

# A Captology Study on Behavior Model for Persuasive Ubiquitous Technology

M. Shahrom, E. S. Kassim, N. Humaidi, and N. H. Zamzuri

**Abstract**—This is a conceptual paper to study the role of privacy in the behavior model for persuasive ubiquitous technology. The study reviews the literature on the factors of persuasive technology, particularly in ubiquitous and pervasive computing. These factors are motivation, ability and trigger. The paper goes on to analyze privacy factor that also plays important role in ubiquitous technology. In theory, although there are some models that explain persuasive technology, including Fogg Behavioral Model that is highly referenced, the inclusion of the privacy, especially in the area of location-based services (LBS) is almost none. Therefore, building on the importance of upholding user privacy, the research is proposed to extend Fogg's model. Several methods will be deployed. First, a quantitative survey to assess the current users' awareness of the persuasive and manipulative part of the technology. Second, a qualitative technique to gather more inclusive understanding of the issue from the viewpoints of users, developer and government agencies. Third, based on the findings, a model will be developed and tested via a quasi experiment that deploys an intervention module. The research is significant and important for the society and national development in several aspects; 1) promoting a comprehensive data protection policy development of cyber security, 2) providing rules to persuasive technology developer on the dos' and don'ts, and 3) educating the society about cyber ethics and privacy.

**Index Terms**—Privacy, ubiquitous technology, behavior model, persuasive technology, captology.

## I. INTRODUCTION

The field of Captology and persuasive technology is growing rapidly. This is due to more computing products, including websites, augmented reality of mobile applications and wearable devices such as Fitbit Flex and GPS tracker smart watch, are designed to change what people think and do every day. As we see it today, Captology is not just a study of computers as persuasive technologies. Instead, Captology is also a way of thinking clearly about target behaviors when

using computing devices and their technologies.

Persuasive technology represents the best understanding of how to maximize ability to influence change in people on the scalability and adaptive intelligence of technology in order to influence the behavior of large groups of people. Individuals can either willingly or unwillingly engage with certain technologies and applications through persuasive technology, and it's the unwillingness that the research is concerned about. When people start to use certain applications and rely so much on using the computing devices, persuasive technology has taken place successfully without them realizing the manipulative invasions. Hence, due to this, the important question of the user's privacy and ethics, has become a sensitive issue especially in ubiquitous and pervasive computing area.

### A. Research Problem

One of the fundamental issues raised at The Ninth International Conference on Persuasive Technology 2014 [1] in Italy, was the ethical issue, especially regarding the line between persuasion and manipulation of information. As persuasive mobile applications are continuing to rake in millions in investment, the issues on the manipulation of individual's information is a big question in the area of ubiquitous technology. According to [2], as most smartphones are equipped with location-based applications, mobile technology is becoming progressively ubiquitous, pervasive, and personalized. A report in [3] emphasizes on the serious issues about how vendors who collect the location service based data use and sell it, most often without users' knowledge. The report continues with the major threats to consumers, which are disclosed, tracking behavior, identity theft, personal security and surveillance. Similarly, the HERMES project of the 2008 European Commission claimed ethics and privacy still seems to be a rather unattended in the area. When designers or programmers of mobile applications adopt a current persuasion strategy for ubiquitous computing, there is an important issue they should scrutinize. That is, the privacy issues.

The element of privacy in the persuasive ubiquitous technology has received more concerns than before. However, there is still no formal behavior model of persuasive ubiquitous technology has been proposed in the research area. According to [4], the ability to track a person's current location or information everywhere and anytime is the most essential advantage of LBS, but this information also produces risk that his or her privacy will be compromised and revealed to the intruders or third-party. From this perspective, concerns over privacy can be considered as psychological risks [5], and using LBS applications despite strong privacy concerns can be regarded as risk taking behavior.

