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An Investigation into user Adoption of Personal Safety Devices in Higher Education Using the Unified Theory of Acceptance and Use of Technology (UTAUT)

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ABSTRACT

Educational institutions are temples of knowledge that require the utmost safety and security. To ensure that, they are implementing safety measures, including the use of personal safety devices. Adoption of such devices is uneven and not well understood. The main focus of the current study is to investigate the adoption of Peace of Mind (POM), a personal safety device, by students at a liberal arts college in the United States. The Unified Theory of Acceptance and Use of Technology served as the theoretical framework. Findings from a sample of 405 students confirmed that performance expectancy, trusting belief, facilitating conditions, and social influence had direct effects on the students' behavioral intention to use POM. Based on our findings, we discuss concrete implications for various stakeholders such as higher learning institutions and businesses involved in the innovation and diffusion of personal safety devices. We also make specific recommendations for future research.

Keywords

Technology adoption, higher education, Unified Theory of Acceptance and Use of Technology (UTAUT), personal safety devices

INTRODUCTION

Educational institutions are much more than mere places where students gain knowledge, build careers or engage in scholarly activities, learn to exchange and discuss ideas, build an ecosystem of free ideas, and where they find the genesis of new solutions to real-world problems. In essence, it is a place where they learn life skills for successful lives and careers. However, what about the safety of these temples of knowledge? How strong are safety measures on campuses of all kinds? What is the level of use of personal safety devices on university campuses and what factors play a role in the adoption of such devices? This last question is the main focus of the current work.

At higher learning and other educational institutions, safety is being monitored and ensured through a combination of various methods. Surveillance technologies - security cameras, metal detectors, panic buttons, motion sensors, and password protected doors/keypads, zero tolerance policies – no weapons policies, drug-free zones, etc., are some of the ways or methods. While some governing guidelines are provided by the Department of Justice on the appropriate use and collection of data from such technologies, the responsibility to create safe environments has entirely been left, largely, to the educational institutions and local community support systems (Green, 1999). As a result, there are no standards or uniformity among the approaches, especially with respect to the use of safety devices on campus. The newest innovations in this arena are various kinds of personalized safety devices and their integration with mobile technology. These devices come in all kinds of shapes and sizes as well as a variety of forms of technology, price range, and functions. Whereas some serve as personal alert devices where someone can push a button to let their families and friends know that they are threatened, others are alarms and mobile applications or apps. Some of the apps are GPS based and enable the users notify their friends and family of their location, where they are going, and whether they arrived at their final destination or not. Among the common features of mobile device based personal safety apps are GPS or location-based, alarms, updates from crowd-sourced hot spot data, and geofencing as the most common features (Maxwell, Sanders, Skues, and Wise, 2020).

Although the majority of research into these emerging personal safety devices, especially those that are wearable or mobile apps, has to do with personal fitness and health (Maxwell, Sanders, Skues, and Wise, 2020), they are increasingly being introduced and adopted by colleges across the United States and their students, faculty, and staff (McGrath, 2015). Mobile apps such as React, Sidekick, Tapshield, and Guardly claim to offer enterprise-grade security and promise a solution that enhances security responses campus-wide. The apps have been adopted and have shown to enhance the personal safety of users, especially women, on university campuses (McGrath, 2015). This looks enticing to higher education institutions given the proliferation of mobile devices where nearly every college student is carrying some sort of smartphone. In a nutshell, "campus security organizations are beginning to utilize a number of mobile technologies in order to enhance safety and emergency response on campus" (Zuckerman, 2014, p. 1).

Other technologies have also been deployed on college campuses to ensure safety and security. Among the most popular such technologies that have been introduced for the purpose of keeping academic campuses safe and for the security of campus communities are closed-circuit television, remote video monitoring, and night-vision equipment and aircraft for expanding the scope and nature of campus-wide security arrangements (Lonsway et al., 2009). Furthermore, geospatial technologies and global positioning systems for campus crime modelling and mapping (Leitner, 2013), "blue light" emergency phones connecting the caller directly to campus police or security (Burling, 2003), automatic license plate recognition systems (Sundararaman, Vijayalakshmi, Swathi and Mohapatra, 2016), RFID computer chip embedded in student ID cards, and large-scale X-rays and mobile truck X-rays for screening and detecting radiation-related threats (Purpura, 2013) have also been utilized.

By 2016, a number of low-cost wearable devices (e.g., REACT Sidekick, Wearsafe, Artemis, Safelet, Nimb, Silent Beacon, Revolar, Stiletto, etc.), and mobile apps (e.g., bSafe, Safety Assistance, SafeTrek, Watch Over Me, Witness, SafeSnapp, Emergensee, Bugle, Kitestring, etc.) are in use by students, for their protection in case of emergency, on-campus or off-campus. In addition, students can flaunt Mobile Personal Safety Devices (MPSDs) as a fashion accessory, "cool gadgets," or jewelry, which is another reason for the rising popularity of MPSDs among students (Chuah et al., 2016). In 2014 alone, the overall market for MPSDs and other associated apps was more than $340 million. What is more, it is expected to grow exponentially in the near future (Gallup, 2014).

