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Towards the Development of Persuasive Multimedia Model of Truancy Awareness (PMTA): Review of Research

[1]Mohamad Lutfi Dolhalit, [2, 3]Sobihatun Nur Abdul Salam, [1]Ariffin Abdul Mutalib and
[3]Muhammad Saiful Bahri Yusoff
[1]Faculty of Information and Communication Technology,
Universiti Teknikal Malaysia Melaka (UteM), Melaka, Malaysia
[2]School of Multimedia Technology and Communication, Universiti Utara Malaysia (UUM),
Changlun, Malaysia
[3]School of Medical Sciences, Universiti Sains Malaysia (USM), Kelantan, Malaysia

Abstract: Various computer system with embedded persuasive effects has changed people's behavior in many ways. Therefore, this study extends the persuasive technology research in the application of persuasive technology in creating awareness which intends to propose a persuasive multimedia model of truancy awareness for secondary school students. Accordingly, 16 related models were compared and systematically analyzed with the main objectives to review and analyses the previous applications and models that are related to the development PMTA Model and to identify and select the generic component of the PMTA Model. By investigating the selected model this study suggests the common components applied by the researchers in developing a persuasive application to create awareness towards certain behaviors. Accordingly, by understanding the related components it will help to develop PMTA Model in a systematic way. The result of the reviews, indicates that 8 common components were outlined. In addition, future work need to be established to extract and gathering the detail of sub-component that contains in the common component.

Key words: Persuasive technology, truancy awareness, multimedia, analyses, develop, established

INTRODUCTION

It is undeniable that the computer system has change people in many ways by changing the way we work, the way we think and it will continue to affect in unimaginable ways. In line with that the advancement in internet, web, multimedia content and mobile device has created interactive information technology opportunities for persuasive communication. The effect of this technology has created the understanding towards technology that deliver persuasive messages has led to the investigation of persuasive technology Fogg (2003) defined as a computer technology that are purposely developed to change user's attitudes or behavior.

The applications of interactive technology, e.g., multimedia, played an important role in assisting the delivery of persuasive messages (Spagnolli *et al*., 2016). Using multimedia also attracts the learner's attention in term of self-meaningful learning, self-paced interaction and retention in understanding of the content (Liu *et al*., 1998; Mayer, 2014), thus helps learners to integrate information more effectively without using any coercion or deception. Consequently, provides great solutions for various fields such as social aspect and promote positive behavior learning environments.

Research shows self-awareness is identified as one of the important areas that can improve student attendance and student performance (Chong *et al*., 2015; Joshi and Dutta, 2016), besides school policies, supervision and program. With so much emphasis being placed on the use of multimedia instructional material in schools, it is surprisingly found that very little indication exists that school systems are using mcultimedia instructional as a solution for truancy prevention (Kuo and Kuo, 2015). Thus the lack of studies on the effects of using multimedia technology on truancy awareness prompts questions about its importance the implementation of persuasive multimedia for truancy awareness which emphasizes on student's self-awareness is crucial in the context of Malaysia education system. In conjunction with the statement, the main purpose of this study is to propose a Persuasive Multimedia Model of Truancy Awareness (PMTA) among secondary school students with two specific objectives are formulated as follows:

Corresponding Author: Mohamad Lutfi Dolhalit, Faculty of Information and Communication Technology,
Universiti Teknikal Malaysia Melaka (UteM), Melaka, Malaysia

- To review and analyses the previous applications and models that are related to the development PMTA Model
- To identify and select the generic component of the PMTA Model

MATERIALS AND METHODS

In achieving the stated objectives, this study employs three phases of activities which are literature review, systematic review and comparative analysis. The relationship between the activity and output of this study is summarized in Table 1.

As illustrated in Table 1, this study implemented three phases of activities. The first phase started with literature review which involved 16 selected models related to persuasive technology and awareness studies from reputable journal. The selected models were reviewed and analyzed to validate the suitability of the model with this study. Second phase involved a systematic review in which the common elements such as a design guideline, persuasive approach and persuasive principle were extracted.

Lastly, comparative analysis conducted to get generic component for the development of PMTA Model. The comparative analysis was utilized in this study as this technique is one of the quicker techniques in gathering information and formulate the answer. The finding of the related activities is discussed in the following section.

Table 1: Summary of activity

Activities	Outputs
Literature review	Selection and justification of 16 previous persuasive technology applications and models
Systematic review	Understand the common component of PT Model
Comparative analysis	Selection of generic elements of PMTA Model

Systematic review on existing model: Prior to proposing the components of PMTA Model, a systematic review and analysis of the selected model and application were conducted. They are discussed critically as follow.

