



A Framework for Multi-Dimensional Perspectives of Green Practices in Construction Sector

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ABSTRACT

Concern about the outcome of human interaction with the environment has increased demand for environmentally friendly practices. Research on environmentally friendly practices indicates that green practices can be implemented at individual-firm-project levels. Changing the construction industry to a more environmentally friendly one requires a multi-faceted sequence at individual, project and organizational levels. Yet, there persists unclear understanding of the relevance of certain influencing factors at each of these stages. The aim of this paper is to advance a multi-perspective model of green construction practice. At the moment, there is a dearth of literature on the interrelationship of green practices at individual-firm-project levels. Thus, not much is known about the interplay of the three levels in influencing implementation of green practices in the industry. The present study, therefore, bridges the knowledge gap; and theorizes possible influences of interplay between the three dimensions of green practices. This is relevant to practitioners and scholars interested in green practices research.

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Introduction

There is overwhelmingly increasing evidence suggesting overbearing environmental limits on the planet earth, hence endangering the world population (Du Plessis, 2007). Meanwhile, one of the major challenges confronting the universe is how to achieve environmental sustainability practices (Huber, 2004). There is also intense pressure for environmentally friendly practices in construction sector, which requires new approach to mitigate the problems arising from their activities (Du Plessis, 2007; Smith & Perks, 2010). Emerging environmental guidelines provides minimum limit to the negative environmental impact and at the same time lower energy consumptions (Jang, Choi, Kim, & Chang 2012). The pressure towards green practices among industry players are based on many problems and the failure of the previous practice (Liu, Low, & Yang 2013).

Construction sector is indisputably one of the leading hazardous and risky industries in most countries of the world (Ding, 2008). The industry consumes about 40% of all resources with adverse environmental effect (Suliman & Abdelnaser, 2009), depletes the scarce natural resources and pollutes the environment (Hillstad, Xie & Haugland, 2010). To drive the industry towards attaining environmental sustainability, professionals in the built environment should adopt green practices at all levels. Hence, identifying interrelationship of green practices at individual-firm-project level becomes imperative. While concern about environmental issues is increasing, not much is known on how environmental strategies evolve over time (Dahlmann & Brammer, 2011).

Green construction practices are key success factor for achieving environmental sustainability (Odebiyi et al., 2010). The concept at project level includes maintaining suitable approaches in terms of choice of materials, sources of materials, concept and design methodology to improve the overall performance, decrease environmental burden of projects, waste

reduction and achieve environmentally friendly ecology (Abolore, 2012).

Previous research may have settled on why firms implement green practices (Nunes & Benett, 2010). However, there seems to be dearth of available literature that highlight on the possible influence of the interplay at individual-firm-project levels. This resulted on the growing concern for more sustainable practices to construction activities generally, including the attitudes, disposition and responses of key industry players for its capacity to considerably reduce the built environment role in energy consumptions (Robichaud & Anantatmula 2011).

Similarly, green practice in construction requires to be implemented at the individual-firm-industry (Zainul Abidin, et al 2012), there by devising new approaches to the built environment profession. Changing the construction industry to become more environmentally friendly requires multi-faceted sequence at individual, project and organizational levels. Yet persists unclear understanding of the relevance of certain influencing factors at each of these stages (Marshall et al 2005).

El Dief & Font (2010) focuses specifically on hospitality industry at both individual and firm levels of implementing environmental management strategies and identifies two dimensions of planning/organization and operations. Zuo & Zhao (2014) observes that though there were substantial researches on various aspects of green construction from diverse perspectives; there is insufficient and systematic review of existing body of knowledge which plays a critical role to not only identify the common research clusters but also indicate future research trends. In addition, at the moment there are limited published articles suggesting a possible influence of interrelationship between green construction practices at individual-firm-project levels. Not much is known about the interplay of the three levels in influencing the adoption of environmentally friendly practices in the industry. One major contributions of this study is bridging the knowledge gap and

complementing the existing literature by modeling the interplay of dimensions of green construction practices.

