SUSTAINABLE HOUSING: DEMOGRAPHIC ANALYSIS OF CUSTOMERS' DEMANDS IN KLANG VALLEY

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Abstract
Construction industry in Malaysia has been creating thousands of opportunities boosted by a series of government policies during economic recession in 2008. Although construction sector contributed to economic growth, the resourced of this intensive sector also caused resource depletion, environmental pollutions and global warming. This has drawn for the need for sustainability development. Public are aware of the importance of sustainability due to environmentalists are frequently emphasising upon adverse impacts of development and urbanisation on our mother earth. This research aims to understand consumer's perception, wiliness-to-pay and preferences in Klang Valley, Malaysia due to high intensity of GBI certified green buildings are located in the area. 294 valid responses were collected using structured questionnaire surveys distributing. Data collected were undergone descriptive analysis and correlation inferential analysis using statistical analysis software – SPSS Version 20. It was found that consumers with higher income level are more willing to pay extra cost incurred in obtaining green buildings. Most of the respondents preferred to have basic public amenities located within radius of 750m from house. They also prefer to own houses with better sound proof as well as greater greenscape area.

Key words: sustainable housing, green building, rating index, consumers perceptions

INTRODUCTION

In Malaysia, construction sector recorded gross output of RM 91.3 billion, which is RM 37.3 billion higher compared to 2005 with double digit growth of 11.1% average annual growth of gross output (Yunus and Yang, 2011) . In terms of performance of sub-sector in construction sector, residential posted RM 20.3 billion out of RM 91.3 billion or equal to 22.3% of total gross output in 2010 (Yunus and Yang, 2011). The value of gross output for residential further escalated to RM 26.4 billion or equal to 24% of total gross output of construction sector (Department of Statistics, 2013). Therefore, construction sector plays a vital role in development in Malaysia as well as in contribution to sustainable development.

On the other hand, building operation consumes for about 40% of global energy and accounts for about 40% of carbon emissions (Heravi and Qaemi, 2014). Apart from resource intensive in using energy and raw materials, buildings generate wastes, harmful substances and pollutants directly and indirectly into atmosphere (Alnaser et al., 2008). Obviously, sustainability in construction is one of the crucial factor in affecting environment as well as social-economic (Yunus and Yang, 2011). Hence, to achieve sustainability and balances among environment, economic and social, efficient use of resources is vital in development continuity in global perspective (Yunus and Yang, 2011).

In addition, carbon emission, one of the Greenhouse Gas emission (GHG) which leads to global warming, produced from buildings construction and operation will reach 42.4 billion tonnes in 2035, adding 43% on level of 2007 (Zuo and Zhao, 2014). Furthermore, regardless of types of buildings, buildings' life cycle involve renovation, refurbishment and demolition at the end of life cycle. Each of the process in the buildings' life cycle is associated with consumption of natural resources and energy; emission of GHG; productions of noise and pollutants; and production of waste. Hence, the construction sectors, with present attempts, tend to offer highest potential for cost-effective reductions in GHG emission via application of technical and non-technical initiatives (Deuble and de Dear, 2012).

Sustainable building, also known as green building and energy efficient building, is a structure that is labelled as environmental friendly throughout its lifecycle, from pre-construction phase, construction phase, operation and maintenance to refurbishment and/or demolition (Kubba, 2010). Sustainable development does highlight on three major aspects, namely economic, environmental and social aspects. From the three highlighted aspects, it is suggested that sustainable development emphasises upon three major areas derived, which are every people is entitled to justice and equal rights; environmental degradation shall be eliminated; and future generations shall not be destitute as a result of existing actions. Hence, a sustainable development is a growing process that does not compromising the capability of future generation yet meets the current needs (Zuo and Zhao, 2014).