Mobile game to encourage pro-environmental behaviour: Developing awareness, the consequences of human actions on the natural resources is the main aim of this study. A contextual awareness mobile game called Gaea (Centieiro *et al*., 2011) developed to allow users to recycle virtual objects. This application highlighted the details regarding persuasive design tactics and guidelines in the development of persuasive system. Other than that, this model emphasized on the importance of problem specification, user requirement and specification requirement in prototype development.

Passenger's safety in aircraft evacuations: employing serious games to educate and persuade: Chittaro (2012) had proposed virtual simulation games to educating passengers about personal safety in aircraft evacuations. In terms of the functional role of computer in persuasive technology, computer as media simulation is the main strategies adopted in the application where the user can experiment with the whole range of possible actions related to the risk experience. Cause and effects, virtual rehearsal and simulation in real world contexts is the example of computer as a media simulation. As a persuasive tool, three persuasive principles such as suggestion, tunneling and self-monitoring were implemented to guide users through the learning experience. Meanwhile, the use of avatar character as a social actor that gives the suggestion and praise the users showed the games succeeded to simulate the risk experience in aircraft safety.

A customisable dashboard display for environmental performance visualizations: The exploratory study by Filonik *et al*. (2013) propose an application named "The dashboard" a social energy monitoring tool by consumers and peers using a mobile. The intention of "the Dashboard" proto type is to provide the user a comprehensive and intuitive, accessible overview of data that is relevant to their local household. Extrinsic forms of motivation (e.g., peer) were used to act as triggers to foster intrinsic motivations to the user to monitor their energy consumption. In terms of functional roles, "the Dashboard" can play a role of computer as a tool and the media simulation. As a tool the application guide users to monitor household energy usage and simplify the monitoring task and suggest the relevant information. As a media the system provides users to explore the cause-and-effects, thus enable users to explore new behaviours and perspective.

Persuasion for stronger passwords (motivation and pilot study): Many users unaware the implications to choose weak password that will compromise their account resources, privileges and data. Due to the scenario Forget *et al*. (2008) had proposed a Persuasive Text Passwords (PTP) prototype system using the persuasive authentication framework. Five key principles in persuasive technology that are applicable to the challenges of usable security and authentication were drawn. Each principle draws on various persuasive technology as a tools (simplification, personalisation, monitoring and conditioning) and social actor (social interaction).

Wattsup? (motivating reductions in domestic energy consumption): The aim of this project by Foster *et al.* (2010) was to develop the importance of raising awareness about patterns of energy consumption an understanding of householder's perceptions of energy use in the home. Facebook application called Wattsup home energy monitor were designed. The real-time data information from electricity meter is shown in graphical representations which allow users to make a comparison with their peer's regarding the energy usage thus, developing element of competition in reducing energy usage. The Wattup application exploits computer role as a tool and media simulation with five central principles in persuasive technology that is the suggestion, conditioning, self-monitoring, surveillance and cause and effects.

Persuasive game for electricity conservation: Research by Gamberini *et al.* (2012), proposed energy life, a game with the aim to increase user's awareness of their household's energy consumption through mobile devices. Real data consumption from individual electric meter were channelled into the game application and consumption information will return back along with tips, quizzes, historical information. This study embedded computer as a persuasive tool which is the principle of suggestion, conditioning, tunnelling and self-monitoring were applied. Whereas principle of cause and effects was deployed.

Persuasive virtual communities to promote a healthy lifestyle: Current studies have shown that persuasive system and a combination of virtual communities can promote healthy lifestyles (Gasca *et al*., 2008). Thus, this study describes the development of a Persuasive Ecosystem aimed at promoting a healthy lifestyle in patients with a chronic disease. A Persuasive Ecosystem website named health Net is a main tool to provide awareness on the activity and gives proper reward for user activities encouraged by the system. Social learning theories by Bandura (2004), to improve patient life styles were adopted in the system. This system is also supported by secondary system called mobile health net whic his monitor their life style habit and share with virtual communities. Health net applied principle of suggestion, conditioning and self-monitoring in a computer as tools whereas principle of attractiveness, similarity and praise in a computer a social actor is implemented.

