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A framework for the implementation of green certification of buildings in Ghana

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ABSTRACT

Buildings are responsible for more than 40% of global energy use and one third of global greenhouse gas emissions both in developed and developing countries. A number of buildings are constructed every year but only a small number of them can be identified as 'green buildings'. Despite the well-known benefits of green certification of buildings, it still remains in the state of infancy in Ghana, and adequate diffusion and implementation strategies should be put in place to ensure that they become more established. This paper sought to propose an implementation framework that can aid the certifying body in making decisions in relation to implementing the green certification of buildings in Ghana. The methodology was based on schedule interview with representatives of professional bodies with knowledge on the subject matter. The findings of this study indicate that while the knowledge of green certification of building exist in Ghana, some of the professional bodies in the built environment rarely use their influence to promote this green certification of buildings which does not help in its diffusion. The implication of the findings is to enable the certifying body for green buildings in Ghana to make decisions relating to its implementation.

KEYWORDS

Green building certification; innovation; green building implementation; Ghana Green building; Ghana Green Building Council; One Airport Square; Green Star Sa-Ghana

Introduction

Over the decades, significant efforts have been made to promote sustainability in property development due to the enormous amounts of natural resources being consumed daily around the world (Mosly, 2015). Moreover, governments and the public worldwide are responsible for controlling this consumption and looking for innovative and efficient alternatives that potentially lead to sustainable development. The momentum of the green building movement is increasing as the environmental impact of building activities becomes more obvious and significant (Chan et al. 2009). The green certification indirectly assists people in assessing the benefits of green building compared to uncertified buildings. Royal Institute of Chartered Surveyors (2005) defined sustainable building as green building rated by assessment or certification tools. Among the green building assessment tools are LEED, BREEAM, Green Star, CASBEE, Green Mark and Green Globe. Green building also known as 'sustainable building' is a building designed and constructed using methods and materials that are resource efficient or the associated health and

wellbeing of the occupants, construction workers, the general public or future generation are catered for (Landman 1999). Despite the increasing number of buildings of late, only a small number of these buildings can be identified as 'green buildings' (Smith 2007; Seyfang 2010). Adegbile (2013) asserts that due to increase in technological advancement and economic growth, building construction has greatly increased and has accounted for almost half of the greenhouse gas emissions and energy consumed due to the energy used in the production and transportation of materials. In comparison to conventional buildings, studies have shown that green buildings have prolonged lifecycles, lower cost of maintenance and operational costs, reduced water and energy bills and can attract higher rents and experience reduced turnover (Sangster 2006; Say and Wood 2008; Jensen 2011; BCI Economics 2014; Deng and Wu 2014). The rate at which some advanced countries have embraced the concept of green buildings has increased. For instance, UK records over 115,000 certified green buildings with additional 700,000 registered for eventual certification (Ozolins 2010), Canada records over

480 certified green buildings (Redl 2013) and Australia records over 148 certified buildings (Ozolins 2010). In Africa, the concept is now gaining popularity with South Africa recording 50 green buildings (Rogerson 2014). Though efforts have been made by countries like South Africa and Kenya to green their buildings, it is only recently that the concept was introduced into Ghana. This notwithstanding, there have been some significant increase in the number of green buildings which is quite encouraging. For instance, the first green building certification system in Ghana that is the Green Star Ghana-South Africa was issued in 2009. This green certification system was used to certify Ghana's first green building called One Airport Square located in Accra. Subsequently, the Green Star South Africa-Ghana was used to certify Stanbic heights building in Accra. Also, LEED certification system was used to certify Ridge Hospital in Accra, Ghana, United Nations Building in Ghana and Edge certification was used to certify the Baby and Mother Unit at Komfo Anokye Teaching Hospital in Kumasi. These significant contributions from the African countries involved in green building certification was in response to Du Plessis (2007), who indicated that sustainable/green building is still at its infancy stage in developing countries, especially in Africa. Though efforts are being put in place to certify most of the buildings spring up in Ghana, studies have indicated that green building is not extensively practiced (Bangdome-Dery and Kootin-Sanwu 2013). As green certification of buildings still remains at its infancy in Ghana, adequate diffusion and implementation strategies should better equip the general populace to embrace such systems. Therefore, the aim of this study is to propose a framework to enhance the implementation of green certification of buildings in Ghana.

Literature review

Green certification of buildings

The purpose of green rating or certification systems are intended to offer individuals an understanding of label that express a building's sustainability attributes (Rattan, 2015). The green certification indirectly assists the market player in assessing the benefits of green building compared to non-certified buildings. The availability of various green building rating tools is an indication that there is an effort to build more green structures that reduce its impact on environment, increase the social benefits and optimize the economics returns. Thus, with these many available

green building certification tools in the market, either locally or internationally, the agendas of the United Nation for preserving the world from environmental threats can be accomplished.

Green buildings are designed and constructed to reduce the overall impact of the built environment on human health and the natural environment by efficiently using energy, water and other resources, protecting occupants' health and improving employee productivity and reducing waste, pollution and environmental degradation (US Environmental Protection Agency 2009). Green buildings also include measures to reduce energy consumption during the operational phase of buildings as the designers use details that reduce air leakage through the building envelope. Like other certification systems, in Ghana, the Green Star Sa-Ghana is the main certification system adopted for the greening of buildings. Green Star Sa-Ghana certification system section elaborates on this certification system.

