

Critical Variables that Impede Electronic Information Sharing: Administrator's and Lecturer's Standpoint

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Abstract: Prompted by the advancement of information and communication technologies and the prevalent use of smartphones, various institutions have sought to maximize modern technologies to deliver services and facilitate processes. However, numerous educational institutions and public and private universities in Iraq continue to use manual methods to exchange official and unofficial documents among departments. This situation highlights the need to implement novel technologies (both hardware and software) in educational institutions and understand the factors that hinder the adoption of electronic information sharing. This study investigated the critical variables that influence the adoption of modern communication technologies for information sharing among departments in technical institutions, particularly those in Nasiriyah. Data were gathered through questionnaires distributed among lecturers in institute departments and staff in administrative offices. A sophisticated technique called SEM-PLS was utilized to analyze raw data through SmartPLS v.3 in addition to IBM SPSS. A significant relationship was observed between complexities and intention to use and between intention to use -> EIS adoption. No other relationship showed any significant influence on the adoption or intention to use electronic information sharing among departments in the Technical Institute in Nasiriyah. Results of this study will aid decision makers from technical institutes in understanding the barriers that impede electronic information sharing. Developers and designers of e-Services systems can also refer to the results to enhance systems based on end-user requirements.

Key words: Technical institute, sharing information, Thi-Qar, SEM-PLS, SmartPLS 3, sophisticated

INTRODUCTION

Organizations in the public and private sectors around the world utilize modern Information and Communication Technologies (ICTs) (e.g., the internet, computers and smartphones) to deliver services and enhance organizational performance. In the medical sector, ICTs are adopted for sharing patient information (Simon *et al.*, 2009; Ancker *et al.*, 2012). ICTs are generally regarded as a vital component in building a modernized society (Doran *et al.*, 2014) because of their significant influence on the social, economic, cultural and political growth of nations. They have also transformed the way we live and the way we process and interpret the world. ICTs are crucial to the achievement of good governance (Srivastava and Hossain, 2014). Salamat *et al.* (2011) stated that governments of developing countries use ICTs to deliver vital services to their citizens. Obviously, ICTs have prompted important changes in the services provided by governments including license renewal and online voter registration (Hu *et al.*, 2014).

e-Services in general and information sharing in particular in Iraq are relatively new research topics that pave the way for rich research opportunities. The transition from traditional methods to electronic ones seems to be an important public policy issue in technologically advanced nations. In the area of education, ICTs are considered important in knowledge delivery but such effectiveness has yet to be acknowledged in other fields. Adeoye *et al.* (2013) noted that the transition from traditional methods to modern digital media and information has contributed to the expanding role of ICTs in education and their appeal as an effective tool has grown over time, continuing to attract users in the 21st century.

Motivation of the study: We observed the work structure and processes in the Technical Institute in Nasiriyah and found that modern technologies to reduce staff workload and ultimately improve work quality are not maximized. In reality, culture and society are forced to adapt to meet the challenges of the information age (Adeoye *et al.*,

2013). Despite the many benefits of ICTs, various public and private universities and educational institutions in Iraq continue to use manual methods in exchanging official and unofficial documents among departments (Mohammed *et al.*, 2015). The same was observed by Adeoye *et al.* (2013) who stated that ICTs have barely affected the education sector to initiate any significant change and that not many parties in this sector have fully experienced the benefits of modern communication technologies.

Considering these facts, we were motivated to conduct an empirical study with stakeholders to understand the critical factors that may influence the pre-implementation of electronic information sharing among the departments of the Technical Institute in Nasiriyah. The main empirical study was divided into several sections. This study presents the first section which is focused on the diffusion of innovation theory and trust in the internet. The rest of the main data will be published in another research series.

Literature review: Electronic information sharing contributes to the success of electronic ventures in organizations including the provision of electronic services or electronic learning. However, few researchers have focused on understanding the determinants that influence electronic information sharing in Iraq. In this study, several topics related to this phenomenon are discussed in detail.

