INTERNAL AND EXTERNAL FACTORS INFLUENCING GREEN INNOVATIVENESS AMONG CONTRACTORS IN MALAYSIA

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UNIVERSITI SAINS MALAYSIA

2016

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by

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Thesis submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

February 2016

ACKNOWLEDGEMENT

I would like to express my special appreciation and thanks to my supervisor !lias Said, you have been fantastic mentor for me. I would like to thank you for encouraging my research and for allowing me to grow as a researcher. Your advice on both research as well as on my career have been priceless.

A special thanks to my family. Words cannot express how grateful I am to my mother, father, mother-in law, father-in law for all the sacrifices that you've made on my behalf. Your prayer for me was what sustained me thus far. I would also like to thank all my friends who supported me in writing, and push me to strive towards my goal.

At the end, I would like to express appreciation to my beloved wife, Durra Afifah Binti Fazilah Shuhaimi who spent sleepless nights taking care of our son, Ali Wafiq and was always my support in the moments when there was no one to answer my queries. Last but not least, I would like to thank my brothers and sister for supporting me spiritually throughout writing this thesis and my life in general. May Allah grant us Jannah.

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ABSTRAK

Kajian lepas telah membuktikan inovasi adalah kunci utama kepada kejayaan sesebuah syarikat. Tetapi, sangat sedikit k!\iian tentang inovasi hijau yang dilakukan dalam konteks kontraktor binaan di Malaysia. Objektif umum kajian ini adalah untuk menaksir takat daya inovatif hijau di kalangan kontraktor di Malaysia, serta untuk meneliti faktor dalaman dan luaran yang mempengaruhi daya inovatif hijau mereka. Kontraktor telah distratifikasi mengikut negeri. Pensampelan rawak mudah berkadar telah digunakan untuk memilih firma-firma kontraktor bangunan. Responden bagi kajian ini adalah kontraktor bangunan yang berdaftar dengan Badan Pembangunan Industri Pembinaan (CIDB) di dua belas (12) buah negeri di Semenanjung Malaysia. Buku panduan CIDB, yang diterbitkan dalam bulan Disember, tahun 2012 telah digunakan untuk mendapatkan populasi bagi kajian ini. Sejumlah 500 borang, yang mengandungi soal selidik kendiri berstruktur telah dikirim kepada responden. Sejumlah 293 borang soal selidik yang lengkap diisi dan berguna telah dikembalikan, menghasilkan kadar respons 58.6 peratus. Untuk mencapai objektif pertama kajian ini, skor min bagi daya inovatif hijau firma telah dihitung menggunakan statistik perihalan. Tafsiran skala Likert telah diguna pakai dan lima kategori pengamal inovasi yang diubah suai daripada kajian lepas telah digunakan untuk mentafsirkan daya inovasi hijau skor min yang diperoleh daripada statistik perihalan. Analisis faktor eksploratori dilakukan ke atas faktor dalaman dan luaran firma dan daya inovatif hijau. Seterusnya, korelasi Pearson dan regresi berganda lazim telah

digunakan untuk meneliti perhubungan di antara faktor dalaman, luaran firma dan daya inovatif kalangan kontraktor bangunan di Malaysia. Hasil analisis korelasi menunjukkan bahawa daya inovatif hijau dikalangan kontraktor bangunan di Malaysia mempunyai hubungan yang positif dan kuat dengan budaya alam sekitar, keupayaan alam sekitar, dan faktor luaran firma. Sementara itu hubungannya dengan struktur firma sekadar sederhana sahaja. Keputusan analisis regresi juga menunjukkan bahawa budaya alam sekitar firma memberi kesan yang tertinggi terhadap daya inovatif hijau dikalangan kontraktor bangunan, diikuti oleh keupayaan alam sekitar, dan faktor luaran. Sebaliknya, struktur firma tidak mempunyai kesan yang signifikan terhadap daya inovatif hijau. Pada keseluruhannya dapatan kajian ini konsisten dengan dapatan oleh kajian-kajian lalu. Kajian ini mungkin berguna kepada semua pemegang kepentingan dalam industri pembinaan. Takrif daya inovatif hijau yang dikemukakan dalam kajian ini akan membantu usaha untuk memahami dengan lebih baik konsep inovasi hijau dalam konteks industri pembinaan. Selain itu, kajian ini telah memberi penjelasan yang lebih jelas tentang takat daya inovatif hijau, selain tentang faktor-faktor dalaman dan luaran yang harus ditumpukan bagi mempertingkatkan daya inovatif hijau dalam industri pembinaan di Malaysia.

