Factors Affecting Mobile Applications of Remote Security Cameras at Home and Office: An Empirical Investigation in Southern California

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Abstract

This paper aims to assess and evaluate the factors affecting mobile applications used to access and control security cameras at home and office. Survey data from 397 mobile applications users from Orange County and San Bernardino County in Southern California, USA were collected to test the proposed research model and . hypotheses through structural equation modeling. This study finds that system quality, Information quality and service quality of mobile applications have positive effects on the perceived usefulness and perceived ease of use of these applications, and in their turn, they have a positive effect on actual use of mobile applications which leads to net benefit represented in increased control of users' security, increased convenience and flexibility when remotely accessing their security cameras at both home and office. The use of mobile application to access and control security cameras is growing rapidly in homes and offices; however the benefits of using such mobile applications and factors affecting their use are still unclear in the research literature. There is a lack of researches in this area which makes this study among the first to attempts to fill this gap by empirically investigating the factors affecting the use of mobile applications of home and office security cameras as well as the benefits associated with these mobile applications.

Keywords – Mobile Commerce, Mobile applications evaluations, Home and office security cameras, Information systems evaluations, Information systems security, Information systems success, technology acceptance model, Benefits of using mobile applications, Mobile applications design.

1. Introduction

There is a growing trend in using security cameras at both homes and offices. Several mobile applications are designed to access and control security cameras remotely. Features include live viewing, motion detection, video alerts, night vision, cloud storage and many more. However these benefits introduced to the user of those mobile applications have not yet validated by empirical studies. Also factors affecting the use of these mobile applications are not clear in research. This paper is among the first to try to fill this research gap by empirically examining the factors affecting the use of mobile applications for security cameras at home an office. Furthermore, this paper investigates the expected benefits

associated with utilizing these mobile application used to access and control security cameras at home and office. The paper is concerned with answering the two following research questions:

1. What are the factors that affect mobile applications used to access remote security cameras at home and office?
2. What are the benefits associated with using mobile applications used to access remote security cameras at home or office?

The study used both the technology acceptance model (TAM) (Davis, 1989) and the information systems (IS) success model (DeLone and McLean, 2003) as theoretical frameworks and to build the study research model. Survey data from 397 mobile applications users from Orange County and San Bernardino County in Southern California, USA

were collected to test the proposed research model and hypotheses through structural equation modeling.

The results and findings of this research should have important implications at both the theoretical and practice level. At the theoretical level, it will fill out a research gap by empirically investigating the factors affecting the use of mobile applications for security cameras at home and office as well as examining the benefits associated with using these mobile applications. At the practice level, the findings of this study should provide helpful insights for designers and developers of mobile applications to focus on the features that users see most beneficial when accessing and controlling their home and office security cameras. Developers of mobile application can then redesign those applications to be more tailored and responsive to users' needs and requirements.

This paper starts by reviewing literature that leads to the development of the research hypotheses pertaining to the effect of information quality, system quality, and service quality of mobile applications and how they by their turn affect perceived ease of use, perceived usefulness, attitude, behavioral intention, and actual use of these applications. The paper then discusses the research methodology including the research model and sampling. The research results and finding are then provided and analyzed. The conclusion section at the end of the paper discusses theoretical contributions, implication for practice and the limitation of the study as well as recommendations for future research.

2. Literature Review and Hypotheses development

2.1 Information Quality

Information quality of a system is defined as the quality of the content of the information systems. The more useful is the content, the more quality is the information. Budiardjo et al (2017) empirically examined the influence of knowledge management system quality on users' continuance intention to use in three companies that had implemented a knowledge management system (KMS). The study demonstrated that both system quality and information/knowledge quality influence all the factors that drive the continuance intention regarding

KMS usage, namely perceived usefulness, satisfaction, and trust. Wang and Chien-Liang (2012) empirically investigated the influences of perceived playfulness and information systems (IS) quality on mobile phone subscribers' intentions to use the service. The results confirmed that information quality, system quality, and service quality serve as important antecedents of perceived ease of use and usefulness among mobile phone subscribers. Sumida et al (2017) compared the preference of social media sites and institutional communication channels of higher education institutions by confronting elements that form perceived usefulness and user satisfaction with the system in Brazil. The study revealed that information quality has a positive effect on perceived usefulness and perceived ease of use. This discussion suggests the following hypotheses:

H1: Information quality of mobile applications of security cameras has a positive effect on perceived usefulness of these applications

H2: Information quality of mobile applications of security cameras has a positive effect on perceived ease use of these applications

2.2 System Quality

System quality refers to the component of the system including hardware and software that affect the functionality of the system.

AlShibly (2014) empirically investigated the effects of characteristics of electronic document management systems on their acceptance in Jordon. The results showed that information quality and system quality have positive effects on perceived usefulness and perceived ease of use of this system.

