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The impacts of Service Quality on Continuance Intention to use Video Surveillance-as-a-Service

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ABSTRACT

Video surveillance is one of the most important components of security. With the development of the Internet and especially cloud computing technologies, customers could use video surveillance service remotely. This research aims to find the major factors that will affect customers' perception of the service quality, and reasons that will drive customers to keep using the service. The result showed that trust to vendors cannot significantly affect the continuance intention, but the reliability, responsiveness, flexibility, and features would be the major players in defining quality, and hence perceived usefulness and continuous intention to use the services.

KEYWORDS: Service quality, Customer satisfaction, Continuance intention, Cloud computing, Video surveillance, VSaaS

1. INTRODUCTION

1.1 Research Background.

Video surveillance is one of the most important elements of any security system which aims to monitor, record, store, and playback the video image for many different purposes such as crime prevention and investigation (city surveillance), industrial use (monitoring manufacturing processes, labor activities, etc.), monitoring traffic and transport safety, retails controlling and security… (Valera & Velastin, 2005). With the development of technologies, video surveillance moved to Local Area Network (LAN) and the Internet toward digitization, networking and intelligentization.

Network video surveillance can be done either in a local area network by a computer or a network video recorder (NVR) with video management software software, or remotely through the Internet by IE browser interface, special client software, or even by mobile devices (Kruegle, 2011) . It still requires a lot of knowledge and expertise for system integrators to establish this kind of system, because they need to be familiar not only with video surveillance equipment and have good installation skills, but also need to be experienced in network mapping, port forwarding and everything that is related with establishing LAN and WAN. It is worth pointing out

that network video surveillance has a great scalability and these factors make possible to use it in different size of projects: from household with one and more IP cameras to integrated city surveillance with thousands of cameras used in one project that are connected by LAN, WiFi, 3G, and/or Wimax (Kruegle, 2011). So far there is nothing mentioned about the costs related with installing of IP surveillance, which can also scare away potential customers, especially for household surveillance.

The idea of surveillance in the cloud is not very new, however it still has a few objectives that are needed to be overcome in order to be widely spread among the customers. First objective is network limitations: IP video camera requires a lot of bandwidth in order to deliver desired quality to the customers, and this bandwidth should be sufficient from supplier's side as well as from the consumer side (Zhao, Cui, & Zhang, 2012). Second objective is low awareness of customers: only those who particularly look for the solution of security might be aware of this kind of service.

Surveillance in the cloud could be consider as a version of well-known software model that provides services to the users through the Internet that is called Software-as-a-Service (Cusmano, 2010). This kind of model for IP surveillance in the cloud is called Video Surveillance as a Service (VSaaS) (Limna & Tandayya, 2012; Neal & Rahman, 2012; Zhao et al., 2012). This abbreviation is not widely accepted in the science world; however a lot of manufacturers and some scholars will use exactly the "VSaaS" to describe a network video surveillance system in the cloud. VSaaS provides functions of recording, storing, analyzing and playback in the cloud with help of VMS software preinstalled on the server side. Service providers also offer limited storage capacity for video data, required bandwidth and software maintenance. A user of VSaaS only needs to provide an IP camera and make the right settings so the camera will be able to connect to the service provider server. The video data from a camera will go directly to the VSaaS server, will be stored there until it's overwritten by the latest data or deleted from the server. If a user needs an access to the recorded video data, he/she can use browser or mobile device to connect to the service provider server and retrieve data, playback recorded videos, delete, or export for the further use. There are pros and cons for cloud surveillance that will be very similar as for cloud computing (Armburst et al., 2010; Mather, Kumaraswamy, & Latif, 2009; Mulholland, Pyke, & Fingar, 2010; Neal & Rahman, 2012; Reese, 2009; Zhao et al., 2012). After introduction of video surveillance in the cloud, similar problems and issues as for traditional cloud computing had aroused.

The cloud video surveillance is used by limited amount of people, however, in the year of 2014 it is expected that the world market of VSaaS will grow up to $1 billion, comparing with $500.000 in 2011 (Dale, 2013). Looking at this predicted global trend, it will be very interesting to know if those users have the same points of view and objectives on the cloud computing issues, how they perceive the service quality of VSaaS and what guides them to keep using the service.

This research aims to contribute in two different areas. First, this research hopes to discover the factors that service providers of VSaaS put in prior when describing the service quality. VSaaS factors might be similar with those factors described in the study of Electronic Service Quality (E-S-QUAL) (Parasuraman, Zeithaml, & Malhorta, 2005) and SaaS Service Quality (SaaS-Qual) (Benlian, Koufaris, & Hess, 2011) with some minor adjustment toward security and trust. It also will be very interesting to find out the factors that service providers think should be important for their customers. Second, it might disclose the important consideration that will affect customers' satisfaction and intention to use cloud video surveillance. Knowing the important factors and consideration from both sides, service providers can enhance their service quality and better understand what users expect from their services, they can learn how to increase customers' satisfaction and trigger and strengthen continuance usage intention.

