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Measuring the Level of Housing Defects in the Build-Then-Sell Housing Delivery System

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Abstract**—**When the Malaysian government announced the implementation of the Build-Then-Sell (BTS) system in 2007, the proponents of the BTS have argued that the implementation of this new system may provide houses with low defects. However, there has been no empirical data to support their argument. Therefore, this study is conducted to measure the level of housing defects in the BTS housing delivery system. A survey was conducted to the occupiers in six BTS residential areas. The BTS residential areas have been identified through the media and because of the small number of population, all households in the BTS residential areas were required to participate in the study to enable the researcher to collect the data concerning defects. Questionnaire had been employed as the data collection instrument and was distributed to the respondents of this study. The result has shown that the level of defects in the BTS houses is low, as the rate of defects for all elements are slight. Such low level of defects has apparently only affected the aesthetic value of the houses.

Keywords**—**Build-Then-Sell houses, housing defects, residential areas, occupiers

I. Introduction

THE Malaysian government has implemented the sell-then-build (STB) system for more than 40 years. Within these years, 3.5 million of houses have been produced and have contributed in helping to fulfill the target of the Malaysian government to build 100,000 to 150,000 units of houses per year [1]. Despite this success, The process of the STB system in the method where the developers sell the houses first in order to get the money to build the house seem to trigger a number of problems to the house-buyers as developers are selling the houses which are yet to be completed or not even existed [2, 3].

One of the problems prevailing in STB houses is the proof of defects. For Instance, 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 complaints that had aired concern on shoddy workmanship and defects [4]. The percentage of complaints may be small but concerning the other studies done by Mills et al. [2009] and Josephson and Hammarlund [1999], they have stressed that the defects issue cannot be taken lightly as the cost to rectify the defects is shown to have been 5% of the contract value [5, 6]. In April 2007 the government announces the implementation of the new Build-Then-Sell (BTS) system. This new system will run in parallel with the STB for the trial period of two years. This new system is believed to raise hopes to overcome the shortcoming that surfaces in the conventional STB system. The problems of abandoned projects and late delivery can be solved through the system as the houses are sold only after it is completed. The housing defects issue in BTS system however is still questionable.

There are arguments claiming that defects in BTS will be low as developers are more motivated in providing quality workmanship because buyers may be able to examine the house first before deciding to purchase. In Singapore, Ong [1997] has developed a model to show that in the conventional system, the defects' level is high compared to the new system as the developers put less effort because they have been paid [7]. His study however does not present any data. Sufian and Abd Rahman's [2008] study reports that many authors and practitioners seem to agree that the BTS will provide quality houses as buyers may get to observe the quality of the house [8]. However, the empirical study to prove this has been rather limited.

In Malaysia, few researches are done in order to investigate the implications of the new housing delivery system that is the BTS. However, there is lack of research that focuses on housing defects. Therefore, a study to evaluate defects in BTS houses is substantial. This paper will present the study of housing defects in six residential areas that is previously identified as houses being built according to the BTS housing delivery system. As an addition, causes of occurrence are also measured in this study. The results will give the clue whether the implementation of BTS is successful in providing low defects houses and able to give the developer idea about the defects level at the occupancy stage in BTS houses.

II. Literature Review on Build-Then-Sell and Defects

A. Build-then-Sell Delivery system and Defects

The idea of the implementation of BTS has been a heated debate for the last two decades [9]. The real move was made in April 2007 when the government announced that the new BTS system would be run in parallel with the conventional STB system for the two years' trial period (ibid). Contrasting with the STB system that allows developers to sell housing units to house buyers and collects the progress payment while the houses are being constructed [9], in BTS the developers may sell the house only after it is completely built in the completed property market, with the CCC (Certificate of

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Completion and Compliance) readily issued [9, 10, 11].