Sustainable buildings or green buildings emerge since 1990 in United Kingdom in conjunction with the establishment of British Research Establishment Environmental Assessment Method (BREEAM), the earliest green building rating system in the world (Isa et al., 2013). United State of America (USA), in 1998, came out with own green building rating system, Leadership in Energy and Environmental Design (LEED) whereas Australia established Green Star in 2003. In Asian context, Singapore launched Green Mark in 2005 while Malaysia with Green Building Index in 2009. Since the establishment of the mentioned green building rating systems, except GBI, many studies demonstrate that building certified with BREEAM, LEED, Green Start and Green Mark have recorded higher return on investment and better indoor environmental quality (Isa et al., 2013); (Deng et al., 2012). As developers are expecting to capture more benefits from their green investments, unproven statistics and result about return on investment and undefined consumers' demand factor, have become the pulling factors for green investments (Deng *et al*., 2012). Besides, green investment involves several risks, such as financial risks, economic risks and tenant risks (Isa et al., 2013). In terms of financial risks, due to innovative construction techniques and technology which requires higher initial costs, longer planning phase and greater probability of variations, green buildings involve higher initial construction costs compared to conventional buildings (Yiing *et al*., 2013). In addition, green buildings are subjected to tenant risks associated with demand and supply of the properties, especially understanding and perception of consumers, herein refer to property buyers, upon green buildings or sustainable buildings (Deuble and de Dear, 2012); (Isa *et al*., 2013).

Sustainability or going "green" has gained public awareness since last decades (Borin *et al*., 2013). Construction industry, as one of the labours and resources intensive sectors, is vital in promoting sustainability by optimising resources used, reducing energy usage as well as decreasing construction wastes and greenhouse gases emission. Hence, green buildings are introduced with the establishment of green building rating system, BREEAM, since 1990 in United Kingdom. In Malaysian context, Green Building Index (GBI) is one of the green building rating systems established since 2009 to promote sustainable development. This is also in line with the Green Mission or '*Penarafan Hijau'* programme that was initiated by the Ministry of Works Malaysia in 2002 that looks into the control and planning of resources towards providing a sustainable living environment. As for GBI, it is still at infancy phase after 5 years of implementation (Isa *et al*., 2013). Malaysian Green Building Rating System – Green Building Index (GBI). GBI is an environmental rating system for buildings, which is established by Malaysian Institute of Architects (PAM) and Association of Consulting Engineers Malaysia (ACEM) in year 2009 (Jacquemin, 2012). GBI is based on voluntary basis, where developers might opt to whether adopt and adapt GBI criteria in buildings construction (GBI, 2014). Also, there is no legislation and regulation to stipulate the mandatory of GBI in new buildings construction either in residential buildings or non-residential buildings. There are three major types of GBI Rating Tools, namely Residential Rating Tool (RRT), Non-residential Rating Tool (NRRT) and Industrial Rating Tool. Besides, each type of GBI rating tool can be further divided into New Building Construction and Existing Building. Both the GBI Rating Tools assess buildings in 6 criteria, which are energy efficiency, indoor environmental quality, sustainable site planning and management, material and resources, water efficiency, and innovation (Refer Figure 1).

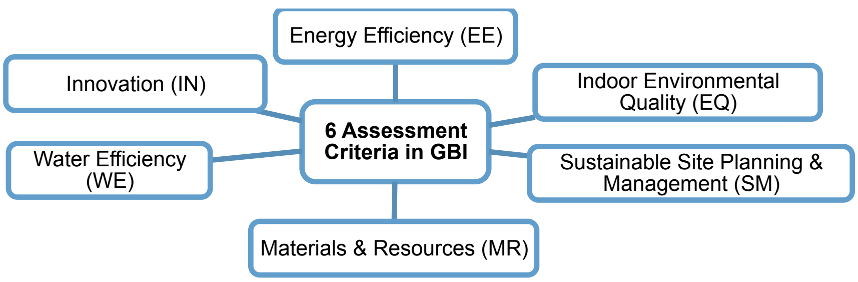

Figure 1: Six Assessment Criteria based on Green Building Index Rating Tool for New Residential Construction Version 3.0

Malaysian Construction Industry and Sustainability Agenda

In Malaysia, the total electricity consumption in 2007 was 99.25 billion kWh where industrial sector accounted for 38.6% whereas residential and commercial sectors recorded for 13.1% of the amount of final electricity consumption respectively (Chua and Oh, 2010). At the same time, construction industry made up 3% of total Gross Domestic Product (GDP) in 2007 (NRE, 2008). Although construction industry only accounted for 3% of GDP in 2007, it played vital role in sustainability and carbon emission as regardless of sectors and industries, most of the economic activities are carried out in buildings which involves use of energy.