Such innovation is good. But, is it useful? How much useful? How do we know? There is little empirical research and data analysis available on the nature, acceptance, and use of personal safety devices in the context of higher education institutions. Moreover, despite the tremendous promise these safety devices offer, colleges and universities are confronted with finding creative ways to encourage students to use these systems in a large scale (Horvath and Pisciotta, 2015). Therefore, it becomes indispensable to assess the extent of adoption of campus safety systems/devices and study the indicators of such proliferation and analyze the effectiveness of such devices. Such studies will lead to an improved understanding of the interplay between institutional, social, and behavioral factors in information sharing, among higher learning communities.

Therefore, the core objective of this study is to investigate the user acceptance of Peace of Mind (POM), another personal safety device, recently institutionalized by over two dozen higher education institutions across the United States. Utilizing the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh, Morris, Davis and Davis, 2003) and its extension by Cody-Allen and Kishore (2006) as a theoretical framework, this study will investigate personal safety devices acceptance and use in the context of higher education institutions. In doing so, the predictive ability of Unified Theory of Acceptance and Use of Technology (UTAUT) model will be tested using path analysis, which is a type of structural equation modelling (SEM). Although UTAUT has proved to be a useful tool for enhancing our understanding of user acceptance of technology, it has not been extensively tested in such an environment and context as personal safety on college campuses that is invariably unique. Participants of this study were students at the Sage Colleges that adopted POM as a campus-wide security reporting device. The results of this study will help academic administrators and policy makers to understand the adoption and acceptance levels of such security devices by students. It will assist campus safety officials in developing a better personal safety device implementation and training programs in order to help make campuses safer. In addition, findings will contribute towards improving the UTAUT and creation of a more comprehensive technology acceptance model.

LITERATURE REVIEW

There is interest in innovation that strives to improve public safety. Recent incidences occurring on academic campuses have led to universities seeking new technologies that will enable them ensure a safer campus environment. For instance, new wearable safety devices such as the Peace of Mind (POM) are being introduced and adopted by students and faculty. The Unified Theory of Acceptance and Use of Technology (UTAUT) model has been used to study and understand technology adoption with major constructs such as performance expectancy, effort expectancy, social influence, and facilitating conditions. Existing research on personal safety & security devices focuses primarily on the quality of the devices and their functions. More research and data are needed that specifically address factors relating to technology acceptance and use behavior of wearable safety devices. There is

also a gap in the literature concerning how technology adoption extends to large groups such as students and faculty, which the current study attempts to bridge. The study proposes a modified model, based on UTAUT, that will assist in examining factors affecting technology adoption and use.

Campus Safety

With recent violent events on college campuses, such as the Virginia Tech shooting in 2007, there is an increasing concern about campus safety as well as an intensified focus on how to enhance security (Addington, Ruddy, Millier and Devoe, 2002; Rasmussen and Johnson, 2008). There is ample research on student and staff perceptions and concerns about campus safety. Concerns range from minor crimes (e.g., vandalism and underage drinking) to more serious crimes (e.g., aggravated assault, theft, sexual assault, and homicide). Law Enforcement Management and Administrative Statistics (LEMAS) collects information reported from campus public safety departments. According to a descriptive study by Bromley (1995), minor infractions are the most commonly reported type of crime on college campuses. However, it was also found that reports of serious crimes are increasing disproportionately in comparison to the surrounding communities (Bromley, 1995; Hummer, 2004). A large portion of the literature focused on issues facing women specifically, due to college-aged women experiencing a disproportionately high risk of victimization on campus (Rader and Cossman, 2011; Wilcox, Jordan and Pritchard, 2007).

In general, students frequently reported taking a variety of precautionary measures (e.g., locking car doors, carrying a safety device, planning alternate routes) in order to feel safe on campus. Students also reported that knowing details relating to campus design such as visibility, lighting, and visible safety devices (e.g., security cameras, emergency telephones) had an effect on feelings of overall security. Maintenance and visibility of these factors was positively correlated with feelings of safety (Baker and Boland, 2011; Fletcher and Bryden, 2009). Residency on or off campus also affected safety behaviors, with students living off campus being more likely to carry a safety device or weapon (Pritchard, Jordan and Wilcox, 2015). The literature suggests that students and faculty have a heightened awareness of their physical safety while on campus as well as room for further innovations and improvements by educational institutions.