In short, in the BTS system, only completed houses will be sold. In this case, house-buyers may be free to - see and evaluate the house as the first step towards house-purchasing. Understandably, if the house meets their expectations and reaches their level of satisfaction, then purchasing the house is inevitable, if not foreseeable. Otherwise, they have the rights to refuse and the risk is not burdened on them.

For developers, on the other hand, they have to see this system as a warning bell – they have to be more professional in providing quality houses with less defects and more cautious about the completion time to avoid the house-buyers from changing their minds and canceling the purchases due to the quality and late delivery issue [2, 10]. The BTS system is also believed to be able to eliminate defects, as buyers can see what they are getting and pay only after they are satisfied with that house. If the developers produce sub-standard houses, it is most probable that they are not going to be able to sell the houses [9].

B. Evaluating the Defects

There are quite a number of methods in evaluating the defects such as the Northern Ireland House Condition Method [12], Defects Index Method [13], Housing and Environmental Defects Index [14], Priority Ranking Method [15], Standardize Subjective Rating Method [16] and Listing Defects Method [17]. Considering the importance of the severity of the defects' measurement in Georgiou et al. [1999] study, this study has been determined to utilize the Defects Index Method as proposed by Pedro [2008] [18, 13]. The method is deemed appropriate to be used in this study as it is considered appropriate cases of defects' severity, which is important in measuring the level of these defects [18]. It is also more accurate and gives detailed explanation in measuring defects. Moreover, it was developed with consideration given to the occupiers as the respondents. The method works by using score points based on the defects' severity. Pedro [2008] recommends a five-point scale each labeled as minor (5 points), slight (4 points), medium (3 points), severe (2 points) and critical (1 point) to rate the defects' level to each selected building element. The explanation for each defect scale is stated in table I.

TABLE I
EXPLANATION FOR EACH DEFECTS SCALE

Minor Defects	No defects or defects without noteworthy
Slight Defects	Defects that affect the aesthetic value
Medium Defects	Defects that affect the aesthetic value and use or comfort
Severe Defects	Defects that affect the use or comfort and endanger health or safety and may cause minor accidents
Critical Defects	Defects that endanger health or safety and may cause major accidents

Source: Pedro (2008, p.329)

The DI method suggests 37 elements to be assessed in Pedro [2008], where some elements might be entirely cultural-based [13]. The element which is used in Portugal, as an example, might be inapplicable to be implemented in Malaysia. Thus, for this study, the building element review has been done in order to select the important building element that will be utilized in this study. In total, fourteen building elements have been identified from the previous studies namely the roof; internal and external floors; internal and external walls; internal and external doors; windows; the ceiling; electricity service; plumbing facilities; sanitary equipment; water supply and drainage. Apart from building elements identified by Pedro [2008], two building elements that are plumbing facilities and drainage system have been added in this study [13]. These elements are important in the context of tropical housing.

III. RESEARCH METHOD

This study has employed the survey research method. The quantitative data collection technique that consists of closed-ended and open-ended questions was used to gather the data concerning the defects.

A. The Build-Then-Sell Residential Areas

The BTS system is still new in Malaysia. Therefore, there is still no record of developers who implement or who have had applied this system. Because of this reason, the researcher has to rely on the media such as the newspaper, banner or brochure to identify the BTS residential areas. In order to measure the level of defects in the BTS system, two criteria have been recognized in selecting the residential areas; (1) the residential areas are built according to the BTS systems; (2) the BTS residential areas have been occupied within three years. The descriptions of BTS residential areas that have been found from the media are as below:

- *Residential area A* used to be a former oil palm plantation. Now it is an integrated development of 426 acre freehold land comprising of 3, 119 units of residential, commercial and industrial properties located in Kulim, Kedah. In this residential area however only 40 units of BTS houses are built. Two types of houses provided in this residential area are single and double storey terrace. The facilities available in residential area A include the mosque, field and playground.
- *Residential area B* consists of only 12 units of houses. Situated in a small town of Muar, Johor, all houses in residential area B are semi-detached. Due to the low-density of residents and limited land area, there are no facilities available at residential area B.
- *Residential area C* is composed of double-storey terrace houses with several different designs. There are 65 house units of BTS houses this residential area. It is provided with facilities such as paved roads and playground. This residential area is located on swampy vicinity in Sepang, Dengkil and was previously a former oil palm plantation.
- *Residential area D* used to be an oil palm plantation in Selangor and consists of 96 units of single-storey terrace and 48 units of single-storey semi-detached houses. The residential area is completed with shops and mosque.
- *Residential area E* which was a former lallang plantation in Shah Alam consists of 148 units of BTS houses with an area of 2, 200 acres of prime freehold land. The residential units in residential area E are all double-storey super link. It is

of low-density population with 4 units per acre. It has luxurious landscapes with a recreational park and facilities.

- *Residential area F* was an oil palm plantation and situated in the suburban area of Kuala Lumpur. The residential area comprises of 30 units of BTS houses with no facilities available. All houses in residential F are double-storey terrace.

B. Respondents and Sampling Technique

The respondents for this study are the occupiers in BTS houses. The reason for selecting occupiers as respondents is because they are the end user of the 'product', in this case the house. They have more experience about the house condition which lies at the post-occupancy stage [19]. Professionals will focus more on the technical aspects whereas the buyers would have their own personal perceptions towards the quality of their house [20]

In most studies, typically the entire population of the target respondents is wide. It is impossible to approach them all as it will take time and also it will be costly. In this case, therefore, it is necessary that the sampling is done. In this study however, the population of BTS projects cannot be ascertained as the Malaysian government also does not have the list of developers who implement the BTS system. Only several residential areas were identified through the media. With the circumstances, researcher decides to approach the whole population to gather the defect data. Islam [2008], Neuman [2000] and Babbie [1998] refer to this as a census [21, 22, 23].

C. Data Collection

The questionnaires were employed to gain generalization about the severity of defects occurring in BTS houses. In all BTS residential areas, questionnaires were administered directly to the occupants during the door-to-door visits requesting if the questionnaire can be completed on the spot [22]. Otherwise, the respondents would be told that the questionnaires would be left for awhile as suggested by Islam [2008] and Babbie [2002] in order to give room to the respondents to answer the questionnaire and it will be collected later [21, 23].

Hence, after the respondents had completed the questionnaires, taking advantage from the face-to-face survey where the researcher has asked an open-ended question to the respondents. It was done as an expansion to the questionnaire. The questionnaire was first evaluated to know the elements that were rated as severe or critical by the respondents. Then, the open-ended question was asked according to the questionnaire. The question was: why do you think the defects occur on this element? Previous question was only asked to the respondents who had the time and had no problem answering. As suggested by Malterud [2001] and Driscoll et al. [2007], the smaller group of respondents was asked to gain more understanding and obtain more detail about the topic [24, 25]. Out of 151 who answered the questionnaires, 39 respondents gave response to the open-ended question.

D. Method of Analysis

Since there are two types of data collected, the method used to analyze them is different. The quantitative data from the questionnaires were analyzed using descriptive statistics namely the frequency test in the Statistical Package for Social Science (SPSS) software, while the qualitative data from the open-ended question was analyzed manually.

To suit with the Malaysian situation, slight amendment was done to Pedro's method. Thus, the present study will use the mean score to rate the defects. Because of that, defects score in Pedro's study also changes from minor to critical at the score range of one (1) to five (5) that are; 1 = minor, 2 = slight, 3 = medium, 4 = severe and 5 = critical. Fourteen (14) important building elements that have previously been decided were computed using the mean score. The mean score was then interpreted according to Alston and Miller [2001] and Boone et al. [2007] study [26, 27]. The description below shows the extent to which this study rates the defects based on the mean score.