Green Star Sa-Ghana certification system

The Green Star SA-Ghana is the certification system for Ghana as decided by the Ghana Green Building Council (GhGBC). This certification system was adapted from the Green Star South Africa Building rating system. because of its ease of use, ease of customization to Ghana and because of the logical transition from the existing tool to its own tool (Osae-Akonnor 2014). In the certification of the One Airport Square for instance, GBCSA wrote a report to GBCA to allow for certification of the One Airport Square building in Accra using the Green Star SA but with some minor recommended changes, but call the tool Green Star SA-Ghana (Alfris and Braune [n.d]). Therefore, Australia has some amount of control over the certification tool because Green Star South Africa originated from Green Star Australia. This confirmed what Ozolins (2010) identified about BREEAM and Green Star certification system, as have been used in their country of origin but offer guidance for the development of green building rating systems for other countries or regions based on their model. According to Redl (2013), green certification schemes are rarely taken into account when there is lack of interest and knowledge in green certification schemes. Nonetheless, if stakeholders have an experience with green certification, they are often willing to apply this certification on other future projects as well (Redl 2013).

Since its adaption the Green Star SA-Ghana Certification System has been used to carry out a number of projects. Discussed in One airport square section is one of such projects.

One airport square

The One Airport Square building in Accra is the first green building in Ghana certified with the Green Star SA-Ghana certification tool. The green building attained a certification level of four stars (Design Stage). The building has several green building features that is intended to ensure that it operates more efficiently and with less environmental impact. The building uses natural ventilation through openable windows and uses an under floor 'cool' air distribution system (Mwangi 2016).

The key aspects of One Airport Square are public spaces, solar building integration, vernacular building strategies, integrated planning process, renewable building materials, participation of users in planning process, use of innovative design tools, low cost designs, the use of locally manufactured building because of the high import duties (Mwangi 2016). To reduce the consumption of drinking water, there are technologies that limit the amount of outflow, the duration and the time of delivery, while it is expected the reuse of grey water and rainwater for the toilet (Modern Green Structures and Architecture 2015). The building was commissioned in 2010 and completed in 2015 with a surface area of about 17,000 m².

Conceptualising the framework for the implementation of green certification of buildings

In the construction industry, new products and services transmissions are very slow (Reichstein et al. 2005). Green building certification is not new for many developed countries like the UK, US, Canada, Australia and Japan based on the periods they were introduced, but it is a new concept for most developing countries like Ghana. There have been innovations recognized by the Architecture Engineering and Construction industry including Building Information Modelling (Azhar et al. 2008), green building products and technologies (Lippiatt 1999) and green building guidelines and assessment systems (Potbhare et al. 2009). The environment within which the construction industry exist is periodically undergoing transformation (Ofori 2012) and the only means for a construction industry to survive in this complex and changing environment is through innovation (Steele

and Murray 2004). Goodrum and Haas (2000) postulates that one main accomplishment in the construction industry is their innovative ability as Potbhare et al. (2009) identify green guidelines and assessment systems as innovation.

However, an innovation would be perceived useless no matter how well it is designed, if not adopted by the society (Rogers 2003). Therefore, it becomes imperative that for easy adoption, those who want innovation should increase their extent for its diffusion (Chigona and Licker 2008). One of the basic steps towards maximizing the adoption of innovation like green building certification is to grasp the components that affect its diffusion or the drivers that motivate the society to adopt such innovation. Mark et al. (2001) identify innovation as a concept or a product that the adopter perceives to be new. Diffusion is a process in which a new approach or innovation is shared between identified or specified networks for a period of time among teams of a social system (Rogers 2003). According to diffusion of innovation (DOI), these four factors are very significant; the innovation itself, the channels for the communication, the time frame and the social system. DOI's version of diffusion occurs over time with preceding circumstances.

The innovation itself

DOI's preceding attributes to the acceptance of an innovation are; relative advantage, compatibility, complexity, observability and trialability. These attributes when compared to the adoption of green building certification systems essentially means what is involved in accepting this new concept as pitched against the benefits of adopting it. The attributes are expounded below to include:

Relative advantage is the extent to which an innovation is comprehended to be superior compared to the traditional method. Kato et al. (2009) identified in his study that building managers in Australia for instance are elated for obtaining a competitive advantage over others because of their buildings certified as Green-Star rated office building. According to Martianov (2016), certification in accordance with the green standards increase the investment attractiveness of the building.

Compatibility is the extent to which an innovation is comprehended to be in line with prevailing socio cultural standards, needs and previous familiarities of would-be-adopters. Rogers (2003) further states that an innovation that is not compatible with the prevalent ethics and customs of the social systems are not

easily adopted. He further compared this innovation compatibility to the adoption of contraceptives in countries where sacred dogmas prevent the adoption of birth-control practices as in Moslems and orthodox nations.

Complexity is the extent to which an innovation is comprehended as being difficult to appreciate and enforce. Marsh (2009) report acknowledged that inadequate experienced consultants and contractors in relation to green building works result in delays of projects. This characteristic correlates negatively with the degree of adoption. New concepts that are easy to grasp will be accepted swiftly than new ideas that need the adopter to acquire new skills and understandings. This can be compared to the green certification system in Ghana where the built environment would have to develop their capacity to be able to adopt this innovation. The development of green building certification hinges on the availability of skilled and trained people to fill the emerging green jobs (Hammer et al. 2011).

