

Are Smart Buildings Same as Green Certified Buildings? A Comparative Analysis

ZakariAmamata*, Bashir Faizah Mohammed** andBadiru Yunus Yusuf**

* Department of Property Management, Faculty of Geo-information and Real Estate, Universiti Teknologi Malaysia& Department of Estate Management Federal Polytechnic Bauchi, P. M. B. 0231 Nigeria

** Department of Architecture, Faculty of Built Environment, Universiti Teknologi Malaysia81300 Skudai Johor Malaysia

Abstract- The adoption of sustainable Architecture shows that green building is a key element for successful built environment in this dispensation, which call for policy innovative as an ingredient to enable the paradigm shift in the building industry and create guidance towards a sustainable future. More often the smart buildings are usually mistaken for green buildings and they are different in terms of construction materials and intentions and level of sustainability. The aim of this paper is to differentiate amongst buildings that have been rate rated by some selected countries which include; USA’s Leadership in Energy and Environmental Design (LEED) UK’s Building Research Establishment Environmental Assessment Methodology (BREEAM) and the Malaysia’s Green Building Index (GBI). A review of literature on the current dispensation of sustainable buildings was carried out from various data bases which include internet and other books source to come with the comparison between green buildings and smart buildings’. This method is based on review of literature. Smart buildings and green buildings are both subset of the sustainable buildings and are might have some similar characteristics but might be different as mostly smart buildings are technological oriented as they rely more on information Technology (IT)

Index Terms- Green Certified Buildings, Smart Buildings, Sustainable buildings, Technology

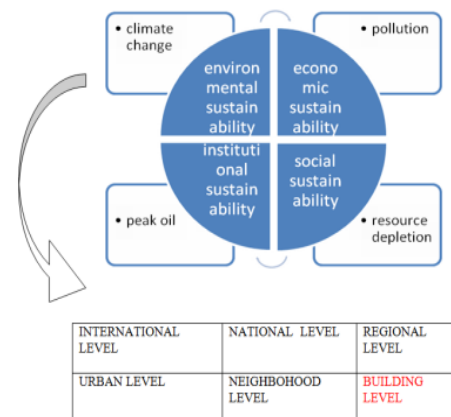
1. INTRODUCTION

The research look into green buildings and various types available with special consideration on smart buildings which is a sub-set of green buildings. These buildings are been rated with different rating tools and categories. On one hand green buildings have swept the construction industry since the year 2000, with commercial buildings taking the lead and office building in the trail. A green building is one that considers and reduces its impact on the environment and human health. Sustainable-green building is a subset of sustainable construction, representing simply the structure. While sustainable construction most comprehensively addressed the ecological, social, and economic issue of a building in the context of its

community Kibert, (1994) and Yudelson, (2009). On the other hand, smart buildings have some criteria of green building which are; integration of building systems on a common IT infrastructure or shared network utilizing open protocol and common HMI; high-performance buildings that provide significant benefits to building owners, property/facility management professionals, and end-users; maximize building performance and energy efficiency and use open protocol and are technology neutral strategies that add long-term, sustainable value to the property. Smart buildings successfully merge building management and IT systems that can dynamically optimize system performance and simplify facility operations. Integration greatly reduces both the hardware expense and frustration associated with installing and operating multiple autonomous building systems.

Energy, climate and building policies

Policies to enhance energy conservation, efficiency and sustainable planning at the local building authority level are more common in developed countries while in the developing countries these policies are less common (Siong, 2006). Many cities and towns have embraced sustainability as solution and a long term approach to advancement in activities and growth. This as an ingredient to enable the paradigm shift in the building industry and create guidance towards a sustainable future (Mondazzi, 2008).



materials, the treatment and the reutilization of solid waste materials all cause serious ecological problems that, the comprehensive solution is beyond the scope of architecture or construction technology. Although there are measure that an Architect could put in place in the designing and construction of buildings that would reduce an adverse effect on the ecology with regard to climate change

Fig.1 Conceptualization concept of sustainability

The Brundtland report (1987) and the Rio declaration(1992) which were published under the title ‘Task for the 21th Century’ served as a guiding principles for the implementation of ‘sustainable development’ It require the participation of all professionals from the various field of science and various sectors of the economy and society (Kunszt, 2003). The International Union of Architects (UIA) and the International Council for Building Research (CIB) played a key-