The Concept of Green Practices

The history of green practice can be reflected back to the space programmes which provide details on the fragility of the planet earth, thus intensifying call for increased environmental conservation strategies (Manaktola & Jauhari 2007; Han, et al 2010). However, understanding green practices stem from environmental sustainability principles. The process of observing and reconstructing human interaction with the natural environment was pursued with the ideal behaviour of optimum environmental conservation (Faghihmani, M. 2010); emphasizing on a more balanced and mutually beneficial attitude between the diverse eco-system. It is an idea of environmental responsiveness founded by scholars such as Arago'n-Correa (1998), Sharma & Vredenburg (1998) in the management literature, referring to firms' propensity to implement environmentally friendly practices beyond regulatory requirements. The practice falls within the followings: land saving, material conservation, energy saving, storm water runoff-reducing, and pollution reduction (ECO Northwest, 2001; Shi, et al 2013), thus focusing on integrating the core environmental values. These are implementable practices which set to minimize negative environmental effects (Lee, Abdul Wahid & Goh, 2013) encompassing 3Rs of reduce, reuse and recycle (Mohindra, 2008).

Saha & Darnton (2005) views on "green" reflects issues such as environmental concerns, preservation of biodiversity, humanitarian concerns, clean water, corporate social responsibility, fair trade, animal welfare, equality and sustainability. The interpretation of green is industry specific, aiming at environmental protection, when describing products/project as green. Green product may equally be conceived in relation to specific period. For example, some project might have green concept at the initial stage but environmentally unsafe as the project ages.

The studies of González-Benito & González-Benito (2006) categorize environmentally friendly practices into three perspectives: planning/organizational, operational practices and communication practices. They further suggest that planning and organizational practices indicate how environmental sustainability approach has been adopted. These relate to organizational culture which is implemented at firm level. The operational practices imply transformation in the entire processes, which is necessary for the protection of the environment (Sarkis, 2001), which can be broadly categorized product and process related practices (González-Benito & González-Benito 2006).

Definitions of greening fit well with micro or macro aspects of protecting the earth and, more specifically, local communities are deeply rooted in an understanding of greening (Lucas-Darby, 2011). Furthermore, adopting green practices will result in enhanced use of scarce natural resources, while maintaining a balanced ecosystem (Smith & Perks, 2010). Green practices are often interchangeably used to mean environmentally friendly practices/behaviours, pro-environment practices, eco friendly practices, environmental sustainability and environmental proactivity among others. This has to do with environmental protection generally, which depends on the industry, level of involvement and implementations, commitments and attitudes.

Pro-environmental practice/behavior is an integrated activity which is based on the perspective for considering ecological dimension and ecosystem so that all actions offer minimum environment impact (Kollmuss & Agyeman 2002;

Steg & Vlek, 2009; Suwanto, W.A. 2013). It includes implementing environmental regulations as set by the state (Henriques & Sadorsky, 1996). Green practice when implemented at various levels, allows organizations to determine the degree of their overall actions on environment and how to improve where necessary (Berry & Rondinelli, 1998 in Darnall, et al. 2010). Implementing environmentally friendly practices facilitate environmental management which is beneficial to the entire eco system, offers competitive edge and increase end user satisfaction (Seroka-Stolka & Jelonek 2013). Claver, et al (2005) summarize green practices to mean "producing more with less". In other words, green practices are an attitude towards environmental sustenance, transversing human, organizational, community and products endeavor. It is a green behavior for production, manufacturing, construction, consumption, etc which can be adopted and implemented at various levels, including environmental management strategies, proactivity and stewardship.

Above discussion describes various definition and concept of green practices as proffered by different scholars, which is often perceived from behavioral perspectives, process, materials sourcing and supply, policy implementations, products design, consumer actions etc or combination of both, which are industry specific. There is the general consensus that green practices concept revolves round environmental sustainability principles. This is hitherto referred to as environmentally friendly, eco friendly environmental proactivity. The practice targets strategic approach that allows optimum resource utilization, limiting waste generation and promoting healthy biodiversity interaction. Similarly, it is about behaviours and attitudes which can be adopted at individual level, organization level and product/project level that provides the leads towards green agenda.

Green Construction Practice

Environmental concern and their strategy including planning, design and construction principles have been traced back to the late 19th century (Cassidy, 2003) with green practices and construction movement that started in the 1970s during the Global Energy Crisis. In construction industry's context, the term 'green' connotes meaning such as high performance, environmental-friendly, sustainable, integrated design and energy efficient, environmentally-sustainable (see for example Kibert, Sendzimir & Guy, 2002; Zainul Abidin, N., Yusof, N. & Awang, H. 2012; Lehtiranta, Liisa, Hampson, Keith, & Kenley 2012), environmental stewardship practices (AASHTO, 2004). Environmental sustainability incorporates responsible technical and behavioral practices (Bohdanowicz 2006). Some scholars refer an activity or practice that focus on maximum environmental performance as pro-environmental behavior, for instance Han, et al (2010). Attitudes that rigorously seek to minimize negative impact of one's actions on both natural and built environment such as in resource conservation and the use of non-toxic substances, energy consumption, reduce waste in production (Kollmuss & Agyeman 2002; Steg & Vlek 2009). Clem (2008) posits that green practice reflects a social consciousness around saving and advancing the earth's natural resources, preserving and protecting them for the sake of posterity. Other authors describe green practices as an aspect of corporate social responsibility (Knox & Maklan 2004; Weber 2008) or responsible environmental behavior (Hines et al 1986/87).

