EDMS Use in Local E-Government: Extent of Use and Overall Performance Mediated by Routinization and Infusion

Completed Research Paper

Carlos Miguel Afonso
University of the Algarve
cafonso@ualg.pt
José L. Roldán
Universidad de Sevilla
jlroldan@us.es

Andrew Schwarz
Louisiana State University
aschwarz@lsu.edu
Manuel J. Sánchez-Franco
Universidad de Sevilla
majesus@us.es

Abstract

This study analyzes the effects of several post-adoption behaviors (extent of use, routinization and infusion) on overall performance in using an Electronic Document Management System (EDMS). Furthermore, we test whether the routinization and infusion variables mediate the influence of the extent of use on overall performance. This research collects data from a survey answered by 2,175 employees (EDMS users) of Portuguese municipalities. The Partial Least Squares technique is applied to test the model. The results showed that routinization is directly predicted by the extent of use, whereas infusion is directly affected by the extent of use and also by routinization. Consequently, such post-adoptive behaviors are interrelated not only in a sequential process, but also in parallel. In addition, overall performance is directly influenced by routinization and infusion. Finally, an indirect effects analysis shows that routinization and infusion mediate the relationship between extent of use and overall performance.

Keywords

Post-adoption behaviors, overall performance, partial least squares, edms, e-government.

Introduction

Electronic Document Management Systems (EDMS) are organizational information systems and technology (IST), which emerged from the 90s to manage digital documents for organizational needs (Sprague, 1995). EDMS allow organizations to carry out documental records management, to improve management processes, the organizational communication of concepts and ideas, to manage knowledge, and to enhance the efficiency of activities, and they have an important role in organizational memory (Borglund & Sundqvist, 2007; Hjelt & Björk, 2007; Sprague, 1995). Furthermore, EDMS enable governmental organizations and municipal councils to secure document transfers and to comply with legislative requirements (Wilkins et al., 2009; Sprehe, 2005). Despite all the potential benefits resulting from implementing EDMS in organizations, its success depends on the use that the great majority of employees make of the system (Johnston & Bowen, 2005; Gunnlaugsdottir, 2008). Therefore, a low use of this IST produces a low level of productivity (Venkatesh & Davis, 2000) and a high level of use potentially leads to better performances (Sundaram et al., 2007). In this way, to obtain benefits with a better performance, the use of EDMS (extent of use) is a necessary but not sufficient condition. The use of EDMS by employees must be active and thorough.

Though the research stream related to the benefits resulting from EDMS use is important, it has been scantly expressed (e.g., Borglund & Sundqvist, 2007; Cho, 2007; Bhattacherjee et al., 2008; Gunnlaugsdottir, 2008; vom Brocke et al., 2011). This is why it is appropriate to develop more research to

address more insights about the link between EDMS uses and their results. Therefore, we intend in our work to study various types of use of EDMS, beyond the traditional measure of usage based on the frequency and amount of use (extent of use). These different types of post-adoption behaviors are a use integrated into the work routine (routinization) and a use that enhances individuals' work productivity (infusion) (Sundaram et al., 2007). We also want to study how these various types of use relate to each other and how they affect the results of the use of an EDMS by a user. Furthermore, an analysis of the indirect relations is performed with the aim of assessing whether the routinization and infusion variables mediate in the relationship between extent of use and overall performance.

In order to accomplish the research objectives proposed, this work is organized as follows. At the beginning, we present a literature review related to overall performance and the three types of post-adoption behaviors that we intend to explore and also connect to the various relationships between them. As a result of this literature review, some hypotheses are proposed. Next, the research method is shown, followed by the results. A discussion of these results is addressed, based on an analysis of the data collected from a survey answered by 2,175 employees. The last section includes the conclusion, with the practical implications of the results for the work for managers and professionals. The limitations identified in this study are also offered.