Meanwhile, greenhouse gas emission (GHG) as well as energy and waste sectors in Malaysia were recorded the highest contributors of GHG emissions (NRE, 2008). Energy sector, where construction industry and buildings are categorised therein, included energy industries, transport, residential and commercial, manufacturing industries and construction, and others. Whereas, waste sector made up of landfill, domestic and commercial wastewater treatment, and industrial waste water treatment. In terms of GHG emission in 2000, energy sector amount for 147,001 Gg CO_2 equivalent (66%) while waste sector recorded 26,357.1 Gg CO_2 equivalent (12%) of GHG emission (NRE, 2008). Therefore, consumers' activities accounted for 78% of the total GHG emission.

At COP15[1], Malaysia Prime Minister Data Seri Najib Razak announced, by 2020, to voluntarily reduce GHG emissions intensity by 40% of GDP based on 2005 levels (NRE, 2008). This voluntarily initiative demonstrates willingness of Malaysia in combat climate change due to GHG emission in terms of sustainable development. Therefore, several energy efficiency (EE) measures and policies were formulated and implemented by Government as an effort to accomplish the GHG emission reduction by 2020 (Chua and Oh, 2010). In relation to energy sector, there are four potential mitigation options. The two main mitigation options with respect to buildings or construction industry are implementations of energy efficiency and implementations of renewable energy in industry, commercial and residential sector (Chua and Oh, 2010).

NEEMP[2] and NGTP[3] are two policies, formulated and implemented to assure productive use of energy and minimise waste as well as contribute to sustainable development. NGTP was launched in 2009 to minimise and reduce negative impacts of human activities. In NGTP, green technology interpreted as any development and application of systems, equipment and products to conserve natural environment as well as resources. Also, NGTP has the following criteria to be met, (i) minimise degradation of environment, (ii) has zero or low GHG emission, (iii) safe for use and promotes healthy environment, (iv) conserve the use of energy and natural resources, and (v) promote use of renewable energy and resources (Chua and Oh, 2010). In addition, Government has engaged on demonstration of green building construction as an effort to promote sustainable development in Malaysia, where Low Energy Office (LEO) and Diamond Building were initiated and built by the Government. Low Energy Office (LEO) is hosted by Ministry of Energy, Green Technology and Water or also known as *Kementerian Tenaga, Teknologi Hijau dan Air* (KeTTHA) while Diamond Building of Energy Commission of Malaysia and Zero Energy Office are owned by Malaysian Green Technology Corporation, which are contribution of government in implementing energy efficient buildings (Chua and Oh, 2010). KeTTHA is also the leading government ministry to promote green economy and living, where it has been actively organising knowledge dissemination platforms to introduce the green technology in the industry for the benefit of community living.

Furthermore, Construction Industry Development Board (CIDB) and Energy Efficiency and Conservation Agency Malaysia (EECAM) are two government institutions formed to responsible and coordinate upon development and implementation of sustainable buildings and energy efficient programmes (Jacquemin, 2012). Also, Malaysia first green building rating system, Green Building Index (GBI) was launch in 2009, initiated by Malaysia Institute of Architects (PAM) and Association of Consulting Engineers Malaysia (ACEM), to support reduction of GHG emissions in context of construction industry (Chua and Oh, 2010). GBI provides comprehensive framework for building assessment in terms of six main criteria. Also, several incentives are given to buildings' owner or investor for buildings certified under GBI. incentives such as tax exemption and stamp duty exemption (Jacquemin, 2012). Further details GBI will be discussed in following sub-chapter.

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[1]Conference of Parties on 15th Session, United Nations Framework Convention on Climate Change (UNFCCC)
[2]National Energy Efficient Master Plan (NEEMP)
[3] National Green Technology Policy (NGTP)

Regardless of initiation of GBI since 2009 and formation of several government institutions in few years back, as efforts to accomplish the GHG emission reduction agreement in COP15, sustainable construction or green building is still a new concept to most of the construction players in Malaysia (GhaffarianHoseini *et al*., 2013). Although the government shown its commitments in sustainable development by implementing several policies and rewarding incentives, construction players in private sector are not actively coincide with the policies implemented (Jacquemin, 2012). Professions with technical knowledge in terms of sustainable architectural design, energy efficient building equipment design and green project management are essential in implementing sustainable building, Malaysia as a developing country, however, is lack of related professional experts (Papargyropoulou *et al*., 2012). Lack of technical knowledge among construction industry players, especially developers, architects, engineers, quantity surveyors and project managers, becomes the one of the pulling factor of green buildings (Isa et *al*., 2013).