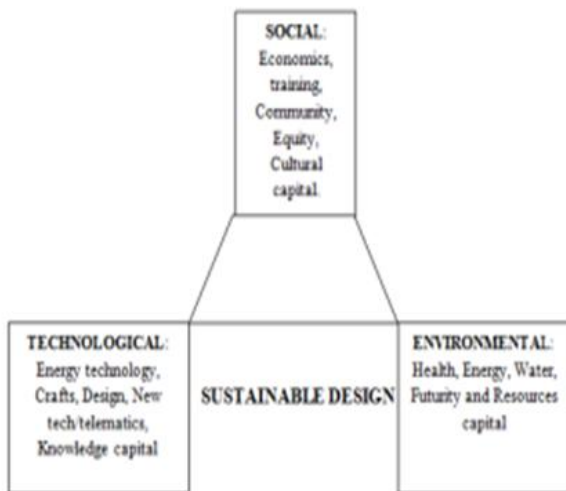
Social-Cultural Requirements-Critics of globalization have identify that quite a number of countries, region and cities would lose their identity with the advent to globalized the world and Architecture has a key-role in the preservation of identity, which is a reflection of how we can deal with the environmental issue in a more measurable terms. Besides providing solutions to eliminate or minimize environmental problems, there is need for a holistic approach to a sustainable environment

II. PURPOSE OF THE STUDY

The purpose of this work is mainly to differentiate amongst building that have been rate rated by some selected countries which include; USA’s LEED, UK’s BREEAM, and the Malaysia’s GBI

III. RESEARCH METHODOLOGY

A review of literature on the current dispensation of sustainable buildings was carried out from various data bases which include internet and other books source to come with the comparison between green buildings and smart buildings’. This method is based on review of literature Creswell (2012).



role in the detail study of the tasks of sustainable architecture and sustainable construction. After the first International Symposium of sustainable Construction in Tampa, Florida in 1994, Kibert’s definition for sustainable construction was unanimously accepted as a first approximation and was emphasized by CIB in its publication title AGENDA 21.

Fig.2 Three perspectives on sustainable design: source adopted. (Edwards, 2005)

Construction Ecology- The process used in producing most building materials; bricks, cement, glass and steel required a great no of thermal energy, which may add to the adverse effect of climate change. The use of environment-friendly building

IV. DISCUSSION

A. Smart Buildings Have Several Things In Common:

- Integration of building systems on a common IT infrastructure or shared network utilizing open protocol and common HMI.
- High-performance buildings that provide significant benefits to building owners, property/facility management professionals, and end-users.
- Maximize building performance and energy efficiency.
- Use open protocol and are technology neutral strategies that add long-term, sustainable value to the property.

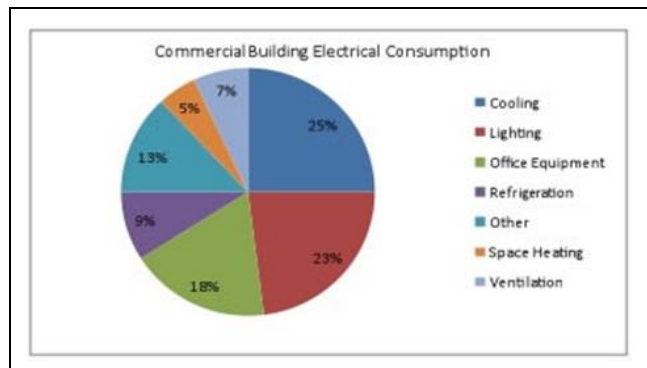


Fig. 3: A pie chart showing commercial building Electrical consumption with varying percentage. The New Straits Times Press Malaysia

Smart buildings successfully merge building management and IT systems that can dynamically optimize system performance and simplify facility operations. Integration greatly reduces both the hardware expense and frustration associated with installing and operating multiple autonomous building systems.

a. How They Work

Integration begins with a common IT backbone or infrastructure; the majority of buildings utilize separate and usually proprietary systems that have their own controls, protocol, cabling, and HMI. Once individual building systems are integrated onto one network they can be monitored and controlled by a single interface, accessible via a secure Web browser for unlimited user access. Additional use of a network operating center (NOC) allows for 24/7 monitoring and control of an unlimited number of equipment, systems, and buildings by personnel with the proper training and skill set. Utilizing open-protocol such as LonWorks® and BACnet® allows the building systems to employ the best sensors and technology on the market while not being tied to a particular vendor or manufacturer.