Liu, et al (2013) stress that, all decisions and actions made must reflect external needs as well as advanced technologies and management approach integrating strategies, techniques, and

construction products that are eco-friendly, which makes it different from the regular construction processes (Hoffman & Henn 2008). It commences with early decision at project level, such as in the design and documentation stage, because once facility is developed, changes might become more difficult (Liu, et al., 2013).

Green construction practice implies sustainable building, sustainable design, high performance building, and whole building design, integrated design, green building (Robichaud & Anantatmula 2011). In broader terms, the concept comprises of structure, which is conceived and developed, operated, maintained or recycled with objectives to use natural resources wisely, improve employee productivity, protect occupant health, and reduce the environmental impact (Umar & Khamidi 2012; Nurul Diyana & Zainul Abidin 2013). The process incorporates environmental consideration at every stage of construction services provision, which focus on design, construction, operation and maintenance phases and takes into account the lot design and development efficiency, resources, energy and water efficiency, indoor environmental quality, maintenance and the buildings overall impact on the environment (Kibert, 2007). They are also referred to as space and energy efficient home, green home which offers absolutely healthy living environment to its residents and operate by using sustainable materials from natural sources with minimum environmental effect (Alias, Sin & Aziz 2010).

Glanvinich (2008) conceived green construction as “planning and managing a construction project in accordance with the contract documents in order to minimize the impact of the construction process on the environment”. This definition is limited in scope on what constitute green construction practices. In China for instance, green construction practices guidelines fall within six (6) broad areas, namely; land conservation and construction using land protection, environmental protection, energy conservation and utilization, material conservation and utilization, construction management, water conservation and utilization (Shi, et al 2013).

Robichaud & Anantatmula (2011) posit that environmentally friendliness mean a philosophy associated with project and construction management practices that seek to: promote the sustainability of built environment; minimize or eliminate impacts on the environment, natural resources, and nonrenewable energy sources to enhance the health, wellbeing and productivity of occupants and whole communities; cultivate economic development and financial returns for developers and whole communities; and apply life cycle approaches to community planning and development. Green developments’ eco-friendliness, climate responsiveness and organic protective measures safeguard as well as minimize environmental impact of hazards (Sunday, Suneetha & Ademola 2010). To Ofori (2000), green practices initiatives involve introduction of environmentally friendly construction materials and the development of complex assessment tools for the entire construction project, including materials, thereby integrating clients requirement by other stakeholders.

One definition of green construction is the conceptual design practice which integrates resource reduction and waste emissions for the period of its whole life cycle, facilitates construction industry to have a positive and practical attitude towards environmental resources (Zainul Abidin 2010). It emphasizes on the principles of conservation and efficiency, resource-efficient materials, waste minimization, sustainable site, water efficiency, energy ventilation whereas other practices help to minimize environmental impact and resource

consumption (Kibert, 2007; AlSanad et al 2011; Nwokoro & Onukwube, 2011). The proximity of materials saves cost and reduces pollution by fuel burning through transportation (Sunday, et al., 2010). These can be realized with the preparedness and capacity of construction organizations to drive change (Bourdeau, 1999). Accordingly, green construction practice and interconnected definitions represent the solution, which satisfies the principles of sustainable development, and starts well before construction per se (in the planning and design stages) and continues after the construction team has left the site (Hill & Bowen 1997).

Construction firms in a bid to employ environmentally friendly practices engage their whole activities including materials sourcing or supplies (Thipparat, 2011). This has emerged as an environmental sustainability tool and philosophy for proactive and leading construction organizations (Ojo et al., 2012). Green supply chain practices is been implemented as an antidote for best practice in the construction industry because it largely takes environmental elements into consideration (Ojo, Mbohwa, & Akinlabi, 2013). Thus, green supply chain is an integral part of green construction practices. This is because it aims to maximize the overall environmental profit by adopting a life cycle approach through material selection, product design, manufacturing, sales recovery (Ojo, et al., 2013), hence, serves as a catalyst for firm realization of sustainability objectives (Shi et al., 2012).