- If the defects' mean score is between 1 and 1.49, then the defects are considered minor.
- If the defects' mean score is between 1.50 and 2.49, then the defects are considered slight
- If the defects' mean score is between 2.50 and 3.49, then the defects are considered medium
- If the defects' mean score is between 3.50 and 4.49, then the defects are considered severe
- If the defects' mean score is between 4.50 and 5.00, then the defects are considered critical

The open-ended responses about the causes of defects' occurrences were analyzed manually.

IV. Result and Discussion

A. Response Rate

The total numbers of houses in the six residential areas are 439 housing units. Nevertheless, 119 houses have to be excluded from this study because the houses were either under renovation or still unoccupied. This left the population for the study to be only 320 houses. The 151 responses received from the occupants have constituted the response rate, which is read as 47.2%. The unavailable respondents were either not at home while the survey was being conducted or simply because they refused to answer the questionnaire.

B. Evaluation of Defects in Each of BTS Residential areas

- The results reveal that in *Residential area A* the defects are slight with the overall mean of 1.47. Seven elements were rated as minor and seven elements were rated as slight. There was one respondent in residential A, who rated the drainage as critical. Two elements that were good in performance are windows and external doors. For both elements, 9 respondents rated them as minor (no defect or defect without noteworthy) and there was only one case of slight defects (which affect the aesthetic value) making the mean of the elements 1.10. The most problematic element is plumbing facilities with 3 severe cases. The rate of defects for that element however is still slight, which is 2.10. The result obtained is shown in table II.

TABLE II
FREQUENCY OF DEFECTS' SEVERITY FOR RESIDENTIAL A

Building element	Defects' severity (Frequency) MI	SL	ME	SE	CR	MD	ROD
1. Roof	6	1	2	1	-	1.80	SL
2. External wall	8	2	-	-	-	1.20	MI
3. Windows	9	1	-	-	-	1.10	MI
4. External doors	9	1	-	-	-	1.10	MI
5. External floor	7	1	2	-	-	1.50	SL
6. Ceiling	6	3	1	-	-	1.50	SL
7. Internal wall	7	3	-	-	-	1.30	MI
8. Internal doors	7	3	-	-	-	1.30	MI
9. Internal floor	9	1	-	-	-	1.20	MI
10. Sanitary equipment	8	2	-	-	-	1.40	MI
11. Electricity installation	6	3	-	-	-	1.90	SL
12. Water service	7	2	-	1	-	1.50	SL
13. Plumbing facilities	6	-	1	3	-	2.10	SL
14. Drainage	7	1	1	-	1	1.70	SL
Overall mean						1.47	MI

Notes: MI - Minor; SL - Slight; ME - Medium; SE - Severe;
CR – Critical
MD – Mean Defect, ROD – Rate of defect

- In *Residential area B,* defects data as presented in table III exhibits that there are three elements that have no defects namely the internal floor, water service and plumbing facilities. Only one severe case is reported to be the external doors, simultaneously being rated the worst condition in residential area B. The mean for this element however is still slight that affects only the aesthetic view.

TABLE III
FREQUENCY OF DEFECTS' SEVERITY FOR RESIDENTIAL B

Building element	Defects' severity (Frequency) MI	SL	ME	SE	CR	MD	ROD
1. Roof	3	2	-	-	-	1.40	MI
2. External wall	2	2	1	-	-	1.80	SL
3. Windows	4	1	-	-	-	1.20	MI
4. External doors	2	1	1	1		2.20	SL
5. External floor	3	2	-	-	-	1.40	MI
6. Ceiling	2	3	-	-	-	1.60	SL
7. Internal wall	2	2	1	-	-	1.80	SL
8. Internal doors	4	1	-	-	-	1.20	MI
9. Internal floor	5	-	-	-	-	1.00	MI
10. Sanitary equipment	2	1	2	-	-	2.00	SL
11. Electricity installation	4	1	-	-	-	1.20	MI
12. Water service	5	-	-	-	-	1.00	MI
13. Plumbing facilities	5	-	-	-	-	1.00	MI
14. Drainage	3	1	1	-	-	1.80	SL
Overall mean						1.47	MI

Notes: MI - Minor; SL - Slight; ME - Medium; SE - Severe;
CR – Critical
MD – Mean Defect, ROD – Rate of defect

The overall result of defects in residential B is 1.47 that falls under the category of minor defects (no defect or defects without noteworthy).

