Impact of the Three IS Qualities On User Satisfaction in an Information-Intensive Sector

Sylvie Michel[1] and François Cocula[2]
[1]University of Bordeaux, France
[2]Pôle Universitaire de Sciences de Gestion, France
sylvie.michel@u-bordeaux.fr
francois.cocula@u-bordeaux.fr

Abstract: According to the literature, when Information Systems are assessed, the variables and their relationships should be contextualized. This paper therefore considers the relationships between the three main quality variables (system, service and information) and satisfaction in the context of banking, a highly information-intensive sector. Information quality plays an even more important role in a highly information-intensive sector. The conceptual framework of information intensity used to validate our model has been statistically tested by means of a structural equation modeling method. Our results support the hypothesized relationships: system and service quality have a significant influence on information quality which, in turn, exercises a significant influence on satisfaction.

Keywords: information quality, system quality, service quality, satisfaction, high information intensity, banking sector

1. Introduction

In 2016, European banks invested millions in their IS in order to be competitive. Indeed, with the evolvement of new technologies, information has become a vital part of competition, especially in the banking sector (Patel, et al., 2016; Aburas and Raihan, 2013; Petter, et al., 2013; McLaren, et al., 2011; Drucker, 1999), which is highly information-intensive. With the substantial investment in IS by banking organizations, banking CEOs and managers are handicapped by the lack of appropriate models and instruments to measure the success of IS or IS user satisfaction and, in turn, are unable to justify investments in existing and future IS (Ababneh, et al., 2017)

IS evaluation is extremely important in the field of information systems. From the early work of Lucas (1975), several conceptual models have attempted to explain how to evaluate IS. Much research has been devoted to IS evaluation and to IS satisfaction (Chin and Lee, 2000, Mahmood, et al., 2000, Padinha and O'Neill, 2016; Au, et al., 2002, Vaezi, et al., 2016). The challenge of developing measures for evaluating the success of information systems is still prevalent today (Petter, et al., 2012, 2013, Dwivedi, et al., 2015). DeLone and Mclean (2003) explain that satisfaction is determined by three IS qualities: system quality, service quality and information quality. But, the relationship between IS qualities and satisfaction in general, and the context in particular, had remained largely unexplored until recently. Firstly, the relationships among the three types of quality and satisfaction in an information-intensive sector might not be the same as those in a non-information-intensive sector. Less is known about this evaluation in different contexts, especially in a high informational context. Moreover, any IS evaluation should be based on the organizational context in which it is used (DeLone and McLean, 2003). Secondly, the assumption that these three types of quality do not affect each other needs a major rethink (Wang, 2008; Wang and Liao, 2008; Chen and Cheng, 2009; Gorla, et al., 2010), while DeLone and McLean (2003) and other researchers (Seddon, 1997, Petter, et al., 2013) strongly express the need to examine the interrelationships among the constructs in the DeLone and McLean model. Thus there has been a call for a deeper theoretical understanding (Petter, et al., 2008) of how perceptions of system quality, information quality, and service quality are related, and related to user satisfaction (Ghasemaghaei and Hassanein, 2015). For example, Petter, et al. (2013) ask for more research in order to better understand how to positively influence information quality.

The goal of this article is to propose and validate a model which determines IS satisfaction in a high information-intensive sector, in the light of the Information System Success Model (Delone and McLean, 2003). More precisely, this study investigates the relationship between IS quality variables and satisfaction in the banking sector. The aim is first to propose a contextualized operationalization of the four variables, and second to validate our hypotheses as to the existence of relationships between each of them. Contextualized

Reference this paper: Michel S and Cocula F "Impact of the Three IS Qualities On User Satisfaction in an Information-Intensive Sector" *The Electronic Journal Information Systems Evaluation Volume 20 Issue 2 2017, (p85-101)* available online at www.ejise.com

operationalization means an attempt to define and measure constructs in a particular and specific context, here the banking sector. The main hypothesis that we advance in this paper is that system quality and service quality affect information quality positively, and information quality positively affects satisfaction, in a high informational context.

The study used two surveys to collect data. Given that the empirical strategy is to create variance in perceived system quality, information quality, service quality and satisfaction, in a high information-intensive sector, we use structural equation modeling (SEM) to test our proposed research model. By empirically testing a model that explains the relationship between IS qualities and satisfaction in a high informational context, this research contributes to IS theory by introducing a focus on the role of information quality. The main contribution of this research is in two areas, summarized as follows. First, we use an explicit causality model to analyze the relationship between satisfaction and IS quality. Using the framework of information intensity, this enables us to state that satisfaction, in an information-intensive sector, is determined by information quality. That is, that relationship between IS quality variables and satisfaction can depend on the information intensity of the sector. Second, the measures of IS qualities developed in this study have practical value as research and diagnostic tools and the findings provide useful insights to help organizations improve IS evaluation management practices.

This paper is organized as follows. The next section presents the literature review. The third section proposes the conceptual framework, research model and development of hypotheses. The fourth section describes the research methodology and data collection, followed by analysis of result in the fifth section. The sixth section provides a discussion of findings and implications, and the final section concludes with limitations and avenues for future research and practice.

2. Literature review

2.1 IS user satisfaction

DeLone and McLean (1992) proposed a generic model unifying the literature on the evaluation of IS: the Information Systems Success Model - ISSM. They identified six levels of IS success (system quality, information quality, use, satisfaction, individual impact and organizational impact), which interact in both a procedural and causal sense. In 2003, DeLone and McLean developed a new version, which introduced three main modifications. First, they added user service quality as an independent variable, basing this essentially on the study of Pitt, et al., (1995). They then went on to modify the "use" variable, splitting it into two sub-variables: "intention to use" and "use" (Davis, 1989; Davis, et al., 1989). Finally, as they considered that the impacts could be measured at several levels, individual, organizational, and even national, they preferred to regroup all the impacts into one: "net benefits". Their model has become one of those most widely used for measuring IS success, especially via the notion of user satisfaction. It is this notion we utilize here in studying the case of account officers and the IS front office of retail banks.

The 2003 version of the ISSM model has been extensively tested in the literature, either wholly or in part (Almutairi and Subramanian, 2005; Urbach, et al., 2008; Petter, et al., 2008; Petter and McLean, 2009) and the results confirm the overall validity of the model. As regards relationships between quality variables, we can cite the study of Petter and McLean (2009). In their meta-analysis, they aggregated the results of fifty-two empirical studies testing the relationships of the 2003 model, at an individual level. Their objective was to estimate the strength of the interdependent relationships between two constructs. In order to do so, they tested fourteen hypotheses, incorporating the principal elements of the ISSM model (DeLone and McLean, 2003).