b. Benefits and Capabilities

- *Tenant attraction and retention.* A significant benefit to the building owner is the expectation that smart buildings can demand above-market rents, have low vacancy rates, and can reduce turnover through higher customer service, added technologies, and increased efficiencies.
- *Reduced operating costs.* Smart buildings are usually highly efficient buildings where operating costs are significantly lower than comparable buildings. Using accurate, intelligent monitoring and control of energy-intensive systems such as HVAC and lighting help reduce costs.
- *Energy metering.* Integrated systems allow for sub-metering of individual tenants; tracking and automatically invoice tenants for their energy use. This not only gives the tenant control of their electrical costs but may allow for shared savings through demand response programs.
- *Fast and effective service.* Smart building technologies give building management professionals the tools they need to better serve tenants, occupants, and users. Accessing building systems via the Internet makes it easier for facilities professionals to assess real-time conditions, detect problems, and monitor building performance off-site. Problems are identified early and solved immediately, sometimes prior to the customer realizing there is a problem.
- *Simplified operations management.* Changes to a system can be made from a network operations center (NOC). The result is a leaner facility management operation which directly correlates to reduced labor costs.
- *Enhanced life safety and security.* A fire situation is perhaps the most commonly cited example of how integrated systems are beneficial. A fire alarm is triggered and the integrated building systems respond: Smoke exhaust dampers open and fans operate, the paging and intercom system warns the occupants and issues instructions, the access-control system unlocks doors for evacuation, lighting is turned on, and security cameras provide emergency personnel with a view of the fire.
- *Mobile security systems.* A Web-based security system allows security personnel the ability to view live video from surveillance cameras on a laptop or portable device. Future technology. Since technology and equipment are changing rapidly, a building with an IT backbone utilizing open protocol will be ready to support almost anything that comes onto the market. Additionally, with tenant needs changing, a smart building is flexible enough to adapt quickly.
- *Added revenue stream.* Smart buildings can offer occupants wired and wireless high-speed Internet along with other communications services such as Voice over Internet Protocol (VOIP) that will maximize the building's revenue per square foot.
- *Environmentally friendly.* Monitoring and control of energy use for the purpose of reducing consumption defines a green building. While it may be possible to

have a green building that isn't smart, all green buildings will have some form of a building automation system (BAS). The BAS could allow a daylight-harvesting system to work together through an IT backbone with interior lights and photoelectric and occupancy sensors to provide optimum light levels and save energy use.

B. Green Buildings'

Sustainable design

The concept of sustainable development can be traced to the energy (especially fossil oil) crisis and the environmental pollution in the (1970's) shortage of energy, global warming, urban sprawl, air pollution, overflowing landfills, water shortage, disease and global conflict will be the legacy of the twenty first century unless the movement of sustainability is implemented (Ali, 2008). In broader perspective sustainability main goal is to strike a balance of interaction amongst; biological resource system, the economic system and the socio-cultural system (Newman, 2001). According to Yudelson (2009), green building is the one that considers its impact on the environment and human health; while, high-performance building design is the building that has gain the certification from a third party certifier like; USA's LEED, UK's BREEAM, Singapore's GREEN MARK or the Malaysia's GBI.

- Sustainable/green building is a subset of sustainable construction, representing simply the structure. While sustainable construction most comprehensively addressed the ecological, social and economic issue of a building in the context of its community (Kibert, 2007)
- Green buildings are part of a global response to increasing awareness of the role of human activity in causing global climate change. Buildings account for more than 40% of all global carbon-dioxide emissions, one of the main culprits implicated in the phenomenon of global warming.
- Green buildings have swept the construction industry since the year 2000, with commercial buildings taking the lead and office building in the trail (Yudelson, 2009). A green building is one that considers and reduces its impact on the environment and human health.
- Green building, sustainable construction, high performance buildings are mostly used interchangeably but are difference. Sustainable/green buildings can be defined as the facilities which are the outcome of sustainable construction for the purpose of promoting occupant health and resource efficiency, minimizing the impacts of the built environment on the natural ecology system (Kibert, 2004)