In addition, green practice in construction involving multi-faceted stakeholders, can be initiated by a group, different from the planning group, and executed by yet another group (Wu & Low 2010). It however, requires the commitment and collaboration with the stakeholders in order to secure positive environmental effect of the end product (Liu, et al., 2013). And to adopt this issue, there is a now existing international environmental assessment tool throughout the life cycle of a project commencing from the design, construction, operation and maintenance (Sunday, et al 2010). The practice is about energy efficiency, quality management system, and using environmentally friendly approach.

Furthermore, green practices can be described as a broad term, covering a wide range of behaviours aimed at reducing the negative environmental impacts generated by a firm’s products and services (El Dief & Font 2012; Hoffman & Henn 2008; Han et al 2010; Robichand & Anantatmula, 2011; Serpell et al.2013; Adegbile, 2013). These behaviours/activities can be operational or organizational (Alvarez Gil, Burgos Jimenez, & Céspedes Lorente, 2001; González-Benito & González-Benito, 2006; Saha & Darnton, 2005). Operational practices relates to individual and project level behaviours to implement environmental management system, while organizational concerns with firm characteristics. “Green” is the watch word, to attain the global perspectives on environmental sustainability agenda. Construction consultants /practitioners conceive green and act green to create green in all infrastructure development. This is referred to here as CACgreen in construction performances.

From the above discussions, green construction practices can be summarized to consist of set of behaviours that not only reduce negative environmental impact arising from construction and allied activities but allow positive tradeoffs between diverse ecosystems, reduce pollution discharge and promote healthy environment. These are demonstrated by way of adopting and implementing at various levels (individual, firm and project). The practices stem from the general concept of green practices as applied in other sectors such as in manufacturing, small and

medium enterprises (SME's), hospitality industry, food and beverages sector, among others.

Thus, green construction practice can be conceptualized as the responses of industry professionals in assimilating environmental behaviour at various levels involving (design for the environment, resource conservation, green materials sourcing and supply, waste and pollution control) the creation and sustenance of the built environment in order to attain eco-friendly environment and achieve the goal of green agenda. Green behavior in construction can be exhibited and implemented from the inception stage to the materials specification and sourcing through the supply chain, down to the entire project life span. Figure 1 below explains this concept.

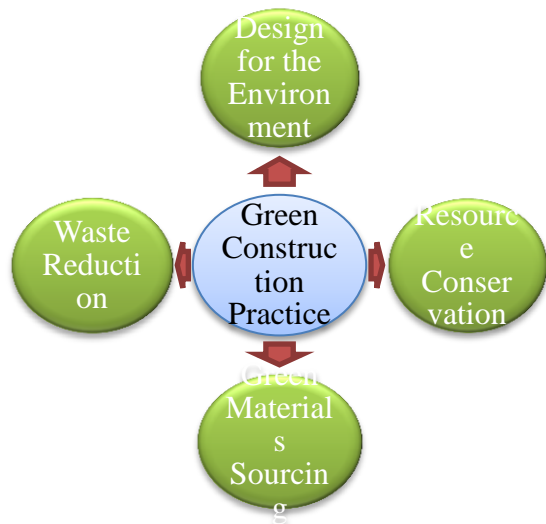


Figure 1: Green Constructions Practice

Dimension of Green Construction Practices

Previous studies have indicated three dimensions of green practices to include individual, firm and project levels. At individual levels, it is a behaviour that aim at protecting the environment and generally referred to as environmentally friendly behavior, proenvironmental behaviour, conservation behaviour and stewardship behaviour (Mobley et al 2009). At the firm level, it involves organizational attitudes on environmental commitment and referred to as environmental proactivity, stewardship; while at project level, green practices refer to as green construction, green building, energy efficiency and ISO 14000 compliance. Sustainable construction researchers have interchangeably used sustainable practices to describe green practices, hence, providing limited systematic and comprehensive work linking the drivers to environmentally friendly practice adoption and implementation at various levels. This has result in misrepresentation of the various drivers and barriers.