Lee et al (2017) examined the factors influencing the behavioral intention to use food delivery applications through an extended technology acceptance model. The results showed that user-generated information, firm-generated information, and system quality have a significant effect on perceived usefulness. In addition, system quality and design quality strongly influenced the perceived ease of use, which improved perceived usefulness. Cheng (2013) empirically examined consumer attitudes toward the use of and consumer behavioral intention to use a Radio Frequency Identification (RFID) door security system at Taipei Arena Ice Land. The results showed that system quality has a significant positive impact on perceived usefulness and perceived ease of use and information quality also has a significant

positive impact on perceived usefulness and perceived ease of use. Tilahun and Firtz (2015) investigated antecedents of electronic medical record system implementation success in low-resource setting hospitals. Their study showed that information quality, system quality and service quality have a significant positive effect of perceived usefulness and perceived ease of use. This discussion suggests the following hypotheses:

H3: System quality of mobile applications of security cameras has a positive effect on perceived usefulness of these applications

H4: System quality of mobile applications of security cameras has a positive effect on perceived ease of these applications

2.3 Service Quality

Service quality refers to the necessary functions and tasks that are needed to keep the system in good condition such as maintenance, repairs, upgrades and patches.

Hsu (2015) empirically investigated backpackers' continuing usage intention of travel websites based on expectation. The study confirmed that information quality, system quality and service quality have positive effects on perceived usefulness and perceived ease of use of travelers. Choi et al. (2015) examined the effects of product attributes and service quality of transportation card solutions on service user's continuance and word-of-mouth intention. The results confirmed that the service quality of transportation card solutions has a positive effect on the users' perceived usefulness and perceived ease of use. Tai et al. (2017) investigated website quality and online trading influences on customer acceptance of securities Brokers in Taiwan. The results demonstrated that website quality positively affects perceived usefulness and perceived ease of use, both of which are key factors in predicting users' attitudes towards usage. Fernandes and Pedroso (2017) investigated the effect of self-checkout quality on customer satisfaction and re-patronage in a retail context. They found that quality of the self-checkout systems has a positive effect on the perceived usefulness and perceived ease of use of the retail customer. Ayo et al. (2017) examined the factors affecting e-banking usage based on electronic service (e-service) quality, attitude and customer satisfaction. The result reveals that perceived e-service quality has a strong influence on customer

perceived usefulness as well as perceived ease of use. Te- This discussion suggests the following hypotheses:

H5: Service quality of mobile applications of security cameras has a positive effect on perceived usefulness of these applications

H6: Service quality of mobile applications of security cameras has a positive effect on perceived ease of these applications

2.4 Perceived Ease of Use

Perceived ease of use refers to the degree to which a person believes that using a particular system would be free of effort.

Muchran (2015) analyzed trust, perceived ease of use, perceived usefulness and experience to intention to use internet banking. The data were obtained using questionnaire given to customers. The populations were customers of BNI Bank listed as service users of Internet banking. The results showed that perceived ease of use has significant effect on perceived usefulness and perceived ease of use has significant relationship with intention to use internet banking modernized by experience. Nasri and

Mohamed (2014) empirically examined the factors influencing the intention to use Internet Banking in Tunisia. The impact of perceived usefulness, perceived ease of use, awareness, social norm, security and privacy, and computer self efficacy on intention to use Internet banking were tested through structural equation modeling. The findings proved that customer intention to use Internet banking can be affected by perceived usefulness and perceived ease of use of Internet banking. In turn, perceived usefulness can be affected by both perceived ease of use and influence social. Joo et al. (2014) conducted a study to add new variables, namely user interface, personal innovativeness, and satisfaction in learning, to Davis's technology acceptance model TAM and also examine whether learners are willing to adopt mobile learning. The study attempted to explain the structural causal relationships among user interface, personal innovativeness, perceived ease of use, usefulness, intention to use, and satisfaction in learning. The results of the structural equation modeling revealed that user interface and perceived ease of use had significant effects on perceived usefulness. Sho and Sagynov (2015) investigated the factors that affect usefulness, ease of use, trust, and

purchase Intention in the online environment by the applying the technology acceptance model. They examined the effects of factors such as product information, price, convenience, and perceived product or service quality on perceived usefulness.

The results showed that perceived ease of use has a significant effect on perceived usefulness for the online shopper. Dong (2017) examined why do Chinese consumers use the Internet of Things (IOT) systems and if consumers' cognitive and affect experiences moderate the relationship between psychological perception factors and perceived usefulness. The research results showed that perceived psychological factors (perceived ease of use, perceived intelligence, perceived convenience and perceived privacy risk) have significant effect on the intention and behavior of IOT systems usage through perceived usefulness. Also Cognitive experience moderates the relationship between perceived ease of use and perceived usefulness. This discussion suggests the following hypothesis:
H7: Perceived ease of use of mobile applications of security cameras has a positive effect of perceived usefulness these applications

