ENHANCED INFORMATION SYSTEMS CONTINUANCE MODEL FOR MOBILE WELLNESS APPLICATIONS

AHMAD FADHIL BIN YUSOF

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Faculty of Computing
Universiti Teknologi Malaysia

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Specially dedicated to my families, lecturers and friends
Thank you and I really appreciate for the endless support and Doa’.
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ABSTRACT

Usage of Mobile Wellness Application (MWA) has been proven to be one of the ways to overcome obesity through the practice of self monitoring. However, based on the literature, users have difficulties in prolonging the usage of MWA. Study of MWA continuance use seems to be one of the less explored and examined topics in Information System (IS) domains. Also, most of the existing researches regarding MWA gave focus more on the effectiveness and approaches in developing MWA and were not guided by IS theories. Thus, this study aims to identify factors that influence continuance use of MWA in the context of Malaysia by adapting the Information System Continuance Model (ISCM) as a post adoption IS theory. A survey method was applied using the purposive sampling technique. Data were collected from 164 users of MWA from two different sources; MWA users whom undergone a wellness programme for 10 months and MWA users from online wellness groups on the internet. Partial Least Squares (PLS) method based on Structural Equation Modelling (SEM) was used for analysing the survey data. The outcome of this study offered a theoretical model for encouraging the continuance use of MWA. This research reveals that Perceived Interactivity and Social Norm also influence the continuance use of MWA, and Perceived Usefulness is found to be the strongest factor. Finally, the findings of this study can be useful to MWA users and mobile apps developers, and has the potential to be a guidance for marketing strategy to produce a sustainable MWA in the mobile apps market.
ABSTRACT

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LIST OF SYMBOLS

$R^2$ - Coefficient of Determinant
$f^2$ - Effect Size
$Q^2$ - Predictive Relevance
$P$ - Estimated probability of rejecting the null hypothesis $(H_0)$ of a study question when that hypothesis is true
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CHAPTER 1

INTRODUCTION

1.1 Overview

Obesity is now classified as one of the most dangerous illnesses and the number of obese persons continues to increase. According to the World Health Organization (WHO), there are at least 2.6 million people who died each year because of obesity (February, 2010). In Malaysia, a National Health and Morbidity Survey conducted by the Ministry of Health in 2011, revealed that 15.1% of Malaysian were overweight compared to the 4.4% of the population in 1996. According to Saiful Adli Suhaimi, the Senior Assistant Director of the Health Education Division of Ministry of Health of Malaysia, 43% of adult Malaysian, 26% of primary school children, and 20% of teenagers, were obese.

According to WHO, obesity is defined as “abnormal or excessive fat accumulation that impairs health.” The Malaysia Association for the Study of Obesity (MASO) stated that obesity is the result of the energy acquire from the food being greater than the energy required.
Eating a healthy diet is one method for preventing obesity (Hesketh et al., 2005). Organizing a healthy diet requires discipline and guidelines in order to acquire healthy food and to control food intake. Daily food intake depends on individual caloric requirements. Seriously obese individuals require a high level of discipline in terms of their food intake to successfully lose weight. These individuals must be committed to following a plan for their daily food intake.

Yon et al. (2007) and Tsai et al. (2007) in their research, reported that the most effective method for managing diet is through self-monitoring. Self-monitoring is the recording of dietary intake and physical activity so that individuals are aware of their behaviors. Usually the recording process is in the form of a diary and the information that is usually recorded includes dietary intake, physical activity, and daily weight. Self-monitoring is one of the most important features of behaviour therapy and it involves keeping a detailed record of specific behaviours that overcome obesity, particularly food intake and physical activity (Berkel et al., 2005).

In order to overcome the problem of obesity, researchers have studied obesity interventions using internet based tools. These tools normally include three primary components that combine dietary restrictions, physical activity, and behavior. Advances in Internet-based infrastructure and accessibility have produced effective web-based health behavior interventions that help users improve their behavior by practicing self-monitoring.