2. LITERATURE REVIEW

2.1 The Software, Platform, Infrastructure (SPI) Framework of Cloud Computing.

Mather et al. (2009) defines cloud computing by 5 attributes: multitenancy (cloud computing model is based on sharing resources at the network level, host level, and application level), massive scalability (the ability to scale systems' bandwidth and storage space), elasticity (ability for users to increase or decrease computer resources as needed, ability to direct resources to other uses if needed) , pay as you go, and self-provisioning of resources (allows users to provision resources by themselves and network resources without intervention of cloud IT personnel). A common model of cloud computing services called "SPI" (software-as-a-service -SaaS, platform-as-a-service - PaaS, and infrastructure-as-a-service - IaaS).

The Software-as-a-Service Model (SaaS).

If in traditional Application Service Providers (ASP) model users buy software online and download it to their hardware, in SaaS model users don't need to buy the software, but rent it in terms of pay-per-use (Mather et al., 2009). Users simply use their browser to access the software without thinking what the operating system is used on the other end, where the software is hosted, or what computer language is used in writing the software (Reese, 2009). Examples of SaaS can be Gmail, Google+, Facebook, etc.

The Platform-as-a-Service Model (PaaS).

In the PaaS model vendors provide an environment for application developers, who develop their applications and provide it through the vendors' platform. Service providers usually develop toolkits that are hosted in the cloud and accessed by users with computer browser, define standards for development, and channels for payment and distribution (Mather et al., 2009). Examples of PaaS can be Windows Azure, Apprenda, Google App Engine, etc.

The Infrastructure-as-a-Service Model (IaaS).

Traditional hosted application model provides an entire infrastructure for customers' applications; sometimes it involves purchasing or leasing a special hardware for the specific application. In the IaaS model vendors also provide the infrastructure, but involving the clouds makes it possible to offer pay-per-use model and to scale the service depending on demand. Vendors can offer either infrastructure or hosting only, or also can offer other services, such as application development, support, and enhancement. IaaS vendors don't give too much details of their hosted servers, for example, computing resources, location, security, backup, and others (Mather et al., 2009). Examples: Amazon Web Services, Rackspace, AppNexus.

2.2 SaaS Service Quality.

The three major reasons why customers stop using SaaS are unfulfilled technical specifications, security problems, and poor quality customer service (Benlian et al., 2011). In the software platform such as SaaS, that is completely dependent on the Internet infrastructure, the issues of data security and service availability are especially vital (Mather et al., 2009). If vendor fail to fulfill customers' expectations about the service, it may have crucial outcome not only for customers, but also for vendors themselves, because SaaS customers have higher bargain power comparing with other software models, and users can switch to another vendors more easily (Choudhary, 2007; Mulholland et al., 2010). All of these put higher responsibility for vendors to offer higher service quality and focus more on quality management. In order to deliver better service quality vendors of SaaS should know toward which aspects they need to allocate the company resources and how users perceive and evaluate the SaaS.

The study of service quality was a very hot topic for the last 30 years. In 1991 (Parasuraman, Berry, & A.Zeithaml, 1991) conducted empirical studies to develop and define service quality (SERVQUAL). They created a multiple-scale instrument to quantify customers' perceptions of companies' service quality, defining service quality as the correspondence to customer needs in the service delivery. The original SERVQUAL instrument defined five service quality elements: Tangibles, Reliability, Responsiveness, Assurance, Empathy.

Service quality model and scale was adopted in many IS studies defining IS service quality from perspectives of IS users or professionals (Kettinger & Lee, 1997; Watson, Pitt, & Kavan, 1998). With the development of the Internet and electronic commerce several adaptations was proposed to the IS service quality measurement to emphasize the difference between customers' evaluation processes for offline and online service quality. It was found out that for researching online service quality the development of more extended scale is required. In the year of 2005 Parasuraman et al. (2005) detailed four broad sets of dimensions that were relevant to electronic services quality perception, those were: efficiency, system availability, fulfillment, and privacy. Later on Swaid and Wigand (2009) developed an e-service quality scale for online retailers with 6 dimensions: website usability, information quality, reliability, responsiveness, assurance, personalization.