Most studies on technology acceptance showed that perceived ease of use directly influenced attitude towards use (Bruner & Kumar 2005). Al Zubi et al. (2017) examined the direct empirical relationship between independent variables (technology, perceived usefulness, and perceived ease of use) and intention to use internet banking (IB) among 200 SMEs owners in Yemen. The results showed that technology and perceived ease of use and perceived usefulness positively influences intention to use. Cheng (2013) evaluated RFID door security system at Taipei arena. Perceived ease of use was proven to have a significant positive impact on attitudes towards use. In a study of technology adoption in government agencies, Hamner and Qazi (2009) found a statistically significant association between perceived ease of use and attitude, indicating the important role of the ease of use in the formation of users' attitudes. Bashir and Madhavaiah (2015) found PU, PEU, trust and perceived enjoyment to be significant antecedents in predicting customers' attitude towards using Internet banking. This discussion suggests the following hypothesis: Lee et al. (2017) examined the relationships between the determinants that affect customers' use of food delivery apps. Using an extended technology acceptance model, they explored consumers'

experiences in purchasing delivery food through mobile apps. They found that user-generated information, firm-generated information, and system quality have a significant effect on perceived usefulness. In addition, system quality and design quality strongly influenced the perceived ease of use, which improved perceived usefulness. This discussion suggests the following hypothesis:
H8: Perceived ease of use of mobile applications of security cameras has a positive effect on attitude towards using these applications

2.5 Perceived Usefulness

Perceived usefulness refers to the degree to which a person believes that using a particular system would enhance his job performance

Koutromanos et al (2015) investigated factors influencing students and in-service teachers' intention to use a spatial hypermedia application, the HyperSea. Perceived usefulness was the most important predictor linking attitudes and intentions to use such applications.

In an empirical study by Sarrab at al. (2016), they examined factors driving the adoption of mobile learning tools in Omani higher education. The authors used the technology acceptance model as a theoretical framework. Results showed that PU is significantly related to the adoption of mobile-learning Chi and Tsai (2017) empirically examined the impact of critical security factors of mobile applications on technology acceptance model. With integrated perspective, they explored the influence of key factors on perceived usefulness, perceived ease of use, use attitudes and behavior intentions. Perceived usefulness was proven to positively affect use attitudes and perceived ease of use was shown to positively impact use attitudes. Erasmus et al. (2017) tested the technology acceptance model within a South African Enterprise Resource Planning user environment through a cross-sectional survey design. The results confirmed significant paths from perceived usefulness of the information system to attitudes towards using the system. Sarkar and Khare (2017) examined the impact of consumers' personality traits such as value consciousness and coupon proneness on attitude towards online shopping. A self-administered questionnaire was used to collect data and structural equation modeling was used to analyze the data. The results indicate that perceived usefulness and perceived risk influenced

attitude towards online shopping. Value consciousness and coupon proneness significantly moderate the impact of perceived usefulness and perceived risk on attitude towards online shopping.

H9: Perceived usefulness of mobile applications of security cameras has a positive effect on attitude towards using these applications

Yadav (2016) examined the active drivers of adoption of Internet banking in Himachal Pradesh, India. The study showed that perceived usefulness positively influences the intention to adopt Internet banking. Chen and Lu (2016) investigated the effect of perceived usefulness for green transportation consciousness. Their research utilized the methodology of structural equation modeling to establish the theoretical implications of the empirical results. The findings indicate that green perceived usefulness has a positive effect on using intention. Moreover, the findings also indicated that the mediation effect of perceived usefulness has the strongest power to influence using intention. Lau et al (2016) examined the factors influencing purchase intention of smart phones in Hong Kong. The authors found a significant impact of PU on purchase intention of smart phones Ozturk (2016) tested an extended version of technology acceptance model (TAM) to examine consumers' acceptance of radio frequency identification (RFID) cashless payment systems in the hospitality industry. The study results indicated that perceived ease of use had a significant impact on perceived usefulness and both perceived ease of use and perceived usefulness were significantly associated with intention to use.This discussion suggests the following hypothesis:

H10: Perceived usefulness of mobile applications of security cameras has a positive effect on behavioral intention to use these applications

2.6 Attitude

In the technology acceptance model, TAM postulates that individuals can be motivated to use an information system because of the intrinsic rewards derived, like perceived usefulness, perceived ease of use and attitude towards using the system.

Elmorshdy at al (2015) investigated factors affecting live customer support chat in Kuwait. Their study found that attitude of using live support chat has a significant effect on behavioral intentions to use this system. In a empirical study, Lee et. al (2015) investigated the relationship between attitudes towards using mobile application services and customer satisfaction. Attitudes have proven to be the most significant factor for customer satisfaction and compatibility Foong and Khoo (2015) examined the influence of accounting students' attitude on their current knowledge enhancement intention and the moderating role of the learning environment on the attitude-intention relationship. Attitude was a significant predictor of students' current knowledge enhancement intention, which, in turn, positively impacts their level of current knowledge. The learning environment significantly moderates the attitude-intention relationship. An inhibiting learning environment tends to accentuate the differences in current knowledge enhancement intention between students with good attitude and those with poor attitude toward current knowledge enhancement.

