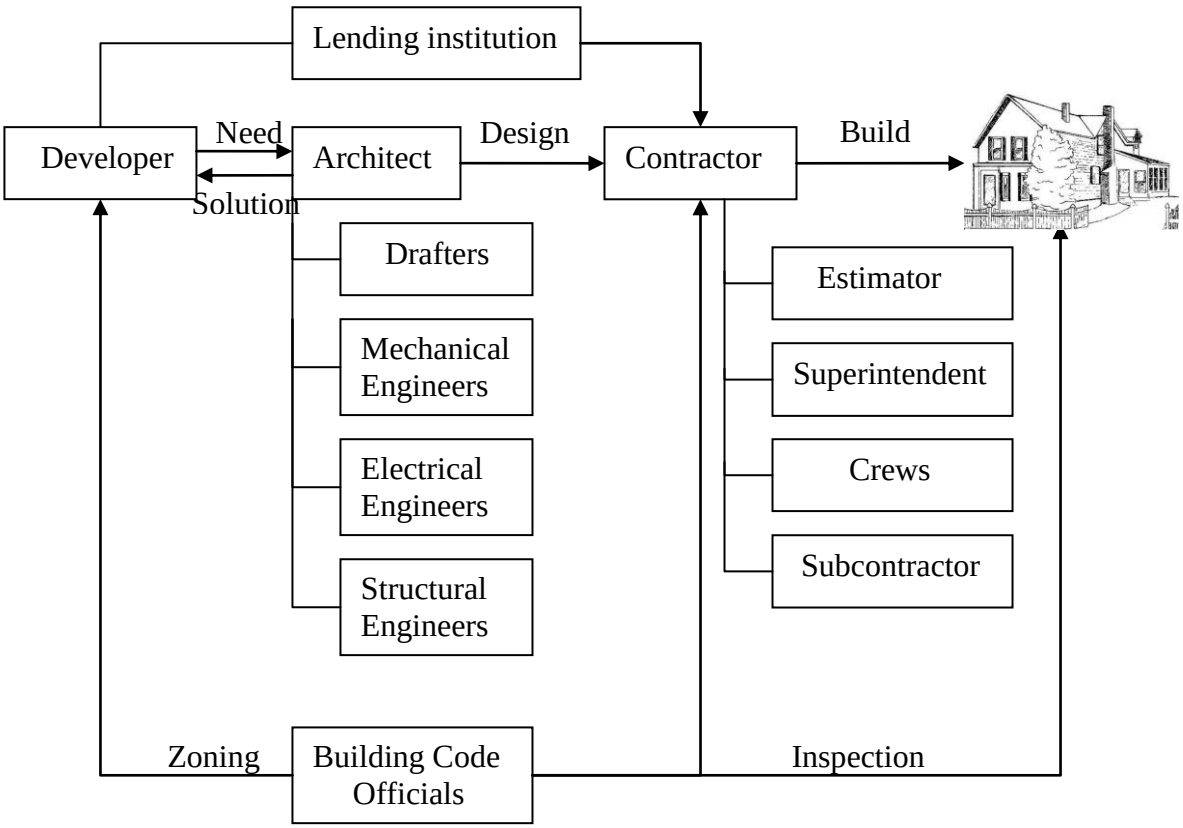

Figure 2.1: Parties involved in a housing project
Source: Adapted from Huth (1996, p. 6)

Previous research have indicated that defects may well start earlier from the design stage. Design plays a major role in determining the condition of a building after completion, especially in the aspect of defects and maintenance (Ramly, et al., 2006). Designers need to understand the impact of their design decisions upon the indoor

quality, occupants' health, comfort, energy consumption and local needs, and without this knowledge, he or she cannot produce a good building design. Al-Hammad, et al. (1997), from their interviews with contractors, owners and architectural and engineering firms (A/Es) have come up with the fact that there are 32 defects in design and these can be divided into 6 groups which are civil design, architectural design, maintenance practicality and adequacy, consultant firm administration and staff, construction specification and construction drawing. Designers' decisions include the specification of materials, layout and integration between different materials and systems. Poor decision will definitely cause defects. It would be appropriate to say that if the design team has a clear picture of what is required by both the contractor and the end-user then there should not be any problems that might surface in the form of defects. However, if the design is so complex with various shapes, spiral forms, inclined, distorted, top heavy in shape and so forth, this will encourage a lot of maintenance and this too, will lead more closely to defects (Ramly, et al, 2006)