Out of the fourteen hypotheses, one was not tested because it had been examined by only one study (H5). Of the thirteen remaining hypotheses, eleven were corroborated, the other two being service quality and user satisfaction (H6), and service quality and use (H14). We observe that the three unsupported hypotheses are associated with service quality, a construct that does not determine either satisfaction or use. We note, therefore, that Petter and McLean's study (2009), which draws on empirical tests, shows that it is unjustified to treat these three quality variables at the same level. The question of eventual relationships between these variables has, however, seldom been considered (Ding and Straub, 2008; Xu, et al., 2013). We take into account the three IS quality variables for these reasons. Firstly, the three qualities variables presented in the Delone and McLean (2003) model are those that determine satisfaction. Secondly, there is no empirical

support for the relationship between service quality and satisfaction (Petter and McLean, 2009). Finally, Ding and Straub (2008) and Xu, et al. (2013) propose to explore new relationships between these variables in different contexts.

Furthermore, in the banking sector, some empirical studies have been carried out using the DeLone and McLean model (Manchanda and Mukherjee, 2014; Romi, 2013; Hussein, 2009; Mashhour, 2008). Other studies have been carried out using the Technology Acceptance Model or FIT model (Baptista and Oliveira, 2015; Oliveira, et al.; 2014; Saleem and Rashid, 2011; Pikkarainen, et al., 2004; Adamson and Shine, 2003; Wang, et al., 2003; Kamel and Hassan, 2003). Very few studies operationalize the variables taking into account the banking context. Only one empirical study deals with internal end users, the account officers who use the front office IS (Manchanda and Mukherjee, 2014). Most studies are on electronic banking (Okechi and Kepeghom, 2013; Andoh-Baidoo, et al., 2010). A few studies have been carried out on mobile banking (Baptista and Oliveira, 2015; Oliveira, et al., 2014; Koo and Wati, 2010; Saleem and Rashid, 2011), and others on online banking (Internet banking) (Koo, et al., 2013; Ho Cheong and Park, 2005; Pikkarainen, et al., 2004; Wang, et al., 2003). Appendix A provides further details on the latter.

2.2 System quality

Nelson, et al. (2005) observe that system quality is seldom studied per se in the literature whereas, paradoxically, this is not the case for information or service quality. Furthermore, these authors affirm that the notion of system quality is difficult to identify as it is all too often "mixed up" with other dimensions, like service quality or ease of use. For other authors, like Seddon (1997), system quality refers essentially to the presence or otherwise of "bugs". DeLone and McLean (2003) most often appraise system quality in terms of ease of use, functionalities, reliability, flexibility, data quality, portability and integration.

The heterogeneity of definitions proposed for system quality has motivated certain authors (Sedara and Gable, 2004) to determine the main dimensions to enable a better understanding of this notion. A similar synthesis has been proposed by Nelson et al. (2005). System quality is assessed in terms of the perception that users may have of their interaction with IS. The authors identify five principal dimensions: accessibility, reliability, flexibility, response time and integration.

2.3 Service quality

One of the most commonly used research instruments to define the concept of service and, by extension, that of service quality, is SERVQUAL (Parasuraman, et al., 1988), which presents service quality as the gap between expectations and the perceived evaluation of Service Performance (22 items for each dimension). SERVQUAL, a measurement scale based on five dimensions (tangible elements, service provider reliability, service provider helpfulness, service provider assurance and service provider empathy), has been adapted to the IS domain (Kettinger and Lee, 1997; Van Dyke, et al., 1997; Pitt, et al., 1997). A similar service quality measuring instrument, SERVPERF, has been proposed by Cronin and Taylor (1992). SERVPERF and SERVQUAL possess the same dimensions, but SERVPERF is restricted to measuring perceptions, which is why it offers the advantage of being "lighter" to implement (Jiang, et al., 2012).

2.4 Information quality

For DeLone and McLean (1992; 2003), information quality is the quality of IS output, the quality of the information produced by the system, principally in the form of reports. For certain researchers, quality information is also defined as information that is fit for use by data consumers (Fit for Use) (Wang and Strong, 1996; Strong, et al., 1997). Nowadays, this point of view is widely held because it stresses that, ultimately, it is users who determine whether the information is suitable for their utilization.

The study that has received most attention is that of Wang and Strong (1996). They proposed a hierarchical structure of data quality grounded in a contextual approach. They determined four categories of data quality: intrinsic, contextual, representational and accessibility. Their aim was to confirm whether the intermediate dimensions (accuracy, interpretability, etc.) correctly explain those categories. After several research phases, the authors finally retained fifteen dimensions in four categories. This typology, now considered as a reference, has been adopted in numerous studies (Dedeke, 2000; Lee, et al., 2002). Aburas and Raihan (2013) proposed an empirical study on the banking sector to measure the Information Service Quality for the customer.

3. Conceptual framework and hypotheses

3.1 IS evaluation based on a highly information-intensive sector

The term ‘‘information intensity’’ was first used by Porter and Millar (1985) and later appeared in a number of studies (Glazer, 1991; Palmer and Griffith, 1998; Bhatt, 2000; Andal-Ancion, et al., 2003). Banking is an information intensive sector (Porter and Millar, 1985; Hu and Quan, 2005; Shih and Fang, 2006; Consoli, 2008; Maçada, et al., 2012; Koo, et al., 2013). For these authors, industries with intensive use of information, like banking, financial and insurance services would benefit more from IT investments than those with low information intensity, such as energy, mining and construction. Porter and Millar (1985) underline that IS are omnipresent throughout the value chain, transforming the value creation path as well as the nature of links between activities. For these authors, each activity is made up of both a physical and an information part. Historically, ever since the first Industrial Revolution, technological progress has mostly affected the physical component. Now this trend has been reversed, and it is the information component of activities which has been turned upside down by the arrival of IS. This “Information Revolution” affects the nine activity categories of the value chain by providing decision-support software, automating processes, proposing huge databases, etc. The IS also enables better coordination between activities, thanks to the exchange of information, both within and outside the company. The authors stress the importance of an IS as a strategic element that varies according to sectors. This explains why they propose a matrix situating enterprises in terms of both value chain information intensity, and information content of the product. We note that banks are to be found among enterprises with high information content, both in production and processes. This signifies that because information is such a highly strategic variable for the banking domain, its quality greatly determines stakeholders’ competitive advantage.

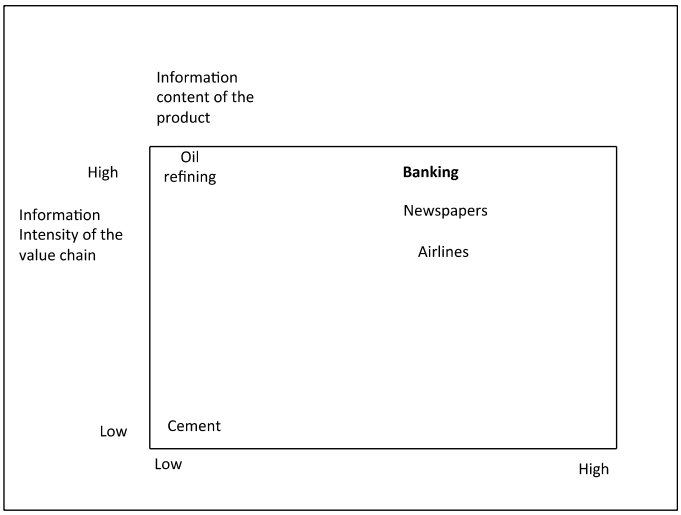

Figure 1: Information Intensity Matrix Porter and Millar, 1985

3.2 Relationship among IS qualities in a highly informational sector and research hypotheses

DeLone and McLean and other researchers (Seddon, 1997) strongly express the need to examine the interrelationships among the constructs in the ISSM model. However, given the importance of information system quality, surprisingly few studies have examined the joint effects of perceived system quality, information quality and service quality (Wang 2008; Wang and Liao 2008; Chen and Cheng, 2009; Gorla, et al., 2010). Therefore, there is a call for a deeper theoretical understanding of how perceptions of system quality, information quality, and service quality are related. However, Ding and Straub (2008) emphasized the need to recognize the different roles of the three types of quality in the revised DeLone and McLean model. In addition, we are not aware of any empirical testing of these relationships.