Srivastava and Dewan (2015) investigated the adoption of cloud computing amongst Indian small and medium businesses through an extension of the technology acceptance model framework. Findings suggest that attitude influences intention to use cloud computing Yushkova and Feng (2017) examined the determinants of the intention to bring mobile phones for recycling. Using structural equation modeling, the study confirmed that attitude, social norms, and knowledge contribute positively and significantly to the intention to bring phones for recycling. As for three mediating effects tested, attitude mediates the relationship between knowledge and intention, as well as between social norms and intention. This discussion suggests the following hypothesis:

H11: Attitude towards using mobile applications of security cameras has a positive effect on behavioral intention to these applications.

2.7 Behavioral Intention

Behavioral intention is defined as a person's perceived likelihood or subjective probability that he or she will engage in a given behavior.

Alalwan et al. (2016) examined the Influence of perceived usefulness, trust and self-efficacy on Jordanian consumers' adoption of tele-banking. Statistical results showed that perceived usefulness, trust, and self-efficacy (listed in order of their influence) are all found to be significant factors predicting behavioral intention. Behavioral intention and perceived usefulness were also confirmed to have significant influence on the adoption behavior.

Chin et al (2011) explored the antecedents of actual use for a medical e-learning system. Results showed that intention to use medical e-learning systems positively affects actual use.

Suh et al (2015) investigated purchase intentions of consumers with respect to organic food. Key influences on intention to purchase were, in descending order, consumer past experience, attitude, subjective norms, trust, and intentions. Elmorshidy et al. (2015) empirically examined factors affecting live chat customer support in Kuwait through the technology acceptance model. The results showed a significant positive impact of behavioral intention to use live customer support chat on the actual use of this online service. This discussion suggests the following hypothesis:

H12: Behavioral intention to use mobile application of security cameras has a positive effect on the actual use of these applications

2.8 Actual Use

Actual use of the system is the stage when the user moves from motivation and behavioral intention to actually utilize the system and explore its features and functions.

Xinli (2015) investigated the effect of using an Electronic Monitoring System (EMS) on reducing corruption in China. The findings showed that the application of EMS has a positive effect on reducing corruption which is a net benefit introduced to organizations and the society. Alshaiby (2015) empirically examined the factors affecting quality features of decision support systems, including system quality, information quality, accompanied with perceived ease of use and perceived usefulness on decision support satisfaction and net benefits. The results revealed that system quality had positive effects on both perceived usefulness and decision support satisfaction. Information quality had positive effects on decision support satisfaction; ease of use had positive effects on perceived usefulness, and decision support satisfaction positive effects on net benefits. Hassan et al (2015) measured the success of higher education centralized administration information system in an e-government context. The study revealed that the use of the e-government information systems leads to net benefits represented in the success of this system. Lwoga (2013) examined the suitability of information systems (IS) success model in the adoption of library 2.0

technologies among undergraduate students in the African context. The study revealed a strong relationship between intention to use and actual use of the library 2.0 technologies and the net benefits to students and user of the system. Tilahun and Fritz (2015) empirically examined factors influencing the implementation of Electronic Medical Record Systems (EMR) in developing countries. User satisfaction and actual use of EMR showed the strongest effect on perceived net benefit of health professionals.. Rana et al. (2013) empirically evaluated the validity of Information Systems (IS) success models for the electronic government research. The results showed a positive impact of actual use of the information systems to net benefits that such a system introduces. This discussion suggests the following hypothesis:

H13: The actual use of mobile applications of security cameras has a positive effect on the net benefits introduced to user of these applications

3. Research Methodology

3.1 Research Model

The well-established information systems (IS) success model of DeLone and McLean (2003) proposes that information quality, system quality and service quality have a positive effect on interim to use the system and on user satisfaction. These later two have a positive impact of actual use of the system, which results in net benefit. The technology acceptance model of Davis 1989 suggests that perceived usefulness of the system and perceived ease of use have a positive impact on attenuate towards using the system. This attitude has a positive impact on behavioral intention to use the system, and behavioral intention as a positive impact on the actual use of the system. In our study we have combined those two well-established theoretical frameworks to arrive at our research model in figure 1 below.

Based on the detailed literature review above, we propose that information quality, system quality and service quality of mobile applications for security cameras (at home and office) will have a positive effect on both the perceived usefulness and perceived ease of use of these mobile applications. We also propose that perceived ease of use will have a positive effect on perceived usefulness of mobile

