

# The Role of Smarthome Technology for Improving Supply Chain and Perceived Value on Housing Retailer

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**Abstract-** Smart building can be a procedure for developing supply chain in civil industry. The current type of housing in Indonesia is classified into several clusters and has varying prices, from prices of hundreds of millions to billions. For homes that have a price of millions, providing comfortable facilities, it is a must such as smart home systems that offer additional safety features, running by IoT (Internet of Things) technology where the owner can control and monitor via smartphones. This kind of system will certainly not be available on simple housing types or mortgages. To use this system, the owner or housing retailer will issue a large amount of cost used for the installation and installation. Some developer offered a smart home technology with a relatively high price, which is around the price of 20 million to a dozen million IDR which not include the usual maintenance and installation of the system. This condition overcomes the problem that housing retailer often difficult to sell a house with extra smart home packages. Mostly, the only high-income consumer can buy a house with smart home features. This problem is the detailed background for this research that aims to design software of smart home that affordable, and to optimize the value of housing used the descriptive quantitative method with a waterfall system as a software development model. At the end reach purposed that the smart concept can be installed at home or housing so that not only owned by a high-end consumer but also with middle to lower consumption.

**Keywords-** Housing, Supply chain, Monitoring, IoT, Smart Home, Perceived Value, Retailers.

## 1. Introduction

Security is something that cannot be negotiated in the modern era, where all data controlled automatically; technology control has entered the realm of transportation, agriculture, building structures, and industrial systems. In a very large area, the monitoring and security system cannot be done manually, considering the number and personnel and technology used are still limited and very expensive. The application and advancement of technology affect the housing sector, where every developer or developer will improve service facilities and finance with a high-tech implementation. The negative impact is that housing prices become swollen and become very expensive. It is not possible to apply to ordinary housing in this case mortgages or small housing, where the security factor becomes very common and there is no monitoring system or control, either at the site control facility parking, yard, parcel, etc. Currently, a smart home or smart home technology has been developed, and in the 21-century housing concept, where electricity control security features or household appliances could be controlled with a smart home, this system is not only for controlling or maintaining one's own home but also around us.

## 2. Literature review

### 2.1 The Concept of Smart House

Smart technology has developed very quickly following the development of the world of computers and networks. The function of a smart home is nothing but to improve the quality of human life; some studies have discussed the concept of this smart home; the concept of smart home is divided into two parts, namely using cables and without wired or wireless. The concept of making a smart home has its challenges where the development of supporting tools and sensors is increasingly diverse and requires various configuration techniques as well [1]. Technological advancements applied to smart home projects are how we apply a technology using smaller electronic components. These devices can be installed around the house, which is expected to be smarter and more sophisticated and can be arranged in full automation. The setting system of a smart home can be in the form of lighting, temperature control, security system controls, others. Smart home technology is usually placed in the kitchen and can be integrated with a refrigerator, microwave, coffee maker and dishwasher. The integration process requires an internet connection that is applied to multiple devices and can be controlled and monitored even though they are outside the room [2]. In addition to being applied to smart home technology, household appliances can be used for supporting and health monitoring. This system works as a personal partner who always provides health information by adding additional sensors such as body conditions such as heart rate, body temperature, and blood pressure. While for smart home entertainment activities are used to regulate television, video, games. In environmental monitoring, the concept of smart home is used to regulate lighting, heating and energy management. The system provides information about the use of electric power. The smart home security system implementation is in gas leak detection system, water leakage, and electricity systems. The most important thing about the smart home concept is how the technology can regulate electricity so that the power consumption used can be more efficient by the green technology concept [3].

### 2.2 Voice Recognition Technology

Many voice recognition or speech recognition technologies are installed on the smart home system.

This system can be a safeguard on the introduction of access rights that are integrated with home security systems. This system works by converting voice signals into digital codes by computers and integrated with other systems [4]. The technology in a smart home is basically to make an integrated residential concept. The control process can be connected to the operating system used today, which is window-based and PC-based. Systems commonly used for control usually use remote or sound-based modes. The smart home system does not make the house isolated from the surrounding environment but becomes safer and looks after each other with tool rock and is mutually integrated. The system can support our daily work and activities and improve a better quality of life [5].

### 2.3 Internet of Things

The smart home system is combined with the IoT (Internet of Things) system. The system has a smart control device that can be installed in the regulation of the use of electric current and energy resources. The system is expected to provide convenience and easy to configure. The tool can recognize the surrounding environment by taking from the sensor input both installed inside the room or outside the room [6].