In the current context of Malaysian perspective, most of the developers, especially small to medium class developers, are yet to involve in green residential buildings due to developers perceived green building construction project involves higher financial risks, undefined market demands and lack of innovative technology and expert in local context (Zainul Abidin, 2010).

Residential developers perceive green residential buildings as low profit margin, as they do not obtain all the corresponding benefits arisen from energy-efficiency investment while they are bound to bear extra costs of new and innovative technologies involved (Deng et al., 2012). In addition, the understanding and perception of consumer with regard to green buildings or sustainable buildings are unknown variables, which determine the level of price acceptability of consumer. Redirecting the extra costs incurred to consumers will increase the property selling price. Increasing in selling price without understanding the perception and acceptability level of consumers will jeopardise competitive power of the developers in the market (Wang *et al*., 2014). Residential developers are profit-oriented private companies which aim to maximise profit margin as well as financial benefits. Developers tend to construct and supply products, refer to residential housings, in accordance to consumers' demands and preferences (Zainul Abidin, 2010). The willingness-to-pay and decision making of consumers are mainly based on their preferences and perception upon the value of the products (Liu *et al*., 2013). Hence, determining preferences of consumers with regard to types of innovative approaches specified in GBI assessment criteria are vital in adapting and promoting green buildings among consumers in Malaysia.

Therefore, to encourage involvement of residential developers in green buildings development, several doubts therewith, which are demands of green residential buildings, perception of consumers and preferences of consumers with regard to green buildings are the essential elements that need to be scrutinised. Thus, the perception of consumer upon green buildings, preferences of consumers upon sustainable criteria and level of consumers' acceptability in relation to price and extra costs are essential doubts to be solved.

This research aims to study on the dimensions of consumer's perceptions and preferences pertaining green buildings, including the willingness-to-pay for extra cost incurred factor.

METHODOLOGY

This is a descriptive quantitative research that studied consumer's perception of green building, willingness-to-pay for green building, and consumer's preferences of green inventions and products by means of structured questionnaire survey. Convenient sampling, one type of nonprobability sampling techniques was adopted, where the questionnaire survey was conducted at three housing sale galleries at developer's offices by distributing structured questionnaires to visitors. Visitors were using tablet to complete the online questionnaire forms accordingly on the spot. The criteria used in the questionnaire study are based on the six criteria of GBI that are energy efficiency, indoor environmental quality, sustainable site planning and management, material and resources, water efficiency, and innovation.

Research Design – Structured Questionnaire Design

The structured questionnaire was divided into three sections: Section One collected information in relation to consumer's perception, willingness-to-pay and expected payback period upon investment of green building; Section Two gathered data in respect of consumer's preferences of green inventions and products in accordance to assessment criteria in Green Building Index (GBI) –

Assessment Tool for New Residential Construction; while Section Three collected socio-demographic or consumer's profile of the respondents as shown in Figure 2.

Section	***Details***
1: Consumer's perception of green building	Questions in this section intent to gather consumer's perception, understanding and willingness-to-pay for extra cost incurred in complying with GBI criteria.
2: Consumer's preferences of green inventions and products in context of GBI	Questions in this section aim to collect data upon consumer's preferences of green inventions and products in context of GBI assessment criteria for new residential construction. This section consists of 5 main groups of characteristics, which were further divided into 3 to 5 characteristics in each group: 1. Energy efficiency (EE) 2. Indoor environmental quality (EQ) 3. Sustainable site planning and management (SM) 4. Material reuse and selection (MR) 5. Water efficiency (WE)
3: Consumer's profile	Questions in this section gather socio-demographic profiles of respondents in terms of gender, range of age, family size, education background and range of annual income.

Figure 2: Structure Design of Questionnaire Survey

FINDINGS

A total number of 294 responses were collected. 158 out of 294 respondents (53.7%) were male while 136 out of 294 respondents (46.3%) were female. Three age groups were identified from the survey: below 30 years, 30 to 39 years and 40 to 49 years. Each age group accounted for 39.5%, 40.5% and 20.1% of total respondents respectively.