ICTs in higher education: Education enables individuals to contribute to society (Okom, 2016). Therefore, education undeniably plays a crucial role in shaping the many aspects of society. In recent years, ICTs have become a dominant component of human activities. According to UNESCO, ICTs have even successfully entered the education sector where they have contributed

to the success of 21st century education. ICTs are also known to increase the organization and management of learning institutions as well as the value of the learning process. According to Culp *et al.* (2005), ICTs are mainly used as a tool to facilitate teaching and learning processes as an agent of change and as a central force in competitiveness, particularly in economics. Although, the significance of ICTs has been widely recognized, the impact of their applications has yet to show any extensive pattern, particularly in other fields.

Technology adoption is deemed valuable in providing the latest information to meet the needs of academic institutions (Kim-Soon *et al.*, 2014). For example, the utilization of modern technologies such as modern computer devices and the internet has changed the way higher education institutions offer their services, leading to the increased competitiveness of these institutions. Modern technologies serve as a medium for delivering knowledge and information and as a tool for advancing administrative research by Mirza and Mahmood (2012), Abbasi *et al.* (2011) and Dadzie (2005). The use of electronic service tools aligned with technological advancement enhances the quality of administrative tasks and information sharing. In universities that use modern technologies such improvements provide resources in various forms. Examples include online and offline databases as an e-Learning tool such as WebCT and blackboard. Resources may also come in the form of services such as virtual help desks and those provided via networks including intranet, the internet and local area networks. Table 1 presents prior studies on ICTs applied in higher education.

Prior works in electronic information sharing: The literature review indicates that research in the field of information exchange within departments is still in its infancy, especially in developing countries such as

Table 1: Research on ICTs in higher education

Researchers/Years	Objectives	Methods	Findings
Oliver (2002)	To explore the role of ICTs in education	Qualitative approach	The study explored the effects of ICTs on contemporary higher education and their potential future developments
Kim-Soon <i>et al.</i> (2014)	To examine the quality of e-Services and how it relates to the frequency scholars use different sources provided by e-Services	Quantitative approach	This study empirically proved the relationship between the level and frequency of use of e-Services in the learning process, research and communication
Abdelsadeq <i>et al.</i> (2014)	To investigate the effect of availability as a security factor on the success of e-Government implementation in Libyan universities. To determine the level of awareness among students of e-government implementation in higher education in Libya	Quantitative approach	In this study, the respondents reported a high percentage of "gree" answers to the factors used to examine the adoption of e-Services
Al-Nuaimi <i>et al.</i> (2014)	To propose a conceptual model for measuring e-Service quality in Malaysian universities	Qualitative approach	This study proposed a conceptual model for measuring the quality of e-Services of Malaysian universities

Table 2: Summary of studies on electronic information sharing

Researchers	Countries	Objective (s)	Method	Findings
Landsbergen, Jr. and Wolken Jr. (2001)	USA	To identify the advantages and boundaries in interoperability, to determine whether all problems are equally prevalent, to understand the meaning of interoperability leaders and their roles	Mixed method	Listed obstacles and offered suggestions for interoperability between federal agencies and state agencies, extended the theoretical model of interagency information sharing (expanded Dawe's Model)
Akbulut (2003)	USA	To investigate the factors that influence the shared knowledge among local and state agencies	Mixed method	Found that the involvement of the local government in electronic information sharing with state agencies is fixed in terms of the characteristics of the agency, environment and electronic information sharing, classified a set of 33 recommendations into three categories (i.e., agency, environment and electronic information) to increase the participation of local and state agencies
Al-Khafaji (2016)	Iraq	To propose a model for G2G interaction among local agencies	Qualitative	Proposed an electronic interaction model based on the discovery that environmental, organizational and technological factors are the major causes of electronic interactions among the personnel of local agencies in Dhi-Qar, presented a set of recommendations for enhancing G2G interaction in Dhi-Qar, as well as in other local agencies that have yet to engage in such interactions

Iraq. Only a few studies actually concentrate on this phenomenon. Table 2 shows the empirical studies on information sharing.