Other than the designer's decision, defects also occur due to the negligence of other parties involved at the various stages in construction. Atkinson (1999) in his study points out that defects are related to the people who carry out the construction - from designer to operative and from senior manager to junior trainee. From the design process to the completion of the project, there will be a lot of people involved in the project, although this depends on how big the project is. The bigger the project, the more parties will be involved. Industry practitioners such as building surveyors, architects, engineers, contractor, sub-contractor and workers obviously do not have the same behavior, skill and also motivation. Shoddy workmanship due to lack of

skill (Ong, 1997; Kangwa and Olubodun, 2006), lack of knowledge (Josephson and Hammarlund, 1999; Atkinson, 1999), lack of communication (Josephson and Hammarlund, 1999; Atkinson, 1999; Pheng and Wee, 2001; Kim, et al., 2008) and lack of motivation (Josephson and Hammarlund, 1999) are proven factors that can bring about the flaws in a building structure. Although Pheng and Wee (2001) state that defects from human are always described as "negligence", shoddy workmanship such as poor installation methods, including poor mixing of materials, poor handling of materials, poor planning (from the contractor) that lead to poor completed quality (Chong and Low, 2006) could not be neglected as this "negligence" will be repeated and it becomes worse if it is not controlled. For instance, in Sommerville and McCosh (2006) study, they have discovered that from 389 that had been reported, 380 defects were related to shoddy workmanship.

Other than that, the material chosen by the main contractors, to be used in the construction is also one of the contributors of defects (Page and Murray, 1996; Pheng and Wee, 2001; Chong and Low, 2006; Josephson and Hammarlund, 1999; Kangwa and Olubodun, 2006). Poor selection material may shorten the life span of the building element, for example the material selection for the roof will impact the roof performance and overall building (Chew, et al., 2004a; Olubodun and Mole, 1999; Ramly, et al., 2006). Inferior or poor building material can cause significant problems such as windows failing to perform and function properly, or the rapid degradation of materials due to climate changes and short life span (Ramly, et al, 2006). The root cause is still on the human who intends to use inferior material rather than quality material. To offer a possible explanation, inferior material is chosen because of the cost pressure. Josephson and Hammarlund (1999) and Atkinson (1999)

both agree with the cost pressure as one of the causes of defects. When a company faces a financial problem, the manager intends to find a way to reduce the project cost. In Sommerville and McCosh (2006) study, they believe that the quality is reduced as developers absorb cost in the construction stage. One of the ways towards cost-reduction is by using inferior material which is much cheaper than the material with high quality. The project cost can therefore, be minimized but naturally, it will end up with unsatisfactory product or perhaps, long term detrimental effects.

Pheng and Wee (2001) in their research have divided human causes of defects into three subsystems namely the technical subsystem, human subsystem and management subsystem. While Atkinson (1999), seems to suggest that defects can be divided to primary, managerial and global causes. Figure 2.2 summarizes the human causes of defects in the housing industry.