Safety Technologies

Schools make use of a wide range of safety technologies in order to protect students and faculty as well as property. There are also guidelines in place regarding the use of safety technologies and educational institutions are primarily responsible for providing a safe teaching, learning, and living environment (Green, 1999). According to a study by Garcia (2003) on primary educational institutions, cameras and similar monitoring devices are the most used safety technology in American schools. Metal detectors were also common, although they are perceived as less effective than cameras. Entry control devices such as buildings requiring an electronic key or card are utilized on campuses as well.

More personal safety technologies are being introduced to college communities through mobile applications and devices (Glass et al., 2015; Zuckerman 2014). React Sidekick, Tapshield, and Guardly are some examples of available safety applications. The POM is an example of a personal and wearable emergency communication and safety device. There are three classifications of wearable technology; notifiers, glasses, and trackers (Stein, 2014). The POM is both a notifier and tracker. It sends information about the user and their location to campus security, as well as allowing direct communication (POMCO, 2015). Despite their relatively common use of these safety technologies, research on use and adoption of personal safety devices on college campuses and by college students is insufficient. The current study focuses on the POM device and aims to explore its adoption using the proposed research model.

Technology Adoption

Technology serves little purpose if it is not widely adopted and utilized by a critical mass of users. One of the primary issues or topics of focus in research that explores adoption and use of technology is what influences the

use, or lack thereof, of certain technologies and what the barriers to adoption are. For instance, wearable technology tends to have a host of barriers to its adoption. Page (2015) identifies several issues facing these devices, including social influence, unobtrusive wearability, and consumers feeling a lack of want or need for such devices. Functionality was found to be an important factor as well. Bodine and Gemperle (2003) showed that participants valued both functionality and comfort, as well as the fact that the benefits of the device must be significant.

UTAUT has been successfully employed by multiple studies to test technology adoption (Chaka and Govender, 2017; Magsamen-Conrad, Upadhyaya, Joa and Dowd, 2015; Yuan, Ma, Kanthawala and Peng, 2015). Literature regarding the use of UTAUT on technology adoption on campuses is scarce. Murphy, Lee and Swinger (2011) analyzed student's perceptions and adoption of a "smart card system" on campus using the model. They looked into variables and behavior such as whether students were international versus domestic, their desire to put money on the card, their gender, and university or class level. However, a smart card system is more of a money-management technology than one with safety at its core. Another study by Šumak and Šorgo (2016) examined teacher's use of interactive whiteboard technology. They found significant results validating social influence, performance expectancy, as well as facilitating conditions as determinants of use. Chaka and Govender (2017) studied e-learning technology adoption in Nigeria and also found strong effects of the three variables on behavioral intent, further substantiating the UTAUT as a suitable model to study technology adoption and use behavior. Generally, existing research suggests that physical comfort, function, and social acceptability affect the adoption of general wearable technology.

Others have utilized UTAUT to study behavioral intention to use mobile and wearable devices as well, including in the healthcare sector (Wang, Tao, Yu, and Qu, 2020), in electronic and online commerce (Al-Saedi, Al-Emra, Ramayah, and Abusham, 2020), and the service industry (Khalilzadeh, Ozturk, and Bilgihan, 2017). All of these studies confirmed that each of the main predictor constructs in UTAUT had a positive effect on consumers' behavioral intention to use wearable devices in all three sectors. However, these and similar relevant literature mainly focus more on other devices, including entertainment devices such as the Apple Watch, rather than directly addressing safety devices, including mobile and wearable ones, that are widely used on college campuses.

Unified Theory of Acceptance and Use of Technology (UTAUT) & Web Trust Model

Models of user acceptance of technology seek to provide an explanation and depiction of the relationship between factors related to individuals' behaviors and attitudes toward the technology, intention of use, and actual use of the technology. Among these is the Unified Theory of Acceptance and Use of Technology (UTAUT) where performance expectancy, effort expectancy, social influence, and facilitating conditions are the predictive determinants with direct effects on technology acceptance and use. The UTAUT was developed by Venkatesh, Morris, Davis and Davis (2003). It was developed by combining eight major models and theories of technology acceptance. These models are: the Theory of Reasoned Action (TRA) (Davis, Bagozzi and Warshaw, 1989), Technology Acceptance Model (TAM) (Davis, 1989; Davis et al., 1989; Venkatesh and Davis, 2000), Motivational Model (MM) (Davis, Bagozzi and Warshaw, 1992), Theory of Planned Behavior (TPB) (Taylor and Todd, 1995), Combined Tam & TPB (C-Tam-TPB) (Taylor and Todd, 1995), Model of PC Utilization (MPCU) (Thompson, Higgins and Howell, 1991), Innovation Diffusion Theory (IDT) (Moore and Benbasat, 1991), and Social Cognitive Theory (SCT) (Compeau and Higgins, 1995; Compeau, Higgins and Huff, 1999). UTAUT was originally developed and empirically validated to serve as the comprehensive model for assessing technology acceptance and use. It has been the favored model for predicting technology acceptance due to its ability to explain a significant percentage of the variance in the dependent variable compared to TAM (Jong and Wang, 2009).