Some of the scholars adopted application service provider (ASP) model findings into IS service quality. ASP delivers specified software to clients over the network after that clients install software by themselves. Ma, Pearson, and Tadisina (2005) developed an ASP-Qual model that describes specifics of the model, for instance, they define seven factors of ASP service quality: features, availability, reliability, assurance, empathy conformance, and security. Prior to them, Sigala (2004) developed an ASP service quality model for companies that has ASP-hosted online web stores. She also suggested several factors of ASP service quality: tangibles, reliability, responsiveness, assurance, empathy, trust, business understanding, benefit and risk share, conflict, and commitment.

In the study of Benlian et al. (2011) they examined all existed study on service quality in order to establish a conceptual framework for more precise and in-depth explanation of service quality of SaaS. They believe that ASP scales developed by Sigala (2004) and Ma et al. (2005) would be the closest to SaaS from a conceptual point of view, however these scales "have not being adequately validated with confirmatory factor analysis and nomological validity test" (Benlian et al., p. 90). Benilian et al. also argues that the previous studies on IS service quality disregarded some important factors such as flexibility and security that are the core dimensions of SaaS in books of Mather et al. (2009), Reese (2009), and Mulholland et al. (2010).

SaaS-Qual Factors as a Second-Order Construct.

In the study of Benlian et al. (2011) these six factors of SaaS-Qual were determined as formative second-order latent construct. It means that the six factors are assumed to be a distinct construct capable of verifying independently from others. This independence presumes a formative model in which these six dimensions are not treated as a single underlying whole construct (in their study is SaaS-Qual), but instead the whole construct is seen as formed by the combination of the six underlying construct. In this study the factors of VSaaS quality will be also viewed as second-order construct.

VSaaS as a Version of SaaS.

There are only a few studies that describe video surveillance as a service (VSaaS) (Dale, 2013; Gao, 2013; Limna & Tandayya, 2012; Neal & Rahman, 2012; Zhao et al., 2012). In this study we will use the terms VSaaS and video surveillance in the cloud interchangeably.

Limna and Tandayya (2012) applied software-as-a-service model (SaaS) model on VSaaS, describing its benefits as "the users don't need to have high skills in system configuration and it (SaaS) reduces a usability learning curve" (p.197). They also mentioned that some of the open video surveillance sources are not suitable for the SaaS model, because the design of the system is made according to the software objectives for the enhanced performance. Authors also imply that in order to reduce the cost of services of video surveillance in the cloud, the VSaaS should be developed as SaaS over the Internet.

According to Zhao et al. (2012), the trend of software moving to the cloud cannot be avoided by video surveillance as well, because video surveillance now is no longer analog, but digital, and it also has networking features such as Video Management Software (VMS), Internet Protocol (IP)

cameras, and Network Video Recorders (NVR). They claim that “In the Internet age not only the desktop software moves toward online services, but the professional video surveillance also cannot stop the torrent of Internet online services and is gradually converting to this model” (Zhao et al., p. 1336). They also believe that VSaaS will speed up the development of video surveillance industry after implementing the Internet (SaaS) model by improving storage management, writing data capacity, reducing integrated costs, and providing flexible and intelligent analysis.

Gao (2013) in his work explains the basic principles of VSaaS and refers to it as “a pure SaaS solution” (p.296), it does not require costly equipment installed at the client site. He explained that video surveillance in the cloud is transformed to the on-line flowing services that are in easy access for mass-market users.

To have an even better understanding of this fact we can do a review and compare attributes of VSaaS and attributes for cloud computing by Mather et al. (2009) in the Table 2-1:

Table 2-1

Comparison of SaaS and VSaaS Attributes

Attributes by (Mather et al., 2009)	**Attributes definition**	**VSaaS attribute definition(Gao, 2013; Limna & Tandayya, 2012; Zhao et al., 2012)**
Multitenancy	sharing resources at the network level, host level, and application level	all users share the same platform to access to the services
Massive scalability	ability to scale systems’ bandwidth and storage space	ability to add as many IP cameras as needed, from household to enterprise level
Elasticity	ability to increase or decrease computer resources as needed, ability to direct resources to other uses if needed	The amount of cameras and storage space can be easily added as the situation requires
Pay as you go	pay only for the time and resources customer use	monthly tariffs per camera, wide choice of additional options
Self-provisioning of resources	allows users to provision resources by themselves and network resources without intervention of cloud IT personnel.	if customers need additional services or devices in the system it can be done quickly and easily by users.