Literature Review and Research Hypotheses

Overall Performance

The use of IST plays a central role in IS (information systems) research (DeLone & McLean, 1992). This use is necessary for the performance improvement of individuals, groups and organizations (Myers et al., 1996). We can find some research related to the benefits of EDMS resulting from features (e.g., Sprague, 1995; Zantout & Marir,1999), implementation (e.g., Sprehe, 2000), and adoption (e.g., Bhattacherjee et al., 2008; Borglund & Sundqvist, 2007; vom Brocke et al., 2011; Cho, 2007; Gunnlaugsdottir, 2008). Research explicitly related to the benefits of EDMs has also been identified (e.g., Johnston & Bowen, 2005; Smyth, 2005; Sprehe, 2005; Wandryk, 1995; Wilkins et al., 2009). In the well-known IS success model, with the aim of keeping the research model simple, only net benefits were used to refer to individual, organizational, and societal impacts (DeLone & McLean, 2003). This approach was possible because these three impact variables are extraordinarily correlated. Overall performance will here be conceptualized as a broad concept that includes individual, workgroup and organizational performance. Individual performance is understood as being the effect of EDMS use on an employee's work performance, usually measured by the increase in individual productivity and also by improving the decision capacity (Ifinedo et al., 2010). Group performance is the impact of EDMS use on subunits or departments of an organization, often measured by improving coordination, interdepartmental communication and productivity (Ifinedo et al., 2010). Organizational performance is usually measured by improvements in customer service, decision-making processes , among others (Ifinedo et al., 2010). To sum up, when the resulting effect of EDMS on an individual performance is strong, it is likely that the performance impact of the working group to which it belongs will also be strong. Furthermore, it is expected that the entire organization will get positive results when its units are positively affected (Ifinedo et al., 2010).

The Role of Extent of Use

Traditionally, usage has been measured as the amount or frequency of use (Schwarz & Chin, 2007), and this is the traditional surrogate measure of the acceptance of an IS (Saga & Zmud, 1994). We then conceptualize extent of use as a combination of the duration and frequency of use. On the other hand, routinization is defined as the extent to which the use of technology has been integrated into the normal work routine of a user, so the EDMS use is no longer perceived as out-of-the-ordinary but actually becomes institutionalized (Saga & Zmud, 1994). Routinization means an efficient use of the EDMS. Research results suggest an interrelationship between extent of use and routinization (Sundaram et al., 2007). It is expected that a greater extent of EDMS use could achieve and support a routinization level having the consequences of the EDMS use integrated into the employee work routine. From the above, the following hypothesis is presented:

H1: Extent of use has a positive influence on routinization

The full degree of potential offered by an EDMS goes beyond the routinization stage (Sundaram et al., 2007). Therefore, we define infusion as the extent to which an EDMS user utilizes this system to its fullest degree to maximize its potential (Jones et al., 2002). Infusion involves the idea of effective use. Hall and Loucks (1977) observe that a continued interaction with an IS (i.e., extent of use) can lead to achieving a higher level of use, that is, infusion. It is expected that a higher extent of EDMS use could achieve and support an infusion level having the consequences of higher productivity, but less strong than if it were integrated into the employee work routine (Jones et al., 2002; Sundaram et al., 2007). Thus, we hypothesize:

H2: Extent of use has a positive influence on infusion

The role of Routinization

As EDMS users become familiar with this IS, they might not be satisfied with the current use situation and may, exploring, find more useful functionalities to support their work tasks (Saga & Zmud, 1994). Therefore, through direct experience and learning processes accumulated in prior stages, users who attain the routinization level have the potential to use an EDMS in a more comprehensive and sophisticated manner, allowing them to attain the infusion stage (Po-An Hsieh & Wang, 2007). For instance, the digitalization of work leads to a decline in the substitutable routine labor and an increase in non-routine cognitive labor (Bhansali & Brynjolfsson, 2007). We therefore present the following hypothesis:

H3: Routinization has a positive influence on infusion

Routinization is a consequence of a learning process known as exploitation, which can improve performance outcomes (Po-An Hsieh & Zmud, 2006). Exploitation is linked to the routine execution of knowledge (March 1991). That is, the improvement of existing competencies by using what has already been learnt; namely, by adaptation. Its results are predictable, achieved quickly and positive, leading to foreseeable and immediate benefits for EDMS users in the short run (Burton-Jones & Straub, 2006). Therefore, it is expected that this level of EDMS use should enable an increase in overall performance, with a stronger effect than simple use and with a less significant effect than infusion. Therefore we hypothesize:

H4: Routinization has a positive influence on overall performance

The role of Infusion

Infusion is achieved through the direct experience of users with the EDMS and an associated learning process known as exploration (March, 1991). This enables EDMS users to use this system to its full potential. Particularly, exploration allows the search for novel or innovative ways of doing things with an EDMS (Burton-Jones & Straub, 2006). Although, its results are not clearly certain in the short-term, long-run performance depends on sustaining a reasonable level of exploration (March, 1991). Indeed, when EDMS users achieve a higher level of usage this may allow them to exploit the fullest potential of an SNS, resulting in more positive overall performance (Cooper & Zmud, 1990). For instance, the increase in non-routine cognitive labor and in value-adding communication activities leads to performance improvements and less stressed-out, happier and more productive employees (Bhansali & Brynjolfsson, 2007; Sundaram et al., 2007). From the above, the following proposition is presented:

H5: Infusion has a positive influence on overall performance

Method

In terms of epistemology, this study uses a positivist approach generally followed in investigations applying structural equation modeling (Roldán & Sánchez-Franco, 2012). Regarding the methodology, the study pursues a quantitative research methodology, using the following methods: literature review, empirical work with primary data collection through a structured on-line questionnaire with closed questions, descriptive statistical techniques, and, to evaluate the model of the study, a variance-based structural equation modeling (Partial Least Squares - PLS). As the methods selected for this investigation are consistent with IS research recommendations (Straub et al., 2004) of the guidelines for the validation of positivist research in information systems, rigorous research is provided.

Participants

An on-line survey was developed to gather information from 2,715 valid responses, allowing the measuring of the post-adoption behaviors and overall performance from using an EDMS in Portuguese municipalities. We applied a pre-questionnaire to validate the understanding of the meaning of the items by the EDMS users. This was given to employees of municipalities who are users of the system under study and members of a focus group. A simulation of sending the invitation message was also carried out. The development of this process resulted in some changes in some statements, formats and also in the correction of some errors. This pre-test process was repeated until we realized that the research tool was ready to be applied.

We sent to all the 308 Portuguese municipalities an e-mail message of invitation: "Request for collaboration in a research project". Nearly 10% responded within a period of 15 days. Given the small number of responses, there was a follow-up by telephone (Urbach & Ahlemann, 2010). This approach resulted in a total of 96 municipalities agreeing to participate. From this total, 25 municipalities with the system used to record correspondence or with the system still being installed were not used in this study.

The participating municipalities had to have a working EDMS and have started the process of the dematerialization of documents and processes. The Presidents of the 71 municipalities involved in the research indicated an employee to send the on-line survey address to the registered EDMS users. The sending of these electronic mail messages to "Request for the participation of EDMS users" started 15 days after the municipalities were contacted; reminder messages were sent at intervals of about 15 days (Urbach & Ahlemann, 2010). The power analysis approach was used for the analysis of the necessary number of responses. The required 599 (Green, 1991) responses for an alpha value of 0.05, a high power of 0.80, a small effect size and four predictors were largely exceeded. Detailed descriptive statistics relating to the respondents' characteristics are shown in Table 1.

Measure (responses = 2175)	Items	Frequency	Percent
Gender	Male	748	34%
	Female	1427	66%
Age	< 24	12	0.6%
	25-34	634	29.1%
	35-44	921	42.3%
	45-54	501	23.0%
	>55	107	4.9%
Education	Less than Secondary school	112	5.2%
	Secondary school	802	36.9%
	University	1089	50.1%
	Master	167	7.7%
	PhD	5	0.2%
EDMS Experience	< 2 years	546	25.1%
	2-5 years	1281	58.9%
	> 5 years	348	16.0%
Internet Experience	<=7 years	364	16.7%
	8-10 years	502	23.1%
	11-13 years	577	26.5%
	14-16 years	467	21.5%
	>=17 years	265	12.2%
Municipality Region	Littoral	1953	89.8%
	Interior	222	10.2%

Table 1. Descriptive statistics of the respondents' characteristics.