The next evolution of computerized health interventions is mobile technology and health or mHealth (Akter and P ray, 2010; Hooker et al., 2012; Littman-Quinn et al., 2011). Currently, researchers are starting to use mobile phones as platforms for delivering health interventions. There are several reasons why mobile phones provide a suitable platform for these types of interventions. Firstly, the adoption of phones equipped with sophisticated technical capabilities is a growing trend. Secondly, users always have their phones and they take them everywhere. Thirdly, context awareness features such as sensors, high speed Internet connections, diaries, and reminders are commonly available phone technologies. Finally, personal information can be delivered securely enabling mobile phone healthcare interventions (Klasnja and Pratt, 2012).
Today self-monitoring can be realized using mobile applications (apps). Mobile apps can be downloaded freely and some offer more sophisticated tools that a user can purchase before the app is downloaded. With the availability of these applications, many barriers to self-monitoring, such as privacy, mobility, and time can be overcome, thus increasing the effectiveness of diet management. The Mobile Wellness Applications (MWA) used in this study were defined as a mobile application that helped users monitor their dietary intake and physical activity while they worked to achieve their target weight or maintaining their ideal weight. In addition to the availability of various MWAs, and the usefulness of mobile phones in assisting self-monitoring, the continuous use of the MWA by the user is an additional and important characteristic that will allow a user to monitor their diet and activities and achieve their health goals. The use of an MWA to self-monitoring diet opens new opportunities for further research in diet management.

1.2 Problem Background

Obesity in Malaysia is serious. Information from the Ministry of Health Malaysia reported statistics through the National Health Morbidity Survey conducted in 2011 recorded that 15.1% of adult Malaysians were obese. This figure was greater than the reported 14% of obese adults in 2006. This means that 2.6 million adults in Malaysia are obese and this makes the obesity rate in Malaysia the highest of all South-Eastern Asia countries (MyHealth, 2014). According to Datuk Seri Rd. S. Subramaniam, the Minister of Health Malaysia, this increase was the result of Malaysian society’s unhealthy nutritional culture and sedentary lifestyles (Utusan Malaysia, 2014).

Various initiatives have been develop to overcome the growing obesity rate including the use of intervention technologies such as the Internet. A review of the literature revealed that many studies have attempted to prove the effectiveness of
Internet interventions as tools to combat obesity. Most of the studies used experimental methods that commonly employed randomized controlled trials and focus groups. Many of these studies confirmed that Internet interventions were successful strategies for overcoming obesity (Goldstein, 2005; Harvey-Berino et al., 2004; Saperstein et al., 2007; Tate et al., 2001). Although, these studies reported promising outcomes for Internet interventions, a few studies claimed that users had difficulties using these methods over the long term and they will return to their old eating habits (Patrick et al., 2009; Sundar et al., 2012). However, there are other studies that described a few factors for successful Internet interventions for weight loss such as online support, accountability, and personalized feedback (Hwang et al., 2010; Tate et al., 2001; Womble et al., 2004).

MWAs are easily available and can be used to overcome obesity. Studies about MWA interventions, also known as mHealth studies, have been conducted (Arora et al., 2014; Burke et al., 2012; Hooker et al., 2012). Despite the advantages of mobility and efficiency displayed by MWAs, Sundar, et al. (2012) suggested that there was no evidence for the sustained use of MWAs that would promote and monitor healthy behaviors. Even though an MWA is an advanced and improved version of a nutritional diary, users must still self-monitor and continue to enter their food consumption and physical activities. The arguments put forth by Sundar et al were supported by Sherry Pagoto, a licensed clinical psychologist and an Associate Professor of Medicine at the University of Massachusetts Medical School, who claimed that “this generation of apps is not advancing the science of behavioral weight loss when mobile technology is certainly advanced enough to be doing so” (Pagoto, 2012).

This study was based on the premise that prolong engagement of the user with the MWA is the key to its effectiveness. This claim is supported by Burke et al. (2011) who stated that frequent monitoring is associated with weight loss. Tate et al. (2001) mentioned that users involved in a greater variety of weight loss activities lost significantly more weight. Likewise, Tufano et al. (2005) found sustainable
persuasive and ubiquitous technologies were needed to overcome obesity. (Tufano and Karras, 2005a).

There is however, a lack of research regarding the continuous use of MWA. There is one related study conducted by Akter et al. (2013) that was concerned with mHealth telemedicine. Most of the studies regarding MWA were not guided by Information Systems (IS) theories. For instance, Riley et al. (2011) claimed that most of the mobile interventions related to treatment adherence did not report a theoretical basis for intervention development. Even though those studies provided a theoretical basis, very few attempted to evaluate any of the theoretical components hypothesized to be affected by the intervention. (Riley et al., 2011)

The most common IS theories applied to studies on continuance use were Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB), IS Continuance Model (ISCM), IS Success Model, and Commitment- Based Model. ISCM is the most widely used theory and it is applied in many different contexts. ISCM has been tested in various contexts such as in micro-blogging (Zhao and Lu, 2012), online banking (Vatanasombut et al., 2008), online auctions (Wang and Chiang, 2009) and online shopping (Al-Maghrabi et al., 2011). In the context of online health, the most recent study that used ISCM was conducted by Akter et al. (2013) to explain the continuous use of mHealth services. Based on previous studies, ISCM is useful as a theoretical reference for explaining continuous use.