For this study, we utilize a modified theoretical model derived from two main theories, namely, the UTAUT and McKnight, Choudhury and Kacmar (2002)'s Web Trust Model. Trust is imperative to successful e-commerce, as consumers must feel that the risk and insecurity (e.g., giving personal information) are worth the benefits. McKnight, Choudhury and Kacmar (2002) developed the Web Trust Model to study trust in the realm of e-commerce. The model contains four primary constructs: disposition to trust, institution-based trust, trusting beliefs, and trusting intentions, which are broken down into 16 sub-constructs.

There is a strong evidence of moderating effects of trusting beliefs (TB) on most of the constructs in technology acceptance models, including the Technology Acceptance Model (TAM) (Wu et al., 2011) and UTAUT (Wu et al., 2011). In addition, some key constructs of the various models that have a strong pair-wise relationship with trusting beliefs include perceived usefulness, one of the constructs in TAM that make up performance expectancy (PE), which is among the strongest predictors of behavioral intention to use (IU) (Ghazali, Ham, Barakova, and Markopoulos, 2020; Tao et al., 2020; Venkatesh et al., 2003; Wu et al., 2011).

Therefore, our study examines six major independent variables in the two models (performance expectancy, effort expectancy, social influence, facilitating conditions, and trusting beliefs) and their effect on the dependent construct, behavioral intention to use. The inclusion of more variables (e.g., trusting beliefs) in the modified model allows for a more comprehensive study that considers the psychological aspects of technology acceptance and use. This would potentially help improve overall understanding of the relationships between institutional, social, and behavioral factors in adoption of technology by higher education institutions.

Main Constructs in UTAUT and Proposed Hypotheses

Performance expectancy (PE) is the extent to which users believe that technology use will enhance their ability to complete a task or function. It was developed from five constructs from the different models pertaining to performance expectancy: perceived usefulness (TAM/T AM2 and C-TAM-TPB), extrinsic motivation (MM), job-fit (MPCU), relative advantage (IDT), and outcome expectations (SCT). This factor is the strongest predictor of behavioral intention to use (IU) but may be affected by gender and age of the user (Venkatesh et. al, 2003).

Performance expectancy has been shown to have an effect on technology use. For instance, Al-Gahtani, Hubona and Wang (2007) found that PE has a direct effect on intention to use a technology. In a study by Oh, Lehto and Park (2009) on travelers' intentions to use mobile devices, PE was found to be the most significant factor of use. PE was also shown to be a significant factor in a study on internet banking adoption by AbuShanab and Pearson (2007).

Therefore, we posited that:

> *H1: PE will have a significant positive effect on IU.*

Effort expectancy (EE) is defined as the ease with which a technology can be used by the consumer. It was developed from three constructs in pre-existing models that capture the concept of effort expectancy. These are: perceived ease of use (TAM/TAM2), complexity (MPCU), and ease of use (IDT). Although EE is a significant factor, its effects diminish with time (Venkatesh et. al 2003). The effect of EE on behavioral intention is moderated by age, gender, and experiences (Jong and Wang, 2009; Venkatesh et. al 2003). Interestingly, EE was found to differ in significance in the context of two countries, the United States and Japan. Straub, Keil and Brennan (1997) found that EE is a more important factor in the United States for determining behavioral intention than in Japan.

Therefore, we formulated the following hypothesis:

> *H2: EE will have a significant influence on IU.*

Social influence (SI) is the extent to which someone perceives that important others believe he/she should use a technology. "Social influence as a direct determinant of behavioral intention is represented as subjective norm in TRA, TAM2, TPB/DTPB and C-TAM-TPB, social factors in MPCU, and image in IDT" (Venktatesh et. al, 2003, p. 451). SI has the most significant effect in the beginning stages of mandatory technology usage versus voluntary use of a technology or device. It is also significant in the early stages of use when the user is unfamiliar with the device. It is affected by three issues: compliance, internalization, and identification. The effects of social influence decrease as experience increases (Venktatesh et. al, 2003).

Social influence's effect on an individual's technology use have been validated by multiple studies. Compeau and Higgins (1991) found that in group settings, the behavior and influence of others had some effect on an individual's technology use. Hsu and Lu (2004) showed a positive correlation between SI through social norms and expectations

with an individual's time spent playing an online game. A study by Wills, El-Gayar and Bennett (2008) found that SI was a significant determinant of health care professional's use of electronic medical record keeping technology.

