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**Universiti Teknologi MARA**

**THE SATISFACTION AND USAGE IN  
THE IMPLEMENTATION OF SMART  
HOME SYSTEM**



Thesis submitted in fulfillment of the requirements for  
**Bachelor of Science (Hons) Information System  
Engineering**  
Faculty of Information Technology And  
Quantitative Science

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## **DECLARATION**

I thereby declare that the work in this thesis is my own except for quotations and summaries, which has been duly acknowledged.

21 November 2005

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## **APPROVAL**

### **THE SATISFACTION AND USAGE IN THE IMPLEMENTATION OF SMART HOME SYSTEM**

**BY**

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This thesis was prepared under the direction of thesis advisor; Pn. Ariza Nordin. It was submitted to the Faculty of Information Technology and Quantitative Sciences and was accepted in partial fulfillment of the requirements for the degree of Bachelor of Information System Engineering.

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## ABSTRACT

In the world of electronic commerce of today and tomorrow, Smart Home System has been the aim for the developer in housing sector as one of the attraction to homebuyer. Good marketing strategy on Smart Home System can have a broad market appeal to new homebuyers. However, understanding of the capabilities of these systems is currently very limited within the housing industry that lead to the few barriers in the implementation of this system. Despite all their work and aimed at the implementation of Smart Home System, this system remained largely unnoticed by the user and certainly underused because lack of education and guidance to the user. Some of the major impediments to market expansion include perceived of use, perceived usefulness, perceived credibility, cost, user interfaces (central) controllers/computer software, and mistrust of technology. The issues highlighted here are about the usage, satisfaction and privacy issues in advance technology of Smart Home System. In order to discover the issue, a condominium that will be defined as Condo-X for the confidentially purpose has been selected. Approximately 180 questionnaires were distributed to the residents as a sample to get their opinion regarding the issues. Hopefully, it will improve a better understanding in identifying their usage and satisfaction in practicing this technology. Besides that, there are several recommendations to improve the quality in the implementation of the system for future benefit.

# CHAPTER 1

## INTRODUCTION

### 1.1 BACKGROUND OF RESEARCH

Advanced in home automation technology have created novel ways of handling routine activity at home. Nowadays, the Smart Home system whereby everything is controlled by a single hand held gadget is widely introduced in housing sector. According to real property agency MK Land Sdn Bhd, Smart Home System consists of home automation technology and provide with broadband access for Internet and local area network (LAN).

The Smart Home System will give direct impact on the e-lifestyle of people living in them. The evolution of this technology has been rapid in many parts of the world. However as world third country, the technology is still in infancy in Malaysia. As a result the usage and satisfactions issues among the user will be the major discussion this research.

The researcher is focusing on user-focused research by applying Technology Acceptance Model (TAM). According to TAM, perceived ease of use and perceived usefulness constructs are believed to be fundamental in determining the acceptance and use of various IT.

Beside the usage and satisfaction, privacy issues are also the main concern in Smart Home concept whereby a smart system interconnects and integrates all smart appliances, controls and sensors that involve the centralization of data. Maner (1996) states that:

*“Lack of an effective analog forces us to discover new moral values, formulate new moral principles, develop new policies, and find new ways to think about issues presented to us.”*

Using the TAM as a theoretical framework, this study will also apply “perceived credibility” as a new factor that reflects the user’s security and privacy concerns in acceptance of Smart Home System (Wang et al., 2003).

By explaining usage intention from the user’s perspective, the findings of this research will not only help the real property agencies to develop better user-acceptance home automation system, but also provide insights into how to present the new technology to potential user.

## **1.2 PROBLEM OF RESEARCH**

The explosion of Smart Home System has drawn the attention in housing sector towards Smart Home System. Real property agencies have tried to introduce this technology to improve routine activity at home. Despite all there and aimed at the implementation of Smart Home System, this system remained largely unnoticed by the user and certainly underused. The issues highlighted here are about the usage, satisfaction and privacy issues in advance technology of Smart Home System. Although millions of money has been spent on building Smart Home System, reports have

shown that potential users may not use the system in spite of their availability.

According to Chapman and McCartney (2002), security in the smart home was considered important by many of the participants in their survey who reported a particular sense of vulnerability to thieves, vandals and delinquents. This was cited as an important reason why the majority (85 percent) of respondents wanted a conventional appearance for their home, so as to avoid drawing attention to the occupant.

As information becomes a key source of value, proper legal systems and rules to protect it need to be clarified. Even though, Cyber laws in Malaysia, The Computer Crimes Act 1997, effective as of the one of June 2000, has created several offences relating to the misuse of computers, there are still significant weaknesses in our law for the protection of information. Among others, it deals with unauthorized access to computer material, unauthorized access with intent to commit other offences and unauthorized modification of computer contents.

### **1.3 SCOPE OF PROJECT**

This study will be limited to the following scope. The scope identified will form the boundary of this study:

- i. This study is limited to residents and developer of Condo-X.
- ii. This study will only touch on smart home technology that related to the computer.
- iii. It is assumed that all respondents are knowledgeable about Smart Home System.