INTERNAL AND EXTERNAL FACTORS INFLUENCING GREEN INNOVATIVENESS AMONG CONTRACTORS IN MALAYSIA

ABSTRACT

Previous researchers have proven that innovation is the key success factor for any firm. Unfortunately, only a few researches on green innovation have been done in the Malaysian contractors' context. The general objectives of this study were to assess the extent of green innovativeness among contractors in Malaysia, and to examine the internal and external factors that influence their green innovativeness. Contractors were stratified according to states. A Proportionate simple random sampling was used to select building contractors firms. Respondent for this study were building contractors that registered with the Construction Industry Development Board (CIDB) in the twelve (12) states of peninsular Malaysia. The CIDB directory published in Dec 2012 was used to obtain the population for this study. A total of 500 structured, self-administered questionnaires were sent to respondents and 293 duly completed and useful questionnaires were returned, yielding 58.6 per cent response rate. To achieve the first objective of this study, the mean score for firm green innovativeness was computed using descriptive statistics. Likert scale interpretation was adopted and the five innovation adopters categories adapted from the literature were used to interpret the green innovativeness mean score obtained from descriptive statistics. Exploratory factor analyses were performed on firm internal, external factors, and firm green innovativeness. In addition, Pearson correlation and standard multiple regression were performed to examine the relationships between internal, external factors, and green innovativeness among building contractors in Malaysia. The results of correlation

analyses show that green innovativeness of building contractors in Malaysia has a positive and strong relationship with firm environmental culture, environmental capability, and external factor. Meanwhile, its relationship with firm structure is just moderate. The results of regression analyses also show that firm environmental culture has the highest significant impact on green innovativeness among building contractors, followed by environmental capability and external factors. On the other hand, firm structure has no significant impact on green innovativeness. Overall, the findings of this study are consistent with that of previous studies. This study may be useful to all the stakeholders in the construction industry. The green innovativeness definition provided in this study will help in better understanding of the concept of green innovation in the context of the construction industry. Additionally, this study has shed more light on the extent of green innovativeness, as well as the internal and external factors that should be focused to enhance green innovativeness in Malaysian construction industry.

CHAPTER!

INTRODUCTION

1.1 Background

This study attempts to answer two research questions: What is the degree of green innovativeness among contractors in Malaysia; and what are the elements that engender the contractors towards green innovation among contractors in Malaysia?

Jain et al., (2010) in their study found different meanings to the term innovativeness. Firm innovativeness is characterized as the inclination or limit of a firm to embrace innovative building items, development strategies, or techniques, or ideas, and business frameworks that are new to the firm and/or the development business. The design is for expanding benefits, as well as to address the issues of the clients or end clients, mulling over supportability and nature.

Jain et al., (2010) further claimed that innovativeness has been perceived as a key achievement component, not just for the general execution and development of firms, but also for their survival in an aggressive business. In the worldwide coliseum, innovativeness has been depicted as the answer for the difficulties confronting the construction industry universally. Morad (2010) believed that in order to achieve environmental and economic sustainability, there must be a pressing need to address these difficulties resulting from the business market dynamics due to the current global economic crisis. Perhaps, problems like the low quality of products, relinquished activities, absence of focus by clients, and incapable and wasteful construction delivery systems are becoming prevalent in many developed and

undeveloped nations. Therefore, some countries have initiated innovative products and processes in the provision of construction process.

There have been significant research interests among scholars in the firm innovativeness across various fields such as sociology, economics, marketing, and management, as well as industries such as manufacturing and construction (Knowles et al., 2008; Jain, et al., 2010). Advancement in this field of research has culminated into substantial number of research interests that focus on measuring innovativeness (e.g., Vazquez et al., 2001; Artz et al., 2003; Shook & Ganus, 2004), dimension of innovativeness (e.g., Hovgaar & Hansen, 2004; Wang & Ahmed 2004), and assessing factors that stimulate firm innovativeness (e.g., Nystrom, 2002; Sandvik & Sandvik, 2003; Theoharakis & Hooley, 2008; Tuominen, Rajalab & Moller, 2004;).

The study of green innovation is somewhat in contrast to the conventional innovation and product development research and is relatively new to the scholarly world. The dominant part of the early studies on green innovation primarily focussed on definitional issues, hypothetical clarifications for the emergence of green development, and the relationship between the performance of green development and budgetary execution (e.g Beise & Rennings, 2005; Rennings & Rammer, 2009; Noci & Verganti, 1999; Foster & Green, 2000; Huang & Wu, 2010; Chen, 2011). However, as of late the scholars seems to broaden their scientific inquiry beyond the business level and investigate the strategy ramifications of environmental innovations, especially in the resources effectiveness enclosure and energy.