Observability is the extent to which the outcomes of an innovation are noticeable to others. Moore and Benbasat (1991) split observability into two; result demonstrability which is the ability to show that positive outcomes have happened for the user; visibility is the ability to divvy up those demonstrations with others. Djokoto et al. (2014) discovered that lack of demand is the biggest barrier to green building certification adoption. The Ghanaian society can better appreciate green building certification if the benefits of using the certification system on the few green buildings are visible for the would-be adopters to know how feasible that is. Without client and customer recognition of the possible benefits of green building certification system, it will be difficult for them to adopt them (Darko and Chan 2016). Basically the GhGBC can liaise with the management of the green buildings and track the performance and benefits of them and make them public for the society. The would-be adopters would have to see the visible benefits of adopting this certification system. The rate of adoption and observability are positively correlated. Chigona and Licker (2008) assert that abstract or vague innovations are usually difficult to adopt and its diffusion becomes very slow. Potbhare et al. (2009) established that the availability of better information is the most essential motivation to stimulate the adoption of green building certification. In order to ensure the widespread of this innovation the 'information barrier' needs to be resolved in advance. These observed benefits can be distributed to society

through the print media, radio programs and television shows (Darko and Chan 2016).

Trialability is the extent to which an innovation may be tested on few buildings before adoption. Redl (2013) asserts that green certification tool is usually applied to a pioneer project from the design and planning phase to the commissioning of the structure then after three to four years, the certification scheme becomes established. Research shows that One Airport Square was Ghana's first certified green building (Osei 2015). One can further make the assertion that, with the pioneer certified green building, lessons were learnt, where the positive ones can be repeated in the future and the strategies would be adopted to alleviate or further eliminate the negative ones. It can therefore be assumed that after the construction of the One Airport Square in Ghana as a green building, the green certification of buildings should have been more established in Ghana. However, currently it is not so in Ghana. A triable innovation characterizes less indecision to the would-be adoptee because the innovation can be adopted by doing as done before.

Communication

Communication is the process by which members create and share information with one another so as to attain a mutual understanding. Diffusion is a specific type of communication in which the information that is shared is associated with new ideas. According to Umar and Khamidi (2012), awareness on green building refers to the ideal strategic model and promotion exercise which aids people to understand why a particular issue is essential and the desire of goals and what is necessary to accomplish a task. Nduka and Ogunsanmi (2016) also defines awareness as a medium of creating a base audience for a product, service or issue. The formation of the Ghana Green Building Council was anticipated to be a major step in encouraging green building in Ghana. According to McGraw-Hill (2013), lack of awareness of the general public is a top obstacle in many developing green markets in Brazil, Colombia, India and Poland. However, in Ghana a research conducted by Osei (2015) identified that there is an awareness of the essence and benefits of green/sustainable buildings among construction professionals, as well as the general public but green building certification has not been adopted massively in Ghana. Hwang and Tan (2012) recommends that green building knowledge and experience of professionals should be enhanced to keep them updated with the evolving information for successful green building project delivery. Umar and Khamidi (2012) suggest that

advertisement on radio stations and TV, website development specifically for green building campaigns, media relations in terms of articles, news release and community are key tools in communicating the green building certification tool. In a study conducted by Cheng and Venkataraman (2016) to analyse the connections between project team compositions and green building certification in green building projects, the project team information of all LEED certified buildings were collected from the Canada Green Building Council (CaGBC) database. According to Cheng and Venkataraman (2016), the CaGBC database was selected to conduct the analysis because it provided accurate project information of certified green building projects. Collected data include project name, locations, grade obtained and team information. Non-governmental organizations, civil society organizations, consumer groups and the media can help raise awareness of the benefits of green building. Currently in Ghana, there is no common database where information on the few green buildings in Ghana can be located. A dedicated website like the website for GhGBC can serve as database for reputable, current and standardized green building data which may be useful.

Time

Time is an indispensable element in the diffusion process. The adoption curve is S-shaped. This means based on when they accept an innovation, individuals are assembled into innovators (those who adopt at the earliest times), early adopters, early majority, late

majority and laggards (those who never adopt) (Rogers 2003). Since innovators are the first to adopt their concept, their adoption decision is not influenced by others. Early adopters are often respected by their communities and have a greater influence on people to motivate them to adopt this innovation. Laggards are the last ones to adopt it. Many a times they lack financial resources to adopt the innovation but eventually give in when the cost of not adopting becomes high.

Social system

Rogers (2003) defined a social system as a set of interconnected units that are involved in combined problem solving to achieve a goal. These interrelated units of a social system may be individuals, informal groups, organizations associations or institutions. Each unit can be distinguished from other units in a form of a social structure. Rogers (2003) postulates that a social system forms a border within which an innovation diffuses. Therefore, the social structure of a social system can facilitate or impede the DOIs in the system.

Figure 1 is Rogers (2003) five stages in Innovation-Decision process which was used to conceptualize a green building certification framework.

Figure 2 is the outcome of conceptualising Rogers (2003) Innovations-Decision which has six stages; Exposure stage, Knowledge stage, Persuasion Stage; Decision Stage; Implementation Stage; Evaluation/Assessment Stage.

