Contractors' Environmental Sustainability: The Roles of Innovativeness and Market Orientation

Jibril Adewale Bamgbade[#1], Ahmed Mohammed Kamaruddeen[*2], Mohd Nasrun Mohd Nawi[#3]

[#]*School of Technology Management and Logistics, Universiti Utara Malaysia, Kedah, Malaysia, School of Technology Management and Logistics, Universiti Utara Malaysia, Kedah, Malaysia*

[1]jibril1717@yahoo.com

[3]nasrun@uum.edu.my

[*] *Department of Quantity Surveying, School of Built Environment, University College of Technology Sarawak, Malaysia,*

[2]qamaruddeen@yahoo.com

***Abstract*— This paper aims to conceptualize the influence of certain organisational innovativeness factors and market orientation on environmental sustainability adoption by Malaysian large contractors. The framework developed in this study intends to establish the link between product innovativeness, process innovativeness, and market orientation (as predictors) and environmental sustainability (the criterion variable) using organisational readiness for change theory to underpin these relationships. Although, it is expected that the findings of this study can be used to develop strategies that could improve environmental sustainability adoption among these contractors, this study did not consider other factors that could also explain the environmental sustainability adoption. It is expected that this study's findings could assist in developing strategies to increase the rate of environmental sustainability adoption among the contractors. Again, it could also be useful for policy makers and other construction industry players.**

***Keywords*—** *Environmental sustainability; product innovativeness; process innovativeness; market orientation*

1. Introduction

The built environment contributes greatly to human's daily life, but the processes involved, and the management of construction products adversely impact the environment so much so that the construction industry has been labelled as one of the major contributors to the greenhouse gas emissions. Aside the air, noise and waste pollution generated by construction processes and the existing building stocks, fossil fuels and minerals extraction use crude processes that are capable of changing the land ecological characteristics. While the recognition of the need for environmental sustainability within the construction industry has been around for several years the construction sector is still taking the lead in energy consumption [1]. An approximately 10% of the global energy consumption goes to building materials manufacturing. Construction and demolition contributes about 40% of the solid waste generated in the developed nations, while operation stage of construction products emits almost 40% of the entire global greenhouse gas emissions [2]. With the apprehension associated with non-renewable resource shortage and the ever-increasing cost of energy, it is imperative to regulate the construction industry's energy consumption.

The environmental sustainability's role in addressing the complex problems of construction and the environment have become an increasingly pressing challenge, especially in order to restore balance between the natural and the built environment, as both realms are highly interconnected [3]; [4]; [5]. In view of the obvious benefits that are associated with environmental sustainability within the construction industry, and considering the size and importance of the construction industry to economic development of many countries and its immense contribution to environmental damage, construction stakeholders, public governments and their agencies are increasingly integrating the concept into construction project execution to improve the construction industry's overall performance [6]; [7]. This important concept will also improve the industries' image, because for a long time, the construction industry pays little or no attention to the continued existence of human communities.

Furthermore, while incorporating the principles of environmental sustainability, the contractors are expected to be innovative to attain societal and clients' satisfaction, aspirations and needs while also improving their competitive advantage [8]. This will require the industry to develop and implement new ideas that has both practical and commercial benefits [9]. Innovation in

International Journal of Supply Chain Management
IJSCM, ISSN: 2050-7399 (Online), 2051-3771 (Print)

construction is generally believed to include a significant introduction of new processes, products or management approaches, which is expected to increase organisational efficiency [10].

Towards meeting the objectives of this study, the rest of this article is organized as follows: the next section reviews readiness for change theory. Then, the relevant literatures related to environmental sustainability is discussed. Next, product innovativeness, process innovativeness, and market culture are discussed alongside their relationships with environmental sustainability.