2.3 Continuance Intention.

Continuance intention refers to post-adoption behavior, in the case of IS it is a continued IS usage behavior, the model that was well developed by Bhattacherjee (2001). The big part of this model was borrowed from expectation confirmation theory (ECT) that based on user’s psychological motivations which appear after initial adoption. Bhattacherjee model includes concepts such as satisfaction, confirmation, and usefulness as main antecedents of intention of IS continuance intention. Benlian et al. (2011) suggests that in terms of SaaS service quality-related reasons of continuance (discontinuance) intention, the model requires more precise approach to service quality confirmation. They argue that Bhattacherjee (2001) continuance model can present as their nomological framework, where ”newly developed measure of SaaS-Qual can stand in for Bhattacherjee’s variable of service quality confirmation” (Benlian et al., p. 116). In addition, Benlian et al. assumes that if SaaS-Qual shows adequate nomological validity,

"can replace Bhattacherjee's original and rather abstract construct (confirmation), and thus provide a more robust and more highly conceptualized variable within IS continuance model" (Benlian et al., p. 116).

2.4 Perceived Usefulness.

Perceived usefulness is defined by Davis (1989) as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p.320). In the Technology Acceptance Model (TAM) perceived usefulness is an important belief that influences the behavior of IS acceptance among broad range of computer technologies, it captures the instrumentality of IS use; if a system has a high level of perceived usefulness, it means it has a positive use-performance relationship (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989).

The Relationship between Perceived Usefulness and IS Continuance Intention.

In TAM perceived usefulness is defined as a direct predictor of future acceptance intention (Davis, 1989). In the study of Bhattacherjee (2001) he found out that in terms of IS environment perceived usefulness is a significant predictor of user's continuance intention, therefore we hypothesize:

Hypothesis 1: User's perceived usefulness of VSaaS has positive effect on continuance intention of VSaaS.

The Relationship between Perceived Usefulness and Satisfaction.

In the study of Bhattacherjee (2001) they studied the relationship between perceived usefulness and satisfaction, defining the perceived usefulness in this relationship as the most important ex post expectation that influences user's post-acceptance affect, or satisfaction. In the study of SaaS service quality by Benlian et al. (2011) was found that user's perceived usefulness even though is not the main but salient predictor of customer satisfaction, therefore, we hypothesize:

Hypothesis 2: User's perceived usefulness of VSaaS has positive effect on satisfaction with VSaaS.

2.5 Customer Satisfaction.

Customer satisfaction is the most universal and essential concept in marketing, it also the main result of company activity on the market (Patterson, 1993). As was mentioned by Hanan and Karp (1989), the first objective of any business is not to sell, not to supply for customers, but make them satisfied and motivate them to do more business with the company in the future. In the field of information systems studies, the customer satisfaction issue is considered as the key measurement of IS success (DeLone & McLean, 1992). IS professionals have found that customer' satisfaction can be a very reliable criterion for predicting purchase intention, together with system attributes and system quality (Khalifa & Liu, 2003).

The Relationship between Satisfaction and Continuance Intention.

According to the Expectation Confirmation Theory (ECT), user's continuance intention is determined mostly by their satisfaction with prior IS use (Oliver, 1980). The studies of Technology Acceptance Model (TAM) also provide indirect support for the satisfaction-continuance intention relationship (Davis, 1989). In terms of IS continuance intention, in the study of Bhattacherjee (2001) was found that "satisfaction with IS use is the strongest predictor of users' continuance intention" (p.364). Similar results were found in the study of SaaS satisfaction by Benlian et al. (2011), therefore, we hypothesize:

Hypothesis 3: User's satisfaction with VSaaS has positive effect on continuance intention to use VSaaS.

2.6 The Relationship between Service Quality and Perceived Usefulness and Satisfaction.

The Relationship between Service Quality and Perceived Usefulness.

Perceived usefulness is an important factor of customer continuance intention and satisfaction (Bhattacherjee, 2001). As shown in the study of Benlian et al. (2011) service quality has impact on perceived usefulness of SaaS; even though this relationship is not as strong as satisfaction, it still needs to be included in this study. Considering all previous studies we hypothesize:

Hypothesis 4: Service quality of VSaaS has positive effect on perceived usefulness of VSaaS.

The Relationship between Service Quality and Satisfaction.

In the study on SaaS service quality by Benlian et al. (2011) he showed that service quality has a very strong impact on customers' satisfaction. In their study they found that service quality has a larger impact on satisfaction, rather than on perceived usefulness, explaining that the users didn't really have chance to fully experience usefulness of a young SaaS model. Examining the importance of satisfaction, we hypothesize:

Hypothesis 5: Service quality of VSaaS has positive effect on customers' satisfaction with VSaaS.

2.7 Trust.

Trust is claimed to be the main key to understand the relationships between customers and online companies, but the role and significance of trust in the building behavioral intentions toward online service vendors have stayed unclear (Gummerus, Liljander, Pura, & Riel, 2004). Trust is identified as customers' readiness and willingness to rely on service provider, it also minimizes perceived risk of using services (Moorman, Zaltman, & Deshpande, 1992). Users' perception of trust is relied on the competence, benevolence, and integrity of service provider (Mayer, Davis, & Schoorman, 1995). Users' trust evolves through the relationships between customers and service providers as customers accumulate more experience with the providers and find out that their expectation based on promises of service providers are met (Urban, Sultan, & Qualls, 2000).