### 2.4 Pricing Strategy

Price can likewise be balanced using markdown estimating (amount, practical, occasional limits, installment terms) and remittances (exchange, limited time); prejudicial valuing (client portion, item frame, area, time); mental evaluating; special estimating (misfortune pioneers, unique occasion evaluating, money refunds, low interest financing, longer guarantees, free support, limits); and land estimating (FOB-Origin, uniform conveyed, zone, basing point, cargo assimilation). Be that as it may, the two purchasers' and rivals' responses should be considered before evolving costs [7]. Value hypothesis in financial aspects characterizes how the organizations should set costs under specific suspicions to expand their benefits [8]. In any case, the static idea of the value hypothesis and its inflexible suspicions for cost, cost and amount (item) make it inapplicable to promoting professionals. At the point when these presumptions are damaged, it turns out to be difficult to gauge the idea of the interest (request bend) and a benefit expanding cost cannot be resolved. Presumptions that advertisers cannot stand to have

incorporated, a constant situation, single item firms, and all clients paying a similar value [9]. According to [10] "Prices are what must be given by consumers (buyers) to get a product" [10]. Prices often are the most flexible element among the four marketing mix elements. Besides that, [11] "Implementing a low price policy compared with competitors can be created, if the company has an advantage compete at low costs [11]. Likewise, according to [12] "Pricing and price competition are the number one problem faced by marketing executives." However, many companies do not seem to handle pricing well [12].

#### 2.4.1 Perceived Value

Consumer perceived value is a tradeoff among seen and yielded advantages (or positive and negative outcomes) [13]. The apparent advantages are a mix of various components, in particular: physical characteristics, benefit qualities, and specific help acquired in utilizing the item. Seen esteem is the general appraisal of purchasers on item benefits dependent on what they get and what they give. [14] Seen esteem comprises of four measurements in particular: 1) Emotional Value is an advantage acquired from prosperous sentiments or proclamations delivered by the item. 2) Social Value is an advantage gotten from the item's capacity to enhance social self-idea. 3) Functional (value/esteem for cash) is the advantage acquired from the item identified with transient cost decrease. 4) Quality Value (execution/quality) are benefits gotten from seen quality and anticipated execution of the item [15].

#### 2.5 Housing Retailer

Housing demand plays a vital role in influencing the market value of residential type property. It is due to the offer of land for limited development in terms of power will always be in terms of demand always change and increase. Ref. [16] explained that consumer demand for housing is influenced by the following factors: a) Location; the existence of a housing location, whether it is centered at the very edge of the city affect consumer interest in buying a home. More strategic the location of the housing means that it is getting better and has a level higher demand. b) Population increase; for the reason that everyone needs a place to live as shelter, then every increase in population is natural or non-natural (due to

urbanization) will increase demand going home. c) Consumer Income; the ability of someone in owning a home is greatly influenced income earned. d) The ease of getting a loan; in the residential property market, housing demand is affected as well by government policies and financial institutions such as banking. e) Amenities; Facilities here include public facilities and social facilities, including infrastructure, educational facilities, health, religion, facilities transportation, and others. The existence of these facilities builds as well as attract investors who will further increase demand will be housed in the area. f) House Prices; as in the case of the theory of demand and supply, the higher the price goods will cause a decrease in demand for goods intended. If the price of medium-sized homes rises, while the tendency of owning a house with this price level will decrease and demand will shift to homes at lower prices.

### 3. Methodology

This research method, using quantitative and descriptive. For developing software used waterfall method. This method used to design the function of a smart home technology system that is purposed to monitor guest and different household appliances. Foreign data can be automatically inputted into a family data base. This system is not only installed at home but can be integrated with other systems, for example, using a mobile phone by using the voice recognition settings panel. According to [17], the descriptive method conducted to determine the value of independent variables, either one variable or more (independent) without making comparisons or connecting with other variables. In quantitative descriptive research is known descriptive hypothesis. The descriptive hypothesis determined by setting specific criteria or limits based on theoretical studies by the researcher [17]. The hypothesis for this research shown in table 1 below:

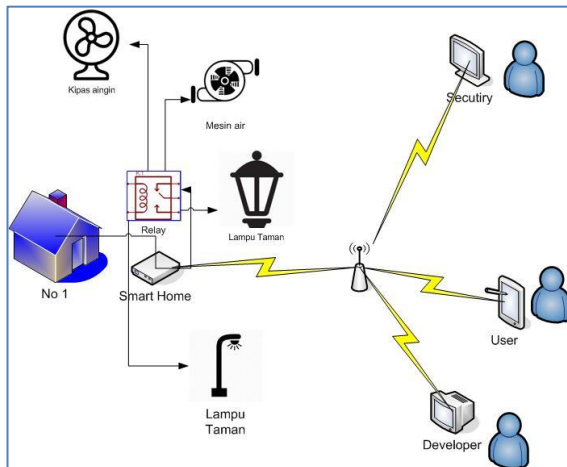
**Table 1.**Hypothesis Proposed

Hypothesis	Assumption
H <sub>1</sub>	Middle-low income consumers cannot buy a house with a smarhome feature
H <sub>2</sub>	The value of the house with the affordablesmarhome application is higher than houses with expensive smarhome
H <sub>3</sub>	The total cost for designing and making a smartphone device is in the range of 4 million Rupiah up to 6 million Rupiah