Diffusion of innovation theory: In IS research, Diffusion of Innovation (DOI) theory by Rogers (1995) is widely used to explain how users adopt new technologies. Innovation generally involves the creation of ideas, practices or objects that are perceived to be genuinely new by groups of people, individuals or other units (Rogers, 1995; Zaltman *et al.*, 1973). Rogers (1984, 1995) suggested qualities of innovation that drive people to adopt the innovation including complexities, observabilities, relative advantages, compatibilities and trialabilities. These qualities are widely used in research to explain the reasons behind the adoption of innovation and the diffusion of any innovations related to IT. Kwon and Zmud (1987) observed that only complexities, compatibilities and relative advantages have presented consistent patterns in explaining the critical factors related to innovation adoption. According to researchers, not all aforementioned qualities are consistent, especially observability and trialability. By contrast, researchers recognized relative advantages and compatibilities as consistent and positively correlated with innovation adoption. Complexities also maintain a consistent but negative relationship with adoption (Tomatzky and Klein, 1982).

Rogers (1995) defined relative advantages as “the degree to which an innovation is seen as being superior to its predecessor”. Comparable to TAM’s perceived ease of use construct, compatibility is “the degree to which an innovation is seen by the potential adopter as being

relatively difficult to use and understand”. Compatibility refers to “the degree to which an innovation is seen to be compatible with existing values, beliefs, experiences and needs of adopters”. Trialability is the “degree to which an idea can be experimented with on a limited basis.” Observability is the “degree to which the results of an innovation are visible”. In existing studies, different views are presented with regard to the compatibilities, complexities and relative advantages as well as their roles in innovation adoption in a broad range of areas (Tomatzky and Klein, 1982; Kwon and Zmud, 1987; Karahanna *et al.*, 1999; Perez *et al.*, 2004). Previous arguments indicate that DOI theory can be harnessed in the higher education sector. Thus, in the current study, DOI theory was considered in evaluating electronic information sharing among the departments of the Technical Institute in Nasiriyah.

Trust in the internet: Carter and Belanger (2005) noted that perceptions of trustworthiness may influence the intention of citizens to utilize modern technologies in the public sector. e-Service adoption for instance is known to be hindered by a lack of trust (Carter and Weerakkody, 2008; Wang and Emurian, 2005). Transactions between two parties are typically rooted in trust. As revealed by Pavlou (2003), the presence of risks calls for trust. Therefore, previous studies proved that the user trust in internet technology can predict the adoption of modern communication technologies (Belanger and Carter, 2008; Venkatesh *et al.*, 2003). In the present study, the adoption of electronic information sharing among the departments of a technical institute is argued to be dependent on the employee’s trust in internet technology.

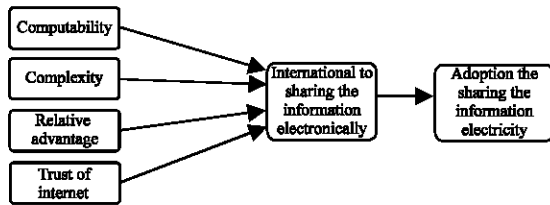


Fig. 1: Conceptual model

Conceptual model: Miles and Huberman (1994) explained that a conceptual model is a visual or written product. According to Mills *et al.* (2010) a conceptual model uses deductive research to yield general information about issues relevant to a study, i.e., literature review. Therefore, inductive research is often adopted in in-depth analyses of relevant research topics. The conceptual model for the present study is presented in Fig. 1.

MATERIALS AND METHODS

Instrument and data collection: A quantitative research design was adopted in this study. In this research design, a questionnaire survey served as the primary tool for data collection. The questionnaire was developed based on existing literature and then distributed to a random sample. Participation in the survey was completely voluntary. The objective was to understand the critical factors that may affect the pre-implementation of electronic information sharing among the departments of the Technical Institute in Nasiriyah.

Sekaran and Roger (2010) explained the significance of choosing a language for the questionnaire that perfectly suits the level of understanding of the respondents. In the present study, the questionnaire was written in Arabic and English with consideration of the use of Arabic in most public institutions in Iraq. The respondents were allowed to raise questions and were offered assistance should they require further explanation. Most of the respondents took <15 min to complete the questionnaire. A total of 64 questionnaires were returned.

The constructs of interest in this study were “EIS adoption” (ADO), “Intention To Use” (ITU), “trust in the Internet” (IOT), “complexity” (COMPX), “compatibility” (COMP) and “Relative Advantage” (RA). The theoretical constructs were obtained using validated items drawn from previous research. Specifically, ITU and ADO were measured using items adopted from the works of Davis (1989), Davis *et al.* (1989) and Naimi (2008). IOT, COMPX, COMP and RA were adopted from the works of Lean *et al.* (2009), Carter and Belanger (2005) and Slyke *et al.*

(2004). All items were measured using a 5-point Likert-type scale ranging from “strongly agree” to “strongly disagree”.

