



UNIVERSITI PUTRA MALAYSIA

***ENVIRONMENTAL CONCERN AND INTENTION TO ADOPT GREEN
CONCEPTS AMONG HOUSING DEVELOPERS IN KLANG VALLEY,
MALAYSIA***

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MALAYSIA**

By

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**This is submitted to the School of Graduate Studies,
Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of
Doctor of Philosophy**

August 2015

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

ENVIRONMENTAL CONCERN AND INTENTION TO ADOPT GREEN CONCEPTS AMONG HOUSING DEVELOPERS IN KLANG VALLEY, MALAYSIA

By

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August 2015

Chair : Professor Ahmad Hariza Hashim, PhD

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Environmental degradation caused by construction activities has raised concern regarding sustainability issue. Although developers are showing interest in sustainable construction, the implementation is not industry wide. General environment beliefs are believed to have effect on developers' behaviour. Therefore understanding their environmental worldviews enables the assessment of their attitudes about green concepts, which helps in anticipating behaviour intention to adopt the concept in future housing projects and devising necessary intervention to behavioural change. The objectives for this study are (1) to explore the structure of the environmental concern scale that is the New Ecological Paradigm (NEP) scale, (2) to determine the predictability of attitude, subjective norm and perceived behavioural control (PBC) toward the intention to adopt green concept, (3) to determine the mediating role of attitude, subjective norm and PBC on the relationship between environmental concern and intention to adopt green concepts and (4) to determine the mediating role of attitude, subjective norm and PBC on the relationship between the sub-dimensions of environmental concern and intention to adopt green concepts.

A cross-sectional survey was conducted among developer organisations in Klang Valley and 87 usable questionnaires were returned, yielding a response rate of 24.5%. In addition, in-depth interviews were conducted with five project managers to gain more insights on specific issues of concern and the findings were used to support statistical outcomes. An examination of total pro-NEP score indicated a moderate level of environmental concern among respondents. High scores on both pro-NEP and pro-DSP items revealed that there was a co-existence of both ecological and anthropocentric view of the environment and this was further supported by the in-depth interviews. Factor analysis supported the multidimensionality claim of the environmental concern scale where four distinctive dimensions were found, namely Human over nature, Eco-crisis, Rights of nature and Limits of growth. These factors explained 61.6% of the variance and each has acceptable internal consistency.

Multiple regression analysis revealed that the prediction model was statistically significant and accounted for approximately 67% of the variance in intention to adopt green concepts. PBC was the best predictor, followed by subjective norm and attitudes. This was supported by the interview outcomes where informants shared a stronger sentiment on factors that facilitate or impede the adoption of green concepts in housing projects. Multiple mediation analysis with bootstrapping technique was used to test the effect of environmental concern and its facets on intention to adopt green concepts through attitude, subjective norm and PBC. Results revealed that eco-crisis facet has significant direct relationship with attitude as well as behavioural intention. PBC was found to be a significant mediator for the relationship between environmental concern and human over nature with behavioural intention. In the mediation model between eco-crisis dimension and behavioural intention, apart from PBC, attitude was found to be another significant mediator of the relationship.

It is concluded that in general respondents held a moderate pro-NEP perspective with the coexistence of both an ecological and a human dominance view of the environment. The contribution of PBC in predicting intention implied that organisations tend to exhibit stronger intention to adopt green concepts when they perceive they have adequate resources, opportunities and skills. In addition, PBC was a vital mediator in explaining the relationship between environmental concern and its sub-dimensions of human over nature and eco-crisis with intention to adopt green concepts.

The NEP scale was proven to be a reliable and valid measurement tools in developing countries like Malaysia. The integration of general environmental concern and the Theory of Planned Behaviour (TPB) was meaningful and has contributed new insights on behavioural intention. In addition, the use of the sub-dimensions of environmental concern has extended understanding on environmentalism. Bootstrapping techniques has proven its utility in unveiling potential mediators in small sample size even when total effect is insignificant. Practically, government needs to strengthen the concern for eco-crisis through various educational programmes and trainings. In addition, the public sector needs to walk the talk by moving toward a more sustainable development path. Regulations and financial benefits can be used to expedite the uptake of green concepts among housing developers. Consumers should also be made aware of their roles as ecological citizenship that could help in protecting and restoring the natural environment.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**KEPRIHATINAN ALAM SEKITAR DAN NIAT UNTUK MENGAMALKAN
KONSEP HIJAU DI KALANGAN PEMAJU PERUMAHAN DI LEMBAH
KLANG, MALAYSIA**