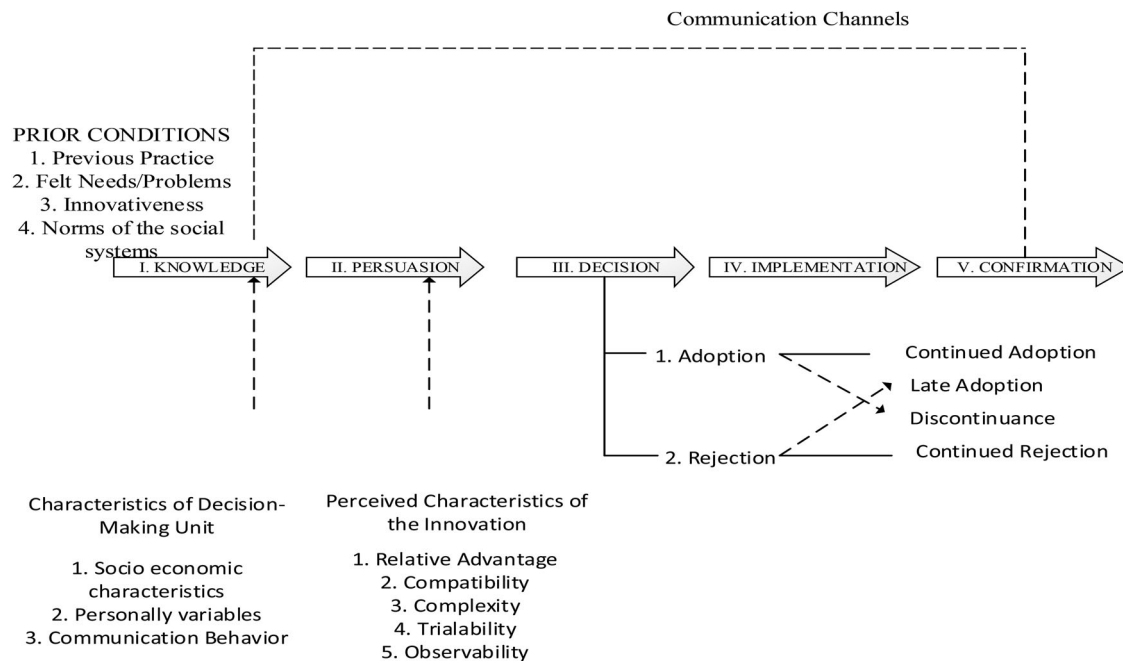


Figure 1. A model of five stages in the innovation-decision process. Source: Rogers (2003).

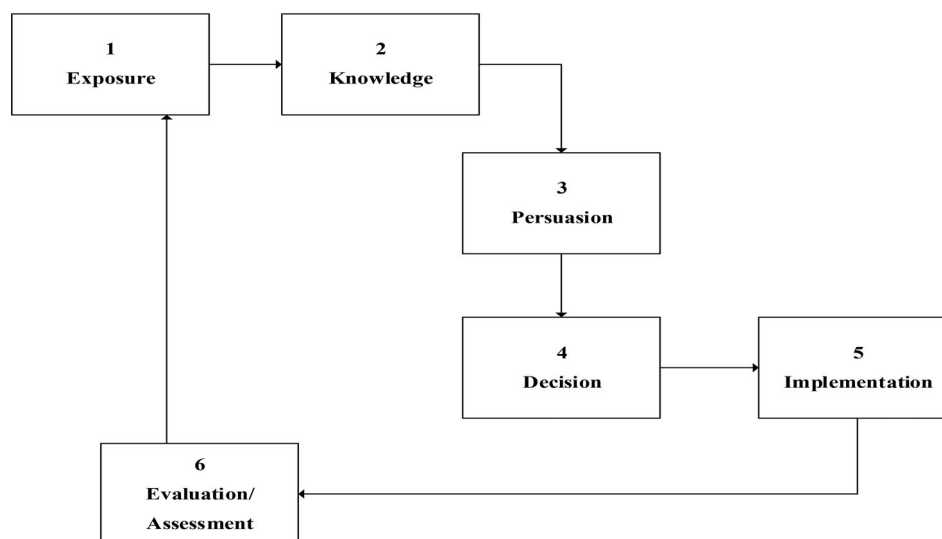


Figure 2. Conceptualized green building certification framework. Source: Authors construct adapted from Roger (2003) Diffusion of Innovation Theory.

Methodology

This research adopts a qualitative methodology, in which semi-structured interviews are used for data collection. The respondents were sampled purposively and representatives of each professional body were interviewed. The respondents were selected using the following criteria;

1. Members of professional bodies in the built environment
2. Knowledge on green buildings
3. Willingness of the participant to partake in the research

A representative from each professional body was chosen because of the likelihood of getting the same responses if more than one representative was chosen from each professional body. Also in qualitative studies, the objective is to understand and give meaning to the subject matter rather than quantify and generalize to a wider population. Professional bodies in the built environment were used in this study because, according to Rogers (2003), professional bodies as a unit in a social system has the ability to promote or impede the diffusion of an innovation. The Chartered Institute of Builders (CIOB) (2015) defines professional bodies as associations dedicated to the advancement of knowledge and practise of professions through developing, supporting, regulating and promoting professional standards for technical and ethical competence. In all, a total sample size of ten professional bodies made up of Ghana Institute of Architects, Ghana Institution of Surveyors, Ghana Institute of Construction, Ghana

Institute of Planners, Ghana Green Building Council, Institution of Engineering and Technology, Ghana Real Estate Developers Association, CIOB-Ghana and Association of Building and Civil Engineering Contractors of Ghana were involved. However, due to ethical reasons they were labelled as PB1, PB 2, PB 3, PB4, PB 5, PB 6, PB 7, PB 8, PB 9, PB10 not in chronological order. It is worth noting that qualitative research usually relies on small numbers with the aim of studying in-depth of a phenomenon. Data was collected by the use of semi-structured interviews and then transcribed and coded using Nvivo 11 Pro. In designing the interview guide for the data collection, the constructs in the conceptual framework were used as themes in the interview guide in order to collect useful and relevant data.

Discussion and findings

The fundamental concept of this paper was underpinned on Rogers (2003) DOI theory that, social systems (organizations associations or institutions or professional bodies) form a border within which an innovation diffuses.