294 valid responses were collected, with 158 male respondents and 136 female respondents. 116 respondents are aged below 30 years, 119 respondents are aged from 30 to 39 years and 59 respondents are aged from 40 to 49 years. No response was recorded for consumer aged 50 and above. 42.2% of the respondents have 4 to 5 family members. On the hand, 64.6% of respondents have undergraduate level in terms of education background. In respect of annual income, respondents with annual income of less than RM30, 000, less than RM50, 000, less than RM75,000, less than RM100,000, and RM100,000 and above were recorded, respectively, 13.3%, 27.6%, 20.1%, 21.8% and 17.3%.

In respect of consumer's preferences of green inventions and products in accordance to GBI assessment criteria, "Basic public amenities within 750m from central" recorded the highest mean value across five groups with 4.46 out of 5. The second place was followed by "Use of better sound proof walls and floors materials" (EQ group) with mean value of 4.38 over 5. "Larger greenscape for open space to reduce heat island effect" (SM group) shared the same place with the former with the same mean of 4.38. In terms of ranking within one group, "Use of high thermal insulation roof and wall materials" achieved topmost place with 4.14 out of 5 in EE group; "Providing of recycling bins and recyclable segregation plan", on the other hand, recorded higher mean value with 4.03 within MR group; whereas, "Use of water efficient fittings to save water consumption" achieve highest score of 4.37 within WE group.

In general, most of the consumers or respondents heard about green building and have little knowledge about it prior to the moment of participating in the survey. The mean value of consumer's level of understanding upon green building was 3.00. In addition, most of the respondents are willing to absorb 5 to 10% of the extra cost incurred in complying with GBI assessment criteria. Besides, a moderate positive correlation was shown between consumer's perception of green building and consumer's willingness-to-pay for extra cost incurred compared to conventional building, which means that consumers with higher level of understanding and knowledge of green building concept are more willing to pay for extra cost incurred with GBI building.

With regard to correlation between consumer's perception and socio-demographic characteristics, gender, family size and income level were proven that no correlation was existed, which means gender, family size and income level do not affect consumer's perception as well as ecological conscious consumer behaviour. However, education background shown moderate positive relationship whereas age shown weak negative relationship. Hence, consumers with higher level of education backgrounds were proven to have better ecological conscious as well as better understanding of green building.

In terms of correlation between consumer's willingness-to-pay for extra cost, family size and education background did not show any correlation. In contrast, income level show moderate positive relationship, where consumers with higher income level are more willing to pay for extra cost incurred therewith compared to conventional housing. Age shown weak positive correlation with willingness-to-pay while gender shown weak negative correlation with willingness-to-pay.

Consumer's Preferences of Green Inventions and Products in accordance to GBI Assessment Criteria

Among five green inventions or products (characteristics) in group of energy efficiency (EE), use of high thermal insulation roof and wall materials achieved the highest score of 4.14, which was ranked tenth position across five groups. In respect of indoor environmental quality (EQ), use of better sound proof wall and floor materials recorded the highest score of 4.38 within the group while ranked second place across five groups. With regard to sustainable site planning and management (SM), respondents were most preferred basic public amenities, such as bank, school, supermarket and playground, are within radius 750m around the centre with an average score of 4.46 within the group, which was the topmost ranking across five groups as well. Furthermore, providing of recycling bin and segregation plan within the development area was ranked the highest, with mean value of 4.03, within group of material reuse and selection (MR). Moreover, the highest mean score within group of water efficiency (WE) was 4.37 under using of water efficient fittings to save water consumption, which took the fourth place across five groups. Table 1 summarises the mean value of each characteristic in each group, rank of each characteristic within the group and across five groups respectively.

Table 1: Summary of Mean Values and Ranks within Five Groups of Assessment Criteria

Group	*Green Invention / Product (Characteristic)*	*Mean Value*	*Rank (Within Group)*	*Rank (Across Groups)*
Energy Efficiency (EE)	Use of high thermal insulation roof and wall materials.	4.14	1	10
	Use of photovoltaic to generate electricity.	3.94	3	13
	Use of high efficient lighting with motion detector to control lighting.	3.54	4	16
	Availability of high speed internet router.	4.05	2	11
	Availability of building user manual.	3.54	4	16
Indoor Environmental Quality (EQ)	Use of non-volatile organic compound (VOC) materials.	4.26	3	8
	Use of non-formaldehyde materials.	4.30	2	7
	Maximising daylighting area.	4.22	4	9
	Use of better sound proof walls and floors materials.	4.38	1	2
Sustainable Site Planning and Management (SM)	Basic public amenities within 750m (Bank, playground, restaurant, supermarket, school, etc)	4.46	1	1
	Public transport stop within 500m or public transport interchange within 750m.	4.31	3	6
	Cycling network – bicycle lane.	3.67	4	15
	Larger greenscape for open space to reduce heat island effect.	4.38	2	2
Material Reuse and Selection (MR)	Use of recycled content materials for building construction.	3.86	2	14
	Use of local construction materials.	3.50	3	18
	Providing of recycling bins and recyclable segregation plan.	4.03	1	12
Water Efficiency (WE)	Use of rainwater harvesting system to store rainwater for irrigation purpose.	4.33	2	5
	Use of treated and recycled wastewater for irrigation purpose.	3.43	3	19
	Use of water efficient fittings to save water consumption (Closet, wash basin and shower head).	4.37	1	4