applications Perceived usefulness will have a positive effect on both attitude and on behavioral intention to use mobile applications. Perceived ease of use will have a positive effect on attitude to use mobile applications. We also propose that attitude will have a positive effect on behavioral intention to use these applications, and behavioral intention will have a positive effect on the actual use of mobile applications. We finally propose that the actual use of mobile applications will have a positive effect on the net benefits introduced to the users in both the home and office.
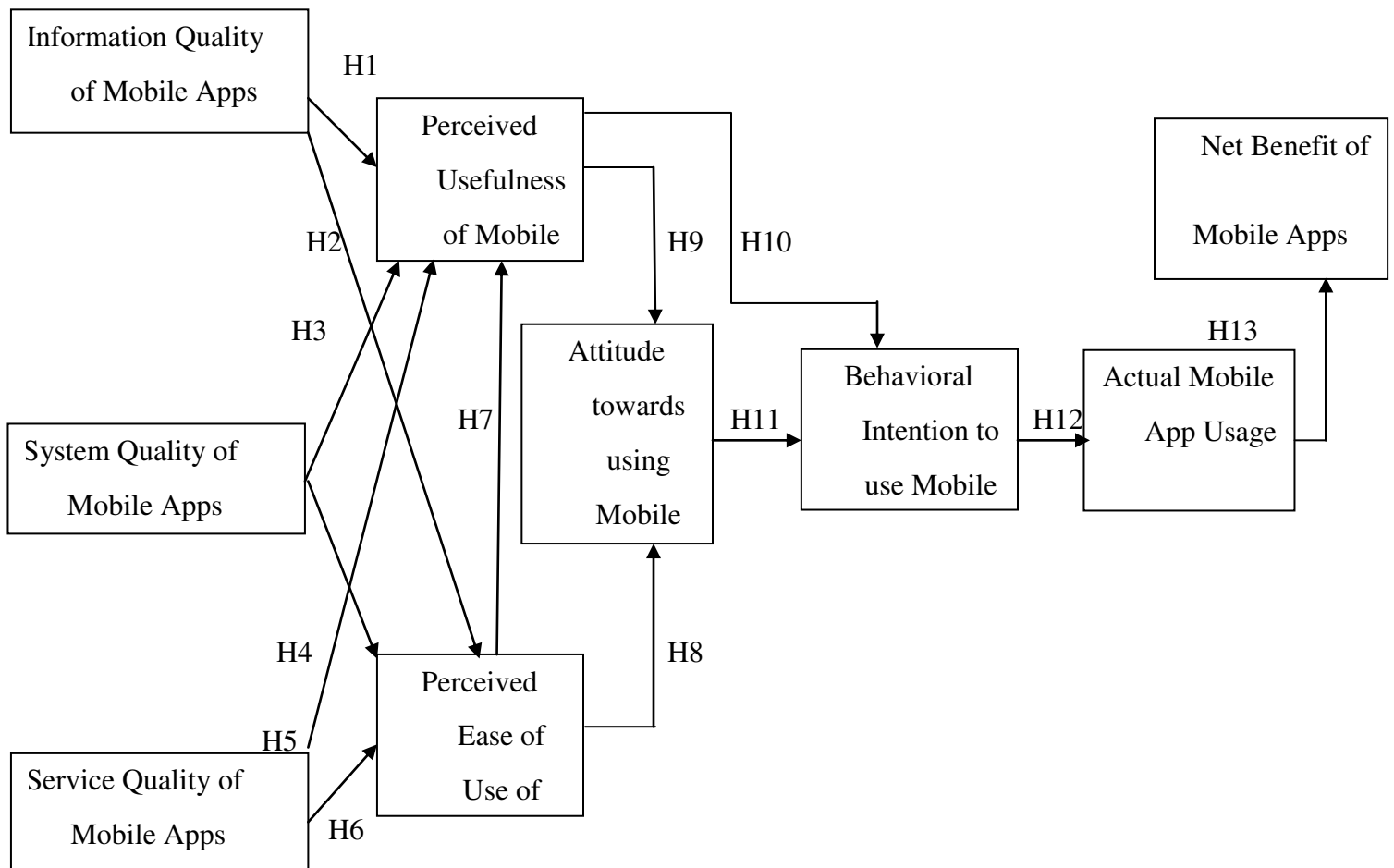
Figure 1. Research Model

3.2 Sampling

The sample selected for this study was users of security cameras at home and office in both Orange County and San Bernardino County in southern California, USA. A total of 500 questionnaires were distributed in March 2018 equally between users at home and office. We emphasized the confidentiality of responses in the cover letter. Demographic information provides data regarding research participants and is necessary for the determination of whether the individuals in a particular study are a representative sample of the target population for generalization purposes.

We have received a total of 438 surveys by the deadline, 41 questionnaires were excluded because respondents did not complete the questionnaire appropriately. The final sample size was 397, which represents a 79% response rate. The questionnaire developed to measure the variables of the study used a five-point Likert scale. The information quality, system quality and service quality and actual use constructs were adopted from DeLone and McLean (2003).

The perceived usefulness, perceived ease of use, attitude and behavioral intention constructs were adopted from Davis (1989). The first part of the questionnaire was designed to obtain some demographic information including gender, age, and type of organization that the responder belongs to. Table 1 shows the demographic profile of the respondents.