2.7.1 *The Relationship between Service Quality and Trust.*

Trust toward service quality was conceptualized in different ways. Parasuraman, Zeithaml, and Berry (1988) defined trust as a dimension of service quality among other factors. In the study of Gummerus et al. (2004) trust is conceptualized as a mediator between service quality dimension and customer satisfaction. In this study they proved that "the conceptualization of trust is an important mediating factor in building customer loyalty in a content-based services context. Trust was found to be the strongest predictor of customer satisfaction, mediating the effect of online quality" (Gummerus et al., p. 182). Therefore, we hypothesize:

Hypothesis 6: VSaaS service quality has positive effect on trust.

2.7.2 The Relationship between Trust and Satisfaction.

Many scholars have studied a relationship between trust and customer satisfaction in the IS field. In the study of Kim, Ferrin, and Rao (2009) is proposed a link between trust and customer satisfaction in terms of examining pre-purchase and post-purchase behavior in online shopping. Another study of customer loyalty in online shopping by Chiu, Lin, Sun, and Hsu (2009) suggests that trust has direct influence on satisfaction. Trust is also seen as critical principal of customer satisfaction in a mobile world context (Lin & Wang, 2006). Considering all studies on trust above, we hypothesize:

Hypothesis 7: Trust has positive effect on satisfaction with VSaaS services.

2.7.3 The Relationship between Trust and Continuance Intention.

According to Liu, Marchewka, Lu, and Yu (2004) trust can determine specific behavioral intention in customers' perception. Malhotra, Sung, and Agarwal (2004) in their study also proved that trusting believes can trigger internet users' behavioral intention, such as continuance intention. Therefore, we hypothesize:

Hypothesis 8: Trust positively related with continuance intention of VSaaS.

3. RESEARCH DESIGN AND METHODOLOGY

3.1 Research Framework.

This study will examine the factors that influence customers' continuance intention toward video surveillance as a service (VSaaS) based on the previous models of SaaS-QUAL (Benlian et al., 2011), and trust as a factor that is influenced by service quality (Gummerus et al., 2004), and

which also influence customer satisfaction (Wu, 2013). The conceptual framework of this study is presented in Figure 3-1.

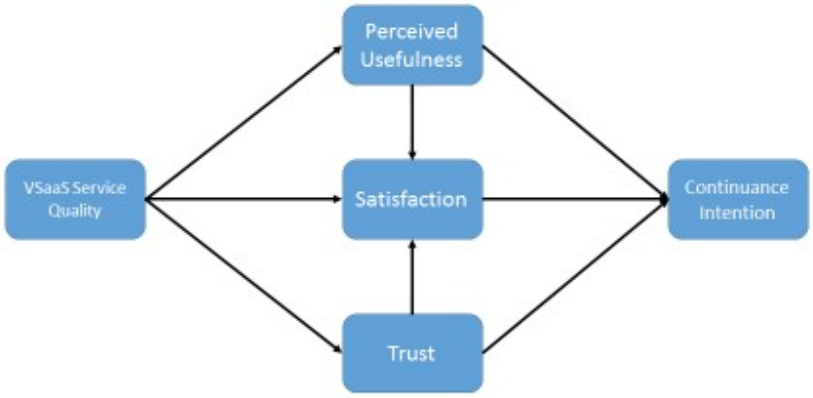

Figure 3-1. Conceptual framework

3.2 Construct Measurements.

This study will use a survey method to collect required data and test developed hypothesis. The measurements of required factors will be taken from previous studies and will be rephrased in order to correspond with the area of video surveillance in the cloud, using 7 point Likert scale from 1 to 7. There will be total of 75 survey questions, excluding demographic questions (please see Appendix 1 for more information):

- 45 items for VSaaS service quality, where 42 items are adopted from the SaaS service quality by Benlian et al. (2011). These factors will be analyzed as second-order construct with a coefficient of each first-order factors to the second-order factors (Benlian et al.);
- 3 items for continuance intention that was adopted from Bhattacherjee (2001) and used in SaaS quality by Benlian et al. (2011);
- 4 items for satisfaction also adopted from Bhattacherjee (2001) and used in studying SaaS quality;
- 4 items for perceived usefulness that is taken from Davis et al. (1989);
- 4 items for trust adopted Wu (2013);

4. RESEARCH RESULTS

This research used a convenient method of online survey for collecting the data for analysis. The data collection was hold from the end of February till the middle of June, 2014. The survey was distributed on the international forums and websites that have any relations with video surveillance in the cloud. Many respondents were contacted directly by the private messages with a request to fill up the survey. Totally, it was 336 responses collected, 5 of them were incomplete that's why we could not use it in the data analysis, what makes the total number of usable responses is 331.