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Kemerosotan alam sekitar yang berpunca dari aktiviti-aktiviti pembinaan telah membawa kepada keprihatinan masyarakat terhadap isu kemampunan. Meskipun pemaju-pemaju perumahan menunjukkan minat dalam kaedah pembinaan mampan atau lestari namun pelaksanaannya tidak meluas. Kepercayaan persekitaran umum dipercayai mempunyai kesan terhadap tingkahlaku pemaju-pemaju perumahan. Pemahaman mengenai pandangan semesta kumpulan ini membolehkan kita menilai sikap mereka terhadap konsep hijau di mana ini akan membantu dalam meramal niat untuk mengamalkan konsep hijau dalam projek perumahan pada masa hadapan serta merancang intervensi yang membawa kepada perubahan gelagat. Objektif-objektif kajian adalah untuk (1) meneroka struktur skala keprihatinan alam sekitar iaitu skala New Ecological Paradigm (NEP), (2) menentukan kebolehan ramalan sikap, norma subjektif dan persepsi kawalan gelagat terhadap niat mengamalkan konsep hijau, (3) menentukan peranan perantara sikap, norma subjektif dan persepsi kawalan gelagat ke atas hubungan antara keprihatinan alam sekitar dan niat mengamalkan konsep hijau serta (4) menentukan peranan perantara sikap, norma subjektif dan persepsi kawalan gelagat ke atas hubungan antara sub-dimensi keprihatinan alam sekitar dan niat mengamalkan konsep hijau.

Satu tinjauan irisan lintang telah dijalankan dalam kalangan pemaju perumahan di Lembah Klang dan sebanyak 87 borang soal selidik telah dikembalikan di mana ini menghasikan kadar maklumbalas sebanyak 24.5%. Temubual terperinci turut dijalankan dengan lima pengurus projek untuk mendapatkan pandangan mereka terhadap isu-isu yang berkaitan dan keputusan kajian telah digunakan untuk menyokong keputusan statistik. Kajian terhadap jumlah skor pro-NEP menunjukkan tahap keprihatinan alam sekitar yang sederhana dalam kalangan responden. Skor yang tinggi untuk item-item pro-NEP dan pro-DSP menggambarkan kewujudan bersama perspektif ekologi dan antroposentrik terhadap alam sekitar dan ini telah disokong oleh keputusan temubual terperinci. Analisis faktor menyokong pernyataan tentang wujudnya pelbagai dimensi dalam skala keprihatinan alam sekitar di mana empat

dimensi telah diperolehi iaitu manusia mengatasi alam semulajadi, krisis ekologi, hak alam semulajadi dan pertumbuhan terhad. Faktor-faktor ini menjelaskan 61.6% variasi dan mempunyai ketekalan dalaman.

Analisa regresi berganda mendedahkan yang model unjuran adalah signifikan dari segi statistik dan menyumbangkan lebih kurang 67% variasi niat mengamalkan konsep hijau. Persepsi kawalan gelagat merupakan peramal terbaik diikuti oleh norma subjektif dan sikap. Ini turut disokong oleh keputusan temubual di mana informan menunjukkan sentimen yang lebih kuat terhadap faktor-faktor yang menyenangkan atau menghalang pengamalan konsep hijau dalam projek perumahan.

Analisis perantara berganda dengan teknik *bootstrapping* telah digunakan untuk mengkaji kesan keprihatinan alam sekitar dan ciri-cirinya terhadap niat mengamalkan konsep hijau melalui sikap, norma subjektif dan persepsi kawalan gelagat. Keputusan mendedahkan bahawa ciri krisis ekologi mempunyai hubungan langsung yang signifikan dengan sikap dan niat gelagat. Persepsi kawalan gelagat merupakan pembolehubah perantara yang signifikan ke atas hubungan antara keprihatinan alam sekitar dan manusia mengatasi alam sekitar dengan niat gelagat. Untuk model perantara di antara dimensi krisis ekologi dan niat gelagat, di samping persepsi kawalan gelagat, sikap turut merupakan pembolehubah perantara yang signifikan ke atas hubungan tersebut.

Secara amnya, responden menunjukkan tahap pro-NEP yang sederhana dengan kewujudan bersama perspektif ekologi dan dominasi manusia terhadap alam sekitar. Sumbangan PBC sebagai peramal terbaik niat mengamalkan konsep hijau menggambarkan bahawa organisasi menunjukkan niat mengamalkan konsep hijau jika mereka berpendapat bahawa mereka mempunyai kemampuan dari segi sumber, peluang and kemahiran. Di samping itu, PBC merupakan pembolehubah perantara yang penting dalam menjelaskan hubungan di antara keprihatinan alam sekitar, ciri dominasi manusia terhadap alam sekitar dan ciri krisis ekologi dengan niat mengamalkan konsep hijau.

