Smart Home: A Literature Review

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Abstract: *Concerning Green Building and the benefits, it offers- smart homes its one of those. Installation of smart products gives the home and its occupants' various benefits such as technology and personal computing have brought us over the past 30 years of convenience and time, money, and energy are conserved. However, average homes there is nowadays do not have these systems and appliances installed. Therefore the most common and affordable is for the homeowner to add smart products into their own home and enjoy the use. A Smart Home is applied in homes nowadays because it is the specialized feature it offers to conserve the earth's limited resources. This study further discussing the benefit of the Smart Home concept. By using the latest ten years of publication for extensive literature review methodology perhaps may contribute to enhancing the existing knowledge.*

INTRODUCTION

A smart home is an entirely automated home and exists to ease and provide convenience to everyday activities in the home. This technology allows all electronic devices to act 'smart.' They integrate technologies and services through a home network to improve living quality. It covers a broad aspect that includes security, energy-saving, ventilation, smart kitchen, and more with smart devices such as remote control, etc. [1]. According to Klarin [2], smart home technologies can reduce energy usage in the residential sector. Today, the Internet of Things (IoT) is the smart home that can create an interactive energy management system for homes. Its invention is to make people's lives simpler and better, especially in their home environment.

In ensuring long-term exploitation of resources without jeopardizing future generations, the concept of sustainable development is being considered and evolving in the 70s, especially in the 80s of the last centuries. It is based on the concept of development (socio-economic development in line with ecological constraints), the concept of needs (redistribution of resources to ensure the quality of life for all), and the concept of future generations (ensuring the obligatory quality of life for future generations with resources with attainable long-term utilization) [3].

For the past two decades, Green Building concepts and practices have become an interest in the world. It is known for its viable solution in delivering sustainable buildings and have less harmful effects on the environment, resource consumption, and human health. A Green Building has less impact on human health and uses less water and energy than a typical building. It promotes higher indoor air quality and has different building materials, furnishing, and furniture [4][5].

Concerning Green Building and the benefits, it is a residence that has appliances, lighting, air conditioning, heating, televisions, computers, video system and entertainment audio, security, and camera systems. They are capable of communicating with one another and can be controlled remotely by a schedule, from any room in the home, and remotely from any location in the world by phone or internet [6].

Installation of smart products gives the home and its occupants' various benefits such as technology and personal computing have brought us over the past 30 years of convenience and time, money, and energy are conserved. However, traditional homes there are nowadays do not have these systems and appliances installed. Therefore the most common and affordable is for the homeowner to add smart products into their own home and enjoy the use. A Smart Home is applied in

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homes nowadays because it is the specialized feature it offers; it is to conserve the earth's limited resources. The primary services a Smart Home provides are as follows: detect health conditions; eldercare, healthcare, childcare safety; store and retrieve multimedia from smart home; surveillance; and devices monitor and control- Smart homes benefits in limiting environmental impact, saving on energy cost and improving building security and safety [7].

The biggest yet problem faced in applying a smart home system is the cost. Although several companies provide a smart home system or sell smart devices, they are quite expensive. Which only affordable to the upper-class. Good savings and income are crucial elements to install this system. The majority perceive smart home technology as a luxurious commodity; only the upper class can afford them. A smart home system is in its early stages of development [8]. The market for smart appliances is only influential players who can afford it—resulting in a lack of competition, leading to disproportionally high prices. Consumers in respect of technology availabilities are very selective when it comes to investing in technology and convenience [9]. Despite the issues highlighted, the Smart Home has benefits for construction players (Architect, Engineer, Quantity Surveyor, Contractor, etc.) and the public. Therefore, studying the benefit of a smart home can enhance the existing knowledge and may trigger a further understanding of the concept itself.

LITERATURE REVIEW

By referring to Table 1, Smart homes utilize appliances and a home-based network to connect all household appliances and the outside internet world. Some useful properties, such as improving energy efficiency, thus lower electrical bills, increased security in homes, upgrading appliances, on-demand video programming, and safety mechanisms for the elderly to live in the home [10].

The appliances and devices are all receivers, and to control the systems; it uses a simple remote control or keypads that act as the transmitter [11]. An example of how it operates, if the user wants to turn off the lamp in another room, click on the function button on the remote control, and the transmitter will issue a message in a numerical code to alert the system to its command. An identifying unit number will then be transmitted to the device, stating its command. There is also a code that commands "turn off" to the device.
According to Roshan [7], having a smart home system will significantly benefit a wide area, limiting environmental impact, electrical cost savings, and improved house occupants' building security and safety. Occupants using the smart home will be much safer and

consider saving the environment from destructive impacts.

According to Georgiev & Schlögl [6], a smart home is a residence installed with computing and information technology that interacts with the occupants' needs to provide comfort, security, and entertainment through the usage of technology within the home and connection to the world beyond—even the most significant difference between a smart home and a traditional house. Concerning the health monitoring or any health/related issues, according to the World Health Organization (WHO) studies, it is stated that approximately by 2050, at least 20% of the world's population will be at the age of 60 years old. People at this age will mostly suffer from chronic diseases or cannot live independently; in short, about 650 million people will be living with disabilities [12]. So, having this Smart Home innovation today will significantly benefit consumers in the last days.

According to Boyanov & Minchev [12], present computing is an application where ambient intelligence monitors the home environment to provide context-aware services and facilitate remote home control. They offer a better quality of life by using automated appliances control and assistive services, which will ease the users.