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### B. Research Motivation

In the related theory, one of the most referenced behavioral models of persuasive technology is the Fogg Behavior Model (FBM) that claims a behavior is a creation of three factors: motivation, ability, and triggers [6]. The FBM states that for a person to execute a target behavior, one must: (1) be sufficiently motivated, (2) have the ability to perform the behavior, and (3) be triggered to perform the behavior. The research proposes to include the privacy element in the model of persuasive technology and claims that one must also be warned about the privacy consequences when using the ubiquitous and distributed systems. Since the element of privacy is currently missing and relatively unexplored area in FBM, this factor needs to be analyzed in order to study the human behavior model for persuasive ubiquitous technology.

### C. Research Questions

This conceptual paper is intended to identify and understand the factors that affect the persuasive behavior of ubiquitous technology.

- 1) Why despite the manipulation capacity in the ubiquitous technology, people are still keen to use the applications?
- 2) How privacy plays a role in determining the users' persuasive behavior when using ubiquitous technology?

### D. Research Objectives

The answer to the research questions will be based on an extended review and analysis of the existing persuasive technology model.

- 1) To assess the current state of users' awareness of the persuasive ubiquitous technology capability of persuasion and manipulation.
- 2) To develop a comprehensive persuasive ubiquitous technology framework that takes into account the importance of privacy for multiple stakeholders of users, developers and government.

### E. Hypotheses

The hypotheses developed for this research in order to support the research objectives are:

- 1) When users who lack privacy and ethics awareness, perceived the benefits of sharing privacy is higher than the negative implications, then they are more likely to be the victims of data manipulation in the persuasive ubiquitous technologies.
- 2) Privacy concerns influence peoples' behavior to be wiser in adopting persuasive ubiquitous technology.

## II. ANALYSIS AND DISCUSSION OF THE LITERATURE

This section will explore the persuasive technology factors that influence the behavior to use the technology. The focus is to improve the existing model of FBM by adding the privacy element so that the model can be expended in the area of persuasive ubiquitous technology.

### A. The Concept Of Persuasive Technology

Persuasion in technology is described as an effort to change attitudes or behaviors or both to use the technology. There are five basic terms and concepts for persuasive technologies

according to [7]:

- 1) The focus is more on the attitude or behavior change resulting from human computer-interaction (HCI) and not from computer-mediated communication (CMC).
- 2) The planned persuasive effects of technology is focused, and not on the side effects of technology use.
- 3) It concentrates on endogenous, or "built-in", persuasive intent of interactive technology, not on the exogenous persuasive intent (i.e., intent from the user or another outside source).
- 4) It distinguishes between two levels - technology can persuade on two levels, macro and micro.

Fogg also identifies and describes seven types of persuasive technology tools or interactive products that are designed to change attitudes or behaviors or both. The tools are: reduction, tunneling, tailoring, suggestion, self-monitoring, and surveillance. There are several rules of persuasion, but according to [7], the most important rule is: the designers of a persuasive technology should never try to persuade a person of something they themselves would not consent to be persuaded to do. As digital technology becomes an increasingly ubiquitous presence in our life, it constructs new opportunities to positively influence behavior.

At present, persuasive computing technologies have been applied in at least 12 domains. Marketing, health, safety and environment are the four most significant and promising domains of persuasive technologies for the foreseeable future. For instance, persuasive technologies are widely used in marketing to motivate customers to buy products and services. With the growth of social media and e-Commerce on the Internet, many online businesses take the initiative to recommend relevant products to the customer based on her interests. Whereas in health domain, the persuasive technologies involve persuading people to form a healthy routine and take preventive measures against illness. The use of a commercial montage to persuade people to eat healthy food and to exercise is an example of the strategies in health domain. In the safety area, computing technologies are used to promote the safety and security or to prevent disaster and catastrophe. The drivers can gain advantage to be persuaded while driving such as to control or reduce their speed using an application stored on mobile devices. However, some of the applications used in safety domains always involve in data collection behavior, thus contribute to ethics and privacy issues. The technologies in environment domain are used to persuade people to preserve or restore the natural environment. One of the strategies is concentrating on reducing environmental and social risk factors, so that the global problem of disease can be avoided. This incorporates promoting safe household water storage, better hygiene measures and harmless management of toxic substances in the home and workplace.