1.3 Problem Statement

This study agrees with the arguments made by (Burke et al., 2012; Klasnja and Pratt, 2012; Tufano and Karras, 2005b) who claimed that a MWA can be an effective intervention for weight loss if used continuously. However, except for a
study by Akter (2013) that did examine the issue of continuous usage, previous studies on MWA mostly focused on the effectiveness of new mobile apps developed for their studies on obesity prevention or approaches for developing MWAs to combat obesity. For example, previous studies claimed that the existence of continuous interactions between users of an online wellness community resulted in long-term weight loss success. Continuous interactions also helped users to quickly adapt to the apps and become familiar with them (Klasnja and Pratt, 2012; Lieffers and Hanning, 2012).

In other studies (Klasnja and Pratt, 2012; Chen et al., 2012; Liang & Yeh, 2011; Kim, 2010; Hwang et al., 2009; Wang & Chiang, 2009; Hong et al., 2008), the researchers claimed that social involvement allowed users to discover ideas and tips regarding a healthy diet. Users were also exposed to valuable information and this lead to successful weight loss. Community support and social involvement were factors that led to the continuous use of a MWA. These two factors were proven to be effective when embedded in the development of a MWA. However, these factors have not been integrated with any continuance model, especially in the context of MWA. This opens the opportunity to further explore other potential factors that may be critical and encourage a user to continuously use MWA.

There is still a lack of studies related to the continuous use of MWAs, especially those guided by Information Systems theories. Currently the only study is one conducted by Akter (2013) who proposed a model for the continuous use of mHealth. However, the focus of Akter’s study was mobile telemedicine services and not the specific MWA. Thus, the factors that influenced Akter’s users to continue to use the MWA remain unknown. This current study was conducted to identify the factors that encourage users to continue using a MWA for self-monitoring and as a tool for overcoming obesity.
1.4 Research Questions

This study investigated the factors that influence the continuing use of MWA. The main research question for this study was:

*How to encourage users to continue to use a MWA?*

Subsequently the following three research questions were developed for this study:

i) What are the factors that influence the intention to continue to use the MWA?

ii) How to develop a model that would encourage the intention to continue to use the MWA?

iii) What suggestions can be made to mobile apps developers and to ensure that users will continue to use the MWA?

1.5 Research Objectives

There were three main objectives of this study:

i) To investigate the factors that influence the intention to continue to use the MWA

ii) To develop a model for encouraging the intention to continue to use the MWA.

iii) To provide suggestions to mobile apps developers and users to ensure that users will continue to use the MWA.
1.6  Scope of Study

The scope of this study was limited to the post-adoption of technology that focused on factors that contributed to the intention to continue to use a MWA by individuals in Malaysia. This study investigated various factors that involved behavioural aspects that had the potential to influence the intention to continue to use the MWA. This study was based on empirical research and the respondents had experience using MWAs. This study was based on calorie-based paradigms for overcoming obesity implemented by many established wellness practitioners and wellness companies such as SparkPeople and MyFitnessPal.

1.7  Significance of the Study

This study made the following contributions:

This study addressed an individual user’s intention to continue using a MWA. The results should be of interest to mobile apps developers and users.

A developer can refer to the model developed in this study to focus on the factors that influence the user’s intention to continue to use a MWA. This would allow developers to create features that would benefit their users.

As for users, they are at the receiving end of the apps development. They are provided with apps that can assist them to self-monitor their diet and keep their commitment to use the apps. As a result, a MWA can be used to its full potential and the user would enjoy the benefits of continuously using the app. Wellness consultants could provide their customers with apps that would help them keep track
their diet. Consequently, participants in wellness program would be more likely to realize their health goals.

1.8 The Organization of the Thesis

The remaining chapters are organized in the following manner. Chapter 2 outlines the literature review that looked at Information System (IS) Continuance use Model, mHealth Continuance Use Model, existing MWAs, and the identification of research gaps in MWA research. Chapter 3 presents the methodology used in this study. Chapter 4 discusses the development of the proposed model and pilot study. Chapter 5 describes data analysis and discussion in Chapter 6, and lastly, Chapter 7 provides a conclusion for this study.
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