2. Conceptualization of Readiness for Change Theory

Readiness for change as conceptualized by Armenakis Harris & Mossholder [11], refers to "cognitive precursor to the behaviours of either resistance to, or support for, a change effort" (p.681). According to Weiner [12], organisational readiness for change is a multifaceted construct which is composed of two dimensions: change commitment and change efficacy. The change commitment is a reflection of organisational employees' shared determination to implement the proposed change. Change efficacy, on the other hand, explains employees' shared belief in their collective capacity to implement a proposed change [13]. Although organisational readiness for change has been conceptualized as a multi-level construct [14], the focus here is on one set of the behaviours that is organization-specific as that would allow us to attain a parsimonious concept development and measurement. This dimension is preferred in this study, especially considering Weiner, et al's [13] position that when an organisation exhibits high readiness for change, members are more likely to effectively initiate the change agenda, practices and procedures that are needed to support innovation. Therefore, firms need a better understanding of organisational readiness for change to implement or generate innovations [15].

In the same manner, environmental sustainability is perceived as a change initiative involving all players within construction organisations at every level of the project execution to be willing to change from traditional practices and explore innovative construction concepts, practices, products and ideas that are aligned with the concept of environmental protection [16]. Thus, focusing on readiness for change at organisational level would provide opportunities for future studies that are directed toward collective capacity to implement a change.

3. Environmental Sustainability

The ecological and resource demands that are associated with transforming human societies are quite challenging [17]. Globally, buildings and infrastructural development are important energy consumers, and has also increased pressure on the environment [18]. An approximate 10% of the global energy consumption goes to building materials manufacturing. Construction and demolition contributes about 40% of the solid waste generated in the developed nations, while operation stage of construction products emits almost 40% of the entire global greenhouse gas emissions [2]. With the apprehension associated with resource shortage and the ever-increasing cost of energy, it is imperative for the construction industry to adopt the principles of environmental sustainability in construction. This necessitated the emergence of an international collaborations during the last decade to drive the construction industry towards the path of sustainable development [19]-[20].

Environmental sustainability is aimed at reducing impacts and make the construction activities more sustainable [21], [22]. This concept became important due to construction's damaging effects, such as various forms of environmental pollution, resource depletion and biodiversity loss on a global scale [23]. And there are several identified issues under environmental sustainability requiring analysis of construction industry's impacts on the immediate environment to be viewed from "cradle to grave" perspective [23]. The construction industry is expected to create a healthy and non-toxic environment by consuming less renewable and non-renewable materials. In the long run, a construction design that is environmental-friendly is capable of realizing the goals of environmental sustainability as it will encourage a healthy and safe interior atmosphere, energy efficiency, the use of ecological benign materials, as well as attaining eco-conscientious communities [24], [25].

Environmental sustainability in construction also includes natural resource extraction, which contractors and builders have little or no influence upon, but which they can discourage by demanding less finite natural resources, more recycled materials, and waste generated in other manufacturing processes, thus resulting in increased competition to produce more eco-efficient products [23], [25]. Shifting and adapting to reuse in construction is a movement that has gained more recognition from many researchers [26], [27], [28], as this supports the key drivers of environmental sustainability in terms of reducing resource consumption, energy use in transporting materials, thereby reducing pollution and conserves bio-diversity.

A review of literature [29], [30], [31], [32] reveals that all construction activities consume large amount of certain constituents of the earth's non-renewable resources. The usage of these generic resources (energy, water, land and materials) results in changes to ecological structure of the biosphere [33]. The construction industry requires extractions and consumption from the earth's resources in order to continually preserve the built environment. And these consumptions, according to Sev, [34], include the energy needed to maintain the existing

stock (operational energy consumption), which is far greater than their embodied energy. It is for this reason that the construction firms need to consider resource management as a vital management tool to attain the three R's of reduction, reuse and recycling of the non-renewable resources (Figure 1).