Thus, we propose the following:

> *H3: SI will have a significant positive effect on IU.*

Facilitating conditions (FC) are defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et. al, 2003, p.453). This construct was derived from perceived behavioral control (TPB/DTPB, C-TAM-TPB), facilitating conditions (MPCU) and compatibility (IDT). When facilitating conditions are "moderated" by variables of experience and age, it shows a "significant influence" on usage behavior (Venkatesh et. al, 2003).

The influence of this variable on intention of use has been supported in several studies (Thompson, 2001; Venkatesh and Davis, 2000). Thompson (2001) showed that facilitating conditions must be present for the behavior to occur without significant difficulty. "Policies, regulations, and legal environment are therefore all conditions critical to technology acceptance," (Norazah and Ramayah, 2010, p.399). We posit that facilitating conditions are crucial to the adoption and use of a device.

Thus, it is hypothesized that:

> *H4: FC will have a significant positive effect on IU.*

The use of ***trusting beliefs (TB)*** in the proposed model was based on its significance in the Web Trust Model (Mcknight et. al, 2002). It is defined as the confidence that technology will fulfill its intended purpose and thus is dependable and reliable. There are three common trusting beliefs: competence (trust that the device will function correctly), integrity (honesty/promise keeping), and benevolence (trust that the device will work in the interest of the user) (McKnight, et. al., 2002).

Trusting beliefs have been proven to have an effect on technology usage. For example, cognitive trust and emotional trust positively influence an individual's intention to use technology (Komiak and Benbasat, 2006). Alternatively, feelings of distrust or risk perception reduce the likelihood of technology adoption (McKnight, et. al, 2002). Additionally, one study found that trusting beliefs towards an institution make an individual more likely to utilize their service (Luo, Zhang, and Shim, 2010). In general, trusting belief has been shown to be an influencing factor on most of the constructs in UTAUT or their key elements such as perceived usefulness (an element of performance expectancy (PE)) and perceived ease of use (a key component of Effort expectancy (EE)) (Ghazali et al., 2020; Wu et al., 2011).

Therefore, with regard to POM we test the following hypotheses:

> *H5: TB will have a significant positive effect on IU*
>
> *H6: TB will have a significant mediating role on the effect of EE on IU*
>
> *H7: TB will have a significant mediating role on the effect of PE on IU*
>
> *H8: TB will have a significant mediating role on the effect of FC on IU.*

Behavioral intention to use (IU) is defined by Brown et al. (2002) as users' attitudes toward using a technology and their intentions to use that technology in voluntary use environments. BI includes plans of continued use. BI is linked to existing beliefs about effects of the technology (e.g., risk and reward) more than beliefs about the actual technology.

Behavioral intention's influence on overall use is supported by literature (Al-Gahtani et. al, 2007). Subjective norms as well as self-efficacy impact behavioral intention. IU has been found to be driven by perceived usefulness (Fu, Farn and Chao, 2006; Norazah, Ramayah and Norbayah, 2008).

After a thorough review of the literature, there seems to be a lack of empirical data on personal safety device adoption, especially in the context of academic environments. College campuses are microcosms which have unique

safety needs; thus, existing research findings cannot be easily generalized to such a specific environment. Further research must be conducted with the campus environment in mind in order to bridge the gap in the current safety device research. Through this study, we aim to introduce and support the proposed model as well as identify factors affecting student's adoption of personal safety devices on college campuses.

METHODS

Data Collection

The instrument used to collect data for the current study was adapted from numerous questionnaires used in several studies to test the UTAUT with a slight modification by the researchers. The questionnaire comprises of two parts with a total of 38 items. Part one contains 9 background information questions such as the gender, age, academic status, and related demographic questions about the research participants. The second part of the questionnaire contains 28 questions related to study variables in a Likert-type scale choice and an open-ended question. Data was collected electronically, by deploying the questionnaire on SurveyMonkey®. The URL to the survey questionnaire was sent to all active students of The Sage Colleges via email. The anonymous data was automatically entered to excel file and then converted to a format for SPSS Amos version 24 for analysis.

Participants of the Study

The Sage Colleges was purposely chosen as the site for the study of adopting a handheld personal safety device called Peace of Mind (PMO). Of the total body of nearly 3000 students who received the online survey questionnaire, 405 students completed the questionnaire. The respondents were 88.1% female (N=357), 11.1% male (N=45) and .7% who did not identify their gender (N=3). The majority of the participants (58.3%) were between 18 and 20 years old, followed by those between ages of 21 and 22 (27.9%). Those between 23 and 25 years and those over 25 years make up 6.4% each. Over 98.5% (N=399) of were undergraduates and 0.5% (N=2) were graduate students, while 1% (N=4) identified as other. Most of the participants (61.7%) live on campus (N=250) and the rest live off campus. Technology related background of the participants is presented in Table 1 below. Accordingly, most participants (almost 51%) didn't receive any training regarding POM although they carry the gadget. Of those who received training, most of them received less than 30 minutes of training on how to use POM. Their experience in using POM also range from those who had it for over a year (15.6%) to those who had it for less than 6 months (74.2%). When asked about their comfort level on using any handheld technology, however, most (55.3%) feel they are either comfortable or very comfortable.