4.1 Descriptive Statistics.

The demographic information of the survey respondents includes: gender (male or female), age (4 groups: 18-29, 30-49, 50-64, and 65 and older), marital status (single, married or in domestic partnership, divorced), region of living (North America, Latin America, Europe, CIS, Asia, Africa, and Australia and Oceania), education (high school, professional college, bachelor degree, master degree, and PhD), respondents' experience with video surveillance and VSaaS services, and application of VSaaS services (home, business, other).

The descriptive information and characteristics of respondents are presented in the table bellows:

Table 4-1
Characteristics of Respondents

Categories (n=331)		**Frequency**	**Percentage**
Gender	Male	263	79.5%
	Female	68	20.5%
Age	18-29	127	38.4%
	30-49	154	46.5%
	50-64	50	15.1%
	65 and above	-	-
Marital Status	Single	113	34.1%
	Married or Domestic Partnership	192	58%
	Widowed	26	7.9%
Region	North America	68	20.5%
	Latin America	51	15.4%
	Europe	154	46.5%
	CIS	30	9.1%
	Asia	28	8.5%
	Africa	-	-
	Australia and Oceania	-	-
Education	High School	13	3.9%
	Professional College	75	22.7%
	Bachelor Degree	114	34.4%
	Master Degree	128	38.7%
	PhD	1	0.3%
Experience with CCTV	Less than 1 year	59	17.5%
	1-2 years	101	30.5%
	3-5 year	98	29.6%
	5 years and more	74	22.4%
Experience with VSaaS	Less than 1 year	136	41.1
	1-2 years	163	49.2
	3-5 year	32	9.7
	5 years and more	-	-
Application of VSaaS	Home	152	45.9%
	Business	162	49%
	Other	17	5.1%

4.2 Confirmatory Factor Analysis.

Confirmatory Factor Analysis (CFA) is a procedure that can imply the estimation and specification of one or more hypothesized model of factors structure. The analysis was conducted by using AMOS software package for SPSS. In the model there are five latent constructs (variables) that are composed with their subsequent multiple items (indicators).

The overall model fit is represented by a few measurements: relative Chi-square (CMIN/DF, should be <5), goodness-of-fit index (GFI, should be >0.9), adjusted goodness-of-fit index (AGFI, >0.9), standardized root mean square residuals (RMR, <0.05), comparative fit index (CFI, should be >0.95), and root mean square error of approximation (RMSEA, <0.08) (Anderson, Babin, Black, Hair, & Tatham, 2006).

Table 4-2
Results of Confirmatory Factory Analysis

Constructs	Items/ Factors	Items reliability			Average Variance Extracted (AVE)
		Standardized factor loading	t-value (C.R)	p-value	
VSaaS Service Quality					
Responsibility	RES_M	0.951	38.598	***	0.904
Reliability	REL_M	0.943	36.959	***	
Flexibility	FL_M	0.950	A	***	
Features	FE_M	0.960	40.629	***	
Satisfaction					
Satisfaction item 1	S1	0.892	A	***	0.743
Satisfaction item 2	S2	0.831	20.031	***	
Trust					
Trust item 1	TR1	0.854	20.792	***	0.742
Trust item 2	TR2	0.875	26.087	***	
Trust item 3	TR3	0.855	A	***	
Perceived Usefulness					
Perceived Usefulness item 1	PU1	0.892	25.583	***	0.802
Perceived Usefulness item 2	PU2	0.904	A	***	
Perceived Usefulness item 3	PU3	0.884	25.021	***	
Perceived Usefulness item 4	PU4	0.902	26.323	***	
Continuance Intention					
Continuance Intention item 1	VSCI1	0.868	A	***	0.760
Continuance Intention item 2	VSCI2	0.875	20.651	***	
Goodness-of-fit measurements of the model (CFA)					
X^2 (p-value)	193.417 (0.000)				
DF	78				
X^2/DF	2.480				
RMR	0.019				
GFI	0.930				
AGFI	0.892				
CFI	0.982				
RMSEA	0.067				

4.3 Structural Equation Modeling.

The CFA shows the good fit of the proposed model, the next step would be to test hypothesis using structural equation modeling in AMOS software. Structural Equation Modeling (SEM) is aimed to verify the overall model and the interrelationships between variables in the study. The same as in CFA, in SEM observed variables are shown by ovals and their indicators are shown by squares in the Figure 4.1:

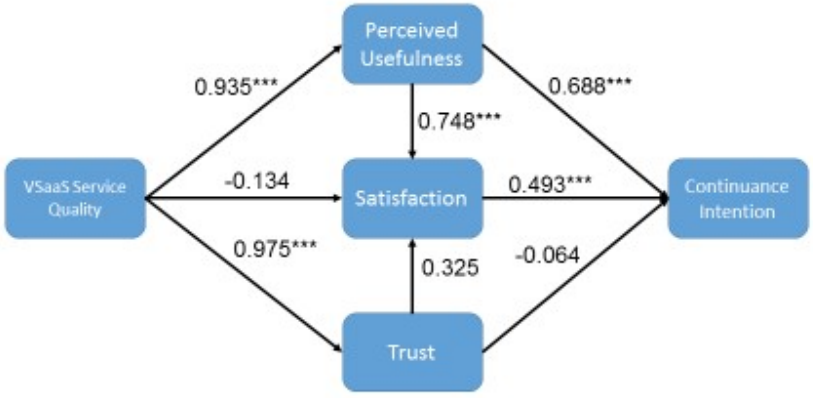

Figure 4-1. Structural equation modeling

In order for the model to have a good fit, the same measurements as in the CFA are used: relative Chi-square (CMIN/DF, should be <5), goodness-of-fit index (GFI, should be >0.9), adjusted goodness-of-fit index (AGFI, >0.9), standardized root mean square residuals (RMR, <0.05), comparative fit index (CFI, should be >0.95), and root mean square error of approximation (RMSEA, <0.08) (Anderson et al., 2006). The results of SEM for this study are presented in the table 4-3:

Table 4-3
Results of Structural Equation Modeling

Path Relationship	**Standardized Coefficients**	**C.R.**	**p-value**	**Result**
H1: Perceived Usefulness (PU) → Continuance Intention (VSCI)	0.688	5.101	***	Supported
H2: Perceived Usefulness (PU) → Satisfaction (S)	0.748	5.953	***	Supported
H3: Satisfaction (S) → Continuance Intention (VSCI)	0.493	3.269	0.001	Supported
H4: Service Quality (SQ) → Perceived Usefulness (PU)	0.935	25.273	***	Supported
H5: Service Quality (SQ) → Satisfaction (S)	-0.134	-0.391	0.696	Not Supported
H6: Service Quality (SQ) → Trust (TR)	0.975	24.530	***	Supported

Path Relationship	Standardized Coefficients	C.R.	p-value	Result
H7: Trust (TR) → Satisfaction (S)	0.325	1.032	0.302	Not Supported
H8: Trust (TR) → Continuance Intention (VSCI)	-0.064	-0.728	0.467	Not Supported

5. RESEARCH CONCLUSIONS AND SUGGESTIONS

With the development of the Internet, many traditional industries have shifted toward providing services online. It's not only E-commerce, but also online programming, online storage, meeting friends online and so on. Video surveillance wasn't an exception, that's how Video Surveillance as a Service (VSaaS) has appeared. This research is aimed to establish the major factors that can affect service quality of online video surveillance, and also to understand the customers' behavior toward intention to use the service continuously in the future.

Another important unsupported hypothesis of this research that was supported in major works of Parasuraman et al. (1988), and also in the research of SaaS quality of Benlian et al. (2011), is H5 where Service Quality has direct impact on Satisfaction. The reasons that H5 is unsupported can be different: firstly, the construct of service quality was changed in order to have a proper model fit; secondly, biased answers of the respondents; and lastly, the items of service quality that was left (responsiveness, reliability, flexibility, and features) are more likely to affect Perceived Usefulness construct, rather than Satisfaction.

From the results, Service Quality have positive impact on Trust (H6), however Trust do not affect neither Satisfaction (H7) nor Continuance Intention (H8). It shows that Trust is not important factor for people to keep using VSaaS, but it can affect Satisfaction in a very small degree. Hence, the construct Trust can also be eliminated from the further researches.

Another hypothesis that has been supported shows that Service Quality has significant effect on Perceived Usefulness (H4) (it is similar in the study of Benlian et al. (2011) . It means that customers mostly look for useful attributes of the VSaaS, such as those that was left after SEM: Responsiveness, Reliability, Flexibility, and Features. According to the results these four factors of service quality are the most important in evaluating VSaaS quality. At the same time, Perceived Usefulness has a great impact on Satisfaction what makes H2 to be supported also. Hence, to make the customer satisfied, VSaaS providers need to increase Perceived Usefulness of their services based on the factors mentioned above.