According to Chen et al., (2006) green innovations have turned into one of the vital strategic devices to achieve sustainable development among manufacturers. Previously, companies had often perceived as pointless to put assets in

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environmental activities. However, Porter and van der Linde (1995) found that strict ecological regulations and prominent environmentalism have changed the aggressive principles in practices. Green innovation identifies green items and procedures, incorporates innovation in technology in energy saving, contamination aversion, waste reusing, corporate environmental management and design (Chen et al., 2006). According to past empirical evidences (Porter, 1981; Porter & van der Linde, 1995; Chen et al., 2006), in order to be competitive in industry, most firms eagerly reshapes and strategizes their execution of green advancement enthusiastically. Therefore, the focused principles are on the green innovations and competition relationship due to the belief that green innovation and competition can enhance the value of products, and in many ways the cost of investments on environmental can be leveraged. Porter and van der Linde (1995) suggested that green innovations ensure the successfulness of firms, enhance corporate outlook, and creating a win-win solution in most contention among economic and environmental problems.

Constructions industry represents a significant portion of national trade. It is the most dynamic services sectors, with a growing exports rate despite a downturn on the world economy. It provides facilities to all end user and producers. Building contractors play a vital role in delivering a successful completion of a project. The construction industry is the fourth employer of labour after agriculture, manufacturing and services. It is essential for a client to select competent contractor to increase the chances of meeting the client's requirement. Due to short life cycle of products and fast-changing technology in green, firms must always stay competitive, strengthen and maintain their competitiveness by adopting their best effort in green innovation (Lin et al., 2011; Tseng, 2011).

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Innovation is expensive and hazardous. Therefore, the barrier to successful green innovation is more overwhelming as administrative compliance, mixture of ideas, for example, Life Cycle Evaluation (LCA) in business decision making, and translating client desires for green products and the use of include resources commitment.

Therefore, the success of green initiative reqmres change in both the outline of courses of action and methods for fabrication, appropriation, utilization and transfers that to be developed to guarantee a more sustainable future for next generation.

This study attempts to critically investigate the relationship between green product, process, management and technological innovations by expanding the empirical findings from earlier studies, based on hypothetical models on product development and traditional innovation research. It seems to suggest that the framework that describes the categories of green innovation activities is somewhat limited and scarce due to the understanding of firms toward green innovation practices. Furthermore, there seems to be very limited piece of literatures dealing with the drivers for green innovations of finns. In addition, increased global competition pressures are also forcing firms to continuously develop and innovate to enhance their green product competitiveness, such as product design and quality, technological service and reliability. A firm must integrate its green innovations for developing and commercializing green products and must facilitate the creation and dissemination of technology innovations within its firm in order to strengthen its competitive advantage (Lee et al., 2009; Bai & Sarkis, 2010).

According to Hult et al., (2004), very little is known about how the antecedents of innovativeness operate under different conditions the firms are in. More so that innovativeness has idiosyncratic properties that make it cannot be transferred from

one firm to another or from one trade to another (Menguc & Auh, 2006). Additionally, despite the enormous breath of literature on innovativeness (Subramanian & Nilakanta, 1996; Fell, Hansen, & Punches, 2002; Black, Kimberly, & Colin, 2003; Hult et al., 2004; Salavou, 2004; Shook & Ganus, 2004; Wang & Ahmed 2004; Das & Joshi 2007; Knowless et al., 2008; Tajeddini, 2010), assessing the extent of firm green innovativeness, yet it has not been given considerable attention. While a firm or industry might be found to be relatively innovative, the pertinent question that should be answered is, to what level is that firm or industry greenly innovates.

Given the aforementioned, the present study is undertaken to assess the green innovativeness level and examine the influencing factors of building contractors in Malaysia. This study, adapts the Rogers (2003) five innovativeness categories to determine the extent of green innovativeness of Malaysian building contractors. The categories are innovators, early adopters, early majority, late majority and laggard; laggard being the least, and innovator being the highest in ranking. *Innovators* – they are the first to try the innovation, interested in new ideas and are willing to take risk. *Early Adopters-* they reflect their leaders' opinion, embrace changes and aware of the need to change. *Early Majority-* They are not usually a leader, but the adopt new ideas before average person. *Late Majority* – They are very sceptical of changes. Takes time to adapt innovation. *Laggards* – They are very conservative and bound by tradition. This is the hardest group to innovate.

At the same time, Knowless et al., (2008) conceptualized firm innovativeness as a product, process, and managerial system. This concept however, fails to capture technological dimension of firm green innovativeness despite the numerous literature

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that associate infonnation technology adoption with green innovation (Ferneley & Bell, 2006; Wang & Swanson, 2007). Thus, this study then added technological innovativeness to product, process, and management system, and at the same time adapting Knowles's (2008) firm innovativeness dimension to get a better understanding of the subject.