Our objective here is to theorize the relationships among the three types of quality in the context of a highly informational sector, and empirically test these relationships in the banking domain so as to understand how various components of quality influence each other and subsequently influence satisfaction.

Our hypotheses are grounded in the conceptual framework of information intensity proposed by Porter and Millar (1985), which states that in an enterprise that operates within a highly information-intensive sector,

information quality becomes an increasingly important strategic variable. Information quality has a greater value in a more information-intense process than in a less information-intense process because of its greater impact on process outcomes (Porter and Millar 1985). Similarly, greater information quality is more important for managing non-routine, difficult and uncertain interdependencies in complex customer-oriented activities.
Xu, et al. (2013), proposed a 3 Q model, based on Wixom and Todd's integrated model of technology by investigating the role of service quality, in addition to system quality and information quality, in website adoption. They theorize and empirically test the relationships among these three types of quality. In line with Xu, et al. (2013), in terms of the relationships among the three types of quality, we first propose that perceived system quality will influence perceived information quality. As information is produced by a system (DeLone and McLean, 1992; Mason, 1978), problems with the system's quality can degrade the actual quality of the information it produces. Moreover, a good system that utilizes, for example, user-friendly and modern technologies can present information to users in an easy-to-understand format, enabling them to use information systems effectively, etc. A well-integrated system provides complete and accurate information so that its information outputs will be useful for users' daily jobs and relevant for decision-making purposes. The above arguments imply that a better system leads to belief in the information.

Thus, we propose the following:

H1: There is a significant, positive relationship between system quality and information quality.

Equally, we have just seen that the literature finds no significant link between service quality and satisfaction. Moreover, a high level of perceived service quality must lead to a higher level of perceived information quality because internal users, such as front office IS account officers, need high information quality. Indeed, if they do not have a high-quality service, for example if they have to wait to repair a bug, or they do not understand technical computer language, or their professional applications do not provide information that is accurate, relevant and timely because the update has not been done, internal users will have a lower perception of information quality. The above arguments imply that a better system service leads to belief in the information.

H2: There is a significant, positive relationship between service quality and information quality.
The attitude-behavior literature asserts that beliefs about objects (in this case, system quality, information quality, and service quality) are linked to attitudes toward an object (in this case, satisfaction). Satisfaction is recognized as an object-based attitude (Ajzen and Fishbein, 1980; Wixom and Todd, 2005), and is viewed as an aggregate cognitive and emotional reaction to held beliefs. Wixom and Todd theorize and empirically support the influence of quality on satisfaction. Thus we predict that information quality, which is an object-based belief, shapes attitudes about satisfaction, an object-based attitude.

H3: There is a significant, positive relationship between information quality and satisfaction.
Accordingly, we formulate three hypotheses: in the banking domain, system quality and service quality have a significant influence on information quality, which in turn exerts a significant influence on satisfaction.

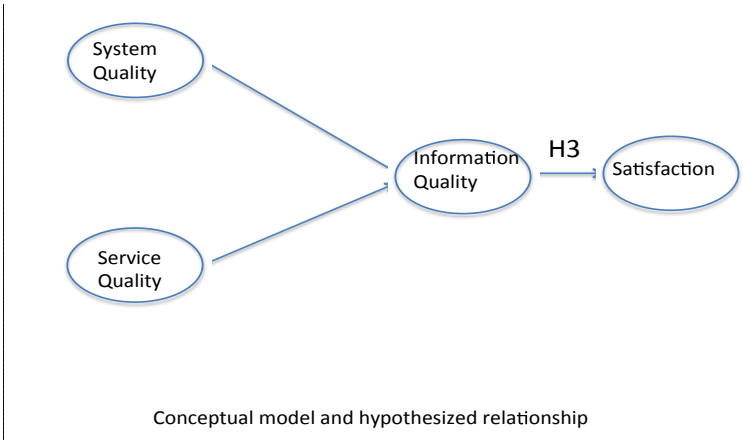

Figure 2: Research model

4. Methodology

The data used to test our hypotheses were collected from the principal French retail banks. We decided to operationalize the variables and to test our model with front office IS account officers. We detail below the operationalization of our constructs and the collection of data.

4.1 Operationalization of the constructs

In line with the recommendations of Churchill (1979), most of the items used in this study have been taken from the literature. However, as a synthesis of the literature reveals the lack of constructs specific to banking IS, interviews were held with retail bank account officers and branch managers, so that we could discover or confirm the items. Analysis of the interviews, and a review of the literature, enabled us to generate a sample of items for each variable. All the questions were formulated on a five-point Likert scale, with responses ranging from “strongly disagree” to “completely agree”. We then carried out different pre-tests of our questionnaire, submitting it first to two experts, Chief Information officers (CIOs) in the banking domain. This was subsequently evaluated by five associate researchers, and the questionnaire was then modified in the light of the tests (Appendix B).

Retail banks have focused on the role of account officer to create value. Indeed, creating a competitive advantage in the value chain of retail banking lies mainly in its distribution and customer relationship activities, a role that an account officer performs with information contained in IS. The quality of information seems to be the determining factor in this competitive environment. The account officer is a professional whose main activity is to provide a customer with advice on banking services. The profession is evolving, particularly because of competitive pressure, but also because of the arrival of new multi-channel and Internet technologies. To carry out their activities, account officers use the IS front office. Their work environment is organized around a computer station, "an office" composed of several computer applications (CRM), and an intranet. Depending on the bank, the office could be different.

4.2 Data collection

Two rounds of data collection were performed by means of a questionnaire sent online to two retail banks. For both data collections, we had a comprehensive sampling frame (at the regional level) and also had all mail addresses. So we set up an online survey, sent by e-mail to the whole sample. We posted our questionnaire on a website and invited respondents to visit the site.

For the first round, the questionnaire was sent to the entire set of email addresses in the sales network: 571 persons in all. We obtained a return rate of 36.6% (209 responses). This first round of data collection took place over a period of one week, followed by an exploratory factor analysis.

For the second round of data collection, we had access to the entire set of branch email addresses: 550 persons. The questionnaire was available online for a period of two weeks, with two reminders, coordinated by the Quality Manager. The return rate was 36.7%, i.e. 202 responses (192 responses). We performed a confirmatory factor analysis and were able to test our hypotheses using this second collection of data.