Design requirements for ambient display: In the study by Kim *et al.* (2010), "ambient displays" utilize a non-cognitive processing to display information to support sustainable life styles in conserving electricity usage in personal computers. Ambient display serves as a persuasive technology tool provides real-time feed back without causing interference with the main tasks. To increase awareness towards lifestyle and its impact on ecosystems a MacOSX widget called Coralog and Timelog were created and placed on MaxOSX dashboard. These widget acts as an "ambient display" which provide feedback data to users without interfering user's primary tasks. In terms of functional roles this widget serves as persuasive tools in which principle of, tunnelling and conditioning and self-monitoring were used. To enhanced awareness effects to the users, media as a simulation using principle of cause-and- effects and virtual rewards were applied.

Persuasive technology in reducing texting and driving behaviour: One of the main distraction during driving is text messaging resulted in vehicle accident and injuries. As presented by Miranda *et al.* (2013), there is a need to examine the effectiveness of a persuasive technology in motivating and creating awareness the cause of texting during driving. Persuasive technology as tool and media were used by researchers in 10 min documentary video which apply principle of cause and effects and simulation in real-world contexts, enabling drivers to observe the link between cause and effect texting and driving without experiencing the risk of consequences. The second part of the program is personalized mobile reminder to trigger the avoidance of texting and driving at times when this behaviour occurs.

Persuasive technology to motivate heavy computer users for stretching exercise: Research by Chen *et al.* (2014) had proposed a mobile competition game with sensing technology to detect motion and stretching exercise among competitor. Mobile devices act as a persuasive technology tool in which an app provides users with suggestion, self-monitoring and surveillance of the activities during using the computers. Mobile devices also act as reminder to trigger users to do a stretching where peers can receive competition invitations to participate stretch exercise. Mobile apps act as media where principle of cause and effects. To promote behaviour change using games The Social Cognitive Theory (SCT) (Bandura, 2004) provides the foundation in behaviour change through aspects of intrinsic motivation (Gamberini *et al*., 2012).

Social visualization projection on public awareness and discourse: Reveal-it! is a public electronic interaction

display that assists users to compare the energy consumptions of individuals and communities using data submitted by public citizen. In order to persuade, Valkanova *et al.* (2013) propose a dynamic infographic illustration or data-driven animations from users input were displayed in real time. This projection display will act as electronic communication which present the data as rich and vibrant and more understandable way in exploration of energy consumption. In term of persuasive technology roles, this projection serves as media simulation that shows the real context the important of energy conservation to public users. As a media also provides users to explore the cause and effects thus enable users to explore new behaviours and perspective. It also acts as a digital persuader in visually mapping the original user's data attractiveness and similarity of the system.

Persuasive Multimedia Application (PMA) in strengthening motivation towards smoking prevention and cessation: One of the crucial factors in successful smoke quitting is a desire (awareness and motivation) to improve their well-being. Therefore, developing effective a pproaches to control smoking habit among youth should be a priority. Wan Ahmad Jaafar, Rosli and Munira (Yahaya *et al.*, 2014) had proposed Persuasive Multimedia Application courseware (PMA) in smoking cessation with the aim to increase teenager's awareness and motivation in in such a way as to assist them to quit smoking. This study applied two theoretical foundations in the design and development of the PMTA which is based on persuasive technology, multimedia learning principles and the use of prime theory to explain human motivational systems.

Smoke shooter: Campaign related to the dangers of smoking has been discussed in many researcher but only a few discuss about how to raised the awareness the dangers of smoking to young generations. Ismail *et al.* (2012) have proposed a conceptual framework on the danger of smoking campaign for children's health. This model relies on social learning theory (Bandura, 2004) and Fogg (2003), design model. ADDIE Model is used as the methodology to produce this model. Additionally, this model also focuses on learning theory and approach which are applied in the prototype. Six principles of persuasive technology applied into the interactive mobile game.

Persuasive multimedia to raise stress awareness among the secondary school students: As presented by Yahaya *et al.* (2012), the increasing of stress among students motivates researchers to develop a stress awareness application for secondary school students. This prototype integrated theory of multimedia learning as basics and implemented it with instructional design and combined the development of persuasive multimedia onto the design prototype. The implementation of this application consists of two types of media; videos to indicate the statistics followed by presentation on cause-and-effects and interactive multimedia on stress. To encourage students to avoid symptom of stress, researchers had implemented cause-and-effects and similarity principles in their design to simulate the environment they faced that could be happening.