There are 5 dimensions of finn innovativeness (Wang and Ahmed, 2004): product innovativeness, market innovativeness, process innovativeness, behavioural innovativeness and strategic innovativeness. These dimensions of innovativeness will be discussed in detail throughout chapter 2 of the thesis.

Previous scholars have provides few numbers of definitions for the notion 'eco-innovation'. The earliest was by Fussier and James (1996). They define eco-innovations as "new products and process of which enhance the value of the product and at the same time reducing its impact to the environment" (Bartlett & Trifilova, 2010). Whilst Kemp and Pearson (2007) define eco-innovation as "the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organisation (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives".

Accordingly, factors influencing firm green innovativeness were conceptualized as either internal or external. The internal factors are firm structure conceptualized as formalization and centralization, while firm environmental culture is conceptualized as adhocracy culture and market orientation. Firm environmental capability is conceptualized as transformational leadership style and firm learning. Likewise,

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external factors are conceptualized as government support for innovation, environmental uncertainty, and market competition.

However, the literature reveals that evidence on the drivers for green innovation is somewhat limited. Green innovation initiatives involve processes that are high risk, uncertain and consumption of many resources. Therefore, it seems to suggest that firms can acquire knowledge, assistance and techniques through empirical findings towards understanding green innovations.

The intended principal contribution of the current study on the green innovativeness literature was to ascertain the green innovativeness level as well as the impact of internal and external factors on independent-dependent relationship. This endeavour could help to confinn whether the Malaysian construction industry is lagging in tenns of green innovation.

1.2 The Malaysian Scenario

Recently, innovativeness of small and medium enterprises (SMEs) has been given much attention in Malaysia (Hilmi et al., 2010). This can be attributed to the fact that SMEs (building contractors inclusive) have been acknowledged as a major representation of the strategic thrust in the economy of Malaysia (SME annual Report, (2006). Additionally, SMEs plays an important role in Malaysia's effort in achieving a developed nation status. SME serves as the technology provider and enabler to various industries. They constitute 96.1% of the Malaysia establishments (Hilmi et al., 2010). Despite these contributions to the Malaysian economy, Shen-Li

(2005) observes that SMEs need to urgently enhance their competitive advantage through innovativeness because of their being vulnerable to the dynamic nature of the world economy. In addition, innovativeness will enable SMEs to play a vital role in the quest to create home-grown multinational corporation (MNC).

Recently, innovation is one of 10 premises of the Tenth Malaysian Plan (2011-2015) presented by Prime Minister Dato' Seri Mohd. Najib bin Tun Abdul Razak, on 10 June, 2010. This is a clear testimony that Malaysian government recognizes the importance of innovation in her quest to improving national productivity and performance.

Additionally, various seminars and workshops have been organized, and meetings held by both government agencies and nongovernmental firms, such as the Economic Planning Unit (EPU), Construction Industry Board (CIDB), Real Estate and Housing Developers Association (REHDA), and House Buyers' Association (HBA). In those forums, the debate was on how to improve the quality of Malaysian construction industry, where subsequently, the question of how innovative are building contractors, has become a major issue of discussion.

There are various types of efforts that have been carried out to increase the quality of the construction project management so that project delivery system can be increased. For example, government had set up one special agency to monitor and coordinate construction activity namely Construction Industry Board Development Malaysia (CIBD). Contractor which carried out the construction jobs need to register with CIBD Malaysia under one of the categories namely building work, engineering work and mechanical work and electrical.

Besides managing the contractor registration affairs, effort to stabilize image of construction industry also have been practiced. To boost country's construction industry to be more dynamic and can compete in global market, a strategic plan proposed by CIDB was approved. The proposal is about to plan the strategic ways to develop the construction industry by healthier, and effectively competing. Under that plan, this construction industry can use state-of-the-art technology and the latest method.

The environmental impact of the construction industry is paramount due to the generation of construction waste, unsustainable utilization of resources of building materials. According to Fishbein (1998), the construction and demolition industry produces 10 to 30 per cent of waste disposal universally from their activities. In Malaysia, in spite of various government approach activities to address the issue of construction waste and the like, construction waste is the biggest waste stream in the country. The phenomenon suggested that the contractors put least priority to on-site waste management and control, and sustainable resources. The contractors deal issues on a day-to-day basis using project management and problem solving techniques. They are responsible based on the contract to execute projects, supply building materials, labours, equipments (engineering vehicles and tools) and services to ensure project completion on site. However, in many circumstances subcontractors will normally execute projects in portions when delegation takes place.