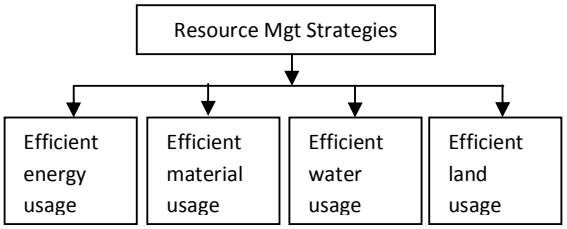

Figure 1. Strategies for achieving Environmental Sustainability in Construction. (Adapted from Ref. [34])

4. Product Innovativeness and Environmental Sustainability

Product innovativeness is a distinct phenomenon that contributes to organisational growth and competitiveness [35]. And it is becoming almost impossible for firms nowadays to ignore innovativeness in production considering the outpouring of its importance and the rate at which companies rely on them for competitive advantage [36].

Thus, product innovativeness is pursued in response to customers' demand for new products or executives' desire to penetrate new markets. According to Wang and Ahmed, Hilmi, Ramaya, Mustapha and Pawanchik, and Akgun, Keskin, Byrne and Aren [37], [38], [39], as quoted in Kamaruddeen *et al*., [40], product innovativeness refers to the uniqueness of new products that is being introduced to the clients in an appropriate period. Product innovativeness is important for several reasons. Aside the fact that it presents a great opportunities for firms in terms of growth and expansion into new areas, substantial product innovations is known to establish firm's competitive dominant positions, while giving newcomer firms a strong leverage within the industry [41]. Earlier studies [42], [43] suggested that more innovative products require additional firm resources and a novel approach to be successful. Product innovativeness also implies capacity of the firm to deliver new products using technology to supersede competitors in offering and other products introduced by the firm.

The green innovation literature has demonstrated that the market performance of new products that incorporates green dimension is gradually improving lately by assuming higher demands, thereby phasing-out the non-green alternatives and the environmentally unfriendly products. According to Kam-Sing Wong, [44], the successes recorded by incorporating green into new product was measured using product's perceived environmental performance, firms' economic prosperity, and consumers' subjective assessment. And it was revealed that green innovative products are well justified by its capacity to meet both consumer and corporate environmental requirements. However, it is important to detail out the level at which product innovativeness within the construction industry can improve environmental protection, and push the construction stakeholders to concentrate more on different innovativeness dimensions that are needed to be implemented in construction projects lifecycle [45]. While contractors are known to develop a number of innovativeness subject to their specialized areas, other professionals within built environment also needs to strive to develop technologies that not only capitalize on higher profitability and cost efficiency, but also to reduce construction impacts on the environment [46].

Innovative construction products must be responsive to customer choices, be flexible in construction type that is adaptable to users' changing needs, uses reduced materials and lesser energy during material transportation and actual on-site construction, including functionality of construction components [47]. Thus, following Kamaruddeen *et al*., [40], this study defines product innovativeness as Malaysian contractor's readiness and capability to introduce innovative construction products or materials to the market, or adopt same within a reasonable timely fashion.

Consistent with the foregoing empirical evidence and theoretical perspective, it is expected that product innovativeness may improve the adoption of environmental sustainability among Malaysian contractors.

5. Process Innovativeness and Environmental Sustainability

Process innovativeness refers to the innovation in the production mode. While new products development are often regarded as innovation cutting edge within the marketplace, process innovativeness also plays a very important and strategic role by its ability to make products (technological or management related) no one else can, or fashion it in such a way that it is seen better than any other one [48]. And this portends a powerful source of advantage for firms [49]. Within construction, process innovativeness is characterized by innovations that occur leading to the sequence of operations to achieve an outcome or end-product, even though, there is no requirement for the process innovation to affect the nature of the end product. Process innovativeness, being an "*optimization and getting the bugs out of the system*", empowers firms by reducing operational costs, and its adoption is assumed to be determined by certain

environmental and organisational factors [35]. Thus, process innovativeness is important within construction, being an industry with certain peculiarities. And considering the fact that construction is an industry driven by single and unique projects [50], it is expected that the construction firms consider the uniqueness of each project and deploys techniques within the context of client's requirement and demands. Therefore, each construction project requires a better understanding of the different forms of process innovativeness attributes existing within its context [51].