Green Practice at Individual Level

Cushman-Roisin (2012) describes green practice at individual level simply as 'doing good and avoiding bad'. It is probably best viewed as present and future concern for oneself and entire members of the ecosystem (Bamberg & Moser 2007). Individual general conservation stance is reflected by their different environmentally friendly actions such as recycling, materials source etc (Lee, Choi, Kim, Ahn & Katz-Gerro 2012). The concept corresponds to the classification of green practices put forth by Stern (2000) of "environmental activism", "other environmentally significant behaviours (specifically including actions through organizations), and "private sphere environmentalism" (those more private actions). It is an attribute of environmental disposition and commitments (Smith & Perks

2010; Akadiri et al., 2012). This has become a debate especially when individuals perform actions that are capable of endangering the environment (Akadiri & Fadiyi 2013).

Therefore, at individual level, construction stakeholders need to have a sense of empathy to connect them to, and see themselves as part of, the environment (Azapagic et al., 2011). Green practices in construction requires key industry players to assume a position of built environment "creators" and "receptors" of the consequences arising from, hence striving to balance actions and outcome. In short, green practices at individual level involves environmental activism and environmental concern which can be conceptualized as environmentally friendly practices or behaviours that provides leading role in: resource utilization and conservation, waste reduction as well as motivation and enlightenment on the cost and benefit of environmental actions in a given society, institution or organization.

Ramus & Killmer (2007) argue that there are three dimensions to individual employee green practice. First is pro-social behaviour, which concurrently supports the welfare of the individual and that of the organization they belong to. Second, environmental behaviour is discretionary behaviour, in which employees take charge to effect corporate change and produce value-creating components. Third, environmental behaviour is an extra-role behaviour that is "not formally required for employees' job" with rarely any clear goals or reward systems to encourage environmentally beneficial behaviour.

The argument put forward by many authors is that, even at the macro level, green practice in construction industry can only be a reality if the practitioners themselves are aware of, have knowledge of, and are motivated by, green practices (Bhattacharjee, Ghosh, Jones & Rusk., 2012; Cordano, Welcomer, Scherer, Pradenas & Parada, 2011; Zainul Abidin, 2010; Nurul Diyana & Zainul Abidin, 2013). In fact, green practice at individual level provides basis to reach the larger segment of the society. Thus, described as the overall preparedness to reduce, mitigate or stop negative environmental impact as a result of resource utilization. To achieve these individuals need to have the physiological and psychological mindset in forms of attitude, belief and commitment.

Green Practice at Firm Level

Firms' level green practices can be categorized within a stream of environmental proactivity, defined as a propensity to go beyond the enabling legislation or the industry standard (Garce's-Ayerbe, et al 2012). This is whole firm's environmental action strategy inbuilt into organization's *modus operandis* for biodiversity conservation. This comes in form of environmental management system, covering a wide range of practices aimed at reducing negative environmental impacts generated by firm's activities including products and services (El Dief & Font 2012), depending on the nature of the industry to which organizations belong.

Sharma & Vredenburg (1998) opine that a firm is environmentally proactive if it presents "a consistent pattern of green practices, across all dimensions relevant to their range of activities not beyond regulatory provision or in response to isomorphic pressures within the industry as standard business practices". This might be out of genuine concern for the environment or in appreciating its inherent advantages such as in business environment. For example, clients look for express demonstration of organizational commitment towards green practices, provision of environmental friendly services and visible steps to conserve resources and collaborative efforts with eco-friendly suppliers (Manaktola & Jauhari 2007).

Green practices at firm level includes utilizing internal assessment tools such as benchmarking and performance measurement (Nash & Ehrenfeld, 1997), publicly disclosing environmental performance information, establishing environmental performance goals (Hart, 2005), training employees in ways to improve the environment, linking employee compensation to environmental performance, as well as performing internal and external environmental audits, (Welford, 1998).

Firm corporate environmental strategy engagement such as green practices requires to be communicated to the concerned stakeholders in order to form an opinion regarding environmentally friendly performance of that organization (González-Benito & González-Benito 2006). Nowadays, firms are increasingly being compelled to declare environmental and social impact of their activities (Waddock et al. 2003). Firm environmental behavioral changes has implication at levels such as operational, functional as well as internal culture and values (Fraj-Andre´s et al. 2009). This is required to streamline for best practice in terms of environmental sustainability.