The key issues being discussed in conferences, meetings, and workshops organized by either Construction Industry Development Board (CIDB) or International Conferences relates to the following issues regarding the Malaysian construction industry. First, an innovative construction delivery system needs to be adopted to

solve the problem of abandoned and late payment of construction projects (Yusof et al., 2008). Second, an innovative construction concept and practice such as sustainable construction, needs to be adopted (Economic Planning Unit bulletin 2004; Majdalani, et al., 2006; Hussein, 2007). Third, there is a need for the adoption of innovative management practice (Hussein, 2007).

While the Malaysian government encourages the industry players to adopt innovative construction and technology (Economic Planning Unit bulletin, 2004), the building contractors are capable of defining opportunities to advance sustainable construction through innovative construction operation and technology (Majdalani et al., 2006). This role to be played by the building contractors will include the adoption of innovative management and business practice, innovative design, focusing on efficient and sustainable construction, utilization of innovative and high performance materials and system throughout the development processes (Civil Engineering Research Foundation, 1999).

1.3 Problem Statement

Since the United Nations conference on the human environment, held in Stockholm in 1972, global environmental problems have been discussed at policy level and environmental sustainability has entered the political agenda of most countries. Within this context, companies can play a key role. One way in which companies can contribute to the achievement of environmental sustainability objectives is the development of green innovation. Despite the fact that environmental issues had been relegated to minor roles in the innovation research agenda for many years,

sustainability has now been acknowledged as a key driver of innovation (Nidumolu et al., 2009) and green innovation research has rapidly grown over the last few years.

The long-term survival of the construction industry partly depends on innovativeness of the construction players (Koebel, 2008). The need for green innovativeness of all industries in Malaysia including the construction industry has become a national issue of concerns to all the major stakeholders in the construction industry (Hilmi & Ramayah, 2008). As a result, seminars, workshops, and meetings are being held to address the issue of innovativeness in the construction industry with particular focus on the contractors (Loong, 2001; EPU Bulletin, 2004; Hussein, 2007; REHDA Bulletin, 2009).

Quite a number of scholars have suggested that certain internal feature of a firm, such as culture and structures (Kimberly & Evanisko, 1981; Kanter, 1988; Thong, 1999; Russell & Hoag, 2004); firm characteristics, such as firm size (Damanpour, 1991); firm structure and slack resources (Subramanian & Nilakanta 1996) will influence the firm to adopt green innovation. These are referred to as internal drivers. While a firm is capable of managing its internal factors to enhance innovative capability, the external factors i.e. the external drivers, such as role of stake holders, usually are beyond the control of the firm (Yusof et al., 2008). Competitive business environment also plays an influencing role on the innovative capability of a firm (King & Anderson, 1995). There seems to be no known research that examines green innovativeness from a multidimensional perspective. The same goes with the influence of firm structure, culture, resources, and external factors on green innovativeness of the Malaysian contractors in a single study. Hagedoom and Cloodt (2003) study highlights the advantage of using multiple or composite indicators in

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determining a firm's green innovativeness. The reasons are that innovativeness has been examined by scholars as a construct with dimensions and found to be firms' key success factor for overall performance and success (Jansen et al., 2006). There are many approaches to examine green innovativeness that empower scholars to recognise the innovative firms. These include the examination of all aspects such as marketing strategies, new development idea and practice and the affinity to adopt innovative building products.

Among the empirical studies that focused on firm innovativeness in other countries are Subramanian and Nilakanta (1996) in banking industry, Carayannis and Provance (2008) in manufacturing and service industry, Hansen and Dibrell (2008) in wood industry, Khaflan and McDermott (2006) in construction industry, Fell et al., (2002); Barlow (2000) in housing industry.

Nairn and Barlow (2003) explored the possibility of adopting lean and agile production concept to United Kingdom construction industry. The concepts of lean and agile production were both originally adopted from the automobile industry. According to Naylor et al., (1999), firms that practice agile production concept will be using market knowledge and virtual corporation to exploit profitable opportunities in a volatile market place. Furthermore, practicing lean concept means developing a value stream that ensures the elimination of wastes, including time, and a level schedule.

Some of the issues that need to be addressed in the construction industry range from quality of products to late delivery, and to lack of customer satisfaction. Green innovation will therefore benefit not only the innovative contractors, the owner will also benefit from the innovative construction product and process of acquiring the

units. One of the best and most effective ways to enhance competitive advantage of firms is by leveraging their resources and enhancing their green innovativeness (Hilmi & Ramayah, 2008). Additionally, many firms understand the need to be innovative. However, little is known about the factors that influence firm green innovativeness (Hult et al., 2004).