- Table IV demonstrates the frequency of defects' severity in residential area C. The respondents in *Residential area C* reported 10 critical cases and 9 severe cases that occurred to the external floor, which makes the mean for the element 3.18 or similarly rated as medium. Five (5) other elements were rated as minor and 8 elements were rated as slight. Other than that, three respondents also rated the external wall as critical. The mean for this particular element however is still slight. The element that is in the best condition is the roof with 34 from 38 respondents rating the defect as minor. The overall result for the rate of defects in residential area C is 1.72 (slight).

TABLE IV
FREQUENCY OF DEFECTS' SEVERITY FOR RESIDENTIAL C

Building element	Defects' severity (Frequency) MI	SL	ME	SE	CR	MD	ROD
1. Roof	34	3	1	-	-	1.13	MI
2. External wall	12	10	10	3	3	2.34	SL
3. Windows	28	8	2			1.32	MI
4. External doors	30	7	-	-	1	1.29	MI
5. External floor	9	4	6	9	10	3.18	ME
6. Ceiling	25	9	4	-	-	1.45	MI
7. Internal wall	19	16	3	-	-	1.58	SL
8. Internal doors	28	6	1	2	-	1.38	MI
9. Internal floor	24	8	5	1	-	1.55	SL
10. Sanitary equipment	23	8	5	2	-	1.63	SL
11. Electricity installation	23	7	6	1	1	1.68	SL
12. Water service	23	4	8	1	2	1.82	SL
13. Plumbing facilities	20	5	9	2	2	1.97	SL
14. Drainage	19	8	11	-	-	1.79	SL
Overall mean						1.72	SL

Notes: MI - Minor; SL - Slight; ME - Medium; SE - Severe;
CR – Critical
MD – Mean Defect, ROD – Rate of defect

- In *Residential area D,* the highest mean score lies on the sanitary equipment with the mean score read 1.84. The rate of defects however is only slight. The internal doors, internal floor and drainage are three elements that are in the best condition in residential area D. From 38 respondents who gave their feedback in residential area D, 28 of them rated both elements as minor. The results for the frequency of defects' severity in residential area D are presented in table V.
- Meanwhile, for *Residential area E,* the result in table VI shows that the mean for each building element is in the range of slight defects except for the sanitary equipment which defects are labeled medium. Most of the respondents agreed that they did not have any problem with the drainage in their houses. There is similar number of slight and medium cases for sanitary equipment. Overall, the rate of defects for all elements in residential area E is slight with the mean score of 2.02.

TABLE V
FREQUENCY OF DEFECTS' SEVERITY FOR RESIDENTIAL D

Building element	Defects' severity (Frequency) MI	SL	ME	SE	CR	MD	ROD
1. Roof	18	12	6	1	1	1.82	SL
2. External wall	27	8	3		-	1.37	MI
3. Windows	26	6	4	2	-	1.53	SL
4. External doors	24	5	4	4	1	1.76	SL
5. External floor	26	7	2	3	--	1.53	SL
6. Ceiling	20	10	7	1	-	1.71	SL
7. Internal wall	23	10	3	1	1	1.61	SL
8. Internal doors	28	6	2	1	1	1.45	MI
9. Internal floor	28	6	2	2	-	1.42	MI
10. Sanitary equipment	19	11	4	3	1	1.84	SL
11. Electricity installation	22	10	3	2	-	1.59	SL
12. Water service	25	8	4	1	-	1.50	SL
13. Plumbing facilities	22	10	2	4	-	1.68	SL
14. Drainage	28	5	4	1	-	1.42	MI
Overall mean						1.58	SL