5. Results

In this part, we begin by presenting the results of the exploratory and confirmatory factor analyses performed on the four constructs. We then present the principal results of the tests of our hypotheses.

5.1 Assessment of scales

Based on the first round of data collection, an exploratory factor analysis was performed on each of the constructs. Kaiser–Meyer–Olkin (KMO) and Bartlett’s test of sphericity proved positive for all our constructs, and confirmed the appropriateness of using factor analysis.

We used Cronbach's alpha, the most frequently used indicator for testing the reliability of a set of items designed to measure the same phenomenon. Items whose loading was lower than 0.4 were removed (Straub, et al., 2004).

A first exploratory factor analysis based on the first round was carried out on the 10 items of the system quality construct (Table 1). The KMO test indicated 0.790, and Bartlett’s test of sphericity, 363.577 (df = 21),

with a signification of 0.000. We eliminated three items (those relating to reliability, volumetry, and operational risk), as they were too poorly representative. Two factors explaining 61.694% of total variance were identified. The first factor, designated functional quality, consists of 5 items, and the second factor, designated control of technical risks, consists of two items. Scale reliability (Cronbach's alpha = 0.784) was good.

A second exploratory factor analysis was carried out on the 7 items of the information quality construct (Table 1). The KMO test indicated 0.813, and Bartlett's test of sphericity, 430.293 (df = 21), with a signification of 0.000. Two factors explaining 64.3% of total variance were identified. The first factor, designated intrinsic quality, consists of four items, and the second factor, designated ergonomic quality, consists of three items. Scale reliability (Cronbach's alpha = 0.8) was good.

A third exploratory factor analysis was carried out on the 5 items of the service quality construct (Table 1). The KMO test indicated 0.816, and Bartlett's test of sphericity, 795.667 (df = 55), with a signification of 0.000. One factor explaining 66.684% of total variance was identified. Scale reliability (Cronbach's alpha = 0.784) was good.

A fourth exploratory factor analysis was carried out on the 3 items of the satisfaction construct (Table 1). The KMO test indicated 0.703, and Bartlett's test of sphericity, 345.422 (df = 3), with a signification of 0.000. One factor explaining 81.8% of total variance was identified. Scale reliability (Cronbach's alpha = 0.889) was good.

We then carried out a confirmatory factor analysis based on the second round of data collection to test internal consistency, convergent validity and discriminant validity (Table 1). The reliability of these 6 scales, measured by Composite Reliability, was superior in all cases to the threshold of 0.7.

Examining the *t*-tests for the factor loadings enabled us to assess the convergent validity of each model. Convergent validity was confirmed by examining the weighting of the factors (which must be superior to 0.5): all the items have significant factor weighting ($t > 1.96$). Furthermore, the Average Variance Extracted (AVE) was superior to 0.5 for all scales. Finally, the discriminant validity was examined to determine whether inter-factor correlations were less than the square root of the AVE. The discriminant validity of our scales was good for all dimensions. Table 2 shows that the square roots of each AVE were greater than the off-diagonal elements. Discriminant validity is guaranteed.

Table 1: Results of exploratory and confirmatory factor analyses

Construct	Item Codes	EFA First data collection round		CFA Second data collection round	
		Factor1	Factor 2	Loading	
System Quality	SQ1	0.776		0.69 (14.5)	CR = 0.95 AVE = 0.87 Discriminant Validity = 0.95 > $(0.44)^2$
	SQ2	0.731		0.67 (13.8)	
	SQ3	-	-	-	
	SQ4	-	-	-	
	SQ5	0.703		0.63 (11.9)	
	SQ6	0.819		0.63 (11.9)	
	SQ7	0.675		0.76 (17.9)	
	SQ8	-	-	-	
	SQ9		0.843	0.63 (6.6)	CR = 0.9

	SQ10		0.837	0.72 (7)	AVE = 0.77 Discriminant Validity = 0.77 > $(0.44)^2$
Information Quality	IQ1	0.798		0.58 (10.6)	CR = 0.96 AVE = 0.83 Discriminant Validity = 0.83 > $(0.59)^2$
	IQ2	0.792		0.57 (10.1)	
	IQ3	0.727		0.62 (11.8*)*	
	IQ4	0.551		0.83 (20.3)	
	IQ5		0.823	0.72 (14.1)	CR = 0.95 AVE = 0.87 Discriminant Validity = 0.87 > $(0.59)^2$
	IQ6		0.768	0.79 (16.4)	
	IQ7		0.781	0.54 (9.06)	
Service Quality	SERVQ1	0.864		0.77 (22.7)	CR = 0.93 AVE = 0.89
	SERVQ2	0.856		0.83 (30)	
	SERVQ3	0.811		0.74 (20.9)	
	SERVQ4	0.829		0.66 (15)	
	SERVQ5	0.713		0.82 (28.8)	
Satisfaction	S1	0.941		0.911 (30.4)	CR = 0.97 AVE = 0.92
	S2	0.886		0.79 (22)	
	S 3	0.885		0.73 (18.85)	

Table 2: Correlation matrix of latent variables

	System Quality	Service Quality	Information Quality	Satisfaction
System Quality	**0.75**			
Service Quality	0.6	**0,72**		
Information Quality	0.28	0.11	**0.75**	
Satisfaction	0.42	0.12	0.41	**0.79**

Diagonal elements are the square roots of average extracted (AVE).

5.2 The causal model

We applied structural equation models (SEM) to analyze our data, using AMOS version 19 software.

5.2.1 Assessment of measurement model

Since our indicators are manifestations of the construct, we therefore use reflective construct items. The measurement model was tested by means of the maximum likelihood method, and several fit indices of the structural model were then examined (Table 3).

For this model, the number of degrees of freedom was superior to zero (41). Additionally, the assessment of the measurement model was good, as shown by the principal indices, which are given below:

Table 3: Fit statistics of the measurement model

Indices	
χ 2/df (< 2)	3.812
RMSEA (<0.10)	0.007
CFI (> 0.9)	0.905
IFI (> 0.9)	0.907
NFI	0,878

The structural model χ^2/df had a value of 3.812. The CFI and IFI were respectively 0.905 and 0.907, superior to the recommended norms. The RMSEA was 0.007. Global model fit was good. Examination of the different indices showed that the model was good, as confirmed by adequate fit between the hypothesized model and the observed data.

5.2.2 Structural model fit

Structural model fit consists in verifying that the linear relationships between variables are statistically significant. As the sample for our model included 209 respondents, this allowed us to choose a signification threshold of 5%. Alongside this analysis, the standardized coefficients of the regressions, which varied between -1 and +1, were examined in order to estimate the strength of the linear relationship. The proportion of the explained variance (R^2), the percentage of the variable to be explained, was also studied.