Green Innovation studies in the Malaysian construction industry are few. Hilmi and Ramayah (2008); Hilmi et al., (2010) are other innovativeness studies in Malaysia. In the former, the authors examined the market innovativeness of Malaysian small and medium enterprises (SMEs). Their study did not consider big firms such as public listed firms, neither have they specifically focused on building contractors. The latter study examined the effect of product and process innovativeness on performance of Malaysian SMEs, which, of course, is totally different from the current study. Their study suggests that only process innovativeness affects the performance of Malaysian SMEs.

Thus, this study aims to fill this research gap by assessing the Malaysian building contractors' green innovativeness level from a multidimensional approach, and to examine the internal and external drivers that influence their green innovativeness. This study covers both public listed and non-public listed 07 contractors. Therefore, the study attempts to examine these research questions: What is the green innovativeness level of Malaysian building contractors? Are there any significant relationship between firm internal and external drivers, and green innovativeness of contractors in Malaysia? The research questions are summarized as follows:

I. What is the extent of green innovativeness among building contractors in Malaysia?

2. Are there any significant relationships between firm internal drivers and green innovativeness of building contractors in Malaysia?

3. Are there any significant relationships between firm external drivers and green innovativeness of building contractors in Malaysia?

1.4 Research Objectives

Accordingly, the objectives of this research are formulated as follows:

I. To assess the extent of green innovativeness among building contractors in Malaysian construction industry.

2. To examine the relationship between internal drivers and green innovativeness among building contractors in Malaysia.

3. To examine the relationship between external drivers and green innovativeness among building contractors in Malaysia.

1.5 Scope of Research

Firm innovation is broadly classified into administrative and technical (Tan & Nasurdin, 2010). Administrative innovation identifies the segments that influence the social framework and individuals in the firm, for example, rules, parts, systems, and structures that are related and corresponded between one another. The technical innovation identifies to the working segment that influences the technical system in a firm. These include methods of operation, equipment, and production process. These innovations can be acknowledged by adopting new thoughts that identifies the

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products and services in the firm. It can also be realized through the introduction of new components in the process of production of goods or services.

This study focuses on both administrative and technical innovation. The administrative innovation relates to the firm's internal and external drivers which this study seeks to examine, while the technical innovation relates to green innovativeness which this study seeks to assess.

In relation to research in the field of innovation, Kimberly and Evannisko (1981) are of the view that firm innovation research could be studied from two perspectives: adoption and diffusion. The opinion of Wolfe (1994) was from three different perspectives, that is, diffusion of innovation, firm innovativeness, and process theory. Subramanian and Nilakanta (1996) divide the research stream into process of adoption of an innovation, also known as "innovation process research," while the second stream is also known as "'innovation variance research." Innovation variance research studies the relationships between innovativeness of firms, their firm characteristics, their external environment, and their firm performance. The extents of such relationships are established by the amount of variance of the dependent variable explained by the independent variables.

Salavou (2004) believes that a great deal of consideration needs to focus on the differences of findings in relation to green innovations. Therefore, according to Robertson and Gatignon (1986) and Kimberly and Evanisko (1981), this phenomenon calls for more scientific investigation to determine the determinants of innovativeness across disciplines such as marketing, social sciences and finn behaviour. This study is an innovation variance research which focuses on the influences between firm characteristics, firm environmental capabilities, and firm's

reactive drivers on firm green innovativeness located in twelve states of peninsular Malaysia. Literature has shown that prime location of contractor has a significant influence on their green innovativeness (Fell et al., 2002; Nairn & Barlow, 2003). G7 contractors are randomly selected from twelve states of the peninsular Malaysia to participate in this research. Data were collected from one representative of the firm who has the knowledge of green innovative activities of the firms' concerned.

1.6 Significance of the Study

The significant of this study can be classified into three major parts: academics, industry practice, and policy. The academic contribution can further be classified into three: green innovativeness in study in the context of building contractors, research model proposed in the study, and extending the readiness to change theory to suit the construction industry. Most green innovativeness researches do not focus on the building contractors, this study attempt to fill such research gap.

An assessment of existing green innovativeness framework shows that none was specifically suitable for measuring contractors' green innovativeness. Developing a new framework for assessing firm green innovativeness of Malaysian contractors will constitute a stepping stone in providing a means of tackling green innovativeness of contractors.

The model developed in this research strives to determine the significance of internal and external drivers claimed to affect the green innovativeness of firms. Specifically, nine factors are grouped to develop three hypothesis based on both theoretical and anecdotal arguments. Based on the result findings, a final theoretical model of

contractor's green innovativeness will be developed. This model can provide other researchers with the framework they need to explore other areas of green innovativeness in the construction industry.