Items	Choices		
Training received on how to use POM	Not at all N=206 (50.9%)	<30 Minutes N=160 (39.5%)	>30 Minutes N=37 (9.2%)
Length of time/ Experience using POM	0-6 Months N=299 (74.2%)	6 Months-1 year N=41 (20.2%)	Over 1 year N=63(15.6%)
	Uncomfortable/very uncomfortable	Neutral	Comfortable/Very comfortable

Level of comfort in using handheld computer technology	N=81(20%)	N=98 (24.2%)	N=224 (55.3%)

Table 1. Technology Use Background of the Participants

Data Analysis Procedure

Structural Equation Modelling (SEM) is the statistical technique used to analyze data and determine whether there is support or evidence for the various hypotheses in this study. This section explains several steps taken in the data analysis process. First, a Kaiser-Meyer-Olkin (KMO) index was calculated to measure sample adequacy. Table 2 below shows the results of KMO.

Items	Kaiser-Meyer-Olkin (KMO) measure of sample adequacy
PE 1-PE4	.800*
EE1-EE5	.795*
SI1-SI5	.843*
FC1-FC6	.837*
TB1-TB4	.814*
IU1-IU4	.708*

*P < .001

Table 2. Kaiser-Meyer-Olkin (KMO) Measure of Sample Adequacy

The sample adequacy (KMO) for all the 28 items and their respective groups of items, as shown in Table 2 above, were found to be significant at < .001 with values ranging from .708 to .932 which were all acceptable. Then factor analysis/ factor loading was conducted and Cronbach's alpha value calculated to assess reliability. Table 3 presents the factor loading for each construct and the corresponding test of internal consistency. As presented in the table, the overwhelming majority of items loaded on their respective factors. Two items (EE5 and IU1) were excluded for not meeting the loading criteria. The widely accepted cut-off point of 0.70 was used for item inclusion decision and only two items below that cut point (SI2 and FC6) were included because the cumulative averages of the constructs they belong to were above .70. The items were found to be internally consistent with all constructs exceeding the widely accepted, conservative, cut-off point of .70.

Items	PE	EE	SI	FC	TB	IU
PE1	.778					
PE2	.866					
PE3	.863					
PE4	.799					

EE1		.832				
EE2		.864				
EE3		.786				
EE4		.862				
SI1			.786			
SI2			.633			
SI3			.839			
SI4			.930			
SI5			.905			
FC1				.760		
FC2				.783		
FC3				.781		
FC4				.708		
FC5				.739		
FC6				.696		
TB1					.844	
TB2					.901	
TB3					.776	
TB4					.864	
IU2						.823
IU3						.878
IU4						.880
Reliability	.846	.846	.869	.837	.866	.862

Table 3. Factor Loadings of the constructs

Once the factor loadings were completed and the constructs were established, the next step was to run the correlation analysis between the six constructs. Table 4 below shows that all the six variables positively correlated to each other with values ranging from the lowest (.480) to the highest (.748), all statistically significant with $p < .05$.

	1	2	3	4	5	6
1. PE						
2. EE	.725[**]					

3. SI	.494**	.494**				
4. FC	.512**	.589**	.484**			
5. TB	.723**	.663**	.480**	.580**		
6. IU	.690**	.644**	.565**	.577**	.748**	

**P < .05

Table 4. Correlation between the constructs

As a result of the various processes followed, all the six constructs were used in the proposed structural model.

FINDINGS AND DISCUSSION

Result of the test, specifically the model fitness indices and the path coefficients, along with the model, are presented in this section.

The Structural Model Fitness

The structural model for this study included six variables: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Trusting Beliefs (TB) and Intention to Use (IU). The model fit indices are presented below in Table 5. Most of the indices reported in the table include those suggested by Kline (2005), Boomsma (2000), and further supported by Hooper, Coughlan and Mullen (2008, p. 56) that "These indices have been chosen over other indices as they have been found to be the most insensitive to sample size, model misspecification and parameter estimates."

Index	Value in this model	Acceptable Threshold Levels
CMIN (χ^2)	p=.062; (χ^2 =5.558, df=2)	p>.05
CMIN (χ^2)/DF	2.779	<5 (Schumaker &Lomax, 2004)
RMSEA (Root Mean Square Error of Approximation)	0.066	<.07 (Steiger, 2007)
CFI (Comparative Fit Index)	.997	>.95
RFI	.955	>.95

Table 5. Model fit indices

As can be seen in Table 5 above, all the indices met the acceptable threshold of their respective fit indices, confirming the overall fitness of the model with the collected data.