Skala NEP telah terbukti sebagai ukuran yang sah dan boleh dipercayai untuk digunakan di negara membangun seperti Malaysia. Integrasi antara keprihatinan alam sekitar dan Teori Tingkah Laku Dirancang adalah bermakna dan menyumbangkan pemahaman yang baru terhadap niat kelakuan. Teknik *bootstrapping* turut berguna dalam menemui pembolehubah perantara dalam sample size yang kecil walaupun kesan berjumlah yang signifikan. Dari segi praktikal, kerajaan perlu mengukuhkan keprihatinan terhadap krisis ekologi melalui pelbagai program pendidikan dan latihan. Di samping itu, pihak awam perlu menunjukkan contoh yang baik dengan mengamalkan pembangunan yang lebih lestari. Undang-undang dan faedah kewangan boleh digunakan untuk mempercepatkan pengamalan konsep hijau di kalangan pemaju perumahan. Pengguna harus juga diberi kesedaran tentang peranan mereka sebagai warga ekologi yang boleh membantu dalam penjagaan dan memulihkan alam semulajadi.

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My sincere thanks also go to some trusted friends and former colleagues whose moral support and advices have been invaluable to this thesis.

I certify that a Thesis Examination Committee has met on 26 August 2015 to conduct the final examination of Jasmine Lau on her thesis entitled “Environmental Concern and Intention to Adopt Green Concepts Among Housing Developers in Klang Valley” in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Housing is categorised as a basic human need and it is one of the most pressing problems of the developing world. As the pace of economic growth increases, several Asian countries including Malaysia have witnessed acceleration in the number of migrants from rural regions to towns and cities in search of better life and employment. The urbanisation rate in Malaysia was 62% in 2000 (Bank Negara Malaysia, 2010) and is projected to increase to 70% by the year 2020 (The Economic Planning Unit, 2010). Urban explosion of major cities in Malaysia is straining the capacity of shelter delivery system to cope with the influx of affordable housing demand from the lower and medium income groups. The public sector is unable to provide sufficient housing for everyone due to inadequate financial and physical resources. In view of this, the private sector has been entrusted to take over the role of housing supplier to the nation since the 6th Malaysian Plan and its performance has been up to par with output above the government's target .

Like most developing countries, the housing industry not only fulfils shelter demand but also serves as a major impetus in stimulating economic growth as a result of its spillover effects on the growth of other industries through extensive backward and forward linkages (Khan, 2008; Park, 1989). In addition, housing is an essential component of quality of life and urban design where it affects transportation landscape, residents' health and security, employment prospects, education opportunity, social cohesion, environment quality and urban satisfaction (Edwards & Turrent, 2000). Despite the vital role of housing in providing sanctuary, employment and infrastructure to the nation, construction activities have its own share to various negative impacts on physical landscape such as soil erosion and sedimentation, flash floods, dust pollution, depletion of natural resources (CIDB, 2007) and many more. In addition, the construction industry is the largest greenhouse gas contributor that is approximately 40% of total greenhouse gas emissions (Wahida, 2013), hence giving rise to an outcry for a more environmentally responsible approach. Consequently, principles that based on sustainable development such sustainable housing (Seyfang, 2010), smart housing (Buys, Bailey, & Barnett, 2004; Buys, Barnett, Miller, & Bailey, 2005), eco-homes (Goodchild, O'Flaherty, & Ambrose, 2014) and green housing (Hwang & Tan, 2010) have emerged, aiming to deliver properties with lower environmental impact.

As a testament to Malaysian government commitment and obligation, the Tenth Malaysia Plan (2011-2015) recapitulates the need for houses to incorporate green building design and technology in the quest to fulfill the government effort to promote sustainable and environmentally friendly environment (The Economic Planning Unit, 2010). Apart from this, various policies such as National Policy on the Environment 2002, National Physical Plan 2005, National Urbanisation Policy 2006, National Green Technology Policy 2009, National Climate Change Policy 2009 have been devised to guide environmental protection, landuse and conservation. In tandem with Malaysia Plan and other national policies, the issues of sustainability and green construction have been highlighted in the Construction Industry Master Plan (2005-2015) to chart the