Table 1: Demographic Profile of Respondents

Measure	Items	Frequency	Percent
Gender	Male	226	56.9
	Female	171	43.1
	Total	397	100
Age	16-19 years	0	0
	19-22 years	67	16.4
	22-25 years	148	41.1
	Above 25 years	164	41.5
	Total	397	100
User at	Home	208	52.4
	Office	189	47.6
	Total	397	100

An exploratory factor analysis (EFA) on SPSS v.20 was carried out to explore the variables of the research model. All the proposed constructs loaded on single component. Confirmatory factor analysis was then conducted then using AMOS v.16 to assess the validity and reliability of the data. The proposed model consisted of 35 items describing eight constructs: Information quality, system quality, service quality, perceived usefulness, perceived ease of use, attitude, behavioral intention, and actual use of mobile applications of security cameras.

4. Research Findings and Results

4.1 Measurement Model

Model testing can be carried out using measurement model if it is reliable and valid. In this case, the reliability of measures and their convergent and discriminate validity can be verified. Fornell and Larcker (1981) suggested three criteria for verifying convergent validity: the factor loading for individual items is more than 0.50, the average variance extracted (AVE) are above 0.50 and the composite reliability (CR) of all the constructs is above 0.80. As shown in table 2, all three criteria were met, and thus, convergent validity of the measurement model is verified. For confirmation of validity of data Cronbach Alpha is calculated and as shown in it was in all the constructs above 0.90, which is higher than the minimum acceptable value of 0.60 as suggested by Nunnally (1978).

Table 2: Confirmatory Factor Analysis, Validity Analysis, and Reliability Test Results

Concept	Item	Estimate	Average Variance Extracted (>0.50)	Composite Reliability (>0.80)	Cronbach Alpha (>0.60)
Information Quality	IQ1	0.874			
	IQ2	0.846			
	IQ3	0.851	0.756	0.947	0.927
	IQ4	0.834			
	IQ5	0.857			
System Quality	SQ1	0.867			
	SQ2	0.875			
	SQ3	0.828	0.743	0.948	0.924
	SQ4	0.819			
	SQ5	0.872			
Service Quality	SVQ1	0.833			
	SVQ2	0.881	0.716	0.924	0.913
	SBQ3	0.846			
Perceived Usefulness	PU1	0.859			
	PU2	0.883			
	PU3	0.878	0.762	0.941	0.943
	PU4	0.862			
	PU5	0.854			
Perceived Ease of Use	PEU1	0.861			
	PEU2	0.879	0.759	0.936	0.931

Table 2, cont.

	PEU3	0.852			
	PEU4	0.873			
Behavioral Intention	BI1	0.864			
	BI2	0.871	0.751	0.912	0.923
	BI3	0.869			
	BI4	0.849			
Actual Use	AU1	0.877			
	AU2	0.853	0.774	0.943	0.945
	AU3	0.874			
	AU4	0.871			

To assess the discriminate validity of the constructs, product moment correlations between the variables was conducted as shown in Table 3 below. This was to assess the associations among the eight constructs constituting the model. All the correlation coefficients were significant which show that the constructs have a high degree of relation to each others.

Table 3: Discriminate Validity of constructs (Correlation Analysis)

Construct	IQ	SQ	SVQ	PU	PEU	BI	AU
IQ	**0.859**						
SQ	0.289	**0.842**					
SVQ	0.342	0.241	**0.848**				
PU	0.359	0.354	0.478	**0.863**			
PEU	0.428	0.289	0.643	0.411	**0.874**		
BI	0.436	0.307	0.599	0.298	0.478	**0.853**	
AU	0.485	0.311	0.405	0.378	0.307	0406	**0.877**

4.2 Structural Model Analysis / Hypotheses Testing

Structural Equation modeling was applied next to investigate the relationships among the research variables and the standardized path coefficients for confirmation of the hypotheses proposed. As shown in Table 4, the measurement model test presented a good fit between the data and proposed measurement

Table 4: Overall Fit Measurement / Model Evaluation

Measure	Suggested Value	Observed Value
Root mean square residual (RMR)	< 0.05	0.041
Comparative fit index (CFI)	> 0.9	0.957
Goodness of fit index (GFI)	> 0.9	0.963
Normed fit index (NFI)	> 0.9	0.982
Non-normed fit index	> 0.9	0.976
Root mean square error of approximation (RMSEA)	< 0.05	0.373

Table 5 below shows the results of the hypotheses testing indicating the Standard Path Coefficients, T-Values, Significance and whether each hypothesis was supported or not:

Table 5: Hypotheses testing results

Hypothesis	Standard Path Coefficients β	T-Values	Significance	Supported
H1:IQ to PU	0.412	7.731	p < 0.001	Yes
H2: IQ to PEU	0.284	7.116	p < 0.001	Yes
H3: SQ to PU	0.274	6.179	p < 0.001	Yes
H4: SQ to PEU	0.313	8.322	p < 0.001	Yes
H5: SVQ to PU	0.245	7.443	p < 0.001	Yes
H6: SVQ to PEU	0.318	7.255	p < 0.001	Yes
H7: PEU to PU	0.248	6.256	p < 0.001	Yes
H8: PEU to ATT	0.311	7.425	p < 0.001	Yes
H9: PU to ATT	0.294	8.356	p < 0.001	Yes
H10: PU to BI	0.478	8.451	p < 0.001	Yes
H11: ATT to BI	0.584	8.567	p < 0.001	Yes
H12: BI to AU	0.529	7.561	p < 0.001	Yes
H13: AU to NI	0.452	7..458	p < 0.001	Yes

IQ = Information quality; SQ = System quality, SVQ = Service quality, PEU = Perceived ease of use; PU = Perceived usefulness; BI = Behavioral intention; ATT = Attitude; AU = Actual use, and NI = Net benefit.