The top five rankings of each characteristic across five groups in ascending order were "Basic public amenities within radius of 750m from centre of development area", "Using better sound proof wall and floor materials", "Larger greenscape for open space to reduce heat island effect", "Using water efficient fittings to save water consumption", and Using rainwater harvesting system to store rainwater for irrigation purpose". Hence, respondents are preferable of green inventions and products that can improve living standard in terms of convenience and comfort while at the same time save operating costs by means of saving energy and resource consumption. Details of ranking across five groups for all characteristics were shown in the Table 2.0.

Table 2: Summary of Mean Values and Ranks across Five Assessment Criteria Groups

Rank (Across Groups)	*Green Invention / Products (Characteristic)*	*Mean Value*	*Group*
1	Basic public amenities within 750m (Bank, playground, restaurant, supermarket, school, etc)	4.46	SM
2	Use of better sound proof walls and floors materials.	4.38	EQ
3	Larger greenscape for open space to reduce heat island effect.	4.38	SM
4	Use of water efficient fittings to save water consumption (Closet, wash basin and shower head).	4.37	WE
5	Use of rainwater harvesting system to store rainwater for irrigation purpose.	4.33	WE
6	Public transport stop within 500m or public transport interchange within 750m.	4.31	SM
7	Use of non-formaldehyde materials.	4.30	EQ
8	Use of non-volatile organic compound (VOC) materials.	4.26	EQ
9	Maximising daylighting area.	4.22	EQ
10	Use of high thermal insulation roof and wall materials.	4.14	EE
11	Availability of high speed internet router.	4.05	EE
12	Providing of recycling bins and recyclable segregation plan.	4.03	MR
13	Use of photovoltaic to generate electricity.	3.94	EE
14	Use of recycled content materials for building construction.	3.86	MR
15	Cycling network – bicycle lane.	3.67	SM
16	Use of high efficient lighting with motion detector to control lighting.	3.54	EE
17	Availability of building user manual.	3.54	EE
18	Use of local construction materials.	3.50	MR
19	Use of treated and recycled wastewater for irrigation purpose.	3.43	WE

Relationship between Consumer's Perception of Green Building and Willingness-to-pay for Extra Cost

Based on 5-point interval scale measuring upon respondent's understanding of green building, where 1 point was the lowest and 5 points was the highest, the mean value for respondent's perception of green building was 3.00 with standard deviation of 0.882. Based on the result, most of the respondents heard about green building before but only have limited knowledge and understanding about green buildings.

In respect of willingness-to-pay for extra cost incurred in complying with GBI, the mean value is 2.57 with standard deviation of 0.0974. In general, based on mode and mean of data, most of respondents are willing to accept and absorb 6% to 10% of extra cost compared to price of conventional housing buildings (Refer to Table 3).

Table 3: Mean, Median and Mode Analysis for Consumer's Perception of Green Building and Willingness-to-pay

	Consumer's Perception of Green Building	Willingness-to-pay for Extra Cost
Mean	3.00	2.57
Median	3.00	2.00
Mode	3	2
Std. Deviation	0.882	0.974
Variance	0.778	0.949

A moderate positive relationship, with Pearson coefficient of 0.409 exists between consumer's perception of green building and consumer's willingness-to-pay for extra cost incurred in complying with GBI assessment criteria. Consumers perceive lower risk as they have more understanding upon a products (Park et al., 2013). Hence, the greater the level understanding of understanding upon green building, the lower the perceiving risks, the higher the willingness-to-pay for extra cost incurred.