way for Malaysian construction industry (Kamar, Hamid, Ghani, Egbu, & Arif, 2010). Subsequently on 21 May 2009, Malaysia's homegrown green building rating named Green Building Index (GBI) was launched to provide green grading and certification of local buildings. Developed by Malaysian Institute of Architects (PAM) and the Association of Consulting Engineers Malaysia (ACEM), buildings are assessed based on six criteria namely energy efficiency, water efficiency, indoor environment quality, sustainable site planning and management, materials and resources as well as innovation. Recently in April 2013, the Real Estate and Housing Developers Association of Malaysia (REHDA) has launched its own version of green building and carbon rating tool named Green Real Estate or GreenRE, which gives industry players an alternative green tool in terms of more affordable rates and flexible assessment criteria. At present, these green building assessment tools are voluntary rather than mandatory to allow organisation to have more flexibility in their business operations.

In construction project teams, the collaboration among developers (clients), designers and contractors is a critical pre-requisite of project success. Among them, developers are the major steering force as they are the project initiator and principal stakeholder in determining the approach and direction of a project (Abidin & Pasquire, 2005; Abidin, Yusof, & Othman, 2013; Pitt, Tucker, Riley, & Longden, 2009). In view of this, the regulatory strategies by the government will only be effective if developers are willing to participate and take up the leadership role in transforming the construction industry towards sustainability (Majdalani, Ajam, & Mezher, 2006; Zhang, Shen, & Wu, 2011). As sustainable agenda gains momentum in Malaysia, developers that moved away from typical 'brick and mortar' construction to greener practices are seen to have a competitive edge in the future. This study aimed to examine local housing developers' pro-environmental behaviour intention, specifically the intention to adopt green concepts. 'Green' is defined as environmentally friendly practices of a product or activity that reduce the negative impacts on nature and the environment (Burnett, 2007). Thus, green buildings are properties that have less adverse impacts on the environment. The term 'green concepts' was used to gauge housing developers' intention to behave in a sustainable manner based on the six criteria used by Green Building Index (GBI) in certifying green-rated buildings. The study began with a quantitative survey to address the research questions, followed by qualitative interviews to clarify and support the results obtained from phase one of the study. These interviews helped to gather more in-depth information that complements the findings of the quantitative analyses.

1.2 Problem Statement

Since its inception in 2009 until July 2013, GBI has certified a total of 262 projects with a gross floor area of 115 million square feet (Greenbuildingindex Sdn Bhd, 2013). Although developers are showing interest in sustainable construction, the number of green projects is still small. This situation has not differ much from the research carried out by Abidin (2010), who found that a widespread of awareness of sustainable construction among housing developers did not translate into an industry wide implementation. Similar outcome was reported by Ismam & Ismail (2013) that despite high awareness among private housing developers on sustainable concept, they are hesitant to adopt it in their projects. Currently, only big developers were showing interest in sustainable concept with focus on high-end projects while the small and

medium counterparts maintained a more ambivalent stance. Indeed, there is still a long journey towards holistically embracing the concept as a standard practice (Said, Shafiei, Razak, Osman, & Kamaruddeen, 2010) particularly in the conservative construction industry that lacks innovation and has slow rates of change (Winch, 2003; Yitmen, 2007).

The importance of sustainability concept and its slow adoption in the construction industry has attracted numerous studies by local scholars. A review of literature found that the barriers or obstacles to the implementation of sustainable construction was the key issue that has been explored extensively (Abidin, 2010; Abidin, et al., 2013; Alias, Sin, & Aziz, 2010; Esa, Marhani, Yaman, Noor, & Rashid, 2011; Goh, Seow, & Goh, 2013; Samari, Ghodrati, Esmailifar, Olfat, & Shafiei, 2013; Shari & Soebarto, 2012; Tiang, 2011) followed by the level of implementation of sustainability in projects (Abidin, 2010; Esa, et al., 2011; Said, Osman, Shafiei, Razak & Tee, n.d.; Samari, et al., 2013; Tiang, 2011). Due to its applied nature, research in the construction industry has primarily focused more on normative research such as work practices, processes and technologies (Puddicombe & Johnson, 2011). This design thinking mindset has largely neglected the role of social actors such as investors, builders, regulators, the public etc. (Rabeneck, 2008).