RESULTS AND DISCUSSION

Data analysis: This study used Partial Least-Squares Structural Equation Modeling (PLS-SEM) to analyze the questionnaires returned by the respondents. PLS-SEM is a comprehensive statistical approach that creates a set of simultaneous evaluations and amendments to any related conceptual model involving positive or negative latent variables (Anderson and Gerbing, 1991). PLS is widely used to test and validate theories. Fornell and Larcker (1981) explained that PLS is basically used to test psychometric properties and provide appropriate evidence of the existence of relationships. This approach matches the objective of the present study to examine the factors that may influence the adoption of electronic administration in a university. SmartPLS Version 3.0 was utilized in the data analysis of PLS-SEM. In the first step of the analysis, the measurement model was used to test the content and the convergent as well as discriminant validities of the constructs. In the second step, the structural model and hypothesis were tested.

Profile of respondents: In this study, 39% (n = 25) of the respondents were male and 61% (n = 39) were female. The education level of the respondents was categorized into several groups specifically, 47% held bachelor degrees and 11% held master degrees. Diploma and PhD holders comprised 37% and 5% of the respondents, respectively. With regard to computer experience, 41% of the respondents reported having more than 10 years of experience while the others ranged from 4-6 years (23%) and 7-9 years (36%) (Table 3).

Assessment of measurement model (outer model): The measurement model was used to assess the reliability and validity of the stated constructs. Composite reliability, convergent validity and discriminant validity were adopted as the assessment criteria (Chin, 2010; Hair *et al.* 2013). In evaluating the reliability of the reflective measurement model of PLS-SEM, indicator reliability and construct reliability should be assessed (Fig. 2).

To test and assess the reliability of each indicator, the specific loading of an indicator on its associated latent construct was examined. A loading of more than 0.7 is considered acceptable in measuring the reliability of an indicator (Hair *et al.*, 2011; Hulland, 1999). The results can be obtained with the PLS algorithm in SmartPLS.

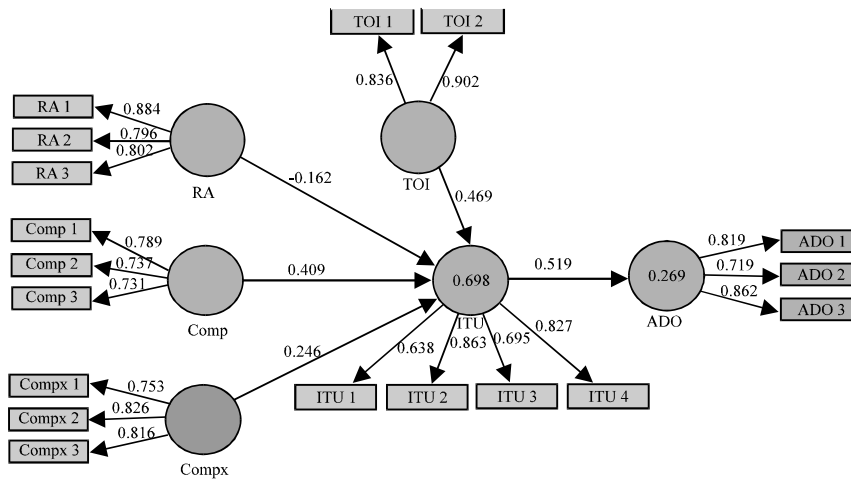


Fig. 2: Measurement model

Table 3: Sample profile

Samples	Frequency	Percentage (%)
Computer experience (years)		
4-6	15	23
7-9	23	36
More than 10	26	41
Gender		
Male	25	39
Female	39	61
Work experience (years)		
1-7	37	58
8-15	24	37
More than 15	3	5
Education level		
Diploma	24	37
Bachelor	30	47
Master	7	11
PhD	3	5

The indicators that showed loadings in the 0.4-0.7 range were suggested for removal only if CR and AVE exceeded the threshold values once the relevant item was deleted (Hair *et al.*, 2013). The CR and AVE tests were generally conducted to measure convergent validity. Fornell and Larcker (1981) noted that, the CR of each construct should exceed 0.70 and the AVE should exceed 0.50 to ensure convergent validity. In the present study, the CR and AVE values exceeded the acceptable levels. The results are presented in Table 4.