IQ has a significant positive effect on PU (β = 0.412), and thus hypothesis H1 is accepted. IQ has a significant positive effect on PEU (β = 0.284), and thus hypothesis H2 is accepted. SQ has a significant positive effect on PU (β = 0.274), and thus hypothesis H3 is also accepted. SQ has a significant positive effect on PEU (β = 0.313), and thus hypothesis H4 is accepted. SVQ has a significant positive effect on PEU (β = 0.245), and thus hypothesis H5 is accepted. SVQ has a significant positive effect on PEU (β = 0.318), and thus hypothesis H6 is also accepted. PEU has a significant positive effect on PU (β = 0.248), and thus hypothesis H7 is accepted. PEU has significant positive effect on ATT (β = 0.311), and thus hypothesis H8 is accepted. PU has a significant positive effect on ATT (β = 0.294), and thus hypothesis H9 is accepted. PU has a significant positive effect on BI (β = 0.478), and thus hypothesis H10 is accepted. ATT has a significant positive effect on BI (β = 0.584), and thus hypothesis H11 is accepted. BI has a significant positive effect on AU (β = 0.529), and thus hypothesis H12 is accepted. AU has a significant positive effect on NI (β = 0.452), and thus Hypothesis H13 is also accepted

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4.3 Discussion of Results

The results of study assessed the factors affecting mobile applications of security cameras at home and office as well as the benefits associated with the use of these applications. It was shown that the information quality, system quality and service quality of mobile applications have a significant positive effect on perceived usefulness and perceived ease of use these applications.

This conforms to previous studies (Sumida et al., 2017; Tilahun and Firtz, 2015; Te-Tai, 2017). The results also showed that perceived ease of use of those mobile applications has a positive effect on perceived usefulness by the users, which also conforms to previous studies (Dong, 2017; Sho and Sagynov, 2015).

It was also shown that perceived ease of use of mobile applications has a significant positive effect on attitude towards using them. This further conforms to previous studies (Enayati et al., 2017; Lee et al., 2017).

The results of the study also revealed that perceived usefulness of mobile applications has a significant positive effect on attitude towards using these applications as confirmed by previous studies (Chi and Tsai, 2017; Mitzner, 2017; Erasmus et al., 2017).

It was also shown that perceived usefulness of mobile applications has a significant positive effect on behavior intention to use these applications, which matches previous studies. (Chen and Lu, 2016; Ozturk, 2016; Henderson, 2015).

The results of study further revealed that attitude towards using mobile applications has a significant positive impact on behavioral intention to use these applications, which conforms to other studies (Foong and Khoo, 2015; Perry, 2017; Yushkova and Feng, 2017).

The study also showed that behavioral intention to use mobile applications has a positive effect on the actual use of those applications, which also conforms to previous studies (Yan and Chung, 2017; Kuhlman et al, 2017; Aras et al, 2015).

Finally the results showed that actual use of mobile applications for security cameras at home and office has a significant positive effect on the net benefits introduced to the user of these applications, which conforms to previous studies (Hassan et al, 2015; Lwoga, 2013; Xinli, 2015). User of these mobile applications indicated that they have increased control of security over their homes and offices as well as increased convenience and flexibility when accessing the security cameras remotely through these applications. They indicated that this is due to the many features built into these mobile applications such as live viewing, motion alerts, sound, alerts, video history playback, and image and video sharing. This answers the second research questions pertaining to the benefits of using mobile applications to remotely access security cameras at home and office.

As far as the first question related to the factors that affect the use of mobile applications for home and office security cameras, the results revealed a significant positive effect of system quality, information quality and service quality on perceived usefulness and perceived ease of use of the application users, which by their turn affect attitude towards using these applications. Attitude also has a significant positive effect on behavioral intention to use those applications. Behavioral intention to use has a significant positive effect on actual use of mobile applications.

5. Conclusion

5.1 Theoretical Contributions

At the theoretical level, this study filled a research gap by assessing and examining the factors that affect mobile applications used to access and control security cameras at home and office as well as the benefits associated with their use.

The study empirically examined those factors through two well-established models, the technology acceptance model (Davis, 1989) and the information systems (IS) success model (DeLone and McLean, 2003).

This empirical investigation is also among the first to explore the benefits of using such mobile applications to access and control home and office security cameras. It was unclear in the research literature if the benefits associated with using those mobile applications are validated.

The study showed that the Information Systems Success Model factors have significant effects on the perceived usefulness and perceived ease of use of the mobile applications of remote security cameras. The users saw that the system quality, information quality as well as service qualities of those mobile applications are very important determinates of their perceived usefulness and perceived ease of use.