### B. The Fogg Behavior Model (FBM)

Many existing behavior theories explain how human change their behavior according to certain phenomenon such as Theory of Planned Behaviors (TPB), Health Belief Model (HBM), Action Based Behavior Model (ABM), Protection Motivation Theory (PMT), Social Cognitive Theory (SCT), among others. [6] has introduced Fogg Behavior Model

(FBM) in the study of persuasive technology behavior as shown in Fig. 1. According to Fogg, persuasion refers to an attempt to influence people's behavior, which is based on three factors: motivation, ability, and trigger. According to [8], motivation can be initiated by pairs of opposites like pleasure/pain, hope/fear, and social acceptance/rejection. For instance, if an individual has an ability to solve certain issues but has no motivation to do it, he will not do so. Instead, ability is also a factor that affects the behavior in certain situation. Though a person is extremely motivated, a behavior cannot occur if he does not have the ability. On the other hand, high motivation can inspire a person to find the means to accomplish a task, thus gain the ability.

Moreover, motivation and ability alone is not adequate to control people's behavior. This is where a trigger takes place, which is something to tell the person to complete the action in a certain moment; it is also indicated as a call to action. "Triggers are connected to motivation. They can be a spark – this tends to motivate a user, a facilitator – tends to offer the ability to highly motivated users, and lastly a signal – when users have both ability and motivation, but it functions as a reminder." [6], [8].

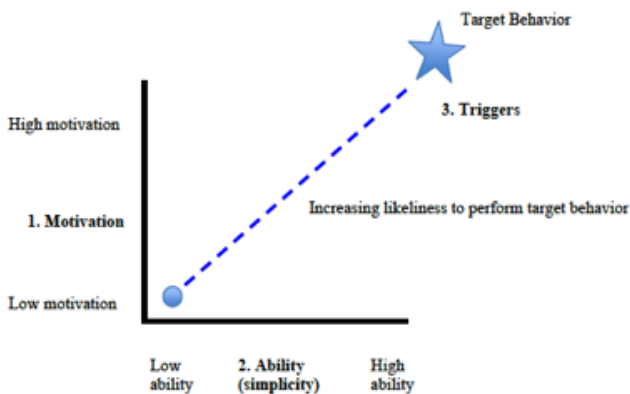


Fig. 1. The Fogg behavior model [6].

As shown in Fig. 1, the vertical axis is for human motivation, while the horizontal axis for human ability. Fogg stated that if people with high motivation and high ability can trigger a target behavior. Other author also argued that the target behavior is only accomplished when people have sufficient motivation, required ability and appropriate triggers [9]. Consider, for instance, how Facebook motivates new users to upload profile pictures. This feature and other activities on Facebook, has persuaded people to take action. That indicates these people have all appropriate motivation and ability, and then Facebook has triggered these people to perform this behavior.

User's experience also plays an important role in many situations because it can motivate people, ability to take an action and finally, triggering their behavior. Therefore, this study was aimed to explore more on FBM and how the theory can be used to study in persuasive ubiquitous technology among people. This will help the technology developer to improve their future product in terms of interface design and many more. Previous studies also stated that the FBM has a high applicability in the case of a human-computer interaction [8].

### C. Ubiquitous and Pervasive Computing and Privacy Implication

Ubiquitous and pervasive computing is the emerging communication development towards embedding microprocessors in everyday objects so they can communicate information. The word ubiquitous means "existing everywhere." Therefore, the ubiquitous computing devices are totally connected and persistently available. Ubiquitous computing is changing daily behaviors of people in a variety of ways such as; people tend to:

- 1) communicate in different ways
- 2) be more active
- 3) conceive and use geographical and temporal
- 4) spaces differently
- 5) have more control

This computing architecture relies on the convergence of wireless technologies, advanced electronics and the Internet. The developers of this technology aim to create intelligence products that able to communicate continuously so that the data generated can be easily accessible. For example, LBS are one of the commonly used and popular ubiquitous technology applications. Hence, this application has received serious attention from researchers and developers in order to identify the factors that affecting the user behavior in the use of new services or technologies.