Firm green practices develop through environmental commitments by way of proactive environmental response which involves changes from conventional attitudes of reactive to proactive (Fraj-Andre´s, Martinez-Salinas, & Matute-Vallejo, 2009). Reactive environmental attitude, are typical of organizations that perceive the natural environment as a threat to their competitiveness and only carry out the minimal changes to meet stakeholders' and regulatory guidelines, on the other hand it begets a proactive attitude that expresses the behaviour of firms that voluntarily develop environmental initiatives that contribute to minimizing environmental impact throughout their operations (Arago'n-Correa et al. 2008). Bowen et al (2002) propose green practices at three levels of analysis to include upstream, downstream and daily internal operations.

In the same vein, researchers such as Ramus, (2002), Darnall, et al. (2010), Nurul Diyana & Zainul Abidin (2013) have identified 13 green practice items engaged by environmentally proactive firms. These are: - improving environmental performance, written environmental policy, specific target for publication of an environmental (sustainability) report, adoption of an EMS and fossil fuel reduction policy. Others include: environmental purchasing policy, environmental training and education, employee responsibility for environmental performance, life cycle analysis, and ensuring management understands sustainable development, toxic chemical reduction policy, and policy of reducing the use of unsustainable products, as well as maintaining same environmental policy standards at home and abroad.

One salient benefit of green practice at firm level is that, it helps to reduce 70% of water consumption, saves 90% of energy consumption, reduces 63% of C&D waste, lowers 20% of accident rate and 80% of quality complaints (Liu, Lau & Fellows 2012). Firm environmental friendly practices are relevant for the implementation of technical measures, which may not necessarily exert a direct impact on the environment, but they do affect firms' formal systems (e.g., environmental training, planning and control of environmental objectives, environmental reporting, or top management support). Admittedly, firm environmental activities are similar across sectors (Alvarez Gil, et al 2001).

Green practices design the path to improve firm environmental performance in a systematized and logical manner (González-Benito & González-Benito, 2006; Azevedo et

al 2011). It is believed that in no distance time, green practices may become a strategic asset in an organization (Heerwagen, 2000). Adopting green practices at firm level describe how organizations change their approach to integrate environmental concern, evaluate firm's environmental performance on a regular basis, delegates environmental responsibilities and provide environmental training for staff (El Dief & Font 2012). Therefore, green practices at firm level can be defined as environmental proactive response and commitments integrated to form part of the firm culture and identity, with primary aim of reducing negative impact and improving environmental excellence.

Green Practice at Project Level

Liu et al (2013) conceptualized green practice at project level to mean decisions and actions that require the commitment and/or collaboration with industry players to ensure that both the processes and outcomes over the lifespan of a facility yield positive environmental effects. Multiple participants are involve in the construction projects, and requires coordination for smooth implementation of project goals. Green practices are strategies devised to reduce waste and conserve energy in a given product, which are integrated at every stage from the design and construction, to renovation and deconstruction (Slabbert 2013). It was described as a more effective approach to realizing environmental sustainability objectives (Ding, 2008). Improving environmental performance of construction sector requires reduction in negative environmental impact at stages of planning and construction (Uttam, Faith-Ell & Balfors 2010; Elforgani & Rahmat 2010). These are critical for construction project particularly those under environmental assessment (Crawley & Aho 1999; Lam, et al 2010). They involve low embodied energy intensity in building materials, efficient allocation of resources, minimum energy consumption, reuse and recycling and other mechanisms to achieve effective and efficient short- and long-term use of natural resources (Ding, 2008).

The practice can be seen through selection of construction materials, building design and technology, construction process and project management system (Serpell et al. 2013). However, where projects are conceived in line with environmentally friendly practices, disregard to sustainability requirements from inception stage has resulted in greater materials and energy intake during construction and operational phases of many building projects (Al-Yami & Price 2006).

Projects that pass through stages of green processes or materials therein such as constructed facility or materials used, manufactured commodity etc are designed for reuse, recyclable, biodegradable, or remanufacture or repair, or disposability (Gadenne, et al, 2009). It could also be identified in the waste generation and disposal strategy and amount of pollution discharge (Zainul Abidin, 2010). Products are perceived as "environmentally-friendly" if they aim at reducing its negative environmental impact (Manaktola & Jauhari 2007) which in construction, can be achieved through actions of consultants or professionals, by adopting and implementing environmental sustainability requirements throughout the project lifecycle.

To achieve this, there is need for technology or process change from conventional approach to a more eco-friendly approach, with development of more efficient, better and a cleaner technology that improves project components. Similarly, the practice at this level demands innovative management methods which can help minimize pollution to the environment from the existing facilities (Khalfan 2002). On the other hand, innovative, new technologies and approach should be integrated

into the construction to improve the environmental performance (Liu, et al 2013). This facilitates full potential of green construction practice.