Theoretically, this research test a model developed for contractors that utilize dependent variable (green innovativeness) measure that is unique and suitable for contractors when compared with previous innovation studies. In particular, this research uses propensity measure of innovativeness that captures all elements of green innovation in building construction. As a result, this innovation study specifically reflects the essence of green innovation adoption models developed within construction and business related literature. Additionally, the research study can provide managers; government institute/members; and policy makers with an instrument to assess how firm's reactive drivers such as environmental uncertainty, competition, and government support for innovation could affect green innovation adoption. Underpinned by readiness change theory, this study provides empirical evidence to bridge the knowledge gap with regard to measuring green innovativeness to identify the innovative firms in Malaysian construction industry. While other innovation researches are underpinned by innovation theory, this study extends readiness to change theory to suit the context of green innovativeness in building construction.

In practice, identifying the green innovativeness level of Malaysian contractors can be a basis for a key performance indicator and benchmarking. Additionally, the present framework could provide the right impetus for change to the current inertia towards green innovativeness in Malaysian construction industry.

1.7 Organization of the thesis

This thesis is organized into seven chapters; Chapter I provides the background information, including the problem statement, research objectives, and the significance of the study. Chapter 2 presents an overview of issues in the construction industry, the need for contractors to be innovative, and the role and characteristics of building contractors. Chapter 3 presents the discussions on innovation, green innovativeness concept, working definitions, measurement, and factors that influence green innovativeness and readiness to change theory, the conceptual framework for the research are presented. This chapter also presents the research hypotheses. Chapter 4 presents the research methodology. The chapter explains the research design, the process of sampling, the method of data collection, and the types of analysis used during the data analysis process. Chapter 5 presents the result and data analyses, research findings, reliability, and validity of the constructs and the analysis of data. Chapter 6 presents the discussions and analysis of findings and lastly Chapter 7 is on the conclusion drawn and the suggestions offered for implementation and future research.

CHAPTER 2

THE CONCEPT OF CONSTRUCTION FIRMS AND GREEN INNOVATIONS

2.1 Introduction

This chapter consists of three sections. It begins by providing the concept of firm and firm followed by the overview of the construction industry in Malaysia and also from global point of view. Then, the firm green innovativeness literature is presented in the last section of the chapter.

Construction industry operates in the business environment of which characterized by its continuous changes and intense competition. One of the methods of surviving in this challenging environment is that the contractor must increase their resources and try to identify both the internal and external factors that influence their green innovativeness.

This chapter accumulates the review from past literature relevant to the subject. First, a general summary of construction industry at the global level is discussed, followed by a brief review of the Malaysian construction industry. Next, building contractors and their roles in Malaysia are presented. The chapter then discusses the concept of green innovativeness, firm green innovativeness in tandem with readiness change theory, introduction of the definition and dimensions of firm green innovativeness in the context of construction industry, and the tools used to measure firm green innovativeness.

2.2 Overview of the Construction Industry

Construction is a significant industry representing overall extent of most nations' Gross Domestic Product (GOP). This division is the biggest modern business in many nations, accounting to around 7% of the employment sector around the world. As per an overview in Engineering News Record (ENR, 2015), total spending of the construction industry worldwide in 2014 was near USD 7.2 trillion. Crosthwaite (2000) specified, the significance of the construction business is closely related to its size as well as to its part in financial improvement. Construction industry creates the facilities that oblige a wide mixture of human exercises, and the infrastructure that interfaces these facilities into an inexorably complex system. The facilities are required for the generation of every single other great outcomes, beginning from those required by different makers and consummation with those required by a definitive buyers to complete demand and supply process.

The construction industry is both profoundly focused and cyclically delicate (Moscarini and Postel-Vinay 2009). The construction industry cannot be considered as to cater the local market only due to the globalization. Construction industries, mainly from the developed nations, are practising methodologies of internationalization that empower them to take advantage from the worldwide market. Specifically, few American and European construction companies have transported their whole operations to the Middle East, because of its lower running expenses, plenty of workers and bigger opportunities. As pointed out byNgowi et al., (2005), there are a few reason in which construction companies enter the global business, for examples: (I) economic booms, for instance, the sudden increase of oil sales, (2) respective and multilateral understandings, which set up conventions that

empower firms to enter the businesses of one another in a different countries, (3) support by a big companies and extensive projects overseas, or work for multinational companies. To achieve a competitive position in the globalized construction market, construction industry are progressively intrigued by cross-country performance comparisons. The global benchmarking is especially imperative in the construction industry, permitting a more extensive perspective of the business industry. As companies need to persistently enhance their benefit to stay focused, they are compelled to re-examine their vision, considering the firm internal conditions, their rivals' strategy, the development of the financial connection and the sustainability issues.