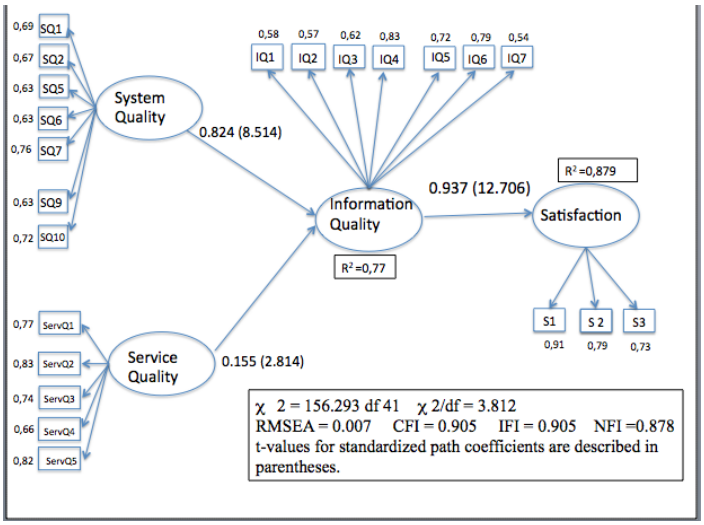

Figure 3: Structural relationships between the different variables of the model

The three relationships tested (H1, H2, H3) were found to be significant at a threshold of 0.05%. We chose to position information quality as the variable explained by system and service qualities (H1 and H2). Hypotheses (H1 and H2) were validated: the statistical links were significant (respectively, *t* = 8.514; p = 0 and *t* = 2.814; p = 0.005). The link between system and information quality was strong, with a correlation coefficient of approximately 0.8. Service quality determined information quality more moderately (0.155). Hypothesis H3 was also validated. The link between information quality and satisfaction was significant (*t* = 12.706; p = 0). The link between information quality and satisfaction was strong, with a correlation coefficient of about 0.937. The proportion of variance explained for satisfaction proved excellent (87.9%).

In a highly information-intensive sector, the model therefore confirms that the principal antecedents of information quality are system and service quality, and that information quality determines satisfaction.

6. Discussion and implications

The aim of this research was first to propose and measure constructs operationalized in the banking sector, a highly information-intensive domain, and then to test the relationships between the qualities determining satisfaction. In addition to their contributions to practice, our findings also have implications for research.

6.1 System quality

System quality, in the banking domain, is a variable constructed via two dimensions, functional quality and control of technical risks, a total of seven items, allowing us to appreciate the main expectations of the banking sales force.

The two most significant items are those involving IS fit to the professional activities of bank account officers (functionalities, all aspects of work). These items were followed by rapidity and ease of use, and general quality. These expectations are in complete accordance with the professional evolution of the sales force, which is increasingly subject to competitive pressure and to reaching its objectives. This means that system quality is appreciated not only in terms of its technical qualities but, ultimately, in terms of its functional fit. The first dimension of our construct is, therefore, symptomatic and representative of IS bank user expectations. But, these items are those usually used to operationalize quality system.

The second dimension, control of technical risks, appears to be specific to bank IS users. To our knowledge, no operationalization of the system quality has highlighted this dimension and these items. This second dimension leads us at the conclusion that because the banking domain is highly regulated and controlled, bank account officers expect a certain degree of protection. System quality as defined, operationalized and validated in these terms, is specific to bank IS users, and this instrument constitutes a theoretical contribution.

At this point, we also offer some comment of items which were eliminated, while they were usually retained by the literature to operationalize system quality. Surprisingly, the item concerning the reliability of the system was not retained. The eliminiation of this item means that the reliability is not one of the account officers' expectations in terms of system quality. We can consider that because reliability (absence of bugs, failures, malfunctions) is one of the basic and core qualities expected, that users may forget it, or take it for granted that it is a non-negotiable. Similarly, items related to flexibility and volume were eliminated. These expectations are probably too far from the main concerns of account officers, and they are ultimately more an expectation of designers and developers.

Finally, system quality as defined, operationalized and validated in these terms, is specific to bank IS users, and this instrument constitutes a theoretical contribution.

Moreover, from the managerial point of view, these results show decision makers and CIOs the particular criteria they must focus on to get a better perception of system quality. This questionnaire can constitute a tool for improving IS quality by showing which points require action.

6.2 Service quality

As a SERVPERF instrument and through the results of our exploratory analysis, we proposed a measuring instrument adapted to the banking context to assess the quality of IS services delivered to account officers. Like Kettinger and Lee (1997), we did not retain the tangible aspects dimension, because the criteria for this dimension do not appear in our interviews. We also decided to eliminate the empathy dimension, because it does not correspond to what we discovered in the initial qualitative phase of the study. We maintained three dimensions and we propose eight items, of which the drafting of six of them were modeled on that of SERVPERF. Our study shows that service quality, contextualized in the banking domain, is a unidimensional instrument made up of five items. Users expect support service staff to be competent and to adapt to their needs (especially as regards their use of everyday language and, equally, by showing their willingness to help). These items are encompassed in the assurance and responsiveness dimensions of SERVPERF. One of the most obvious managerial implications is that banks should invest in training for their support service staff. One of the goals would be to develop and maintain personal relations between sales and support service staff. That way, when a bank account officer encounters a problem and contacts the support service department, the same contact person will answer, thereby ensuring even greater confidence and understanding. In short, this instrument demonstrates that the competences of support service staff must include both technical and

interpersonal dimensions. This instrument allows the service provider to understand how users evaluate these services, and consequently know how to influence these evaluations in the desired way.

6.3 Information quality

Information quality is measured via seven items and two dimensions: intrinsic quality (4 items) and ergonomic quality (3 items). The most important dimensions for bank account officers is the intrinsic dimension of the information (47.4% of explained variance). Information reliability carries the greatest weight in this dimension, closely followed by the need for detailed and accurate information. As regards ergonomic quality, the three items have a high relatively similar weight: the information must be accessible, clearly presented and understandable. For management, this signifies that, for the two dimensions and their items, there are stable attributes that could be used to influence quality. This instrument could be used, initially, to evaluate the information quality delivered by the IS, thereby providing, in a second phase, a firm basis for an essentially corrective policy.

6.4 Model

It should be noted that our model reveals a significant link between service and information quality, showing that in the banking domain, a highly information-intensive sector, service quality determines information quality. To our knowledge, this link has not been evidenced in the literature. This is an important contribution.
It is equally important to note that our model reveals a strong link between system and information quality. Our model shows that in the banking domain, a highly information-intensive sector, system quality determines information quality.

Lastly, our study confirms the strong link between information quality and satisfaction. In the banking domain, a sector in which information is a strategic variable, the satisfaction of users with their IS is explained by the information quality provided by that IS.

7. Conclusion and limitations

Organizations need to be aware of user satisfaction with information systems. User satisfaction is a key determinant of information system evaluation. Existing research on information system satisfaction is inadequate to explain the role of the three IS qualities in a highly information-intensive sector. This paper has focused on developing an evaluation model for user satisfaction in the banking sector, a highly information-intensive sector.

This study proposes, develops and tests a model of the relationships between the three quality variables of an IS (system, service and information quality) and satisfaction in the banking domain, a highly information-intensive sector. We created and statistically evaluated operational measures for each quality variable and satisfaction in a particular sector. In this sector, we made and verified the hypotheses that information quality is determined by system and service quality, and that information quality determines satisfaction.