However, the moderate positive relationship might be affected by other socio-demographic characteristics and psychographic characteristics which required further justification. Table 4 below shows the summary of Pearson coefficient between consumer's perception and consumer's willingness-to-pay.

Table 4: Correlation between Consumer's Perception of Green Building and Willingness-to-pay for Extra Cost Incurred

	Consumer's willingness-to-pay for extra cost		Correlation
Consumer's Perception / Understanding of green building	Pearson Coefficient	0.429	Moderate positive

Relationship between Consumer's Socio-demographic Characteristics and Consumer's Perception of Green Building

By referring to Pearson coefficients shown in Table 5, no relationship exists between consumer's perception of green building and gender as the Pearson coefficient was approximately to 0, which indicates no relationship. Also, that was no correlation between consumer's perception and family size as well as between consumer's perception and income level. On the other hand, weak negative correlation was shown between consumer's perception and age. In contrast, a moderate positive relationship was recorded between consumer's perception and education background with Pearson coefficient of 0.453, which means that consumers with higher education background might have better understanding of green building due to higher exposure of sustainable knowledge (Mohd Suki, 2013). Table 5 summarises correlation between consumer's perception of green building and socio-demographic characteristics.

Table 5: Correlation between Consumer's Perception of Green Building and Socio-demographic Characteristics

	Consumer's Perception / Understanding of green building		Correlation
Gender	Pearson Coefficient	-0.070	No relationship
Age	Pearson Coefficient	-0.202	Weak negative
Family size	Pearson Coefficient	-0.087	No relationship
Education background	Pearson Coefficient	0.453	Moderate positive
Income level	Pearson Coefficient	0.015	No relationship

Relationship between Socio-demographic Characteristics and Consumer's Willingness-to-pay for Extra Cost

There is no correlation shown between consumer's willingness-to-pay and family size as well as between consumer's willingness-to-pay and education background based on Pearson coefficient. However, weak negative relationship with Pearson coefficient of -0.212 exists between consumer's willingness-to-pay and gender, whereas weak positive correlation was recorded between consumer's willingness-to-pay and age. On the other hand, income level moderately correlated with consumer's willingness-to-pay with Pearson coefficient of 0.574. Consumers with higher income level have higher financial ability, in turns having higher capital to invest in green inventions and products to achieve investment returns in long-term compared to consumer with lower economic ability (Gilg et al., 2005). Table 6 summarises correlation between consumer's willingness-to-pay for extra cost incurred and socio-demographic characteristics.

Table 6: Correlation between Consumer's Willingness-to-pay for Extra Cost Incurred and Socio-demographic Characteristics

	Consumer's willingness-to-pay for extra cost		Correlation
Gender	Pearson Coefficient	-0.212	Weak negative
Age	Pearson Coefficient	0.208	Weak positive
Family size	Pearson Coefficient	0.043	No relationship
Education background	Pearson Coefficient	0.082	No relationship
Income level	Pearson Coefficient	0.574	Moderate positive

CONCLUSIONS

In evaluating consumer's perception of green building and willingness-to-pay for extra cost incurred compared convention housing, it was found that most of the consumers have heard about green building and have little knowledge about green building prior to participating in the survey. In terms of willingness-to-pay for extra cost, 39.5% of the respondents are willing to pay for 6 to 10% of extra cost compared to convention housing. 33.0% of respondents are willing to pay for 11 to 15% of extra costs.

Furthermore, by analysing with correlation analysis, a moderate positive relationship was shown between consumer's perception and willingness-to-pay for extra cost. Hence, consumers with higher level of understanding about green building are more willing to pay more for the extra cost incurred.
On the other hand, the results shown that consumer's perception of green building and level of understanding were affected based on the education background of consumers. A moderate positive correlation shown between consumer's perception and education background indicated that the higher the consumer's education level, the higher the level of understanding about green building concept. The positive result shown was further justified by (Diamantopoulos et al., 2003), (Samdahl and Robertson, 1989) and (Arbuthnot and Lingg, 1975). However, education background did not correlated with willingness-to-pay as willingness-to-pay might be affected by other factors such as income level, family, and age (Samdahl and Robertson, 1989). With regard to correlation between willingness-to-pay and socio-demographic characteristics, a moderate positive relationship existed between willingness-to-pay and consumer's income level indicated that consumers with higher income level are more willing to pay for extra cost incurred in obtaining green building.

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