Within the construction industry, process innovativeness involves procedures like lean thinking and agile production [52]. These processes allow firms to meet the market objectives in different perspectives, and also requires them to better understand customers' needs, minimize waste, and reduce defects during the production process [53]. Innovative construction processes have also been noted to reduce the environmental burden of construction projects. And construction that exhibit such processes is always known for value creation which stimulates higher profitability and market share, enhanced stakeholder value, better organizational image and improved environmental sustainability performance [54], [55]. However, this will require the construction firms to change their technologies and better understand the fundamentals of environmental sustainability in building construction [56], [57]. In this study, process innovativeness refers to the readiness and capability of Malaysian contractors to implement innovative construction processes in order to gain more competitive advantage within the industry. It is anticipated that a causal relationship might exist between process innovativeness and environmental sustainability. Therefore, we hypothesize that process innovativeness will improve contractor's environmental sustainability adoption.

6. Market Orientation and Environmental Sustainability

In market-orientation culture, implementation of marketing procedures that prioritizes customer satisfaction more than competitor's ability to do same is stressed. Thus, firms with this cultural alignment believe that customer satisfaction is the most effective way to achieve firms' objectives [58]. Research has however suggested that clients are beginning to demand for environmentally sustainable and eco-friendly products and services [59], [60]. This demand, according to Doonan, Lanoie and Laplante [61], is one of the most important factors driving environmental sustainability adoption, and market oriented firms are always striving to provide products that are environmentally friendly [62]. However, to sustain this cultural dimension, firms are required to develop efficient information systems about customers and competitors, because customer's satisfaction and expectation is a continuous phenomenon that evolves over time, and consistently delivering quality products and services requires consistent observation and response to the changes and needs in the marketplace [63]. Again, market oriented firms promote market penetration with innovative products and services over old and unsustainable practices. And, such organisation assesses market demands and the policies performance on a regular basis, yielding constant and improved environmental sustainability [8], [64]. Therefore, we posit that market oriented firms is a prerequisite and a contributor to environmental sustainability performance in firms.

Based on the theoretical stance discussed above, the conceptual model for the present study is depicted in Figure 2. As shown in the Figure, environmental sustainability is the criterion variable while product innovativeness, process innovativeness and market orientation are the predictors.

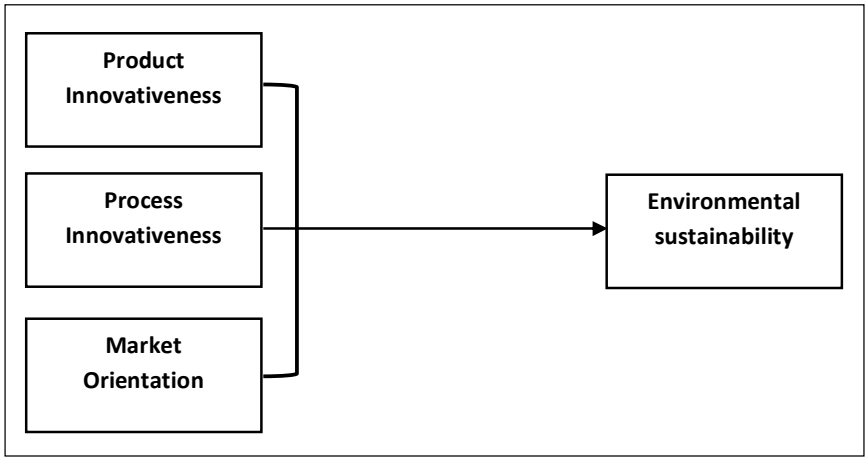

Figure 2. Conceptual model

7. Conclusion

The major contribution of this study is to conceptualize the influence of organisational innovativeness factors and market orientation culture on environmental sustainability adoption by Malaysian large contractors. It was argued that these factors can be given more considerations by Malaysian Construction Industry to determine the level of compliance with the environmental regulations of the Malaysian government. By implication, if these innovativeness factors and market orientation culture are given more considerations, the contractors will be more willing to adopt environmental sustainability. The findings of this study can be used to develop strategies to increase the rate of environmental sustainability adoption among the contractors.