In terms of theoretical implications, the present research provides a greater understanding of the relationships between IS quality variables and satisfaction. This result is important: it stresses the indispensable need for IS evaluation models to be contextualized in terms of their environment. The position of quality variables and their relationships must be studied in context. Moreover, this result also constitutes a theoretical contribution: using the characterization of the sector in terms of information intensity to test the relationships between variables can offer an innovative and promising avenue of research for evaluating IS. Furthermore, we note the particular place of information quality in this model. This represents an interesting research path: in a highly information-intensive sector, satisfaction is mainly determined by information quality. This result deserves further study.

Moreover, from the managerial point of view, the findings of this study significantly demonstrate the ability of information quality to influence satisfaction. Practitioners should assign great importance to the direct power of information quality in a highly information-intensive sector. This questionnaire can constitute a tool for improving IS user satisfaction. These results show CIOs the particular criteria they must focus on in order to get a better perception of system quality, service quality and information quality. This paper proposes a useful evaluation instrument.

This work, however, also presents certain limitations. In this respect, one area of research to improve its external validity, would be to extend this study to other highly information-intensive sectors. These could include closely related activities such as insurance and auditing, or less closely related ones such as aeronautics or pharmaceutical firms. In future research, we aim to test this model in other highly information-intensive sector. Although the results show that information quality, system quality and service quality all affect IS user satisfaction, it is important to realize that other exogenous variables may also play an important role. For example, there may be second-order latent variables that have an important effect on multiple first-order latent variables. We thus encourage future researchers to identify additional salient variables in the context of the banking sector. Finally, future research could include a longitudinal survey to test the proposed model and hypotheses.

References

Ababneh, H., Shrafat, F. and Zeglat, D., 2017. Approaching information system evaluation methodology and techniques: a comprehensive review. *International Journal of Business Information Systems*, 24 (1) pp. 1-30.

Aburas, R. and Raihan, N.H.A., 2013. Measurement models of Information Service Quality: A study on the banking sector. *International Journal of Scientific & Technology Research*, 2 (5) pp. 74-79.

Adamson, I. and Shine, J., 2003. Extending the new technology acceptance model to measure the end user information systems satisfaction in a mandatory environment: A bank's treasury. *Technology Analysis and Strategic Management*, 15 (4) pp. 441-455.

Ajzen, I. and Fishbein, M., 1980. *Understanding attitudes and predicting social behavior*. Prentice-Hall.

Almutairi, H. and Subramanian, G.H., 2005. An empirical application of the DeLone and McLean model in the Kuwaiti private sector. *Journal of Computer Information Systems*, 45 (3) pp. 113-122.

Andal-Ancion, A., Cartwright, P.A. and Yip, G.S., 2003. The digital transformation of traditional businesses. *MIT Sloan Management Review,* 44 (4) pp. 34-41.

Andoh-Baidoo, F.K., Villarreal, M.A., Liu, L.C. and Wuddah-Martey, P., 2010. An exploratory study to examine the success of electronic banking systems implementation in a developing nation. *International Journal of Electronic Finance*, 4 (3) pp. 221-235.

Au, N., Ngai, E. W., and Cheng, T. E., 2002. A critical review of end-user information system satisfaction research and a new research framework. *Omega*, 30 (6) pp. 451-478.

Baptista, G. and Oliveira, T., 2015. Understanding mobile banking: The unified theory of acceptance and use of technology combined with cultural moderators. *Computers in Human Behavior*, 50, pp. 418-430.

Bhatt, G. D., 2000. An empirical examination of the effects of information systems integration on business process improvement. *International Journal of Operations & Production Management*, 20 (11) pp. 1331-1348.

Chang, J.C.J., and King, W.R., 2005. Measuring the Performance of Information Systems: A Functional ScoreCard. *Journal of Management Information*, 22, (1) pp. 85-115.

Chen, C.W.D. and Cheng, C.Y.J., 2009. Understanding consumer intention in online shopping: A respecification and validation of the DeLone and McLean model. *Behaviour & Information Technology*, 28 (4) pp. 335-345.

Chin, W.W. and Lee, M.K.O., 2000. On the formation of end user computing satisfaction: a proposed model and measurement instrument. 21st *International Conference on Information Systems*, Brisbane, Australia, pp. 553-563.

Churchill, G.A., 1979. A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, 6 (1) pp. 64-73.

Consoli, D., 2008. Systems of innovation and industry evolution: The case of retail banking in the UK. *Industry and Innovation*, 15 (6) pp. 579-600.

Cronin, J.J. and Taylor, S.A,. 1992. Measuring service quality: a re-examination and extension. *Journal of Marketing*, 56 (3) pp. 55-68.

Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13 (3) pp. 319-340.

Davis, F.D., Bagozzi, R.P. and Warshaw, P.R., 1989. User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, 35 (8) pp. 982-1003.

Dedeke, A., 2000. A conceptual framework for developing quality measures for information systems. *Proceedings of 5th International Conference on Information Quality*, USA.

DeLone, W.H. and McLean, E.R., 1992. Information systems success: the quest for the dependent variable. *Information Systems Research*, 3 (1) pp. 60-95.

DeLone, W.H. and McLean, E.R., 2003, The DeLone and McLean model of information systems success: a ten-year update. *Journal of Management Information Systems*, 19 (4) pp. 9-30.

Ding, Y. and Straub, D., 2008. Quality of IS in services: theory and validation of constructs for service, information and system. *International Conference on Information Systems.*

Doll, W.J. and Torkzadeh, G., 1988. The Measurement of End User Satisfaction. *MIS Quarterly*, 12 (2) pp. 259-274.

Drucker, P.F.,1999. *Management Challenges for the 21st Century.* 1999, Elsevier Ltd.

Dwivedi, Y. K., Wastell, D., Laumer, S. et al*.,* 2015. Research on information systems failures and successes: Status update and future directions. *Information Systems Frontiers*, 17 (1) pp. 143-157.

Etezadi-Amoli, J. and Farhoomand, A.F., 1996. A Structural Model of End User Computing Satisfaction and User Performance. *Information & Management,* 30 (2) pp. 65-73.

Ghasemaghaei, M. and Hassanein, K., 2015. Online information quality and consumer satisfaction: The moderating roles of contextual factors -A meta-analysis. *Information & Management*, 52 (8) pp. 965-981.

Glazer, R., 1991. Marketing in an information intensive environment: strategic implications of knowledge as an asset. *Journal of Marketing*, 55 (4) pp. 1-19.

Gorla, N., Somers, T. and Wong, B., 2010. Organizational impact of system quality, information quality, and service quality. *Journal of Strategic Information System*. 19 (3) pp. 207-228.

Ho Cheong, J. and Park, M.C., 2005. Mobile internet acceptance in Korea. *Internet research*, 15 (2) pp. 125-140.

Hu, Q. and Quan, J.J., 2005. Evaluating the impact of IT investments on productivity: a causal analysis at industry level. *International Journal of Information Management*, 25 (1) pp. 39-53.