Theme 1

Exposure stage

Awareness of green certification of building

Respondents were asked if their respective professional bodies have created awareness on green certification of buildings. The meaning of awareness according to

Nduka and Ogunsanmi (2016), is to create a base audience for a product, service or issue. Umar and Khamidi (2012) asserts that awareness on green building certification refers to ideal strategic model and promotion exercise which aids people to understand why it is important to implement green certification. Without client and customer awareness of the potential benefits of green building certification system, it will be difficult for them to exhibit interest and consequently demand for them (Darko and Chan 2016).

The association is aware of green certification of buildings. There have been some engagements to sensitise members. The greatest awareness was when the Danish embassy visited the association in 2015 to inform us about a green building exhibition that some members attended (PB 3).

They are aware of green certification of buildings. The professional body is made up of different professions and there are some who have had continuing professional developments (CPDs) on green building but not necessarily green certification of buildings (PB 6)

We recognise its importance. That is what our organisation represents and that is what brought all of us together (PB 8)

The Institute is aware of green certification of building. Some of the architects are part of the team that certified the one airport square (PB 9)

This demonstrates how some professional bodies were using their influences and platform s to promote the green certification of building. However, some professional bodies responded that they have not discussed the green certification of buildings with their members. Though they said that some of their members might have heard about it elsewhere:

The Institute as a body is not necessarily aware of the green certification of buildings. However, as an institute we have plans of incorporating it into our agenda in the future (PB 2)

The Institute as an entity is not aware of green certification of buildings neither has there been any collaborations with any external institutions or body on the subject matter. However, we will be considering it in the future (PB 4)

Importance of green certification of buildings

Professional bodies were asked if they recognize the importance of green certification of buildings. Some of them acknowledged that they know its importance through seminars, trainings etc. Though they

recognize its importance some of them have not made the effort to train their members on them. Below are some of the responses from the professional bodies.

The association recognises the importance of green certification of buildings. One of its guiding principles is to deliver a built environment that is responsive to the changes in the environment by making sure that buildings attain green status (PB 1).

The institute recognises the importance of green certification of buildings (PB 3, PB 7, PB 8, PB 9)

Theme 2

Knowledge stage

The need for intensified training

Knowledge and experience on green building projects are necessary for improving environmental performance of buildings (Li et al. 2014).

There is the need for members to be educated more. Because much of the education is from other countries with no bearing in Ghana, some of the things we read in the journal seem abstract. Some of these information is advanced and not suitable for Ghana. Currently there are no practical steps that locally everybody can follow to ensure that a building gets a green certification (PB 1).

Definitely there are people who will read about it individually or those who are inquisitive will want to read more. Therefore, not everybody knows about it. There is the need for more education on this, especially by using the institute's platform (PB 2)

There is the need for more education. With the Edge software for instance, apart from having a larger platform to educate members, there will be the need for companies to be visited individually and educated more on it. There is the need for clients to be educated and appreciate the benefits of green certified buildings though it might cost a bit higher than the conventional buildings its lifecycle benefits are worthwhile (PB 3)

There is the need for more intensified education (PB 5, PB 6, PB 7, PB 8).

Knowledge on how green certification of buildings work

According to Häkkinen and Belloni (2011), green certification of building can be hindered by ignorance or a lack of common understanding. Sodagar and Fieldson (2008) asserts that in order to design a building

according to a certification system, the design team needs to have access to the best available information on products and tools. However, there is lack of access to knowledge and materials, especially in countries where certified green building is lagging (Choi 2009).

Members know how edge certification which is a green certification of building works (PB 1, PB 9)

Some of the professional Bodies admitted their members do not know how it works because they have not trained them concerning the green certification of buildings.

As a group we have not had trainings about green certification of building (PB 2, PB 4, PB 5, PB 7)

Source of information on green certification of buildings

Diffusion is a particular type of communication in which the information that is exchanged is concerned with new ideas (Rogers 2003). Potbhare et al. (2009) established that the availability of better information is the most essential incentive to stimulate the adoption of green building certification. In order to ensure the widespread of this innovation the 'information barrier' needs to be resolved in advance. This information can be distributed to society through the print media, radio programs and television shows (Darko and Chan 2016). The views of some of the professional bodies concerning where they obtain information on green certification of buildings and other sources of information that can provide information on green certification of buildings are presented below.

Our monthly issue of magazines, gives us links to websites or organisations that talk about green certification of buildings. Our professional body connects us to official documents on green certification of buildings from different governments (PB 1)

'The energy commission, GhGBC, Ghana Standard Authority, Other professional Bodies in the built environment, TV, magazines can be used as a medium of communication' (All Professional Bodies). In a study conducted by Cheng and Venkataraman (2016) to analyze the relationships between project team compositions and green building certification in green building projects, the project team information of all LEED certified buildings were collected from the Canadian Green Building Council (CaGBC) database. According to Cheng and Venkataraman (2016), the CaGBC database was selected to conduct the analysis because it provided accurate project information

of certified green building projects. A dedicated website like the website for GhGBC can serve as database for reputable, current and standardized green building data which may be useful.

Complexity of green certification of buildings

According to Rogers (2003), complexity is the degree to which an innovation is perceived as being difficult to understand and use. New ideas that are simpler to understand will be adopted more rapidly than innovations that require the adopter to develop new skills and understandings.

It is difficult to identify clearly what you need to do to get certified. We have not been educated on how to get certified in Ghana (PB 1)

Based on the seminars and workshops we had on Edge Certification that our professional body have had, it is not complex but requires comprehensive data to be fed into the software which is time consuming (PB 3, PB 8, PB 9)

Theme 3

Persuasion stage

Effective communication of green certification of buildings

Umar and Khamidi (2012) suggest that advertisement on radio and TV stations, website development specifically for green building campaigns, media relations in terms of articles, news release and community relation by creating show participation are key tools in communicating the green building certification tool. Diffusion is a particular type of communication in which the information that is exchanged is concerned with new ideas (Rogers 2003). Interviewees were asked to identify how mass media and interpersonal communication can be used to effectively communicate the green certification of building.