Analysis of Path

The structural model test of the hypotheses resulted in several valuable outcomes. Figure 1 and Table 6 below present the result of the SEM Analysis and results of the hypothesis testing, respectively.

According to Figure 1, the SEM index indicates that 65% of the variation in the dependent variable IU (Intention to Use) is explained by the variation in the independent variables. While some of these independent variables directly influence the dependent variables, the effect of others is indirect. The direct and indirect effects of each variable, along with corresponding paths is presented in Table 6.
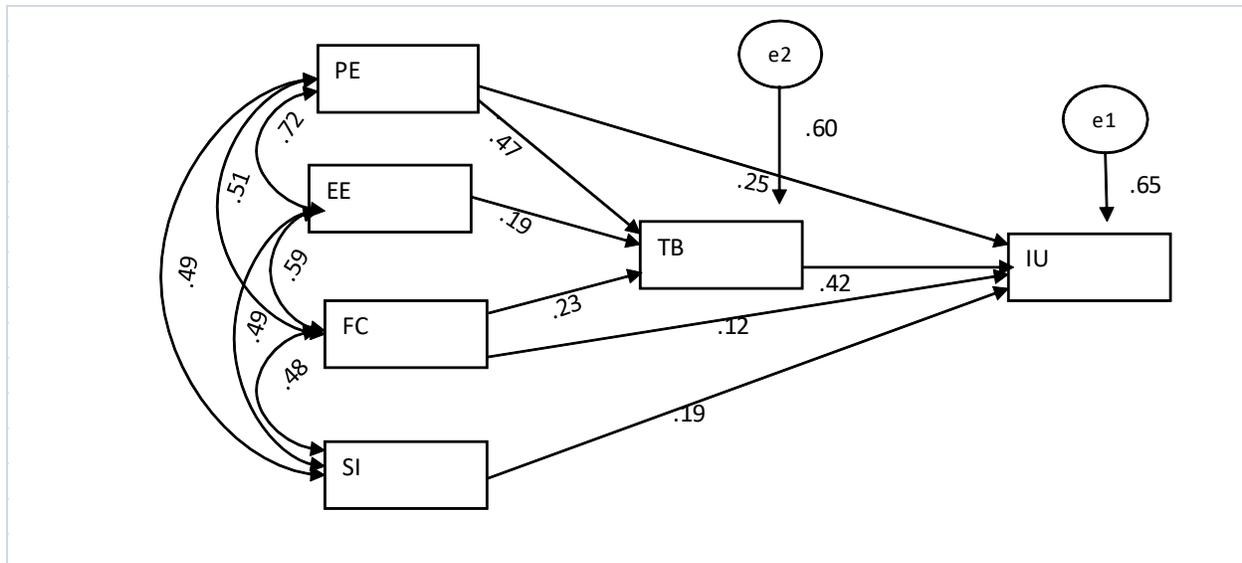
Figure 1. Result of the SEM Analysis

Table 6 below presents the path toward the two endogenous variables (IU and TB) along with regression weights. Four variables directly influence IU and their influence is statistically significant, $p < .005$. The level of effect of these variables from highest to lowest estimate (β) of these variables are TB (.420), PE (.231), SI (.192), and FC (124). In addition, three variables directly influenced TB with a statistically significant effects, $p<.001$ each. The effect of these variables from the highest to the lowest estimate (β) are PE (.470), FC (.229) and EE (.187).

	Path		β (Estimate)	S.E.	P
IU	<---	PE	.231	.053	.000
IU	<---	FC	.124	.048	.002
IU	<---	TB	.420	.053	.000
IU	<---	SI	.192	.044	.000
TB	<---	EE	.187	.053	.000
TB	<---	PE	.470	.051	.000
TB	<---	FC	.229	.046	.002

Table 6. Standardized Regression Weights of the paths

Table 7 below summarizes the direct and indirect effects of the proposed variables on Intention to Use (IU). Supporting all the eight hypotheses, Intention to Use the Peace of Mind (POM) device is influenced by all the proposed variables. However, the degree and the direction of influence vary. Those variables that directly influence students' Intention to Use include Performance Expectancy, Trusting Belief, Facilitating Conditions, and Social Influence, in the order of importance. The variables indirectly influencing students' Intention to Use through the mediating effect of Trust in Belief include Performance Expectancy, Facilitating Conditions, and Effort Expectancy, also in the order of importance.