Hussein, S.A., 2009. *An empirical investigation of information systems success: an analysis of the factors affecting banking information systems success in Egypt*. PhD thesis, University, International Conference on Information System.

Jiang, J.J., Klein, G., Parolia, N. and Li, Y., 2012. An analysis of three SERVQUAL variations in measuring Information System Service quality. *Electronic. Journal Information Systems Evaluation,* 15 (2) pp. 149-162.

Kamel, H. and Hassan, I., 2003. A study on risk factors of Internet Banking. *International Journal of E-Banking*, 5 (4) pp. 17-22.

Kettinger, W.J. and Lee, C.C., 1997. Pragmatic perspectives on the measurement of Information Systems service quality. *MIS Quarterly*, 21 (2) pp. 223-240.

Koo, C.A. and Wati, Y., 2010. Toward an Understanding of the Mediating Role of "Trust" in Mobile Banking Service: An Empirical Test of Indonesia Case. *Journal of Universal Computer Science*, 16 (13) pp. 1801-1824.

Koo, C.A., Wati, Y. and Chung, N., 2013. A Study of mobile and internet banking service: applying for IS Success Model. *Asia Pacific Journal of Information Systems*, 23 (1) pp. 65- 86.

Lee, Y.W., Strong, D.M., Kahn, B.K. and Wang, R.Y., 2002. AIMQ: a methodology for information quality assessment. *Information & Management*, 40, pp. 133-146.

Lucas, H.C., 1975. The use of an accounting information system, action, and organizational performance. *The Accounting Review*, vol.4, pp. 735-746.

Maçada, C.G, Beltrame, M.M., Dolci, P.C. and Becker, J.L., 2012. IT business value model for information intensive organizations. *BAR-Brazilian Administration Review*, 9 (1) pp. 44-65.

Mahmood, M.A. and Burn, J., 2000. Variables affecting information technology End-User Satisfaction: a meta-analysis of the empirical literature. *International Journal of Human-Computer Studies*, 52 (5) pp. 751-771.

Manchanda, A. and Mukherjee, S., 2014. An empirical application of DeLone and McLean model in evaluating decision support system in the banking sector of Oman. *Journal of International Technology and Information Management*, 23 (2) pp. 47-59.

Mashhour, A., 2008. A Framework for evaluating the effectiveness of Information systems at Jordan banks: An empirical study. *Journal of Internet Banking and Commerce*, 13 (1) pp. 1-14.

Mason, R.O., 1978. Measuring information output: A communication systems approach. *Information &. Management*, 1 (5) pp. 219-234.

McLaren, T.S., Head, M.M., Yan, Y. and Chan, Y., 2011. A multilevel model for measuring fit between a firm's competitive strategies and information systems capabilities. *MIS Quarterly,* 35 (4) pp. 909-941.

Nelson, R.R., Todd, P.A. and Wixom, B.H., 2005. Antecedents of information and system quality: an empirical examination within the context of data warehousing. *Journal of Management Information Systems*, 21 (4) pp. 199-235.

Okechi, O. and Kepeghom, O.M., 2013. Empirical evaluation of customers' use of electronic banking systems in Nigeria. *African, Journal of Computing & ICT*, 6 (1) pp. 7-20.

Oliveira, T., Faria, M., Thomas, M.A. and Popovič A., 2014. Extending the understanding of mobile banking adoption: When UTAUT meets TTF and ITM. *International Journal of Information Management*, 34 (5) pp. 689-703.

Padinha, B. and O'Neill, H., 2016. Information systems design and User Satisfaction: A banking case study. *Atas da Conferência da Associação Portuguesa de Sistemas de Informação,* 15 (5) pp. 17-35.

Palmer, J.W. and. Griffith, J.W., 1998. Information intensity: a paradigm for understanding web site design. *Journal of Marketing Theory and Practice*, 6 (3) pp. 38-42.

Parasuraman, A., Berry, L. and Zeithaml, V.A., 1988. SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. *Journal of Retailing*, 64 (1) pp. 12-40.

Patel, K., and Brown, I., 2016. Towards a Theory of Multi-Channel Banking Adoption amongst Consumers. *The Electronic Journal Information Systems Evaluation,* 19 (3) pp. 137-157.

Petter, S. and McLean, E.R., 2009. A meta-analytic assessment of the DeLone and McLean IS success model: an examination of IS success at the individual level. *Information & Management*, 46 (3) pp. 159-166.

Petter, S., DeLone, W.H. and McLean, E.R., 2008. Measuring information systems success: models, dimensions, measures, and interrelationships. *European Journal of Information Systems*, 17 (3) pp. 236-263.

Petter, S., DeLone, W.H. and McLean, E.R., 2012. The past, present, and the future of IS Success. *Journal of the Association for Information Systems*, 13 (5) pp. 341-362.

Petter, S., DeLone, W.H. and McLean, E.R., 2013. Information system success: the quest for the independent variables. *Journal of Management Information Systems*, 29 (4) p. 7-62.

Pikkarainen, T., Pikkarainen, K., Karjaluoto, H. and Pahnila, S., 2004. Consumer acceptance of online banking: an extension of the technology acceptance model. *Internet research*, 14 (3) pp. 224-235.

Pitt, L.F. Watson, R.T. and Kavan, C.B., 1995. Service quality: a measure of information systems effectiveness. *MIS Quarterly*, 19 (2) pp. 173-187.

Pitt, L.F. Watson, R.T. and Kavan, C.B., 1997. Measuring information systems service quality: concerns for a complete canvas. *MIS Quarterly*, 21 (2) pp. 209-221.

Porter, M.E and Millar, V. 1985. How information gives you competitive advantage. *Harvard Business Review*, 63 (4) pp. 149-160.

Romi, I.M., 2013. Testing DeLone and MacLean's model in financial institutions. *American Academic & Scholarly Research Journal*, 5 (3) pp. 121-129.

Saleem, Z. and Rashid, K., 2011. Relationship between customer satisfaction and mobile banking adoption in Pakistan. *International Journal of Trade*, *Economics and Finance*, 2 (6) pp. 537.

Sedara, D. and Gable, G., 2004. A factor and structural equation analysis of the enterprise systems success measurement model. *International Conference on Information Systems*, Washington DC.

Seddon, P.B., 1997. A respecification and extension of the DeLone and McLean Model of IS success. *Information Systems Research,* 8 (3) pp. 240-254.

Shih, Y.Y. and Fang, K., 2006. Effects of network quality attributes on customer adoption intentions of internet banking. *Total Quality Management & Business Excellence*, 17 (1) pp. 61-77.

Straub, D., Boudreau, C. and Gefen, D., 2004. Validation guidelines for IS positivist research. *The Communications of the Association for Information Systems*, 13 (1) pp. 63.

Strong, D., Lee, Y. and Wang, R., 1997. Data quality in context, *Communication of the ACM*, 40 (5) pp. 103-110.

Urbach, N., Smolnik, S. and Riempp, G., 2008. A methodological examination of empirical research on information systems success: 2003 to 2007. *Proceedings of the 14th Americas Conference on Information Systems*, Toronto, Ontario, Canada.