FM and TV stations can be effective ways of communicating green certification of buildings. TV media can be invited during seminars or workshops to communicate it to the general public (PB 1, PB 2, PB 3, PB 4, PB 5)

There was also a concern about inadequate funds to use mass media as a medium of communication. An interviewee noted that, the amount of money required to use the media as a medium of communication deters them from taking this initiative.

The problem with the media is that everything you would want to promote; you have to pay for them.

Being a voluntary organization, there are no funds for that. The funds we have are member-generated which is not enough. It was during the launch of the one airport square and the Eco-build that the media captured them. The media does not provide free services in Ghana. Anytime we get the chance to be on TV we are also not given that opportunity to fully discuss matters on green certification of building (All Professional Bodies).

Observability of benefits of green certification of buildings

Chigona and Licker (2008) assert that abstract or ambiguous innovations are generally difficult to adopt and its diffusion becomes very slow. The Ghanaian society can better appreciate green building certification if the benefits of adopting them are visible for the would-be adopters to know how feasible that is. An example is that companies will demand green buildings if it can be demonstrated that the superior indoor environment quality results in improvements to staff health, staff satisfaction and staff productivity (Wilson and Tagaza 2006).

People need to see the benefits of green building as a means of motivating them. This one airport square building in Accra which is certified needs to be marketed in the media and the benefits must be made known to the masses of people (PB 2).

The benefits must be communicated efficiently. Models should be developed so that people can appreciate the benefits. Design both conventional building and green building and then do simple costing. Then you do cost benefit analysis. How much is it costing you today and how much will it be costing you over a period of time (PB 3).

People need to see the benefits of green building as a means of motivating them to adopt the green certification of buildings (PB 4, PB 5, PB 7, PB 8, PB 9).

Active participation of government

Koski and Lee (2014) asserts that governments can certify their buildings whereas creating specialists in green buildings such that availability and expertise of architects, construction firms and building materials increase. Government and local authority organizations that develop public buildings may affect significantly the development of green certification of buildings if they decide to adopt it (Häkkinen and Belloni 2011). Some of the interviewees said they have not seen the government's commitment unlike other countries where they have pledged their support. Also

there were concerns about the sustainability of the government's commitment.

The government has done a bit more about environmental issues and conservation of energy but is not in the name of green certification. Energy conservation and environmental is one aspect of green (PB 3).

Government mostly provide the short term need of the people instead of the long term needs. Initially, they might give you the support but they may not give us the necessary push. What the politician is interested in are policies that will give them an immediate score (PB 2).

The government's interest is low. If their interest were to be high, then we would have all joined in (Professional Body 7).

There is no visible government support in green certification of buildings (PB 4).

Theme 4

Decision stage

A key factor in facilitating the rate of adoption and implementation of green certification of buildings is the systematic imposition of legal regulations that ensures that individuals follow best practices (Wiafe 2016). The fear for higher investment costs of green building compared to traditional building and the risks of unforeseen costs are perhaps the most commonly addressed barriers for green buildings (Häkkinen and Belloni 2011).

Cost and financing are the biggest challenges in deciding to adopt the green certification of buildings, but Special Mortgage incentives as green building incentives can motivate people to adopt the green certification of buildings (Professional Body 3, Professional Body 6, Professional Body 8)

However, Bartlett and Howard (2000) also agree that cost consultants have been overestimating the capital costs of energy efficient measures and underestimating the potential cost savings. Hydes and Creech (2000) assert that higher costs may also come from the design team and contractors due to their unfamiliarity with green building methods. Without client and customer awareness of the potential benefits of green building certification system, it will be difficult for them to show interest and consequently demand for them (Darko and Chan 2016).

Theme 5

Implementation stage

The Ghanaian society can better appreciate green building certification if the benefits of using the certification system on the few green buildings are visible for the would-be adopters to know how feasible that is. Chigona and Licker (2008) assert that abstract or ambiguous innovations are generally difficult to adopt and its diffusion becomes very slow.

People need to see the benefits of green building as a means of motivating them. This one airport square building in Accra which is certified needs to be marketed in the media and the benefits must be made known to the masses of people (PB 6)

Interviewees made a clear indication that lack of policies is the major reason why people have not adopted the green certification of buildings. Over the years developed countries have moved from 'testing the waters' with green building pilot projects to developing wide-reaching policies that incorporate green building certification (Pearce et al. 2007).

Bye-Laws should be updated to incorporate green certification of buildings. Building inspectors should be trained and equipped to efficiently inspect buildings in the course of construction (PB 1, PB 6, PB 7)

Policy on applying the green certification on at least 70% of their public projects, there should be a collaboration between academia, research and government (PB 5)

Sayce et al. (2007) and Lam et al. (2009) suggest that one of the obstacles in the adoption of green certification of building is the fear of additional construction cost. To overcome this barrier, these authors suggest that financial incentives and innovative fiscal arrangements should be made available so that the extra cost could be accepted with the help of financing arrangements. Incentive is a factor that motivates a person to a particular goal (US Green Building, 2004). Incentives could be in the form of financial incentives or fiscal incentives. Financial incentives are direct monetary funds, grants, loans, rebates, etc. provided by government as a financial support for developers who propose or are willing to involve in green developments (Hashim et al. 2016). Reduced taxes as a green building incentive gives a wide appeal in the private and public sectors and further encourages the adoption of green building certification (US Green Building 2004).