Table 1 Smart Home Definition

No	Definition	Author, Year
1	Smart homes utilize appliances and a home-based network to connect all household appliances and the outside internet world.	Carlucci, Labaccaro & Löfström [13]
2	The appliances and devices are all receivers, and to control the systems, is by using a remote control, keypads, which act as the transmitter.	Farshidi [14]
3	Smart Home system benefits in a wide area including limiting environmental impact, electrical cost savings, and improved building security and safety	Hoffman & Novak [15]
4	A residence installed with computing and information technology may interact with the occupants' needs, provide comfort, convenience,	Katre & Dinesh [16]

	security, and entertainment through the usage of technology within the home and connection to the world beyond.	
5	An application of present computing where ambient intelligence monitors the home environment provides context-aware services and facilitates remote home control.	Lee [17]

The application of a Smart Home System is security, energy management, lighting, air conditioning, and home appliances. In which each one serves a different purpose;

    a)   Security – a security system installed in homes and sends notifications via HD videos directly to a smartphone.
    b)   Energy Management – The ability to incorporate energy management features through lighting, air conditioning, and home devices.
    c)   Lighting – Light and lamp are automatically operated to turn on or off based on the occupancy sensor. For example, the system will use automated drapes function in the morning without turning on the lights, but at night the lights will be turned on when there are occupants and off when there is none.
    d)   Air conditioning – The system will use sensors to detect people's presence in a room and thus turn on and off the air-conditioning and set the temperature accordingly.
    e)   Home Appliances – To keep track of the appliance's energy usage and schedule the operation of massive power-consuming appliances to make use o off-peak electric rates. [1]

The smart home practice offers many benefits to its users. According to Bhati, Hansen & Chan [18], it benefits a wide area, including limiting environmental impact, electrical cost savings, and improved building security and safety. They even transform data to help the users decrease the costs further and increase efficiency by monitoring devices and control and comfort in their buildings. Building occupants can modulate their energy use with smart controls. Furthermore, a smart home enables the user to detect health conditions for the elderly, sick people, or even childcare. They can provide entertainment and surveillance for improved security.

According to Boyanov & Minchev [12], a smart home provides benefits in three categories, which are comfort, healthcare, and security to its users. It uses an assistive service to optimize energy usage as the house is already intelligent enough to reduce energy use by controlling unattended home appliances. These devices learn through daily human activity and behavior. In healthcare, these smart homes provide everyone's facilities regardless of sick or healthy people, young or old. They identify health conditions and ensure assistive services, and gives an alert if required by the user. It benefits the users in the long run as a smart home provides local and remote monitoring. Insecurity, because smart homes are network operated, it is vulnerable to a security threat. Thus, a higher security mechanism is adopted to overcome the problem.

According to Kadam, Pranav & Yash [1], these smart homes are devices that offer benefits to users such as welfare for health monitoring, entertainment for smart home theatre or Multi-room audio, and environmental control with remote to reduce usage and cost. Furthermore, security is smart security for property monitoring and protection or even fire detection, communication for reminders and communication, and green to reduce carbon output.

According to Badica, Brezovan & Badica [11], smart homes can make life more comfortable and convenient. For example, when the fire alarm goes off, it automatically will unlock doors for easy exit, dialing the fire department and light the path to safety. It will also benefit the elderly for their safety, in which it will alert the user to when to take medicine, alert the hospital if the user fell, and track the user's food intake. It is also cost-saving and energy efficiency to use a smart home device. Lights will automatically turn off when the user leaves the room and automatically turn back on with the user's presence.

According to Robles & Kim [9], smart home benefits in four categories. First, it can save money as they consume less energy and cut expenses on utility bills. In the long run, it will also be a good return on investment as its worth will increase and making it easier to sell. Secondly, it will enhance the safety of its users. A smart home provides a monitoring mechanism for children's activities and assists family members. The third is to prevent damage. Smart homeowners can even monitor their house while they are away. For example, if the oven is left on, glass breaks will alert the homeowner, which creates increased security for the homeowners. Last is the convenience enhancement, where it will provide comfort for the homeowners. It can even provide a reminder to the homeowner if they are running low on products.

Table 2 Benefit of Smart Home Concept

Benefit \ Author	[5]	[10]	[6]	[9]	[7]	[1]
Safety - Detection of health condition -Elderly, sick people, childcare	√		√	√	√	√
Security - Video surveillance	√	√		√	√	√
Healthcare -Medicine monitoring		√		√		
Comfort - Provides comfort		√		√	√	√
Entertainment - Storage of multimedia	√					√
Environment - Limitation of environmental impact - Less carbon dioxide and other harmful materials	√					√
Cost - Automated sensors of turning on/off of appliances	√		√	√		√
Energy efficiency - Reduces energy wastage	√		√	√	√	√

METHODOLOGY

Table 3 show the different year of source referred. 19 journals had been used as references while producing this paper.

Table 3 Journal referred

Year of published journal	Total referred
2018	2
2017	5
2016	3
2015	2
2014	4
2013	3
2012	0
2011	0
2010	0
2009	0
2008	0
Total	19

CONCLUSION

In the current review, technology became more efficient but shows that if there is disbelief among the project team members about the Smart Home concept's importance and benefits to be considering and implementing on construction projects, satisfactory results can not be obtained. Based on research and findings, this can conclude that the Smart Home concept may offer several benefits to the construction player and the end-user or potential buyer.

Training and education should be given to everyone involved in the project. In this training, all construction players must have exposure and awareness of what Smart Home may offer in terms of the benefit. A clear definition and criteria of Smart Home are the main highlighted thing to highlight to construction players. A campaign to end-user or potential buyer on what Smart Home may offer positively. Proper communication between the parties involved in the construction, property seller, and to the end-user, it is a must to be developing among them.

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