Construction compames are trying to implement efficient routines to achieve sustainable growth, higher income and competitive advantage. The development of structures and structural building works is embraced in a similar manner around the world: a general contractor also called a main contractor, in charge of conveying a completed product to the owner, subcontracts a significant part of the specific work to specially trade companies or normally used to be called as nominated sub-contractor. The specialty trade subcontractors have specific skills identified with a wide range of construction works, for example, carpentry, painting, pipes, electrical or mechanical work. The building construction incorporates the main contractor, who builds residential and non-residential buildings such as factories and other commercial buildings. The other type of contractors build heavy civil engineering jobs such as highways, bridges, and many other infrastructures related to the national development.

It is additionally of interest to analyse the hypothesis of convergence in efficiency across regions due to the considerable changes that occurred in the construction industry worldwide in recent years, and withal the spread of managerial methods, including the project management (Walker, 2007). North America and Europe correspond to the biggest construction industry markets, including the world's biggest contractors. North America is perhaps the leading region in terms of performance and advanced technology.

In addition, the construction industry in Asia is booming. Asia offers a huge market for construction and engineering services of all kinds and across all sectors. Demands for housing are perpetually growing as the population increases and more people move into cities. All kinds of infrastructure are needed to fortify these populations and to achieve national development objectives in all the regions. The Asian policies additionally incline to keep construction industry diligent as Governments spend on infrastructure as a way of creating jobs and boost up the economy.

2.2.1 Malaysia as the Study Setting

Malaysia received independence in 1957 from The British Colonial and the Federation of Malaysia was formed in 1963 comprising Malaya, Sabah, Sarawak and Singapore. Internal political conflict happened in 1965 forcing Singapore apart from Malaysia. Not long after that, in 1990 Malaysia had been certified as Newly Industrialized Country (NIC) and now Malaysia is the 37[1]h world economic power according to Gross Domestic Product (GOP) at current conversion to US Dollars (Raza et al., 2014).

This country consists of two regions dissevered by the South China Sea — the Malaysian Peninsula and the states of Sabah and Sarawak on the island of Borneo and is centrally located within the Association of South-East Asian Nations (ASEAN). Malaysia is a federation of 13 states and three federal territories. The former British colony gained its independence in 1957. Since Independence, Malaysia has adopted the political system of a parliamentary democracy with a constitutional monarch whose position is rotated every five years between each of the nine hereditary state rulers. The political scene has been characterized by an extra-mundane degree of political stability and continuity through an encompassing national coalition of political parties.

Its territory comprises approximately 330,000 sq km, four fifths of which are covered by tropical rainforest. Due to its bio-diverse range of flora and fauna offering excellent beaches and brilliant scenery, the country is one of the region's key touristic destinations. Malaysia is a multi-ethnic, multicultural and multilingual society with 28.66 million members. Ethnic Malays make up the majority of the population at 57.1% followed by Chinese at 24.6%, Indian at 7.3% and other local ethnicities at 11%. The Malaysian constitution guarantees liberation of religion, albeit Islam is the majority and official religion. Approx. 61.3% of the population practice Islam, 19.8% Buddhism, 9.2% Christianity, 6.3% Hinduism, and 2.6% practice Confucianism and other traditional Chinese religions. The official language of Malaysia is Bahasa Malaysia, but English as well as Chinese are the business languages.

2.2.2 Economical Perspectives

Malaysia is a dynamic country which is perpetually evolving. Being a middle-income country, Malaysia has transformed itself since the 1970s from an engenderer of raw materials into an emerging multi-sector economy spurred on by high technology, cognizance-predicated and capital-intensive industries. Malaysia's Economic Performance ranking ameliorated to 7th place out of 59 economies this year compared with 12th position in 2007. It is one of the 20 biggest trading nations worldwide and was headed of Taiwan, Sweden, Canada, Australia, the United Kingdom and Switzerland. The World Competitiveness Yearbook 20 II Report relinquished by the Institute for Management Development (IMD) perpetuated to rank Malaysia as among the top 5 most competitive nations in the Asia-Pacific region, taking 6th position in the 20 million population category and 2nd position after Taiwan in the GOP per capita less than US$20,000 category. Moreover, the country is the 21th largest exporter among all universal trading nations.

Strategically located in the heart of South-East Asia, Malaysia offers a cost-competitive location for investors intending to establish offshore operations in order to manufacture advanced technological products for both regional and international markets. In addition, Malaysia has a market-oriented economy which is fortified by pro-business Government policies. In 20 II, the Malaysian Administration launched the Economic Transformation Programme (ETP) which is managed by PEMANDU (Performance Management & Distribution Unit) under the patronage of the Prime Minister. The ETP identifies 12 National Key Economic Areas (NKEAs) which are drivers of economic activities that have the potential to materially contribute to the magnification of Malaysia. Its objective known as Vision 2020 of which to transform