Measures

The questionnaire was designed from a comprehensive literature review. Validated instruments adapted from prior studies have been selected to measure use, routinization, infusion and overall performance. All the selected scales have been modified to make them relevant to the EDMS-based context (all items appear in Appendix A). In particular, the variable extent of use was self-reported and was measured by three items adapted from Moon and Kim (2001). First, respondents were asked how many hours they had used the EDMS in the last week. Second, respondents were asked to rate their EDMS use intensity on a seven-point scale ranging from extremely infrequent to extremely frequent. Third, respondents were asked to rate their EDMS usage on an eight-point scale ranging from not at all to several times a day. For the items of the rest of the constructs, a seven-point Likert scale was applied, ranging from "completely disagree" (1) to "completely agree" (7). In this vein, the routinization measure has been adapted from Sundaram et al. (2007). The infusion scale has been taken from the study of Jones et al. (2002). These three previous variables have been modeled as first order reflective constructs. On the other hand, overall performance has been designed as a superordinate multidimensional construct (Polites et al., 2012) that is reflected in three reflective dimensions: individual impact (II), workgroup impact (WI) and organizational impact (OI). These dimensions have been measured with items proposed by Ifinedo et al. (2010). In order to achieve the content validity, a pilot test was carried out with five IS and business professors.

Data Analysis

The research model proposed has been assessed using Partial Least Squares (PLS), a variance-based structural equation modeling (Reinartz et al., 2009). PLS has been chosen based on the following grounds (Roldán & Sánchez-Franco, 2012): (1) This research is focused on the prediction of the dependent variables; (2) the phenomenon under research has not yet been studied in depth; (3) the research model is complex in terms of the number of indicators, the types of relationships (direct and indirect), and the levels of dimensionality; (4) we use latent variables scores in subsequent analysis for a predictive relevance. Overall performance, as a superordinate multidimensional construct, has been operationalized applying a two-stage approach (Wright et al., 2012). We have used SmartPLS software (Ringle et al., 2005).

Results

Measurement Model

The results show that the measurement model satisfies all common requirements (Roldán & Sánchez-Franco, 2012). Individual item reliability is adequate when an item has a factor loading that is greater than 0.7 for its construct or dimension. In our study, reflective indicators and dimensions meet this requirement (Table 2).

	Extent of use	Routinization	Infusion	Overall performance
eu1	**0.868**	0.697	0.458	0.254
eu2	**0.861**	0.644	0.484	0.321
eu3	**0.734**	0.459	0.386	0.190
rot1	0.633	**0.902**	0.565	0.413
rot2	0.718	**0.953**	0.636	0.436
rot3	0.705	**0.927**	0.595	0.416
inf1	0.551	0.657	**0.910**	0.511
inf2	0.507	0.599	**0.917**	0.506
inf3	0.269	0.339	**0.730**	0.403
inf4	0.491	0.587	**0.895**	0.535
II	0.318	0.435	0.574	**0.925**
WI	0.285	0.420	0.508	**0.938**
OI	0.274	0.413	0.496	**0.929**

Table 2. Loadings and cross-loadings.

Since all composite reliabilities and Cronbach´s alphas are greater than 0.7 (Table 3), the model presents reliable constructs and dimensions. Convergent validity is assessed using the average variance extracted (AVE). All reflective constructs and dimensions attain convergent validity because their AVE figures surpass the 0.5 level (Table 3). Finally, all variables achieve discriminant validity. Confirmation of this validity comes, on the one hand, from the cross loadings analysis (Table 2) and, on the other hand, from the comparison of the square root of AVE versus correlations (Table 3).