Many environmental degradation are rooted in human behaviours, thus requires the re-conceptualisation of environmental problems in terms of psychological, social and behavioural factors (Kurz, 2002). Social psychology has proven its utility in the analysis of pro-environmental behaviour (PEB) through a number of approaches to environmental problems. In general, empirical works on PEB can be divided into two main streams namely one that focuses on socio-demographic variables and the other socio-psychological constructs (Dietz, Stern, & Guagnano, 1998). The present study was situated in the latter stream where it is believed that individuals' behaviour toward the environment is somehow related to the way they think and feel about the environment as well as about pro-environmental actions (Guagnano, Stern, & Dietz, 1995; Taylor & Todd, 1995). Unlike studies in other environmentally related domains such as recycling, water and energy conservation, purchase of green products and travel model choice, this link has been overlooked in the construction literature. The decision to adopt sustainable concept in construction is a type of pro-environmental behaviour because green properties are constructed with efficient use of resources and tend to have lower environmental impacts compared to those built conventionally. Therefore, it is crucial to explore this relationship as general environmental beliefs may have effect on developers' behaviour (De Groot & Steg, 2007) and the outcome could provide more insights in expediting the uptake of sustainable construction. Specifically, this study examined the significance of general environmental beliefs in explaining pro-environmental behaviour within an extended Theory of Planned Behaviour (TPB) framework. Previous studies based on the TPB rarely examined more general behavioural determinants such as values or general beliefs (De Groot & Steg, 2007) and to date only a handful of research has been carried out using this extended framework (e.g. Bamberg, 2003; Chen & Tung, 2014; De Groot & Steg, 2007; Gardner & Abraham, 2010). These works analysed the mediating role of TPB in the relationship between environmental concern and intention and/or behaviour using various measures of environmental concern such as those proposed by Fujii (2006), Kim & Choi (2005), Preisdorfer (1996) and Schultz (2001).

In particular, there is a dearth of research utilising the New Ecological Paradigm (NEP) scale forwarded by Dunlap, Van Liere, Mertig, & Jones (2000) as a measure of general environmental concern in understanding pro-environmental behaviour within a TPB framework. Even when the NEP is being used in other studies, the extant literature often failed to consider environmental concern as a multi-dimensional construct (Amburgey & Thoman, 2012) except Luo & Deng (2008), Nooney, Woodrum, Hoban, & Clifford, (2003) and Deng, Walker & Swinnerton (2006). There has been an ongoing debate regarding the dimensionality of the NEP scale. The NEP scale is conceptualised based on five principal facets namely balance of nature, ecocrisis, anti-exemptionalism, limits to growth and anti-anthropocentrism. Nonetheless, researchers tend to merge these facets into one single measure (Hawcroft & Milfont, 2010). Treating the NEP as a unidimensional instrument neglected the fact that each dimension may be susceptible to having positive and negative connotations on human behaviours, which can result in poor measurement of ecological beliefs and erroneous conclusions. While retaining the unidimensionality argument, Dunlap (2008) acknowledged that the NEP scale could be composed of multiple facets particularly when used in different populations. In such case, these distinct factors should be maintained if each produces meaningful description and demonstrates a good internal consistency. Thus, studying the dimensionality and the psychometric qualities of the scale is crucial as it provides scholars with a validated measure of environmental worldviews in deriving global scores and/or sub-scores of environmental beliefs (Fleury-Bahia, Marcouyeux, & Renard, 2014).

Based on the above arguments, this study sought to answer the following questions:

- a) Is the NEP scale a unidimensional or multidimensional construct?
- b) To what extent NEP scale is reliable and valid among developer population?
- c) What is the general level of environmental concern among housing developers?
- d) To what degree does the attitude, subjective norm and perceived behavioural control (PBC) predict the intention to adopt green concept?
- e) Do attitude, subjective norm and PBC mediate the relationship between environmental concern and intention to adopt green concept?
- f) Do attitude, subjective norm and PBC mediate the relationship between the sub-dimensions of environmental concern and intention to adopt green concept?

1.3 Research Objectives

In specific, this study attempted to:

- a) explore the structure of the environmental concern scale (NEP),
- b) determine the predictability of attitude, subjective norm and PBC toward the intention to adopt green concepts,
- c) determine the mediating role of attitude, subjective norm and PBC on the relationship between environmental concern and intention to adopt green concepts and
- d) determine the mediating role of attitude, subjective norm and PBC on the relationship between the sub-dimensions of environmental concern and intention to adopt green concepts.