Conceptual framework for persuasive multimedia learning application in enhancing children's awareness of child sexual abuse: This study reports a design of conceptual framework studies on the current situation in Malaysia on how to prevent child sex abuse by using persuasive multimedia. Since, the current campaign remains insufficient, this research done by Othman and Yahaya (2012), attempt to help children develop awareness regarding sexual abuse and seeking the proper guideline when this situation happened. This study discuss the theoritical framework that explain the overall structure based on the micro and macro design strategis in search an effective way on how to raise awareness and help to design educational program material and method in prevention and intervention. Micro strategy involved in implementation of persuasive design principle such as attractiveness, similarity, suggestion and simulation in real-worl contexts. Macro strategy integrate cognitive theory of multimedia learning in which multimedia design principle and design guidelines for children were involved.

Abuse disable parking: Wan Ahmad Jaffar and Mohamed Zamri (Yahaya and Zain, 2014), in their research believe attitude is a main factor contributes to the abuse of disabled parking. Persuasive multimedia treatment In abuse disable parking is a foundational study on how to apply persuasive theoretical knowledge to respect disable parking by non-disabled persons. The researchers divided two approaches in an attitude change treatment, it is macro persuasion level involved embedded social learning theory in the applications and micro persuasion level where modality and redundancy principle as design strategy were applied.

Overall, this model discusses the approach of multimedia learning as a digital persuader. It also discusses the important strategies in embedding persuasive component in a system. Instructional strategies are also outlined in the model.

RESULTS AND DISCUSSION

Finding of systematic review: In general, most of the studies are basically focused on the persuasive design guideline or process to ensure the developed persuasive application will match with the targets users especially in awareness context. Accordingly, in order to develop a successful persuasive system, it is crucial for a researcher to select the persuasive system guidelines in a real development of persuasive system.

Other than that some of the model discuss persuasive strategy that includes principle, technique and approach to increase their awareness toward certain context or issues. Some of the studies suggested the importance of learning theory approach and instructional strategy to support behavior change. Some of the studies also stress on the methods, technologies and medium used to deliver the persuasive contents, this include comprehensible presentation, some with the logical presentation structure and some with the good persuasive contents to support the intended outcome. Hence, next section will discuss a comparative analysis of to form the general structure of PMTA Model.

Comparative analysis: Accordingly, in formulating the general component of the PMTA Model a comparative analysis was conducted to get generic component for the development of PMTA Model. The analysis was conducted through the model, function and snapshots of the developed prototype and the elaboration of discussion and finding of the selected study. Then the common components of the model are extracted.

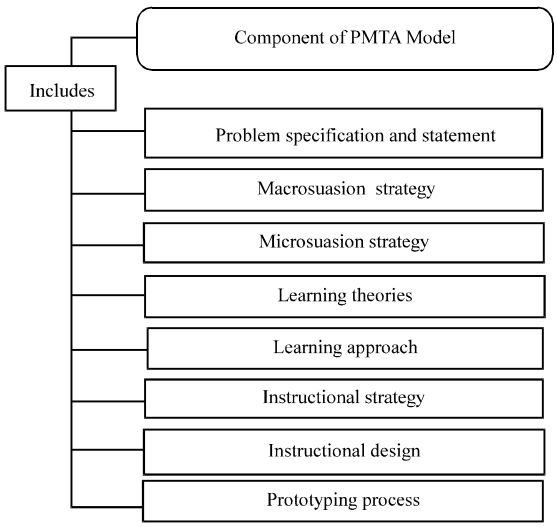

Fig. 1: General component of PMTA Model

Finding of comparative analysis: Based on the comparative analysis, there are ten components that are compulsory to be included in the PMTA Model. Problem specification and statement will be combined since its share the same features and meaning in model development. As most of the listed model shares the similar format, so it is essential to have the structural component to formulate the general structure of PMTA Model. With the aim of this study to propose a conceptual model to assist developers/designers a successful design step in developing truancy awareness applications, therefore the common component gathered from the existing model is illustrated in Fig. 1.

CONCLUSION

In summary, the proposed PMTA Model gives particular attention on how to create awareness using multimedia contents with the help of persuasive strategies. Thus, understanding the common components applied by the researchers in developing a persuasive application to create awareness towards certain behavior really implicated this study. Accordingly by understanding the related components it will help to develop PMTA Model in a systematic way. The next step of this study will involve with more comparative analysis to extract and gathering the detail of sub-component that contains in the common component. In addition, consultation with expert will be conducted to review and validate the model. Afterward, the complete validated model will be tested through a prototyping. The finding of the future research will be presented in the next studies.

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