The identified limitations of this study are as follows: first, although this study considered organisational innovativeness factors that have been found to influence the adoption environmental sustainability in construction organisations, it did not consider other possible organisational innovativeness dimensions (e.g. business innovativeness and new technology) that could also influence environmental sustainability adoption. Second, the study focused only on large contractors. Although, these companies have been observed to be more capable to adopt environmental sustainability than other construction SMEs who are constrained due to their size and resource inadequacy [65], [66], [67], and [68]. Other previous studies have revealed that larger contractors are oftentimes compelled by government regulatory requirements to heed to sustainability considerations. However, environmental sustainability adoption goes beyond firm size. It is, to a large extent, a function of the perceived inherent economic benefits [69].

Acknowledgements

Authors of this paper acknowledge the research funding from the Fundamental Research Grant Scheme (FRGS), Managed by RIMC, Universiti Utara Malaysia (S/O code 12809).

References

[1] Wong, J. K. W., & Zhou, J. *"Enhancing environmental sustainability over building life cycles through green BIM: A review"*. Automation in Construction, Vol 57, pp. 156-165, 2015

[2] Rode, P., Burdett, R., & Soares Gonçalves, J. C. *"Buildings: investing in energy and resource efficiency"*, 2011.

[3] Kibert, C. J. *Sustainable construction: Green building design and delivery* (2nd ed.). Hoboken, NJ: John Wiley & Sons, 2008.

[4] Ofori, G. "*Challenges facing the construction industries of Southern Africa*", Paper presented, Presented at Regional Conference: Developing the Construction Industries of Southern Africa, Pretoria, South Africa, 2001.

[5] Du Plessis, C. "*Agenda 21 for sustainable construction in developing countries*", *CSIR Report BOU E, 204*, 2002.

[6] Ahn, Y. H., Pearce, A. R., Wang, Y., & Wang, G. Drivers and barriers of sustainable design and construction: The perception of green building experience. International Journal of Sustainable Building Technology and Urban Development, Vol 4, No. 1, pp. 35-45, 2013.

[7] Murray, P. E., & Cotgrave, A. J. *"Sustainability literacy: the future paradigm for construction education?"*, Structural Survey, Vol 25, No.1, pp. 7-23, 2007.

[8] Green, K. W., Toms, L. C., & Clark, J. *"Impact of market orientation on environmental sustainability strategy"*. Management Research Review, Vol 38, No. 2, pp. 217-238, 2015.

[9] Dulaimi, M. F., Nepal, M. P., & Park, M. *"A hierarchical structural model of assessing innovation and project performance"*, Construction Management and Economics, Vol 23, No. 6, pp. 565-577, 2005.

[10] Seaden, G., Guolla, M., Doutriaux, J., & Nash, J. *"Strategic decisions and innovation in construction firms"*, Construction Management and Economics, Vol. 21, No. 6, pp. 603-612, 2003.

[11] Armenakis, A. A., Harris, S. G., & Mossholder, K. W. *"Creating readiness for organizational change"*, Human relations, Vol 46, No. 6, pp. 681-703, 1993.

[12] Weiner, B. J. *"A theory of organizational readiness for change"*. Implement Sci, Vol 4, No. 1, pg. 67, 2009.

[13] Weiner, B. J., Lewis, M. A., & Linnan, L. A. *"Using organization theory to understand the determinants of effective implementation of worksite health promotion programs"*, Health Education Research, Vol 24, No. 2, 292-305, 2009.

[14] Shea, C. M., Jacobs, S. R., Esserman, D. A., Bruce, K., & Weiner, B. J. *"Organizational readiness for implementing change: a psychometric assessment of a new measure"*, Implement Sci, Vol 9, No. 7, pp. 1-15.

[15] Panuwatwanich, K., & Stewart, R. A. *"Evaluating innovation diffusion readiness among architectural and engineering design firms: Empirical evidence from Australia"*, Automation in construction, Vol 27, pp. 50-59, 2012.