1.4 Significance of the Study

This section is divided into three subsections addressing contribution to theory, methodology and practice. These contributions are discussed as follows:

1.4.1 *Theoretical and Empirical Contributions*

The usage of social-psychological theories has created much value for construction research as it has been lacking in descriptive research that supports theory building due to its applied nature, which emphasise more on normative research (Puddicombe & Johnson, 2011). Currently, the sub-disciplines in construction such as project management and housing are suffering from under usage of theory in their literature (Koskela & Howell, 2002; Steggell, Yamamoto, Bryant, & Fidzani, 2006). Steggell et al. (2006) analysed the use of explicit theories in housing research published by Housing and Society from 1974-2003 found that less than half used theories in their research and there was no obvious sign of increased usage. The application of theory from other discipline has answered the call from the researchers to more usage of diverse theories in housing research. In addition, built environment research is dominated by design thinking that over-emphasised aspects related to building products and processes such as industrialised building, materials research, computer application and project management (Rabeneck, 2008). Hence, the inclusion of social actors in this study has provided valuable new direction in knowledge accumulation.

The proposition that the NEP there are discernible dimensions of environmental concern matched the conceptualisation forwarded by Dunlap et al. (2000) and while these facets need to be included in future research, it is also necessary to integrate them into existing theories of environmentalism (Amburgey & Thoman, 2012). In response to these suggestions, this study has opted for new insights by incorporating the NEP into a sound theoretical perspective namely the TPB. In fact, the TPB is principally open to further expansion (Ajzen, 2011) and this is warranted as the outcome model may produce better explanatory power of various pro-environmental behaviours. Furthermore, this study expanded previous study by examining the extended TPB framework in local construction context, which to the best of the researcher's knowledge has yet to be attempted in the published literature. In addition, the usage of individual sub-scales of the NEP may reveal interesting patterns in that different dimensions might play different roles in relation to understanding different environmental issue (Knight, 2007; Luo & Deng, 2008; Marshall, Picou, & Bevc, 2005).

This study also made contribution to the body of knowledge through examining the psychometric properties of the 15-item NEP scale in a sample of project managers employed by developer organisations. Learning the underlying structure of the scale is important as it provides scholars with a validated measure of environmental worldviews in deriving global scores and/or sub-scores of environmental beliefs (Fleury-Bahia, et al., 2014). The psychometric properties of the NEP scale have been evaluated in several local samples with stable internal reliability estimates but factor structures inconsistently reported. Ong & Musa (2012) reported a 3-factor structure (ecocentric, dualcentric and technocentric) among scuba divers with an alpha value of .76. In the similar vein, Karpudewan, Ismail, & Roth (2012) and Tan & Lau (2011) treated the scale as unidimensional and reported an alpha value of .71 and .68 in their samples of pre-service teachers and undergraduate students respectively. By examining

the structure of the NEP scale, the results added to the breadth of existing knowledge on the environmental worldviews among different social structure and occupational group.

1.4.2 Methodological Contributions

This study contributed in terms of methodology by applying bootstrapping method, which is one of the more valid and powerful techniques for testing mediation effects (Williams & MacKinnon, 2008). Despite the advantages, many disciplines such as education (Bai & Pan, 2008), management (Wood, Goodman, Beckmann, & Cook, 2008) and supply chain management (Rungtusanatham, Miller, & Boyer, 2014) reported scarce application of this method. The requirement of a significant total effect ($X \rightarrow Y$) in Baron & Kenny's (1986) method has caused many researchers to prematurely concluded that there is no mediation effect after discovering a non-significant relationships. Majority of the social-psychological literature pointed to limited relationship between environmental concern and behaviour as well as intention (Bamberg, 2003) and as a result of this condition, there are high chances of missed mediating pathways and unreported mediation tests for subsequent conditions. On the other hand, bootstrapping method allows the detection of indirect effects or mediations in the absence of a total effect, thus removing the constraint to theory development (Rucker, Preacher, Tormala, & Petty, 2011).

In general, research on environmental worldview and the TPB has mostly utilised quantitative methodologies. This study sought to depart from a single method approach by including supplementary qualitative interviews to inform survey results. This study used predominantly a quantitative approach i.e. questionnaire survey to collect data in the first phase and then used the qualitative method to explore in depth on respondents ideas and views. This helps to increase the validity of findings and offers different information for different stakeholders regarding the issues under study.

1.4.3 Practical Contributions

The integration of environmental concern within the TPB provided insights to policymakers and professional bodies regarding motivations that constitute developer organisations' intention to go green. By examining the predictive utility of TPB model in relation to intention to adopt green concept, it is expected to contribute to understanding of the specific beliefs that may influence the behavioural intention. Applying the TPB model in construction organisations may add some new insights because construction organisations are different from other organisations in many aspects such as structure, team dynamics and decision making. Based on hard facts and figures, concrete guidelines and specific actions could be devised to alter organisation behaviours through changing their beliefs. Apart from non-statutory actions, the results could be used to guide the development of statutory interventions that facilitates the uptake of green construction.