The discriminant validity was established once the square root of AVE from the stated construct exceeded the value of the correlation between that construct and another construct in the model (Chin, 1998). Table 5 reports the results of the discriminant validity based on Fornell and Larcker (1981).

The cross-loadings were obtained by correlating the component scores of each item with all the other factors involved. The items were from 0.69-0.92 at which point the cross-loading was higher than 0.05 (Chin, 1998). The constructs of all items were also relatively high (Table 6).

Table 4: Results of assessment of measurement model

Constructs/Items	Loading	CR	AVE
EIS adoption			
ADO1	0.819	0.843	0.643
ADO2	0.719		
ADO4	0.862		
Compatibility			
Comp1	0.753	0.797	0.567
Comp2	0.826		
Comp3	0.816		
Complexity			
Comp1	0.665	0.841	0.639
Comp3	0.832		
Comp4	0.791		
Intention to use			
ITU1	0.638	0.844	0.579
ITU2	0.863		
ITU3	0.695		
ITU4	0.827		
Relative advantage			
RA1	0.884	0.867	0.686
RA3	0.796		
RA4	0.802		
Trust in the internet			
TOI1	0.836	0.861	0.756
TOI2	0.902		

Table 5: Discriminant validity of variable constructs

Latent variables	1	2	3	4	5	6
ADO	0.802					
COMP	0.437	0.753				
COMPX	0.484	0.507	0.799			
ITU	0.519	0.717	0.611	0.761		
RA	0.541	0.642	0.791	0.618	0.828	
TOI	0.461	0.613	0.611	0.758	0.690	0.870

Assessment of structural model (inner model): In addition to the PLS Algorithm, the present study used a bootstrapping procedure in SmartPLS 3.0. The t-values of every path coefficient were produced along with the p-values (Table 7).

The structural model was used to estimate and evaluate the formulated hypotheses. The results showed

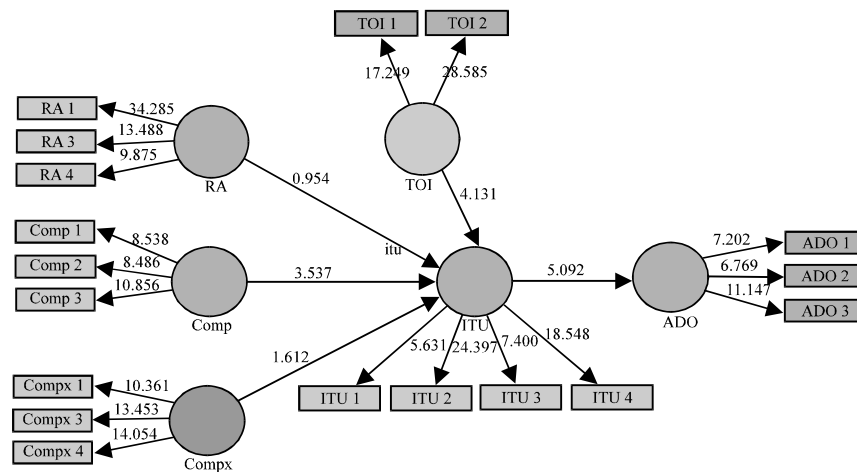


Fig. 3: Structural model

Table 6: Cross-loading factors

Factors	ADO	COMP	COMPX	ITU	RA	TOI
ADO1	0.819	0.471	0.459	0.394	0.445	0.344
ADO2	0.719	0.326	0.333	0.424	0.431	0.448
ADO3	0.862	0.789	0.374	0.424	0.422	0.313
COMP1	0.301	0.737	0.370	0.542	0.485	0.359
COMP2	0.243	0.731	0.299	0.542	0.252	0.427
COMP3	0.444	0.183	0.476	0.535	0.715	0.600
COMPX1	0.379	0.515	0.753	0.453	0.434	0.398
COMPX3	0.321	0.495	0.826	0.496	0.648	0.437
COMPX4	0.459	0.300	0.816	0.513	0.795	0.619
ITU1	0.393	0.463	0.215	0.638	0.212	0.258
ITU2	0.484	0.763	0.603	0.863	0.546	0.641
ITU3	0.280	0.608	0.387	0.695	0.402	0.441
ITU4	0.426	0.677	0.557	0.827	0.616	0.822
RA1	0.531	0.441	0.620	0.588	0.884	0.628
RA3	0.440	0.443	0.766	0.511	0.796	0.515
RA4	0.347	0.506	0.579	0.412	0.802	0.570
TOI1	0.368	0.471	0.581	0.575	0.682	0.836
TOI2	0.430	0.558	0.496	0.729	0.539	0.902