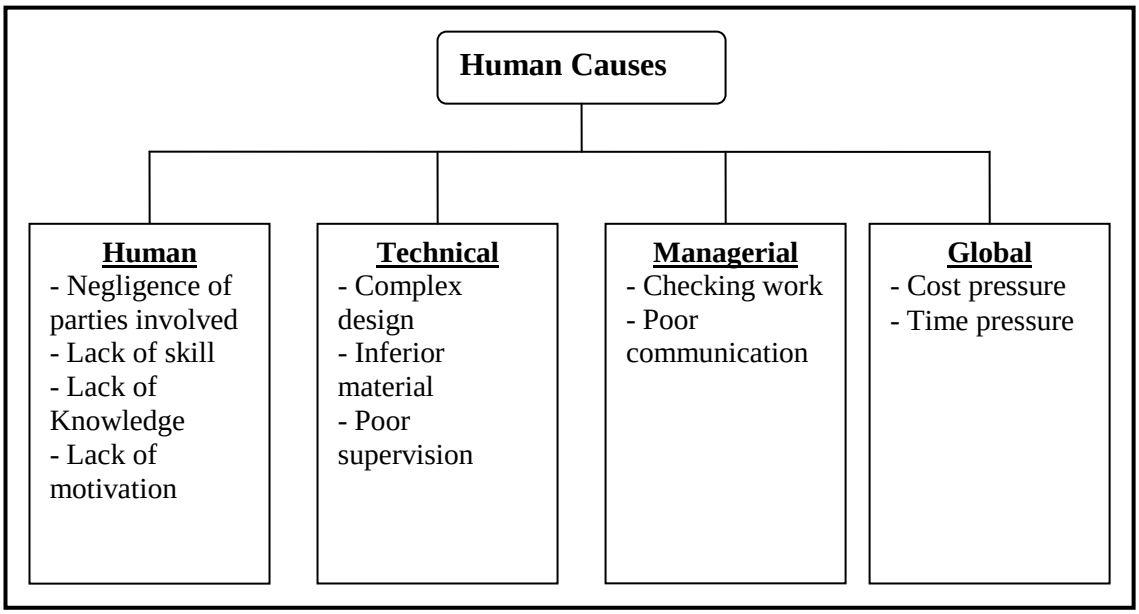

Figure 2.2: Human causes of defects
Modified from Atkinson (1999) and Pheng and Wee (2001)

2.1.3 (b) Natural Causes

Defects from nature including temperature, moisture and dampness will naturally give effect to the building structure. However natural causes of defects tend to be slow and thus they will not affect the building in a short time. Urbanowics (1987) and Pheng and Wee (2001), group natural causes of defects into moisture, movement and chemical and biological changes. Table 2.1 lists the nature causes of defects.

Table 2.1: Natural causes of defects in housing industry.

Group	Causes of Defect
Moisture	• Rain penetration • Ground water • Construction water • Atmospheric humidity • Water supply • Faulty services • Lack of maintenance
Movement	• External load • Wind load • Ground movement • Thermal movement • Moisture movement • Vibration • Physical changes • Chemical changes (corrosion, sulphate attack)
Chemical/ biological changes	• Decay • High temperature • Solar radiation • Incompatible material • Insect attack

(Source from Pheng and Wee, 2001; Urbanowics, 1987)

Nevertheless, defects from nature cannot be avoided. But it can be delayed by proper work from the design to the hand-over stage. Practitioners including building surveyors, architects, structural engineers, quantity surveyors, contractors and sub-

contractor have important roles to play, where they have the obligations to conduct appropriate work and maintain the buildings.

2.2 Housing Delivery System in Malaysia

Currently there are two types of housing delivery systems implemented in Malaysia that is Sell-Then-Build (STB) and Build-Then-Sell (BTS). STB or presale is not an unfamiliar system in Malaysia. Although the STB system is not accepted in most of products, it is a norm in the housing industry. This system is very popular in other Asian countries such as Hong Kong, Singapore and Taiwan. In Malaysia, the STB housing delivery system has been implemented for more than four decades (Yusof, et al., 2007). Although the system has been successful in supplying houses to Malaysian house buyers, a number of problems have evidently arisen which makes the government turns into the more novel Build-Then-Sell (BTS) approach.

2.2.1 Sell-Then-Build

The Sell-Then-Build (STB) means that developers are allowed to sell housing units to house buyers and collect progress payment while they build the houses (Yusof, et al., 2010a). These uncompleted houses might be sold by the developers at the planning or construction stage (Leung, et al., 2007c). STB is also defined as the system of selling or buying a house that are not complete (Fen, 2007). An un-built house is sold when the potential buyer is shown a plan, an attractive brochure or a model house, which the design and workmanship are not necessarily the same with