The qualitative interviews allow the elicitation of detailed perspectives of individuals on their beliefs about nature, how humans relate to nature, their association with built environment and issues faced in implementing green construction. This method provides more comprehensive understanding of the phenomenon of interest through

descriptions of relevant processes and identification of causal mechanism. Thus, it help policy makers and other professional institutions to understand if the intervention identified in the quantitative phase is going to be effective, the way it should be carried out, the timing to carry out the intervention and the target groups. At the macro level, successful intervention tend to encourage greater adoption of green concepts and this allows construction industry to contribute dramatically towards energy savings as well as the reduction of carbon footprints in the country, which ultimately lead to a more sustainable society.

1.5 Scope and Limitations of the Study

There are several limitations of the present study that should be acknowledged. This study was based on cross-sectional mediation design and correlational data. Although this study rested on sound theory and conceptual model, the results were not sufficient to provide evidence of causal effects of environmental concern and the TPB variables on intention to adopt green concepts.

Another limitation to this study is that the variables in the TPB model i.e. attitude, subjective norm and perceived behaviour control were based on direct measures. Indirect (belief-based) measures of these variables were not feasible due to the difficulties in gaining cooperation and initial entry from industry players. However, qualitative interviews were carried out after the quantitative phase using the same questions as those used in the indirect measurement approach and this has provided some additional insights on the issues under study. It should be noted that the TPB is designed to measure very specific actions. Thus, the theory only allows for generalisability to that specific action and not related behaviours.

The sample for this study was restricted to housing developers in Klang Valley, thus the theoretical measures may be limited to that population. Some cautions are warranted when generalising the results of this study to developers in other states due to differences in statutory requirements and organisational culture. Participation in this study was voluntary and this may have resulted in a sample of respondents who held strong views on sustainable construction issues and therefore may not adequately represent all respondents. Furthermore, surveys may increase a common-method bias, which increases the probability that the characteristics of those who responded may be different from those who did not. In addition, only one organisation member that is the project manager was asked to fill in the questionnaire form, which may create problem of single-respondent bias. Dodor & Rana (2009) suggested researchers to use more than one respondent for organisational research in order to obtain the average opinion but this was not able to be achieved due to low cooperation from developer organisations. As such, it was not possible to examine the extent to which organisation members have different opinions or to look at the dynamics within an organisation when it comes to sustainable construction.

Next, this study examined developers' intention to adopt green concepts instead of their actual behaviour. Reason being, actual behaviour is not always equivalent to intention even though previous studies (e.g. Armitage & Conner, 2001; Boldero, 1995; Taylor & Todd, 1997) indicated that the behavioural intention models are robust in predicting behaviour. Apart from this, the scale in this study was a self-report of behavioural

intention and this may not accurately represent actual behaviour (Corral-Verdugo, 1997; Lee, 2011). Respondents might over-report their intention due to self-enhancement as they are keen to show their green efforts and achievements. In addition, self-reports are often being criticised for its high susceptibility to social desirable reporting. However, Chao & Lam (2011) and Milfont (2009) revealed that social desirability is not a great concern in self-reported environmental intentions and behaviours.

In terms of qualitative data, the main limitation is the nature of the sample where it represented a selective sample of respondents who had initially agreed to participate in the interviews. As such, these individuals' views may not be representative of the population of this study. Moreover, the number of interviews conducted was relatively small compared to those in published literature as some respondents dropped out from the phase prior to the interview sessions. Due to their hectic work schedule the time allotted by the respondents for the interviews was rather short where this prohibited further probes for fuller and more meaningful responses.

1.6 Definitions of Terms

General Environment Concern is defined as “the degree to which people are aware of problems regarding the environment and support efforts to solve them and or indicate the willingness to contribute personally to their solution” (Dunlap & Jones, 2002, p.485). General environmental concern is represented by five dimensions namely balance of nature, eco-crisis, anti-exemptionalism, limits to growth and anti-anthropocentrism.

Balance of nature is based on the view that nature is complex and in equilibrium, and therefore is susceptible to human interference (Kempton, Boster, & Hartley, 1995). It measures the extent to which individuals believe that there is balance in nature and that human activities endanger this balance.