## **1.4 OBJECTIVE**

This study objective is as follow:

- i. To identify the types of Smart Home System.
- ii. To investigate the usage and satisfaction among Malaysian in accepting the Smart Home System.
- iii. To investigate issues in right to privacy in implementing Smart Home System.
- iv. To recommend steps to encourage more homeowners to purchase and implement Smart Home System in their premise.

## **1.5 SIGNIFICANCE OF THE RESEARCH**

This study will be significant:

- a) To the developer, it is hope that they will know the residents' need and requirement in order to improve their maintenances and services.
- b) To the residents, it is hope that their knowledge can be gained from this research.
- c) Establishment of mutual trust between residents and housing developer.

## **1.6 LIMITATION OF RESEARCH**

The major limitation in completing this research is lack of time in completing this research because of others commitment and assignments from other subjects that need to be submitted first.

Moreover, during the interview session, some interviewees were very busy and the appointments need to be cancelled for few time. Few barriers also happen during the distribution of questionnaires to the residents. Researcher faces a lot of difficulties to enter the condominium since it is a restricted area guarded by a lot of security guard. Researcher was not allowed to distribute the questionnaires directly to the residents and have to allocate the questionnaires in the mailbox. Only 2 responses received compared to 100 questionnaires that have been distributed. At last, after a month, with the help from the residents' leader, 81 questionnaires have been collected successfully.

## CHAPTER 2

### LITERATURE REVIEW

The review of related literatures is based on the sub topics that support the research.

#### 2.1 Definition of Smart Home

Nowadays, more home are being automated as people recognize the benefits that can derived from automation. According to Gerhart (1999), smart home also referred to as home control, or intelligent home, is actually collection of devices, systems and subsystems, which have ability to interact with one another or function independently.

Smart Home is also an application of the Intelligent Building concept to residential property. Stelcner (1998) adopts a technology-focused perspective when he says: " *An Intelligent Building is one that provides a comfortable and productive environment through automated control systems such as fire-safety, security and energy/lighting management.* "

#### 2.2 Purchase Decision on Smart Home

Research by (Petterson et al., 2001) suggests that the use of smart home technology is not limited to high-income earners or other demographic stereotypes. The results demonstrated that a significant price premium was paid for the incorporation of the technology into new homes in Melbourne, Australia.

Australians have consistently displayed a positive approach to adopting new technology. This is confirmed by the use of high technology appliances in most Australian homes for various demographic stereotypes. This research indicated that most survey respondents were happy to use modern high technology equipment in their household. The research also indicated that “quality” was a highly rated factor in people’s general purchase decisions. Respondents also indicated that “value for money” and “builder’s reputation” were the two important features they consider when choosing new homes.

### **2.3 High Demand for Low Cost Home Control**

According to findings that have been conducted by The Diffusion Group research (2005) via their online survey, the most challenging factor in the home-control industry is not on its innovation but price. The survey that was participated by 2 235 respondents shows, more than half of households are interested in home systems costing less than \$200. About 30% of the surveyed households are interested if the price is between \$200-\$400 and 20% are interested in systems priced at more than \$400. This indicate that, majority of the respondents found that the system is costly.

### **2.4 Market Value on Smart Home**

Smart services technology was originally developed for automation of commercial buildings, and has subsequently gained widespread acceptance to the point where it is almost taken for granted (Boyd, 1994).

Many property developer and tradespeople still do not fully understand the characteristics, capabilities and attributes of automated home systems. While this low level of understanding of the technology at a technical and professional



level exists, the uptake of smart technology by the wider new home market may also remain at a relatively low level. This situation could create market opportunities for developers and builders who recognize the potential of the technology. By developing a strong understanding of the systems and offering it as part of their new home packages, developers could obtain a marketing edge over their competitors. Interpretation of the survey responses suggests that properly marketed smart home systems could have a broad market appeal to new homebuyers ((Petterson et al., 2001).

## **2.5 Challenges in the implementation of Smart Home System**

The development of a smart home involves more than simply plugging in yet another hi-tech appliance. Substantial alterations are required to standard wiring and switch systems, central control systems may be required, and the systems can be further enhanced by the inclusion of smart appliances that are beginning to emerge in the marketplace (Smith, 1998).

Some these appliances are separately installed and do not communicate with each other. In general, they function independently, and require manual activation, adjustment and control and often are not integrated into the house infrastructure.

A number of smart items are still in the development stages and it is as yet impossible to predict actual life cycles. It is expected that the maintenance cost of the electronic devices will be low but those for mechanical devices and motors under frequent use are not yet known. It is quite possible that the management of such items as lamps and motors by a smart system could actually increase their overall performance and life.

Service providers are interested in the financial savings, which might arise from the reduction in need for care assistants to help with manual tasks. Attention must be given to ensuring that this technological support does not result in increased social isolation. The most significant effect should be the enhanced level of independence, which can be enjoyed by the tenants. The saving could be used to reduce the cost of professional care, or to increase the time care assistants and family members devote to ‘‘quality’’ time rather than functional maintenance.