Perceived usefulness and perceived ease of use also have positive influence on attitude towards using these mobile applications. Users indicated that their attitude is positively affected by the perceived usefulness and perceived ease of use of the mobile applications.

Attitude towards using mobile applications also had a positive effect on users behavioral intention to use those applications. Behavioral intention has a positive influence on actual use of mobile applications as also indicated by users. Users have further indicated that the actual use of the mobile application has positively affected the net benefits inducted to them represented in increased control of users' security, increased convenience and flexibility when remotely accessing their security cameras at both home and office. Features like live viewing, motion detection, video alerts, night vision, and cloud storage were very beneficial as indicated by the users.

5.2 Implication for Practice

As the practice level, the findings of this study explored and analyzed the factors that affect mobile applications of security cameras at home and office.

The benefits of using these mobile applications were also examined. The findings of this study should be helpful for the designers and develops of mobile applications to focus on the success factors that will make their applications more tailored around users' needs and requirements focusing on the features that users want to see in these applications. These features should give users more convenience and control over their home and office security cameras. The study also shows a positive relationship between usefulness, ease of use and attitude towards using mobile applications.

Developers of mobile applications should also take these guidelines in consideration when designing a responsive mobile application for security cameras.

5.3 Limitations and Future Research

Our study has a number of limitations. First, the study is limited in terms of the sample size and selection. The study focused on user of mobile applications in Orange County and San Bernardino County in Southern California only.

To increase the external validity of the study, it is highly recommend applying it again to other mobile applications users in other parts of world.

The second limitation is that this study used cross-sectional data rather than longitudinal data. This means it focused more on observing respondents' behaviors rather than changes in behavior. Therefore, further research is encouraged to use longitudinal data to further explain the relationship between the variables of the study. Finally, this study used a quantitative approach to examine the effect of using mobile applications for security cameras on the benefits introduced to the users at home and office.

Using both quantitative and qualitative approaches will strengthen the analysis of the relationship between variables, and will provide enhanced better results that can prove the findings of this study.

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Appendix A: Survey Questionnaire

Dear Participant:

The following survey is about *the factors that affect mobile applications used to access security cameras at home and office and the benefits associated with using these applications.*

We ask you to please indicate your perception about those factors and benefits of mobile applications through a scale of 1 to 5 (1: strongly disagree; 5: strongly agree). Thank you.

	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Mobile application of security cameras are adaptable to my needs at home and office					
2	Mobile applications of security cameras are always available for me when I need them					
3	Mobile applications of security cameras are reliable and I can depend on them at home and office					
4	Mobile applications are fast and provide instant access to my security cameras at home and office					
5	Mobile applications of security cameras are easy to use					
6	The features provided by mobile applications of security cameras are adequate for my needs at home and office					
7	The features provided by mobile applications of security cameras are user friendly and easy to understand					
8	Mobile applications provide relevant features necessary to manage my security cameras at home and office					
0	Mobile applications of security cameras are secure and safe to use					
10	Mobile applications assure continuous and uninterrupted service quality					
11	The technical support staff of mobile applications are knowledgeable to solve any problems that might arise					
12	The technical support staff of mobile applications are responsive to my questions and concerns					
13	I think it is useful to use mobile applications to access my security					

	cameras at home and office					
14	I think mobile applications provide me with convenience when I access my security cameras at home and office					
15	I think using mobile applications of security cameras at home and office enhance my life quality					
16	I think using mobile applications to access security cameras at home and office is an innovative technology that benefited me					
17	I think it is easy to understand how to use mobile application to access security cameras					
18	I have the resources to use mobile applications for security cameras at home and office					
19	I have the knowledge to use mobile applications of security cameras at home and office					
14	Using mobile applications to access security cameras is a good decision					
20	Using mobile applications to access security cameras is a positive step					
21	I like to use mobile applications to access my security cameras at home and office					
22	Overall, my attitude towards mobile applications to access security cameras is favorable					
23	I intent to increases my use of mobile applications of security cameras at home and office in the future					
24	I predict that I will frequently use mobile applications to access security cameras at my home and office					
25	I'm willing to encourage or persuade others to use mobile applications of security cameras at home and office					
26	I'm willing to adopt to new versions and features of mobile applications to access my security cameras at home and office					
27	The use of mobile application of security cameras enhances my home and office security					
28	The use of mobile application of security cameras enhances my control over my home and office					
29	The use of mobile application of					

	security cameras provided me with more convenience and flexibility in securing my home and office					
30	The features available in mobile applications such as live viewing, motion detection, and night vision are beneficial to the security of my home and office					
31	Cloud storage associated with mobile applications of security cameras is beneficial to me					
32	Overall, I see mobile applications of security cameras are beneficial					

Gender: ☐ **Male** ☐ **Female**

Age: ☐ **Years**

Do you use/have used mobile applications of security cameras? ☐ **Yes** ☐ **No**

Do you use/have used mobile applications of security cameras at: ☐ **Home** ☐ **Office**