Ecocrisis (Ecological crisis) is defined as “the likelihood of potentially catastrophic environmental changes besetting humankind” (Dunlap et al., 2000, p.432). This dimension gauges the extent that human interference is causing detrimental harm to the physical environment.

Human exemptionalism refers to the tendency to see human as exempt from the constraints of nature that affect other species (Dunlap & Catton, 1994). The NEP assumes that people reject human exemptionalism. In this study, *anti-exemptionalism* assesses the extent to which individuals believe that humans' ingenuity and technological progress will overcome all social and environmental problems confronting humankind.

Limits to growth are concerned with the fact that the earth has scarce resources (Dunlap et al, 2000). It measures the extent to which individuals believe that nature is a limited resource upon which humans rely.

Anthropocentrism is “a doctrine which posits humanity as the centrepiece of the universe and sees the well-being of mankind as the ultimate purpose of things” (Chandler & Dreger, 1993, p. 169). The NEP does not accept the idea that human

beings are the most significant species on the planet and that nature exists primarily for human use. In this study, *anti-anthropocentrism* measures the extent to which individuals believe that human beings have the right to modify and control the natural environment.

Green is defined as environmentally friendly practices of a product or activity that reduce the negative impacts on nature and the environment (Burnett, 2007). In this study, *green concepts* are the six key criteria in the Green Building Index (GBI) namely energy efficiency, water efficiency, indoor environment quality, sustainable site planning and management, materials and resources as well as innovation, which are being used in assessing the impact of a new building on the environment.

Attitude toward Behaviour refers to “the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question” (Ajzen, 1991, p.188). For this study, it refers to the positive or negative evaluation regarding the adoption of green concepts in housing projects. An organisation will hold a positive attitude if it expects favourable outcomes associated with adopting green concept in housing projects but if unfavourable outcomes are expected from the behaviour then the organisation will hold a negative attitude towards it.

Subjective Norm refers to “the perceived social pressure to perform or not to perform the behaviour” (Ajzen, 1991, p.188). It is defined in current study as perceived support for adopting green concepts in housing projects by significant others. When developer organisations perceive others as being supportive, then they may perform the intended behaviour.

Perceived Behavioural Control refers to “the perceived ease or difficulty of performing the behaviour and it is assumed to reflect past experience as well as anticipated impediments and obstacles” (Ajzen, 1991, p.188). The more resources and opportunities developer organisations think they possess, and the fewer obstacles or impediments they anticipate, the greater should be their perceived control over the behaviour and thus more likely to form strong behavioural intentions that is to adopt green concepts in housing projects.

Intention is defined as “motivational factors that influence a behaviour; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behaviour” (Ajzen, 1991, p181). The stronger the intention, the more the organisation is expected to try, and hence the greater the likelihood that the behaviour will actually be performed.

1.7 Thesis Structure

This thesis comprises five chapters and the overall outline is discussed in the following section. Following this *Introduction* chapter, Chapter 2 reviews the various terminologies of pro-environmental behaviours (PEB) that were being used in the literature, the types of PEB and the commonly used instruments used by scholars to gauge PEB. This chapter also dissects the concepts of environmental concern (EC) and reviews the literature for different measures of EC. The final section of the chapter is the reviews and discussions on socio-psychological theories related to the study of environmental behaviour and this ended with the research framework of this study.

Chapter 3 discusses the research methodology used in this study. It begins with an introduction on the research design used and followed by information on the target population and the sampling plan. Next, illustrations on the instrument, the measurement used for variables, pretest of the instrument as well as the reliability and validity of the scale are presented. The following section details how the survey and interviews were conducted and lastly, data analysis section outlines the data analyses procedures for both quantitative and qualitative phase.

Chapter 4 outlines the analysis of data gathered during the empirical phase of this study. The first section deals with a summary of socio-demographic information of the respondents. The second section illustrates the analysis and discussion of NEP and the third section presents the discussion of the results of model fit using multiple regression analysis. The final section discusses the bootstrapping mediation analysis of the relationship between environmental concern and behavioural intention. The findings of five personal interviews with project managers in the qualitative phase of data collection were also included in this chapter. Text segments from the interview transcripts were being used as support to the quantitative results.

Lastly, Chapter 5 provides the conclusions and implications of this study as well as recommendations for future research. This chapter begins with brief description on the data collection procedure and the demographic structure of the sample. This is followed by the summary of the major findings based on the research objectives, which leads to conclusions. The implications acquired from the major findings are being discussed, which serve to re-iterate the significance of this study. The chapter concludes with recommendations for future study.

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LIST OF PUBLICATIONS

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