Variables	Direct	Indirect (through TB)	Total
PE	.231	.197	.470
TB	.420	.000	.420
FC	.124	.096	.221
SI	.192	.000	.192
EE	.000	.079	.079

Table 7. Standardized Direct and Indirect Effects on IU

In sum, The Sage Colleges students' intention to use the Peace of Mind (POM) personal security device is dependent up on the students' expectation of the device to perform the intended task (PE=.470; p < .001). This is followed by the students' trust of the gadget's reliability/dependability (TB=.420; p < .001) and the availability of support and instruction on how to use the gadget (FC=.221; p < .005). The other variables that influenced the students' intention to use POM significantly, although to the lesser degree are influences by social circles (SI=.192; p < .001) and the effort by students to learn and familiarize themselves with the device (EE=.079; p < .001).

LIMITATION AND DELIMITATION OF THE STUDY

By using an established theoretical framework, a well-developed research methodology and a reliable instrument, this study overcame several limitations. Despite all this, our results must be treated with caution due to some potential limitations. These include:

- Lack of empirical research using reliable instruments to measure latent variables, such as trusting beliefs, hinders attesting previous results and also it is difficult to deduce if the additional items in this study's instrument accurately measured those latent variables.
- Demographics data revealed that most respondents were from a single age group (18-22 years old)
- The study was conducted at a private college that does not necessarily represent or can be generalized for all public colleges and universities.
- The research was conducted within the specific domain of POM. Thus, the findings may not be applied broadly to other forms of personal safety technology.

While we have identified and explained the three common trusting beliefs (competence, integrity, and benevolence) in our definition of the construct, we did not plan to test the role of these three sub-constructs in UTAUT and their relationships to the other constructs. As such, this is one of the delimitations of our current study. We believe future research that attempts to do so will contribute to the literature immensely and help address this gap.

RECOMMENDATIONS FOR FUTURE RESEARCH

This study uncovered interesting findings regarding behavioral intention to use POM in the context of a higher learning institution. Subsequent studies could have several different foci.

- Further research could be conducted to confirm the results of this study at other public colleges and universities.
- A study could be attempted to validate the proposed research model at other colleges and universities (e.g., mandatory vs. voluntary).
- Using the proposed research model as framework could benefit stakeholders and information system researchers more if a longitudinal (change of attitude over time) study involving a cross-section of colleges and universities (private & public) is conducted.

CONCLUSION

The study yielded critical insights into students' behavior, their approval level and key drivers for acceptance of MPSDs, like POM in our study. We now have a refined understanding of the unpredictable interplay between the institutional, social, and behavioral factors in information sharing among higher learning communities. The evidence-based results of this study, with little consideration for variables such as age, gender and level of experience in using technology, present institutions with the required data and its in-depth analysis as an input to devise better student safety practices, policies and trainings.

The practical and theoretical implications of the findings provided measurable benefits to all stakeholders including, but not limited to, students, parents, faculty, and college/university administrators and academic research bodies, for promoting safer knowledge centers; which is our ultimate goal. The answers discovered through this exploration act as a means to s achieve this goal. The fact that more than 55% of the POM users felt either comfortable or very comfortable in using the device, gives enough confidence that such MPSD's can be implementable and be of great value. Just the way end-user satisfaction is generally considered as one of the key measures of information systems success, particularly in previously unexplored environments such as higher education institutions (Shirani, Aiken and Reithel, 1994), these outcomes of the study should be used to evaluate end-user satisfaction. They should also aid in the design, evaluation, and implementation of similar personal safety devices.

Every effort made is with an objective to improve or get better returns or for a noble cause. Especially, return on investment (ROI) in information technology can be measured in broader terms (Cresswell, Burke and Pardo, 2006). In this regard, the findings of this study can be used by colleges and universities in conducting ROI analysis, where cost and return is measured in terms of number of incidents reported by students with the POM device', technological aspects, overall students' personal safety and institutional benefits which in turn offer a safe productive environment. Of the different UTAUT model indicators used for the current study, Performance Expectancy, Trusting Belief, Facilitating Conditions, and Social Influence had direct effect on the students' Intention to Use. Applicability, usage and relevance are important factors for the manufacturers of such Personal safety devices. How technology is adopted and managed in higher education institutional settings impact their businesses. They don't want to produce products that don't sell. This effort and customer feedback can prove to be of great value for producers of such MPSD. The expectation that the POM device would work the way and whatever it is intended to is highly dependent on the intention to use this device by the students. Other key factors that surfaced during the analysis reveal that students put trust in the gadget's reliability and availability of support and training to use the device.

From researchers' viewpoint, the findings enhanced our understanding of the viability of the UTAUT model across higher education institutions and enhance the validity of the original survey instrument developed by Venkatesh et al. (2003). In addition, this exploration introduced, and subsequently validated, an additional construct to the UTAUT (Trusting Beliefs) in exploring behavioral intention to use technology. Another point of importance is that the user acceptance of personal safety devices in higher education was not studied in this manner before. Therefore, the current study contributes to the literature on similar studies and may even present an alternate model to conduct both explanatory and confirmatory studies in other settings for technology adoption and use.

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