Waterfall model for this research to estimate the cost and developing the system seen from the use of hardware and software are as follows:

**Table 2.** Hardware Requirements

Device	Price (IDR)
RELAY 4/8 Chanel	85.000 ,-
Microcontroller Uno	75.000,-
Junction Box	45.000,-
Cable Jumper	15,000,-
Power Cable	25.000,-
Bluetooth Modules	75.000,-
Installation costs	150.000,-
Total	470.000



**Figure 1.** System Design

Figure 1 shows the scheme of designing a smart homework system that will be used to regulate household equipment systems. The system consists of several supporting components, namely: 1) Relay; in this part, the relay component is used as security between AC and DC currents. The relay used has 4 channel numbers of relay channels of various types depending on the needs and functions. The 4 channels can be used to manage 4 different device channels. Channel will be installed in a box connected to a microcontroller that functions as the central control device. 2) Microcontroller box; the control box or microcontroller box is used as a component assembly.

The box can be used both outdoors and indoors. 3) Wi-Fi/Bluetooth module; the Bluetooth module on this system is used as a media connection that connects between a cellphone and PC, with the central control of a Bluetooth module which is more than 40 meters away. 4) User; the user in this system is the owner of the house itself; the user can control all household equipment and monitor it directly using a mobile or Android. 5) Security; Security can be referred to as a security officer. Officers can monitor home supervision directly through the smart home program, a monitoring system in the form of electronic monitoring current or through CCTV cameras and areas around the complex. 6) Developer; developer, in this case, is the housing development party; the developer can supervise and control its territory through the smart home system.

**4. Implementation and System Testing**

**Table 3.** Channel Settings for Relays

```

char val;
void setup() {
pin Mode(2,OUTPUT);
pin Mode(3,OUTPUT);
pin Mode(4,OUTPUT);
pin Mode(5,OUTPUT);
Serial.begin(9600);}
    
```

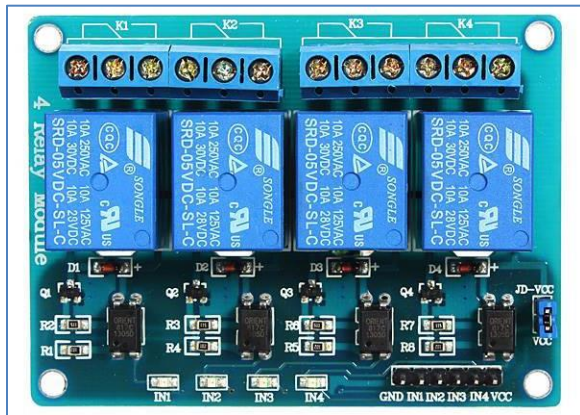
Information: Table 3 is a coding script written using C language, the command function "pin Mode" is used to activate the data channel that will be used to regulate and control electronic devices, the provided channel consists of 4 channels each channel will be used for lights, water machines, fans and garden lights.

**Table 4. Settings with Voice Recognition**

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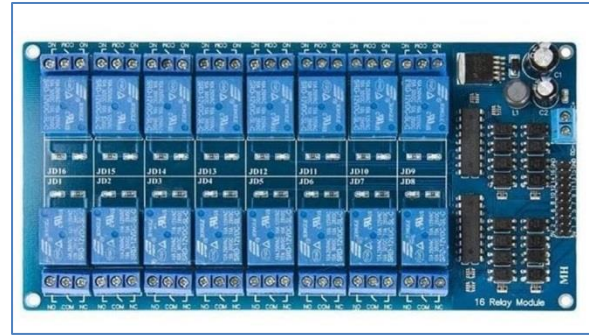
if (command == "turn on the bedroom light")
{digital Write (2, HIGH); } else if (command
== "turn off the bedroom light") {digital Write
(2, LOW); } else if (command == "turn on the
bathroom light") {digital Write (3, HIGH); }
else if (command == "turn off the bathroom light")
{digital Write (3, LOW); } else if (command
== "turn on the garden light") {digital Write (4,
HIGH); }
    