Tax rebates for contractors who construct green building projects should be instituted so as to

encourage contractors to always bid for green building projects. Reduction of import duties on green building materials should also be encouraged (PB 2).

Special Mortgage incentives for green building incentives, tax reduction on green building materials, reduction of import duties on green building materials, public acknowledgement of people who go into green certification of buildings (PB 3).

Theme 6

Evaluation stage

Setting up an evaluation body

Interviewees were asked to identify the body that would conduct the evaluation of a project to assess its conformity with the requirements of green certification of building especially if it will be legalized in the future.

Government Agencies can be charged to aid in the evaluation process (PB1).

A neutral evaluation body should be set up to effectively evaluate buildings according to the green certification systems (PB 3).

Decentralization by leaving the basic ones to the developers, People should also be trained in the evaluation (PB 6).

Monitoring and evaluation is important. They should be done by the GhGBC (PB 8).

For green certification of building to be implemented, its requirements must also be clearly defined and distributed to all professional bodies.

Areas to be evaluated should be clearly defined and communicated to each professional body (PB 2)

The evaluation body must be trained and equipped to handle their responsibilities

People should be trained and well equipped to be able to properly evaluate (PB 7)

Framework for the implementation of green certification of buildings

This research has aggregated and augmented the responses from the interviews and put forth the framework for the implementation of green certification of buildings. The proposed framework has six (6) inter-connected steps which was further divided into three inter-connected phases. Figure 3 is the proposed framework for the implementation of green building

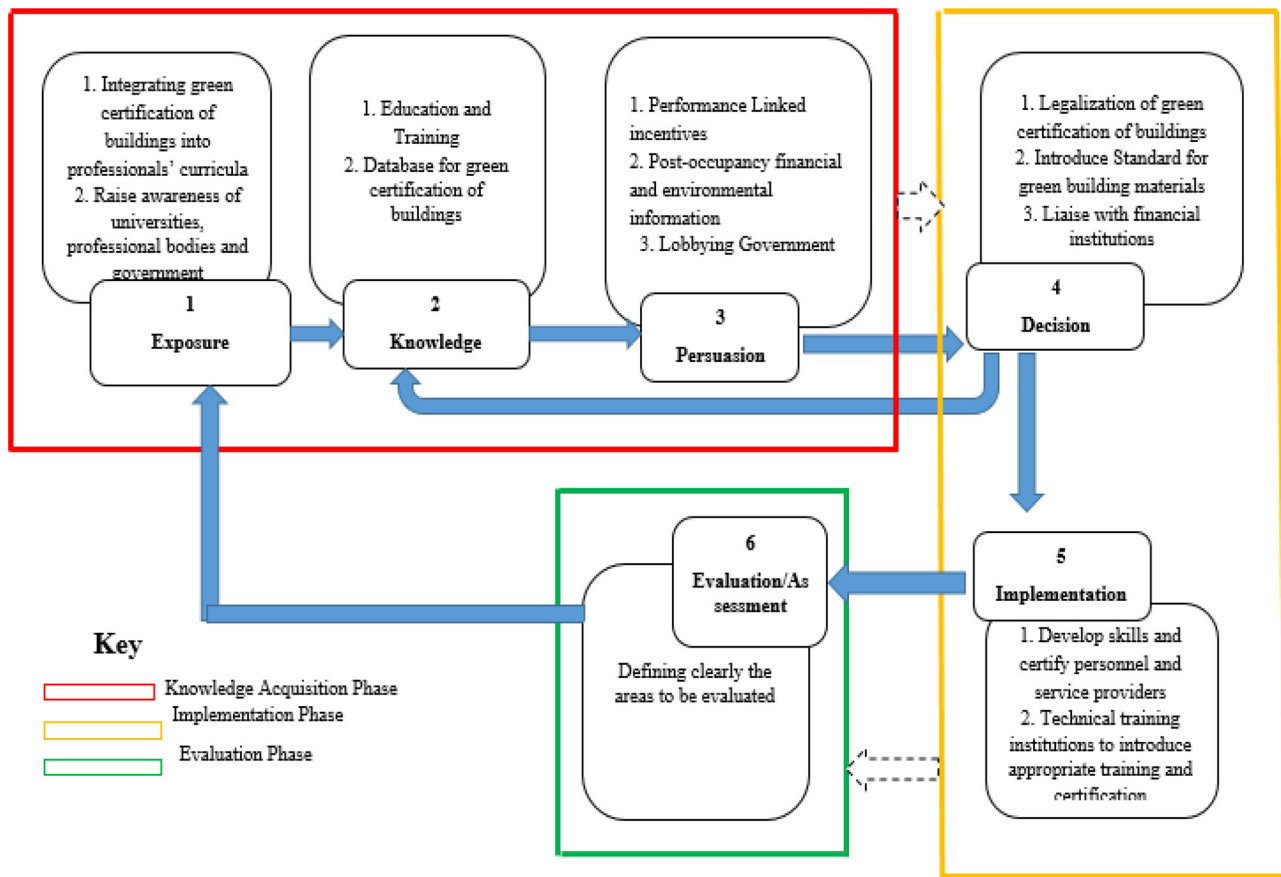


Figure 3. Proposed framework for the implementation of green certification of buildings.

certification in Ghana. The various phases have been expounded to include the following:

Knowledge acquisition phase

Exposure

Professional bodies should be involved in the adoption of green certification of buildings. These professional bodies should liaise with the Ghana Green Building Council to train them in green certification of buildings and its requirements. Some of the ways that the professional bodies can get involved is by identifying their roles in this green building certification and incorporating it into their code of ethics. Therefore, if they are incorporated in the code of ethics of professional bodies it becomes a requirement that members would now actively seek for information on how to apply this on their building projects. Another means of exposure is through incorporating it into the educational curriculum. Some of these professional bodies have made alliance with other institutions to train their members on this green certification of buildings. However, most of them

acknowledged that, the Ghana Green Building Council should spearhead this training exercise and make available to them the necessary training materials to aid this.