Notes: MI - Minor; SL – Slight; ME - Medium; SE - Severe;
CR – Critical
MD – Mean Defect, ROD – Rate of defect

TABLE VI
FREQUENCY OF DEFECTS' SEVERITY FOR RESIDENTIAL E

Building element	Defects' severity (Frequency) MI	SL	ME	SE	CR	MD	ROD
1. Roof	16	13	21	4	3	2.39	SL
2. External wall	28	15	14	-	-	1.75	SL
3. Windows	25	14	16	2	-	1.91	SL
4. External doors	26	17	12	1	1	1.84	SL
5. External floor	31	11	9	6	-	1.82	SL
6. Ceiling	20	17	17	2	1	2.07	SL
7. Internal wall	19	19	16	2		2.02	SL
8. Internal doors	22	20	13	-	1	1.89	SL
9. Internal floor	15	12	19	8	2	2.46	SL
10. Sanitary equipment	8	21	21	5	2	2.51	ME
11. Electricity installation	23	12	15	3	3	2.13	SL
12. Water service	30	14	11	-	1	1.71	SL
13. Plumbing facilities	21	16	13	4	1	2.05	SL
14. Drainage	32	12	9	3	1	1.75	SL
Overall mean						2.02	SL

Notes: MI - Minor; SL - Slight; ME - Medium; SE - Severe;
CR – Critical
MD – Mean Defect, ROD – Rate of defect

- As for *Residential area F*, all respondents from this residential agreed that their internal wall did not have any defect. The highest mean score is shown to be at the external floor with the defects' mean score of 2.33. This score however is still in the range of slight defects. In this residential vicinity, most of the elements however were rated as minor. Only five elements were rated as slight. Table VII presents the results obtained for residential area F.

TABLE VII
FREQUENCY OF DEFECTS' SEVERITY FOR RESIDENTIAL F

Building element	Defects' severity (Frequency) MI	SL	ME	SE	CR	MD	ROD
1. Roof	2	1	-	-	-	1.33	MI
2. External wall	2	1	-	-	-	1.33	MI
3. Windows	1	2	-	-	-	1.67	SL
4. External doors	2	1	-	-	-	1.33	MI
5. External floor	1	1	-	3	-	2.33	SL
6. Ceiling	2	1	-	-	-	1.33	MI
7. Internal wall	3	-	-	-	-	1.00	MI
8. Internal doors	2	1	-	-	-	1.33	MI
9. Internal floor	2	1	-	-	-	1.33	MI
10. Sanitary equipment	2	-	-	1	-	2.00	SL
11. Electricity installation	2	1	-	-	-	1.33	MI
12. Water service	1	1	1	-	-	2.00	SL
13. Plumbing facilities	1	2	-	-	-	1.67	SL
14. Drainage	2	1	-	-	-	1.33	MI
						1.52	SL

Notes: MI - Minor; SL - Slight; ME - Medium; SE - Severe;
CR – Critical
MD – Mean Defect, ROD – Rate of defect

The results for all six residential areas show that in each residential area surveyed, the most defective element is not the same from one area to another. Residential area A has a problem with the plumbing facilities whereby in Residential area B, the most problematic element is the houses' external doors. The defect of external floor is so severe at Residential area C, in comparison with that element in other areas. In Residential areas D and E, the problem lies with the sanitary equipment. Finally, in Residential area F, they have problems with the external floor. Overall, the mean score for the most defective element in each residential area is slight. Only two residential areas with the element rated as medium are in residential area C (external floor) and residential area E (sanitary equipment). In these two residential areas, the open-ended response inhibits that the high level of defects is due to developers may have avoided some piling work. While in residential area E, where most of occupants agreed that sanitary equipment is mostly defective, the low quality material used by developers is the reason why the level of this particular defect is said to be high.