Green practice at project level is about materials, method and management (3M), for environmental well being. Imbibing the culture of collaborative effort in green construction practices provides substantial realizable benefits (Liu, et al. 2013). Built environment consultants such as architects, engineers, and builders are professionals who provide services in technical isolation. This “silo effect” makes it difficult to manage changes, mitigate risks, and contain costs with a holistic view of the project (Robichaud & Anantamula 2011). According to Zainul Abidin et al (2012) implementing green practices and technology at project construction stage requires; more green materials, using technique of ground vibration that will not affect the structures of the neighbouring buildings, control noise and dust, prefer sustainable drainage system, IBS system and effective waste management system.

One prime target of green practice at project level is the overall interaction of the intended product with the environment at pre-development stage, development stage and post development stage including provision of the auxiliary services therein. In short, green practice at project level can be conceptualized as 3M series of interrelated activities of method, materials and management that employs maximum environmental concern at every stage, on every action, resulting in to what is termed green product/building/facility.

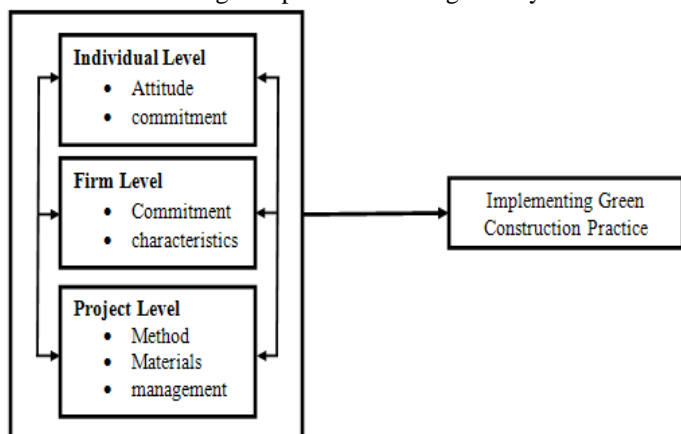


Figure 2: Framework for multidimensional perspective of Green Practices

Interrelationship of Green Practices at Individual-Firm-Project levels

As highlighted earlier, most of the literatures on green construction practice have not specifically focused on the interplay at individual-firm-project levels. Zuo & Zhao (2014) emphasized that, achieving green building for instance depends on three interrelated critical factors of technical, managerial and behavioural. Technical factors relate to green practice at project level, managerial and behavioral are firm and individual aspect respectively. The interrelationship indicates that, at strategic level, firm strategies are designed to align with individual and project level goals (Lapinski et al. 2006). Similarly, Fahlquist (2008) argues that, for individuals to perform an act or behave in environmentally friendly manner, they must obtain the support and backing of their organization or institution. This could be through the provision of resources and enabling environment to motivate and train in a way necessary to allow for environmentally friendly attitude. Hence, the extent to which green practices are performed and accounted for should context utilized. At the level of individual, organization context in form

of culture guides and determines what ought to be done and how it is to be done in an organization. Tudor et al. (2008) demonstrate that a holistic and interrelated framework that includes individual as well as firm focus affects individual environmentally friendly practice. This would influence how projects are conceived, planned and implemented in an environmentally friendly manner.

Available literature shows that individual capacity to implement green practices at firm level is guided by their individual motivation and enhanced by their organization’s characteristics (Pichel, 2008; Ramus & Killmar, 2007). Citherlet & Defaux (2007) stressed on the need for evaluating a construction project on the total emission during construction, and they also stated that material manufacture, transport, replacement and elimination at the end of the building lifetime should be important consideration for energy consumption in its life cycle. Achieving this depends on the capacity of a firm as having resources to do so, as most of these practices are associated with larger organizations (Zainul Abidin 2010), since organizational diversity influences construction project (Hoffman & Henn 2008).

More so, construction manager’s management approach within the core organization activities in relation to the operating environment will reduce the firm environmental impact (Johnson & Scholes, 1993; in Fergusson & Langford 2006). Individual green behaviour also strengthens the organization’s environmental proactivity, hence influencing stakeholders on the type and manner of project to be executed. Individuals could introduce various forms of initiatives within their domain of responsibility which could include projects that saves energy, reduces pollution, improve resource productivity, or reuses waste streams. They could also advocate on behalf of the environment outside of their immediate domain of responsibility by calling the attention of their superiors (Fryxell & Carlos 2003).