## **2.6 Smart Home Package**

According to administrator in Condo-X there are 6 packages offer to the residents. The default package is include when resident buy the home. Where as, the others packages will be provided based on demand. Residents can upgrade their Smart Home System from package 1 up to package 5. Details about the packages are as follows:

### **2.6.1 Default Package**

Smart Card Access

### **2.6.2 Package 1**

Cost = RM 4 300

Appliances:

#### **1. Telephone Control**

- Air-condition in the living room
- Living room light
- Power point in the kitchen

- Power point in the master bedroom

## 2. Cordless Control

- Living room light
- Dining room light
- Kitchen and yard light
- Panic button calls out

### 2.6.3 Package 2

Cost = RM 5 500

Appliances:

#### 1. Telephone Control

- Air-condition in the living room
- Living room light
- Power point in the kitchen
- Power point in the master bedroom

#### 2. Cordless Control (include one cordless unit)

- Living room light
- Dining room light
- Kitchen and yard light
- Master bedroom light
- Panic button call out
- Light all off except bedrooms

#### 3. Motion Detector

- Corridor light

#### 4. Door Sensor

- Entrance light

#### 2.6.4 Package 3

Cost = RM 6 800

Appliances:

##### 1. Telephone Control

- Air-condition in the living room
- Living room light
- Power point in the kitchen
- Power point in the master bedroom

##### 2. Cordless Control (include one cordless unit)

- Living room light
- Dining room light
- Kitchen and yard light
- Master bedroom light
- Bedroom 2 light
- Bedroom 3 light
- Panic button call out
- Light all off except bedrooms

##### 3. Motion Detector

- Corridor light
- Master bathroom light

##### 4. Door Sensor

- Entrance light

#### 2.6.5 Package 4

Cost = RM 7 800

Appliances:

1. Telephone Control

- Air-condition in the living room
- Living room light
- Power point in the kitchen
- Power point in the master bedroom

2. Cordless Control (include one cordless unit)

- Living room light
- Dining room light
- Kitchen and yard light
- Master bedroom light
- Bedroom 2 light
- Bedroom 3 light
- Panic button call out
- Light all off except bedrooms

3. Motion Detector

- Corridor light
- Master bathroom light
- Bathroom 2 light

4. Door Sensor

- Entrance light

5. Dimming Circuit

- Master bedroom light

- Living room light

#### 2.6.6 Package 5

Cost = RM 15 300

Appliances:

##### 1. Telephone Control

- Air-condition in the living room
- Living room light
- Power point in the kitchen
- Power point in the master bedroom

##### 2. Cordless Control (include one cordless unit)

- Living room light
- Dining room light
- Kitchen and yard light
- Master bedroom light
- Bedroom 2 light
- Bedroom 3 light
- Panic button call out
- Light all off except bedrooms

##### 3. Motion Detector

- Corridor light
- Master bathroom light
- Bathroom 2 light

##### 4. Door Sensor

- Entrance light

##### 5. Dimming Circuit

- Master bedroom light
- Living room light

#### 6. Alarm System

- Main door sensor
- Yard Door Sensor

#### 7. CCTV System

- Camera at living room

## 2.7 Privacy Considerations

The privacy movement is primarily focused on protecting the privacy of living individuals. According to Collier (1995), privacy is widely used to refer to a group of related rights, which are accepted nationally and internationally. The principles comprise both the rights that each person entitled to expect and protect, and the obligations of organizations and others to respect those rights.

## 2.8 Ethics In Information System Evaluation

As individual are involved in the evolution process, ethical behavior in information system (IS) is an unavoidable issue. There were no straightforward what ethics entails. Jayarantha (1994) suggested that:

*“ Ethics offers many design guidelines useful for the understanding and the design of human-centered systems, but does not offer models or ways for performing the step. Nor does it offer any models for handling interpersonal and political conflicts”.*

Kant (1784) offers a “categorical imperative” for establishing what is right or wrong and also stated that for ethics to have any basis, human beings must be considered to be of ultimate value and thus an action is good only insofar as it accords people their due respect.

The process of IS diffusion in larger organizations will show a different level of ethical sensitivity among individual (Phukan and Dhillon, 2000). The reason for this may include factors such as a greater likelihood of an educational background and also a higher probability of membership in professional organizations with established codes of conduct. The authors also believe, the vast majority of information technology (IT) users will not have a formal education in IS, will not work full time in IS, are unlikely to belong to organizations for IS professionals and are likely to be confused about ethical issues.

The ethical dimension in IS may be examined in term of its purpose, its processes and the people who lives it affects. According to Harrington (1998), ethical decision-making has four main components; awareness, judgments, intention and behaviors.

## **2.9 Information Security Baselines**

A basic principle in addressing this area is that security problems must first be understood and confirmed as real problems before solutions are presented (J Fitzgerald, 1995). Information normally begins with the identification and clarification of threats to ensure the safety of the information.

In today’s business world, where comparisons with others is a way of establishing standards of quality, it is important that organization understand the typically threats profiles which information systems are facing and what the