C. Evaluation of defects in All BTS residential

Table VII presents the overall result from all residential areas. It can be seen that the lowest defects' mean score is the windows with the mean score 1.58 with 93 of 151 respondents rating the defects as minor which suggests that there is no defect. The highest mean score is the external floor with 2.07 with the majority of critical cases occurring on the external floor with 10 cases.

Overall results suggest that the mean for all elements in all six residential areas surveyed was rated as slight (1.77) which fell in the range of 1.50 and 2.49. It can be concluded that the

level of defects in the BTS housing delivery system is slight. This further makes an indication that the defect only affects the aesthetic value of the BTS houses (overall).

TABLE VIII
FREQUENCY OF DEFECTS' SEVERITY FOR ALL RESIDENTIAL

Building element	Defects' severity (Frequency) MI	SL	ME	SE	CR	MD	ROD
1. Roof	79	32	30	6	4	1.83	SL
2. External wall	79	38	28	3	3	1.76	SL
3. Windows	93	32	22	4	0	1.58	SL
4. External doors	93	32	17	6	3	1.64	SL
5. External floor	77	26	19	19	10	2.07	SL
6. Ceiling	75	43	29	3	1	1.75	SL
7. Stairs	56	24	19	3	1	1.73	SL
8. Internal wall	73	50	23	3	1	1.73	SL
9. Internal doors	91	37	16	3	2	1.58	SL
10. Internal floor	83	27	27	11	2	1.81	SL
11. Sanitary equipment	62	41	34	11	3	2.02	SL
12. Electricity installation	80	31	27	7	4	1.82	SL
13. Water service	91	29	24	3	3	1.65	SL
14. Plumbing facilities	75	33	25	13	3	1.90	SL
15. Drainage	91	28	25	5	2	1.67	SL
Overall mean						1.77	SL

Notes: MI - Minor; SL – Slight; ME - Medium; SE - Severe;
CR – Critical
MD – Mean Defect, ROD – Rate of defect

V. CONCLUSION

The results in the present study have revealed that the level of defects in the BTS system is low as the rate of defects for all elements are slight. Based on the scale in Pedro's [2008] study, it can be concluded that most of the defects in BTS houses have defects that only leave an impact on the aesthetic value of the house [13]. The results for this study have confirmed the studies by Yusof and Mohd Shafiei [2011] and Sufian and Ab. Rahman [2008] who note that the practice of build first and sell later may provide less defective houses [2, 8]. In other words, the practice of the BTS housing delivery system has been proven to be successful in providing houses with low defects. To secure their profit and encourage the customers or buyers to complete their purchases, the BTS housing developers seem to exert more effort in providing quality houses to their potential customers. As for the causes of defects' occurrences, most of respondents agreed that the defects are from the results of construction malpractice such as using sub-standard material and one of the cost-cutting strategies.

The evidence from the present study can serve as an added value to the implementation of the BTS housing delivery system as it is proven that the BTS system is effective in providing high quality houses. Hence, the findings have justified the reason why the BTS system should be implemented in Malaysia. Although the housing defects in BTS system are slight, the results from the open-ended responses imply that there are cases where the workmanship and the material used by certain BTS developers are unsatisfactory. The result shows that residential areas C and D have relatively higher level of defects in terms of the technical aspects of defects (defects that occur when the efficiency of an element is reduced, reasoned by the poor workmanship and materials of inferior quality). It seems to suggest at this point, that there is a problem with the construction practice and as for the house-buyers, when they inspect the BTS house before making the decision to buy, the surface knowledge that they have is proven to be insufficient in order for them to be able to detect such defects. In this case, the government has to be stricter in implementing the law and acts in such a way to continuously monitor the construction phase for the newly built houses. Alternatively, it may be better if house-buyers appoint building surveyors for expert advice before they make the decision to buy.

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