Hoffman & Henn (2008) notes further that, construction project participants such as architects, clients, contractors, consultants, and engineers allow formation of temporary organization which sets temporary culture. These include the roles, decision rules, and power balances among the participants. This interplay for power and influence within the team can be a critical factor, leading to decisions that are suboptimal for the overall sustainability of the project, especially as new green technologies and practices are introduced into projects. They further stressed both individual level biases and that of organization interplay to determine the outcome of a project. Corporate organizations have it in their power to make easier and less expensive for individuals to choose the environmentally friendly option and they can provide information that is easily accessible and as straight-forward as possible (Fahlquist, 2008).

Empirical researches have also shown that individuals who are proenvironment may play a role in corporate greening, although more empirical analyses are still needed in this area (El Dief & Font 2012). Individuals may significantly affect the environment too through other behaviors, such as influencing the actions of organizations to which they belong (Stern, 2000). This interplay cuts across industries. For example, Ramus & Killmer (2007) reports that individual support of environmentally friendly practices as well as organization disposition on environmental concern drives adoption of green practices in the hospitality industry. Individual green practice for instance is necessary to compliment organization environmental strategies which when harnessed leads to a green project. The same observation was made by Sweetman (2007) declaring that

“no matter how good your policies and practices look on paper, you will change nothing without the active support of employees across the organization.”

Generally, individual involvement, observations or actions contribute to the successful implementation of environmental practices (Pichel, 2008). Firm readiness to adopt environmentally proactive practices through individual results in projects partnering with construction stakeholders with environmental concern and subscribed to green projects. McGuire (2010) observes that for significant environmentally friendly practice implementations, there is need for a firm to revisit their products and services which require collaborative strategies within the various units and departments. Thus, the individual's environmental behaviour within organization can be considered “extraordinary” behaviour (Pichel, 2008) or as an example of organizational citizenship behaviour (Boiral & Paillé, 2012). These interactions boost the firm characteristics and corporate image and portray them as environmentally friendly organizations.

Liu, Low & Yang (2013) equally observe that green construction practice is an approach that utilizes firm strategic disposition which is new. It is aimed at achieving project objectives in green building. In reality, when it comes to green practice, more plans and strategies are needed to be aligned with local situations in all stages of construction, including materials sourcing and supply. Zuo & Zhao (2014) stress that there are a lot of managerial aspects of green construction and these include project level, firm level and market level. At project level, specific project management skill sets are required for managing green buildings. These skills and expertise are acquired at individual level, demonstrated and incorporated in the organization's environmental strategy and executed during construction.

Conclusion and Implication

This study compliments existing literature on green construction practice by establishing that, green construction is implemented at individual-firm-project levels. The article further provides a model to examine the influence of the interrelationship in order to determine how best practices on environmental sustainability could be realized in the construction sector. The multi-perspective framework presented has integrated the various dimension of green practice with a possible influence of the interplay between them. Achieving the benefits of green practices entails coordinated implementation across multiple parties to reach certain critical levels of involvement (Hoffman & Henn 2008). Many conclusion can be drawn from this framework as green practices success involves diverse actions, reactions and responses. The model suggests that a clear understanding of the interaction of green practice at each of individual-firm-project level is imperative if the goal of environmental sustainability is to be realized. This will provide avenue to develop clear performance indicators, corporate environmental strategy and overall objectives, harnessed from the multi-dimensional perspectives.

Sequel to this, several research directions can be initiated to compliment the existing body of knowledge in green construction practice. For instance, previous studies have highlighted on the drivers, enablers of green construction practice. Future research can focus specifically on the drivers/enablers at individual-firm-project level to determine the scenario at each level. The model can empirically be tested to examine the effect of the interplay of green practice dimension. Similarly, since construction sector is a multi faceted type, stakeholder's readiness to implement green practice in

construction can be explored, incorporating multi-perspective framework and isolating them into institutional and corporate stakeholders. The framework can also be utilized to assess at what level (individual-firm-project) green construction practice influences competitive advantage, this would encourage the industry players on where and how to implement green construction practices. Individuals drive company towards green practices with the attitudes and environmental commitments, incorporating into firm strategies for obvious advantages. In construction, the organization's environmental disposition influences project partners towards adopting green practice; and sets project goals and objectives in line with environmental concern. The study will therefore, benefit industry practitioners, policy makers and the academic community.

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