[16] Adjarko, H., Osei-Poku, G., & Ayarkwa, J. *"Challenges to the Incorporation of Environmental Sustainability Issues into Construction Procurement at the Local Government Level of Ghana"*, International Refereed Journal of Engineering and Science, Vol 3, No. 11, pp. 42-52, 2014.

[17] Chang, Y., Ries, R. J., & Wang, Y. *"The embodied energy and environmental emissions of construction projects in China: an economic input–output LCA model"*, Energy Policy, Vol 38, No. 11, pp. 6597-6603, 2010.

[18] Ferroukhi, R., Ghazal-Aswad, N., Androulaki, S., Hawila, D., & Mezher, T. *"Renewable energy in the GCC: status and challenges"*, International Journal of Energy Sector Management, Vol 7, No. 1, pp. 84-112, 2013.

[19] Bresnen, M. *"Advancing a 'new professionalism': professionalization, practice and institutionalization"*, Building Research & Information, Vol 41, No. 6, pp. 735-741, 2013.

[20] Kajikawa, Y., Inoue, T., & Goh, T. N. *"Analysis of building environment assessment frameworks and their implications for sustainability indicators"*, Sustainability Science, Vol 6, No. 2, pp. 233-246, 2011.

[21] Abidin, N. Z. *"Sustainable Construction in Malaysia – Developers' Awareness"*. Proceedings of World Academy of Science, Engineering and Technology, pp. 807-814, 2009.

[22] Akadiri, P. O., Chinyio, E. A., & Olomolaiye, P. O. *"Design of a sustainable building: A conceptual framework for implementing sustainability in the building sector"*. Buildings, Vol 2, No. 2, pp. 126-152, 2012.

[23] Ofori, G., Briffett, C., Gang, G., & Ranasinghe, M. *"Impact of ISO 14000 on construction enterprises in Singapore"*. Construction Management & Economics, Vol 18, No. 8, pp. 935-947, 2000.

[24] Stansfield, K. *"Setting a New Agenda for Sustainable Construction"*, Structural Engineer, Vol 79, No. 12, pp. 14 -15, 2001.

[25] Darwish, A. S. *"Eco-Friendly Buildings: the central factor in transitioning to a Green Economy"*, International Journal of Environment and Sustainability (IJES), Vol 1, No. 1, 2014.

[26] Gallant, B. T., & Blickle, F. W. *"The building decommissioning assessment: A new six-step process to manage redevelopment of brownfields with major structures"*, Environmental Practice, Vol 7, No. 02, pp. 97-107, 2005.

[27] Kohler, N., & Hassler, U. *"The building stock as a research object"*. Building Research & Information, Vol 30, No. 4, pp. 226-236.

[28] Bon, R., & Hutchinson, K, *"Sustainable construction: some economic challenges"*. Building Research & Information, Vol 28, No. 5-6, pp. 310-314, 2000.

[29] Kibert, C. J, *"The next generation of sustainable construction"*. Building Research & Information, Vol 35, No. 6, pp. 595-601, 2007.

[30] Marcouiller, D. W., & Tremble, D, *"Mitigating Environmental Problems in Exurban Development: An Overview of Rural-Specific Planning Devices"*, In *The Planner's Guide to Natural Resource Conservation:* (pp. 235-253). Springer New York, 2009.

[31] Tan, Y., Shen, L., & Yao, H, *"Sustainable construction practice and contractors' competitiveness: A preliminary study"*, Habitat International, Vol 35, No. 2, pp. 225-230, 2011.

[32] Yuan, H, *"Critical management measures contributing to construction waste management: Evidence from construction projects in China"*, Project Management Journal, Vol 44, No. 4, pp. 101-112, 2013.

[33] Fuertes, A., Casals, M., Gangolells, M., Forcada, N., Macarulla, M., & Roca, X, *"An environmental impact causal model for improving the environmental performance of construction processes"*, Journal of cleaner production, Vol 52, pp. 425-437, 2013.

[34] Sev, A, *"How can the construction industry contribute to sustainable development? A conceptual framework"*, Sustainable Development, Vol 17, No. 3, pp. 161-173, 2009.