According to [10], [11], LBS are called the killer application as it can provide information and services to mobile users based on their location. A study done by [12] revealed that the activities of sharing information and location by users are mostly influenced by their friends. Nevertheless, the ability to track user's location at anytime and anywhere creates a risk for the individual's privacy and potential misuse of users' location information [13], [14].

### D. Designing Technology and Systems to Prevent Behaviors

In persuasive technology, the focus is to look at human behavior when dealing with technologies. The idea of persuasive technology is to persuade people to use the technology and also to study the behavior change such as preventing a target behavior from happening when using LBS. According to [15], privacy is related to keeping personal data safe and protecting people's identity in terms of name, social security, and purchase behavior. From the viewpoint of law, privacy protection rules stipulate that users' privacy data must be consumed under a few conditions. In outline, there are three angles: transparency, legitimate purpose and proportionality. Transparency indicates users have the advantage to be informed and get to all related information when their privacy information is being managed. Legitimate purpose means users' privacy information must be applied for legitimate purposes which are clearly pronounced. Proportionality implies that just that information which is expected to finish a users' solicitation can be managed, and not more than what is required [16].

Generally, when using the technology people are concerned more about the exposure of their personal information to the third party [17]. Therefore, in order to persuade people to perform the behavior that relates to ubiquitous technology, the privacy factor (Fig. 2) is important

to be included as in the former behavior model. Specifically, people can stop a behavior by removing one of the four factors; motivation, ability, triggers, and privacy. If a developer can do any of these things successfully, then the behavior will not happen and at least not in the same pattern.

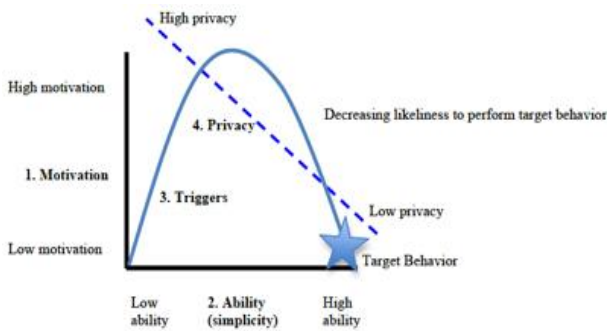


Fig. 2. The Persuasive ubiquitous behavior model.

### E. Privacy and Ethics in Information Systems

Recently, there are debates on persuasive ethics of using information systems among scholars [18]. The discussion emphasizes on abuses and malfunctions of using information systems in several theories of behavior. Therefore, people's awareness on ethics of persuasive technologies is important during crafting and selling by using information system [19]. Ethics in information system can be grouped under four important domains [20]. The first domain is known as privacy in surveillance and communication activities. The second domain is known as accuracy system. It is a collective activity of information that emphasizes on actual facts. The third domain is called property soft-lifting. This domain highlights on the transformation of digital and the art form into an electronic content. Lastly, accessibility the potential social problem is the domain that only limited to those who have the education, resources and money to access information [20].

### III. RESEARCH CONTRIBUTION

- 1) The development of extended persuasive ubiquitous technology behavior model that provides designers and researchers with a systematic way to think about the factors underlying behavior change in ubiquitous environments.
- 2) A framework of persuasive ubiquitous technology design for application developers. By using the extended behavior model as a guide, designers of ubiquitous technology can predict and identify what stops people from performing behaviors that designers seek. For example, if users are not performing a particular location-based services with mobile phone, the model helps designers see what psychological element is lacking.
- 3) Contribute to the Government Transformation Plan of increasing privacy awareness and enforcing cyber security for greater social wellbeing.

### IV. CONCLUSION

Critical consumers have started to attach more and more

importance to security and privacy, which is an opportunity for Malaysian companies to invest in innovative products and services that take these things into account in the design stages. The government intends to play a stimulating role in this development by means of including privacy and security requirements in its purchase conditions.

Creating a culture of privacy and security, and continue to raise privacy awareness to all mobile phone users, are key initiatives to further improve cyber security in Malaysia. In this effort, the country would do well by introducing privacy and security into school curriculums, in particular as it has begun to distribute computers to underserved people and areas. The new advances in technology can help promote world peace.

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