IV. CONCLUSION

The past two decades have witnessed a rapid increase in the number of Sustainable Building Rating System (SBRS) used worldwide; SBRS have played an important role in the sustainable construction delivery system with LEED taking the lead and BREEAM achieving great success in several countries (Xiaoping, *et al.*, 2009). From studies conducted it is clear that all of these tools pointing to a single similar objective that's the implementing the principles of sustainability. Obviously the differences among these tools are also significant as elaborated below (Xiaoping, *et al.*, 2009). There is a great different in temperate, tropical and the Mediterranean climatic conditions as well as the cultural and political diversities, this lead to the party that are involve in the development of the SBRS tools. LEED and BREEAM are established by non-profit third party. Some of these tools have a weighting system while some other don't have weighting systems. These weighting systems were used to establish the difference between green buildings and smart which is that both green buildings and smart building all belong to the set sustainable buildings'. Not all smart building are green buildings in the sense that green buildings are those buildings that have been rated by a rating (weighting system) while a smart building might reduce the impact on the environment but if not rated it is no considered as a green building.

Smart buildings and green buildings are both subset of the sustainable buildings and are might have some similar characteristics but might be different as mostly smart buildings are technological oriented as they rely more on information Technology (IT)

ACKNOWLEDGMENTS

The authors will like to acknowledge and thank the International Doctorial Fellowship (IDF) initiated by Universiti Teknologi Malaysia (UTM) supported by the Ministry of Higher Education, Malaysia (MOHE) for contributing to this research work and Tertiary Education Trust Fund (TETFund) for their contribution to this work

REFERENCES

- [1] Kibert, C. J (1994). Establishing Principles and a Model for Sustainable Construction. Proceedings of the first International Conference of CIB Task Group 16 on Sustainable Construction, Tampa, FL, , vol. 6-9, p. 3-12.
- [2] Yudelson, J. (2009). What is a Green Building? Sustainable Retail Development, DOI, 2009, pp 41 & 43.
- [3] Siong, H. C. (2006). Energy Conservation and Planning- guidelines for energy efficiency efficient residential developments, (CETDEM) and Malaysian Institute of planners 12th August 2006 Armada Hotel Petaling Jaya Malaysia PP 1
- [4] Mondazzi, M. (...). Developing Policy Incentives to Promote Green Building Practices in Boston Seminar of a master of science proposal

- [5] Newman, P., (2001). "Sustainability and cities: the role of tall buildings in the new global agenda." Proc, CTBUH Sixth World Congress, 76-109.
- [6] Brundtland H. T. (1987). World Commission on Environmental Development (WCED) "Our Common Future" United Nations
- [7] Kunszt, G. (2002) Sustainable Architecture. Periodica Polytechnica Ser. Civ. Eng. (47) 1, 5 – 10
- [8] Edward, B. (2007). Rough guide to sustainability. London: RIBA Enterprises
- [9] Creswell, J. W. (2012). Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research, (4th Ed). Boston: Pearson. ISBN 9780131367395
- [10] The New Straits Times Press (Malaysia) Berhad, Balai Berita 31, Jalan Riong, 59100 Kuala Lumpur, Malaysia. Green building fever fast spreading in Malaysia By Francis Dass bt@mediaprima.com.my 2013/11/27 KUALA LUMPUR
- [11] Ali, M. M. (2008). Energy Efficiency Architecture and building system to address global warming: Leadership and management in Engineering, 115, 116 & 119.
- [12] Newman, P., (2001). "Sustainability and cities: the role of tall buildings in the new global agenda." Proc, CTBUH Sixth World Congress, 76-109.
- [13] Xiaoping, M., Huimin, L., and Qiming, L., (2009). A comparison study of mainstream sustainable/green building rating tools in the world. IEEE Xplore

Internet sources

<http://www.greenbuildingindex.org/News/2013-11/BT%20-%20Green%20Building%20Fever%20Fast%20Spreading%20In%20Malaysia>
<http://www.energyworks.com/index.php?page=smart-buildings>

AUTHORS

First Author – Amamata Zakari, M. Sc. Real Estate UTM Malaysia and amazak4real@yahoo.com

Second Author – Faizah Mohammed Basir, B.Tech Architecture MAUTECH Nigeria and faizahbash@yahoo.com

Third Author – Badiru Yunus Yusuf M.Sc. Architecture ABU Zaria Nigeria and badiru.yusuf@gmail.com

Correspondence Author – Amamata Zakari, amazak4real@yahoo.com, amazak4real@gmail.com