[35] Damanpour, F, *"An integration of research findings of effects of firm size and market competition on product and process innovations"*, British Journal of Management, Vol 21, No. 4, pp. 996-1010, 2010.

[36] Wilden, R., & Gudergan, S. P, *"The impact of dynamic capabilities on operational marketing and technological capabilities: investigating the role of environmental turbulence"*, Journal of the Academy of Marketing Science,Vol 43, No. 2, pp. 181-199, 2015.

[37] Wang, C. L., & Ahmed, P. K, *„The development and validation of the organisational innovativeness construct using confirmatory factor analysis"*, European Journal of Innovation Management, Vol 7, No. 4, pp. 303-313, 2004.

[38] Hilmi, M. F., Ramaya, T., Mustapha, Y., & Pawanchik, S, *"Product and Process Innovativeness: Evidence from Malaysian SMEs"*, European Journal of Social Sciences, Vol 16, No. 4, pp. 556-564, 2010.

[39] Akgun, A. E., Keskin, H., Byrne, J. C., & Aren, S, *„Emotional and learning capability and their impact on product innovativeness and firm performance"*. Technovation, Vol 27, pp. 501-513, 2007.

[40] Kamaruddeen, A. M., Yusof, N. A., & Said, I, *"Innovation and Innovativeness: Difference and Antecedent Relationship"*, The Icfai University Journal of Architecture, Vol 2, No 1, 2010.

[41] Danneels, E., & Kleinschmidt, E. J, *"Product Innovativeness from the Firm's Perspective: Its Dimensions and Their Impact on Project Selection and Performance*. Developments In Marketing Science, Vol 22, pp. 409-409, 1999.

[42] Lynn, Gary S, *"New Product Team Leaming: Developing and Profiting from Your Knowledge Capital"*, California Management Review, Vol 40, No. 4, pp. 74-93, 1998.

[43] Lynn, Gary S., Joseph G. Morone, and Albert S. Paulson, *"Marketing and Discontinuous Innovation: The Probe and Leam Process"*, California Management Review, Vol 38, No. 3, pp. 8-37, 1996.

[44] Kam-Sing Wong, S. *"The influence of green product competitiveness on the success of green product innovation: Empirical evidence from the Chinese electrical and electronics industry"*, European Journal of Innovation Management, Vol 15, pp. 468-490, 2012.

[45] Murphy, M. E., Perera, S., & Heaney, G, *"Innovation management model: a tool for sustained implementation of product innovation into construction projects"*, Construction Management and Economics, Vol 33, No. 3, pp. 209-232, 2015.

[46] de Medeiros, J. F., Ribeiro, J. L. D., & Cortimiglia, M. N, *"Success factors for environmentally sustainable product innovation: a systematic literature review"*, Journal of Cleaner Production, Vol 65, pp. 76-86, 2014.

[47] Dammann, S., & Elle, M. (2006). Environmental indicators: establishing a common language for green building. *Building Research & Information*, *34*(4), 387-404.

[48] Riivari, E., Lämsä, A. M., Kujala, J., & Heiskanen, E, *"The ethical culture of organisations and organisational innovativeness"*, European Journal of Innovation Management, Vol 15, No. 3, pp. 310-331, 2012.

[49] Tidd, J., Bessant, J., & Pavitt, K, *Managing innovation: integrating technological, market and organizational change* (3rd ed.): Wiley, John, 2003.

[50] Sexton, M., & Barrett, P, *"A literature synthesis of innovation in small construction firms: insights, ambiguities and questions"*, Construction Management and Economics, Vol 21, No. 6, pp. 613-622, 2003.

[51] Thomson, C. S, *A study of the innovation process within the construction project environment.* (PhD Thesis), University of Dundee, Dundee, Scotland, 2006.

[52] Lwamba, N. M., Bwisa, H., & Sakwa, M, *"Exploring Innovativeness Dimension of Corporate Entrepreneurship on Financial Performance of Manufacturing Firms in Kenya"*. International Journal of Business and Social Science, Vol 4, No. 17.