Vaezi, R., Mills, A., Chin, W. and Zafar, H., 2016. User Satisfaction Research in Information Systems: Historical Roots and Approaches. *Communications of the Association for Information Systems*, 38 (27) pp. 501-532.

Van Dyke, T.P., Kappelman, L.A. and Prybutok, V.R., 1997. Measuring information systems service quality: Concerns on the use of the SERVQUAL questionnaire. *MIS Quarterly*, 21 (2) pp. 195-208.

Wang, R.Y. and Strong, D.M., 1996. Beyond accuracy: what data quality means to data consumers. *Journal of Management Information Systems*, 12 (4) pp. 5-33.

Wang, Y.S. and Liao, Y.W., 2008. Assessing E-Government systems success: A validation of the DeLone and Mclean model of information systems success. *Government Information Quarterly*, (25) pp. 717-733.

Wang, Y.S., 2008. Assessing E-Commerce Systems Success: A Respecification and Validation of the DeLone And McLean Model of IS Success. *Information Systems Journal*, 18 (5) pp. 529-557.

Wang, Y.S., Wang, Y.M., Lin, H.H. and Tang, T.I., 2003. Determinants of user acceptance of Internet banking: an empirical study, *International Journal of Service Industry Management*. 14 (5) pp. 501-519.

Wixom, B.H. and Todd, P.A., 2005. A theoretical integration of User Satisfaction and technology acceptance. *Information Systems Research*, 16 (1) pp. 85-102.

Xu, J.D., Benbasat, I. and Cenfetelli, R.T., 2013. Integrating service quality with system and information quality: an empirical test in the E-service context. *MIS Quarterly*, 37 (3) pp. 777-794.

Yang, Z., Cai, S., Zhou, Z. and Zhou, N. 2005. Development and Validation of an Instrument to Measure User Perceived Service Quality of Information Presenting Web Portals. *Information & Management*, 42 pp. 575-589.

Appendix

Appendix A- Study of IS in banking sector

Year	Author	Conceptual framework	Sector	Quality variables and items	Satisfaction variable and item
2015	Baptista and Oliveira	The Unified Theory of Acceptance and Use of Technology (UTAUT)	Mobile banking	No	No
2014	Manchanda and Mukherjee	An empirical application of ISSM	Banking Sector of Oman	System quality: 6 items: Information that you need, content meets your need, seem to be just about exactly what you need, provides sufficient information, user friendly, easy to use. Information quality: 6 items: accurate, accuracy, useful format, is clear, information that you need in time, provides up-to-date information. Service quality: perception regarding the IT department: 22 items.	User satisfaction with DSS: 4 items: DSS meets the information processing needs of your area of responsibility; DSS is efficient; DSS is effective; Overall, your satisfaction with DSS.
2014	Oliveira, et al.	Task Technology Fit (TTF); Initial Trust Model (ITM); UTAUT	Mobile banking	No	No
2013	Aburas and Raihan	Framework of Wang and Strong (1996) Information services rendered to banks customers.	Banking sector	Information service qualities	
2013	I.M. Romi	ISSM model	American financial institutions	System quality: 6 items: reliability, easy to learn, ease of use, user pre-emptive, flexibility, integration Information quality: 8 items: availability, timeliness, relevancy, accurate, appropriateness, interpretability, completeness, concise representation IS service quality: 4 items: services reliability, assurance, empathy, security	User satisfaction: 5 items
2013	Okechi and Kepeghom,	ISSM model	Electronic banking systems in Nigeria	No	No
2013	Koo, et al.	ISSM model	Mobile and Internet Banking Service	Information quality: 5 items: complete, correct, well formated, up to date, reliability and securely; System quality: 4 items: flexibility, integration, accessibility, timeliness	End user Satisfaction (consumers), 3 items
2011	Saleem and Rashid	Theory of Planned Behavior (TPB), Innovation Diffusion Theory, TTF, Technology Acceptance Model, ISSM model	Customer satisfaction and mobile banking adoption in Pakistan	No	No

Year	Author	Conceptual framework	Sector	Quality variables and items	Satisfaction variable and item
2009	Hussein	ISSM model An empirical investigation of information systems success	banking information systems success in Egypt.		
2008	Mashhour,	No	Banks and other financial institutions in Jordan	No	No
2005	Ho Cheong and Park		Mobile internet acceptance		
2004	Pikkarainen, et al.	Technology Acceptance model (TAM)	Online banking	Information online banking Quality of internet connection Security and privacy	
2003	Wang, et al.	TAM	Internet banking:	No	No
2003	Adamson and Shine	TAM	Bank's treasury	No	No
2003	Kamel and Hassan	TAM	Egyptian banking sector in general and electronic retail banking delivery channels in particular.	No	No

Appendix B– Final questionnaire

Items	Dimension	Codes	Adapted
Globally, the functionalities of the Information System (applications, programs, software, Intranet, etc.) correspond exactly to my needs	Functional quality	SQ1	Delone et McLean (2003) ; Sedera et Gable (2004)
My Information System allows me to carry out all aspects of my work		SQ2	Delone et McLean (2003) ; Sedera et Gable (2004)
My Information System responds rapidly to my requests		SQ5	Nelson et al. (2005)
In general, I find that my Information System is of good quality		SQ6	Nelson et al. (2005) ; Wixom et Todd (2005)
My Information System allows me to obtain the information I need easily		SQ7	Nelson et al. (2005)
My Information System is protected against data loss	Control of technical risk	SQ9	Etezadi-Amoli et Farhoomand (1996)
My Information System is protected against unauthorized access		SQ10	Etezadi-Amoli et Farhoomand (1996)
My Information System provides me with accurate information	Intrinsic quality	IQ1	Wixom et Todd (2005)
My Information System provides me with reliable information		IQ2	Doll et Torkzadeh (1988) ; Chang et King (2005)
In general, I find that the information coming from my Information System is of good quality		IQ3	Wixom et Todd (2005)
My Information System provides me with information at a level of detail and precision appropriate for my work		IQ4	Created
My Information System provides me with information that is clearly presented on the screen	Ergonomic quality	IQ5	Lee et al. (2002) ; Wixom et Todd (2005)
My Information System provides me with information that is clear and understandable		IQ6	Lee et al. (2002)
My Information System provides me with information that is easy to find		IQ7	Lee et al. (2002) ; Wixom et Todd (2005)
The behavior of the support service employees inspires me with confidence		SERVQ 1	Kettinger et Lee (1997)
Globally, I find that the quality of service provided by the support service employees is good		SERVQ 2	Yang et al. (2005)
The support service employees are always willing to help me		SERVQ 3	Kettinger et Lee (1997)
The support service employees have the competence required to respond to my needs		SERVQ 4	Kettinger et Lee (1997)
The support service employees know how to adapt their language to respond to my needs		SERVQ 5	Created
My Information System really pleases me.		S1	Au et al. (2008)
I am delighted with my Information System		S2	Au et al. (2008)
Globally, I am satisfied with my Information System		S3	Au et al. (2008)