```

Table 4 is setting the script on the relay by using the second option, namely with voice recognition or voice-based settings. This setup system is the second option and homeowners can use the hand phone control mode [18].



**Figure 2. Relay 4 Chanel**

The relay function used as a circuit breaker whose working principle is similar to a switch; the relay has two essential parts, namely coil and mechanical switches. The relay will move the switch with a small current consumption but can deliver electric current between 5 volts and 50 ma, in the use of Smart Home consists of 3-baud parts on each relay channel. Namely, the Normally Close (NC) section and automatically stored in the closed condition and Normally Open in the open condition.



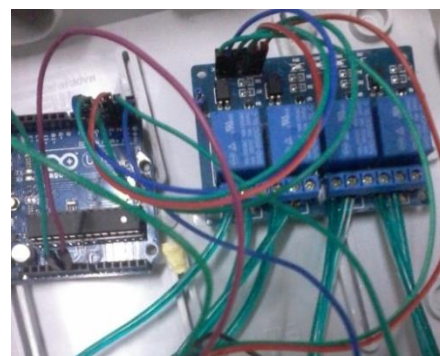
**Figure 3.16 Channel Relay**

Figure 3, there are relays with a larger number of channels, namely 16 Channels, but with more household equipment settings



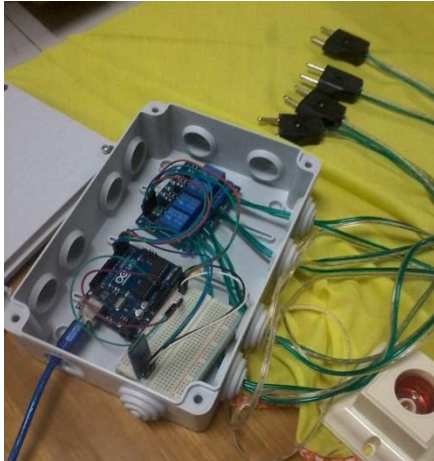
**Figure 4. Bluetooth HC-06 Module**

In the 4images the Bluetooth module used is the HC-06 version, operating at 2.4 GHz, Bluetooth is used for real-time communication with a control distance of 10 to 30 meters wirelessly connected, a distance of 30 meters is considered sufficient for smart concept settings home. Bluetooth will be used to adjust the connection between the microcontroller and handphone, PC or laptop.



**Figure 5. Assembling the Smart Home Module**

In figure 5 above is a module assembly process, where relay 4 channels are connected using AC cables, the relay will be secure when there is a surge in electricity. Relay components work at voltages between 3 to 5 volts.



**Figure 6.** Results of the Final Assembly of the Smart Home

In Figure 6, the results of the assembly of the smart home that has been installed with the smart home and

microcontroller modules, in the smart home module there are three main components, relay 4 channels, an Arduino module as a control and the HC-06 Bluetooth module.

#### 4. Discussions and suggestions for future research

Using the experiment above, the process of assembling of smart home tested by connected with Bluetooth with a control distance of more than 30 meters around the home area, control can use two choices namely using voice recognition and remote mode, smart home devices are assembled in a microcontroller or junction box. The box can be installed and can be removed again as needed. This smart system can be installed in other areas, for example in schools, playgrounds, hospitals, others with an estimated price that is not very expensive and very affordable, the total cost for the system made is 470.000 Rupiah, and it is possible to mass produce it. From system testing, we can conclude that:

**Table 5.** Hypothesis Result

Hypothesis	Assumption	Result
H <sub>1</sub>	Middle-low income consumers cannot buy a house with a smarhome feature	Not Accepted
H <sub>2</sub>	The value of the house with the affordablesmarhome application is higher than houses with expensive smarhome	Accepted
H <sub>3</sub>	The total cost for designing and making a smartphone device is in the range of 6 million Rupiah up to 20 million Rupiah	Not Accepted

Hypothesis 1 (H<sub>1</sub> not accepted, H<sub>01</sub> accepted) mean middle-low income consumers can buy a house with a smarhome feature. Hypothesis 2 (H<sub>2</sub> is accepted, H<sub>02</sub> is not accepted) mean the value of the house with the affordablesmarhome application is higher than houses with expensive smarhome. H<sub>3</sub> (H<sub>3</sub> not accepted, H<sub>03</sub> is accepted) mean the total cost for designing and making a smartphone device is lower than IDR 6 million up to IDR 20 million. Suggestion for further research is that the smart concept needs to be developed better security features, for example by adding Computer vision technology, for example, smarhome will be active if it recognizes homeowners and family members, and the addition of biometric data is very necessary such as retina

detection or irish recognition. Replace the transmitter or Bluetooth components with other devices so that the range becomes further.

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