[53] Kemp, R., & Pontoglio, S, *"The innovation effects of environmental policy instruments—A typical case of the blind men and the elephant?"*. Ecological Economics, Vol 72, pp. 28-36, 2011.

[54] Tseng, M. L., Wang, R., Chiu, A. S., Geng, Y., & Lin, Y. H, *"Improving performance of green innovation practices under uncertainty"*, Journal of Cleaner Production, Vol 40, pp. 71-82, 2013.

[55] Zhu, Q., Sarkis, J., & Lai, K. H. *"Green supply chain management innovation diffusion and its relationship*

to organizational improvement: An ecological modernization perspective", Journal of Engineering and Technology Management, Vol 29, No. 1, pp. 168-185, 2012.

[56] Bos-Brouwers, H. E. J. "*Corporate sustainability and innovation in SMEs: evidence of themes and activities in practice"*. Business Strategy and the Environment, Vol 19, No. 7, 417-435, 2010.

[57] Rohracher, H. "*Managing the technological transition to sustainable construction of buildings: a socio-technical perspective"*. Technology Analysis & Strategic Management, Vol 13, No. 1, pp. 137-150, 2001.

[58] Crittenden, V.L., Crittenden, W.F., Ferrell, L.K., Ferrell, O.C., and Pinney, C.C, "*Market-oriented sustainability: a conceptual framework and propositions"*, Journal of the Academy of Marketing Science, Vol 39, pp. 71-85, 2011.

[59] Bamgbade, J.A, Kamaruddeen, A.M., Nawi, M.N.M, "*Factors Influencing Sustainable Construction among Construction Firms in Malaysia: A Preliminary Study using PLS-SEM"*. Rev. Téc. Ing. Univ. Zulia, Vol 38, No. 3, pp. 132 – 142, 2015.

[60] Carbone, V., & Moatti, V, "*Greening the supply chain: Preliminary results of a global survey"*. In *Supply Chain Forum:* An International Journal. Vol 9, No. 2, pp. 66-76. Taylor & Francis, 2008.

[61] Doonan, J., Lanoie, P., & Laplante, B, "*Determinants of environmental performance in the Canadian pulp and paper industry: An assessment from inside the industry"*. Ecological Economics, Vol 55, No. 1, pp. 73-84, . 2005.

[62] Green Jr, K. W., Zelbst, P. J., Bhadauria, V. S., & Meacham, J, *Do environmental collaboration and monitoring enhance organizational performance?*. Industrial Management & Data Systems, Vol 112, No. 2, pp. 186-205, 2012.

[63] Jaworski, B. J., & Kholi, A. K. *"Market Orientation: Antecedents and Consequences"*. Journal of marketing, Vol 57, pp. 53-70, 1993.

[64] Green, K. W., Toms, L. C., & Clark, J. "*Impact of market orientation on environmental sustainability strategy"*, Management Research Review, Vol 38, No. 2, pp. 217-238.

[65] Darnall, N., Henriques, I., & Sadorsky, P. "*Adopting proactive environmental strategy: the influence of stakeholders and firm size"*. Journal of Management Studies, Vol 47, No. 6, pp. 1072-1094, 2010.

[66] Li, X., Zhu, Y., & Zhang, Z. "*An LCA-based environmental impact assessment model for construction processes"*. Building and Environment, Vol 45, No. 3, pp. 766-775, 2010.

[67] Qi, G., Shen, L., Zeng, S., & Jorge, O. J. "*The drivers for contractors' green innovation: an industry perspective"*. Journal of Cleaner Production, Vol 18, No. 14, pp. 1358-1365, 2010.

[68] Zeng, S. X., Tian, P., & Tam, C. M. "*Overcoming barriers to sustainable implementation of the ISO 9001 system"*. Managerial Auditing Journal, Vol 22, No. 3, pp. 244-254.

[69] Sezer, A. A. "*Contractor use of productivity and sustainability indicators for building refurbishment"*. Built Environment Project and Asset Management, Vol 5, No. 2, pp. 141-153.