Knowledge

The second stage of the conceptual framework answers questions like 'Where can information be found?', 'What is the green building certification system?', 'How does it work?' There is the need for more awareness on what this green building certification is, how it can be used and where to get reliable information. Interviewees mentioned that members of their professional bodies need to be educated more. These professional bodies should be trained to effectively adopt this green certification of buildings when the need arises. Green building projects must be issued on websites and in brochures to sell green building achievements. The maintenance of a green building database which is easily accessible and linked to websites of various professional bodies is key in order to provide a consistent and accurate information. The system will ensure that the easy availability of

information is accurately shared among stakeholders and these professional bodies to promote enhanced discussions among themselves. Data from past projects should be stored on these dedicated websites and retrieved when necessary to support decision making when adopting the green certification of buildings. This database should include the details of energy consumption and environmental loading data of construction materials and products.

Persuasion

Observability of the benefits of having a building certified according to the green building standards persuades people to adopt it. The Ghanaian society can appreciate green building certification if the benefits of using the certification system on the few green buildings are visible for the would-be adopters to know how feasible that is. As Darko and Chan (2016) agrees that there is non-awareness of clients and customers on the potential benefits of green building certification system, it will be difficult for such individuals to show interest and consequently place demands on such certified buildings. The interviewees confirmed that by stating that the benefits of the green certified buildings in Ghana have not been effectively communicated to the masses of people. Data on initial cost of constructing these green buildings must be compared to the life-cycle cost and documented for the purposes of educating others.

The documentation of performance, costs and benefits of green buildings must be practiced, to expand the market. These benefits are mostly not tangible. These benefits are often realized over a longer period with healthier occupants with a positive environmental and social impact on the community as well as lower operating costs. The benefits of green certified buildings must be quantified including the information connected to its detailed features and information related to other indirect benefits such as health to enhance the adoption of green certification of buildings.

Also, according to Landman (1999), the responsibility for learning, educating, demanding and implementing more sustainable or green practices depends on the government rather than the private sector. The interviewees mentioned that they have not seen any visible commitment from the government especially in certifying their public buildings. They also added that they would have made efforts at promoting it if the government had shown some commitment. It should be noted that the government's involvement gives legitimacy to the efforts of environmental

advocacy groups like the Ghana Green Building Council. The legalization of green certification of buildings will persuade people to adopt it. An interviewee mentioned that government has shown interest in this green certification of buildings by modifying the Ghana Building Code which will include some elements of green certification of buildings.

The mass media is also an effective way of sensitizing masses of people to adopt this green certification of buildings. The Ghana Green Building Council should use mass media to effectively propagate the green certification of buildings. The government must also support the activities of the Ghana Green Building Council by funding their activities especially their media outreaches.

Implementation phase

Decision

Incentives are crucial in supporting the adoption of green certification of buildings. Higher up-front costs, potential risks and lack of the know-how and training are often cited as reasons why green certification systems are not adopted. To overcome this, government can provide incentives as a way to stimulate the adoption of green certification of buildings. The use of incentives can be applied to stimulate interest, bridge gaps and encourage green building practices. By providing property tax exemptions and sales tax exemptions, the government either wholly or partially offsets the cost of purchasing, manufacturing, installing and building new green technologies. Non-monetary incentives like loans, expedited permit, assisting research and development, technical assistance, marketing assistance and dedicated staff for green development in building and planning departments can also expedite the adoption of green certification of buildings. In the quest to bridge the difference between the cost of conventional buildings and certified green building projects, having low interest loans, grants or other financial tools can be useful.

Implementation

Implementation is when an innovation is put to use. There is a difference between the decision to adopt green building certification tool and the decision to put it in to use. The availability of professionals who specialize in green building certification is key to push forward with the application of green assessment system. People would have to be trained on how to use this green building certification system before

they can apply them on their projects. One of the barriers identified in literature and during the interviews was lack of information on this green building certification system. The professional bodies who had trained their members on this Edge certification which is a green building certification system admitted that there is the need for more training, how much more those who have never trained their members on them.

Evaluation phase

Evaluation. This is the final stage in the framework where according to Rogers (2003) the organization would assess the benefits and consequences of this innovation. However, in the context of green certification of buildings the evaluation is recognized as identifying the requirements that need to be fulfilled before the project is evaluated and passed as a green building project. The institution or body who is responsible for this evaluation, train people to effectively discharge their duties in project evaluation.

Conclusion

Green building certification is an emerging trend in Ghana and adequate implementation strategies will enable the Ghana Green Building Council to make decisions that relate to its implementation. This empirical research adopted a semi-structured interview guide to provide insight into how the professional bodies in the built environment use their influence in promoting green certification of building and how the green certification of buildings can be properly diffused into our construction industry by using the professional bodies as a diffusion channel. Hence, the empirical data established how the professional bodies in Ghana expect the Ghana Green Building Council to implement green certification of buildings. The evidence gathered suggest that green certification must be recognized as an innovation which requires certain measures to be in place before it can be diffused adequately into the Ghanaian construction system. Therefore, if this framework is taken into consideration by the certifying body in Ghana with regards to green certification of buildings, then the green certification of buildings may be adequately diffused into the Ghanaian construction industry.

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