The final construct in this research is Continuance Intention (VSCI). According to the results of this research, Perceived Usefulness (in a greater degree) and Satisfaction have positive effect on Continuance intention, what makes H1 and H3 supported. Similar results were achieved in the study about post-acceptance model of IS continuous intentions by Bhattacherjee (2001) and in the study of SaaS quality by Benlian et al. (2011). Hence, according to this research, the major factor of continuance intention for customers to use VSaaS would be Perceived Usefulness, or how useful they think the services are. The managerial implication will be discussed further.

5.2 Research Implications.

5.2.1 Academic Implications.

This research focuses on exploring factors that are important for customers in defining the service quality of the online video surveillance and propose the model of continuance intention to use those services. Although, there are a lot of researches that explore Software-as-a-Service (SaaS) quality models (Benlian et al., 2011; Chou & Chiang, 2013), there are still a limited amount of studies that focus on Video Surveillance-as-a-Service (VSaaS) overall, and service quality or continuance intention of VSaaS in particular, which, as was stated above, is a part of SaaS. Even though these two service models are quite similar, there are still a few major

differences that can define the research output. For example, the users of VSaaS are in a very special group of people, who has different concerns about service quality and how they define it. Hopefully, this study can fulfill the gap by understanding not only VSaaS service quality factors, but also by defining the model to study VSaaS quality and continuance intention. Hence, this research may be used as a reference for future studies about online video surveillance.

5.2.2 Managerial Implications.

According to the results of this study, Perceived Usefulness is the major variable that can affect users' Continuance Intention and Satisfaction. In order increase the Perceived Usefulness for customers, the Service Quality should be very high, and the major factors for this are vendor's responsiveness, reliability, flexibility, and features. The higher these four factors, the higher possibility that the customers will keep continuously use the services. These four factors are the major concerns for users when they choose to keep using particular vendor for online video surveillance services.

The findings of the research also contribute to the future marketing strategies for VSaaS vendors and service providers. In their marketing campaigns they would probably need to emphasize more on the possible usefulness of their services. Particularly, it can be responsive customer service (for the factor Responsiveness); it can be accurate, uninterruptable, and punctual service of the vendors (for the factor Reliability); the service should be easily customized, scaled, paying methods should be easily chosen (for the factor Flexibility); vendors of VSaaS should also emphasize on a wide range of functionalities and on a design and appearance of the interface (for the factor Features). Marketers should also define the main customers' segment for their services: whether the main users are mostly CCTV professionals or just home users, male or female, the purpose of the surveillance and so on. Market segments will also define the major characteristics of the marketing campaigns and advertisement.

5.3 Research Limitations.

5.3.1 Sampling.

One of the important parts of this research is a survey that was conducted with the help of online video surveillance users. As the research questions were placed online for a public access there was no chance to control the sampling and choose the right person for filling up the survey. As the most of the respondents (~90%) has less than 2 years' experience with the VSaaS, it might have been affected the results. The applications where the respondents use VSaaS are also different: home users and business users would surely have different perception about the quality of service when they use the online video surveillance. Home users might emphasize more on the beautiful user interface, convenience of the app or the software, flexible ways of paying; when business users would like to have more stable and scalable system.

Countries of origin of the respondents have also affected the results. There were less than 10% of respondents from Asia or CIS countries. And almost 50% of respondents were from Europe. Hence, the country biases are also can seriously affect the results of the study.

5.3.2 Questionnaire Development.

The questions for the survey of this study were written in English. Even though the words that were used to make questions were not very difficult or very special, however, for non-native English speakers it could be hard to fully understand the meaning of all the questions. Also, in the survey there are a few questions that require respondents to have basic vocabulary for video surveillance topic.

Another problem with the questionnaire could be its length. There were too many questions, so that while answering the long survey people's answers become more irrelevant to their real thinking or opinion. If the respondent is not fully involved to the questionnaire then the results can be very biased. However, during the CFA it was shown that some of the items of the survey were useless and can be eliminated in the future studies.

5.4 Future Research Suggestions.

As was stated above, there are not many researches about the VSaaS. This topic is new for the scholars and there are still a lot of chances for future research. First of all, the further research model can be better organized in order to have less constructs and items. The number of survey questions also should be minimized. Future researchers can study business customers and home customers separately, in this case the sampling data would be more homogeneous, and hence the results would be more predictable. The same situation is with country biases: it would be interesting to study the service quality perception and continuance intentions in different regions of the world.

With the fast development of new technologies, the video surveillance is going to be integrated with the “smart house”. It is another interesting field of the research; because in this case a few latest technologies are put together in order to deliver the best experience for the customers. How would users evaluate quality, what reasons will affect their future usage intentions? Those can be the questions for the further research.

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