Table 7: Hypothesis testing results

Hypothesis	Relationship	Beta	SE	t values	p-values	Decision
H ₁	RA → ITU	-0.162	0.170	0.954**	0.341	Not supported
H ₂	COMP → ITU	0.409	0.116	3.537**	0.000	Supported
H ₃	COMPX → ITU	0.246	0.152	1.612**	0.108	Not supported
H ₄	TOI → ITU	0.469	0.113	0.954**	0.341	Not supported
H ₅	ITU → ADO	0.519	0.102	5.092**	0.000	Supported

** p = 0.05

that only two variables of the five exogenous latent variables were supported, namely, compatibility and intention to use ($t = 3.537$ and 5.092 , respectively) (Fig. 3).

Table 8 shows that the R^2 value for the endogenous latent construct (EIS adoption and intention to use) indicated a prediction level that appeared acceptable in the empirical research. That is, the R^2 value of the key target construct (EIS adoption and intention to use) was significantly high at 0.706. This study also supported the previous findings by utilizing the Q^2 predictive relevancy measure.

Table 8: Results of R^2 , Q^2 and f^2

Construct	R^2	Q^2	f^2
EIS adoption	0.269	0.145	-
Compatibility	-	-	0.295
Complexity	-	-	0.075
Intention to use	0.698	0.339	0.368
Relative advantage	-	-	0.024
Trust in the internet	-	-	0.337

After the blindfolding procedure in SmartPLS 3.0 with an omission distance of $D = 7$, the Q^2 value (0.35) for electronic administration adoption was obtained. The Q^2 was well above zero which indicated the predictive relevance of the path model. This empirical study also measured the f^2 value for the supported variables (intention to use compatibility, complexity, relative advantage and trust in the internet). As shown in Table 7, intention to use trust in the internet and compatibility have a large effect size. By contrast, the effect size of complexity and relative advantage was moderate.

CONCLUSION

Despite the growing utilization of electronic services in various settings, their adoption remains limited in public institutions, especially those in developing countries. Nariman and Yamamoto and Seifert argued that interactions are relatively simple and thus include information provision. According to Cloutier interactions involve the exchange of information through using ICTs as the medium. In current conditions, the application of electronic information sharing among departments in public government is vital. However, only a handful of empirical studies have explored electronic information sharing in the education sector in Iraq. This deficiency prompts the need to understand the factors that boost people's intention to use electronic administration systems from the empirical, theoretical and managerial

points of view. The present study explored the factors that may influence electronic information sharing among departments of technical institutions in Iraq. The respondents included employees with experiences in the use of computers or other modern technologies. Questionnaires were distributed as a tool for data collection.

As for data analysis, PLS-SEM was used to analyze and interpret the proposed path model. In the first stage, the reliability and validity measurement model was utilized. In the second stage, an examination of the structural model began with an interpretation of the path coefficients, in addition to identifying the adequacy of the path model. Results of the measurement model indicated that all measures were generally valid and reliable. The structural model analysis revealed that some hypotheses were supported.

The developed path model can serve as a reference for future studies on the adoption of electronic information sharing systems in the public sector in general and universities in particular. This study likewise enriches the literature by shedding light on the factors that affect the adoption of electronic information sharing systems in developing countries such as Iraq.

As expected, this study presented a number of limitations. The population size that participated in the empirical study was small and the study focused only on one technical institute in Iraq. Therefore, future research should explore the topic in the context of the public or private sector, especially in Iraq. This research direction is important because the rate of adoption and use of modern technologies remains limited and not many studies have explored the reasons behind the scarcity of the adoption and use of these technologies.

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