Composite reliability	Cronbach´s alpha	AVE		EU	ROT	INF	OP
0.863	0.762	0.678	EU	**0.823**			
0.949	0.918	0.860	ROT	0.740	**0.927**		
0.923	0.888	0.751	INF	0.540	0.646	**0.867**	
0.951	0.923	0.866	OP	0.315	0.455	0.567	**0.931**

Notes: 1) Diagonal elements (bold) are the square roots of the variance shared between the constructs and their measures (AVE). Off-diagonal elements are the correlations between constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements. 2) EU: Extent of Use; ROT: Routinization; INF: Infusion; OP: Overall Performance.

Table 3. Construct reliability, convergent validity and discriminant validity

Structural Model

The assessment of the structural model is based on the algebraic sign, magnitude and significance of the structural path coefficients, the R^2 values, and the Q^2 test for predictive relevance. Bootstrapping (5000 resamples) is used to generate standard errors and t-statistics (Hair et al., 2011), which allow the evaluating of the statistical significance of path coefficients. Concurrently, percentile bootstrapping confidence intervals of standardized regression coefficients are given. In this manner, all hypotheses are supported since the five direct relationships depicted in the research model are positive and significant (Figure 1, Table 4). In accordance with Chin (1998), we achieve moderate values of variance explained in the dependent constructs since R^2 values are above 0.33 (Table 4). In addition, cross-validated redundancy measures confirm that the structural model has satisfactory predictive relevance for the three endogenous constructs ($Q^2 > 0$). Finally, Table 4 shows the amount of variance that each antecedent construct explains on each dependent variable. In this way, we would like to highlight that while routinization explains only 6.87% of the variance of overall performance, the infusion variable manages to explain 26.65%.

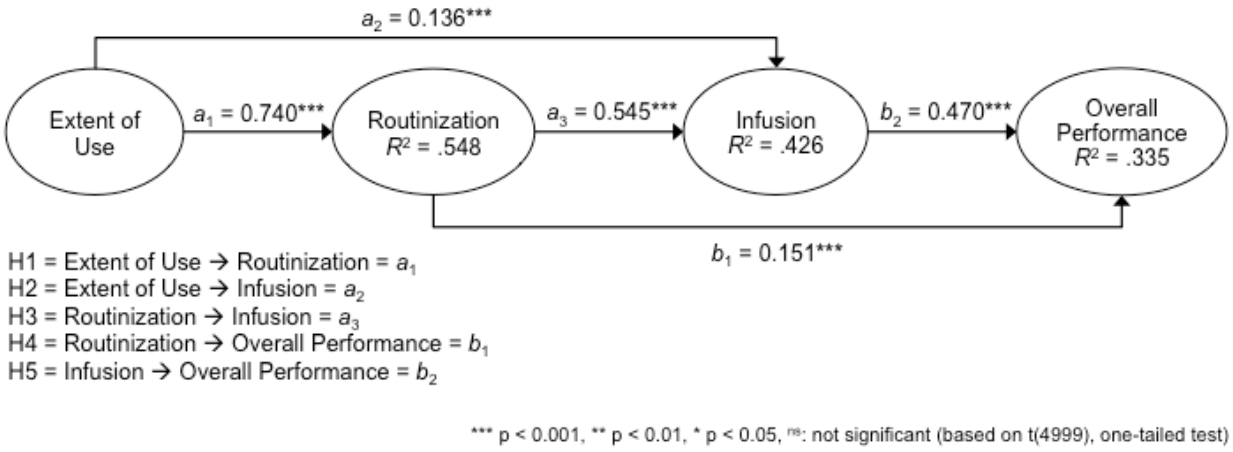

Figure 1. Structural model results

	Direct effect	*t*-value	Explained variance	Percentile 95% confidence intervals		
Routinization (R^2 = 0.548 / Q^2 = 0.470)						
EU (a_1)	0.740 ***	66.841	54.77%	0.718	0.761	Sig.
Infusion (R^2 = 0.426 / Q^2 = 0.300)						
EU (a_2)	0.136 ***	5.256	7.37%	0.084	0.188	Sig.
ROT (a_3)	0.545 ***	21.469	35.25%	0.495	0.597	Sig.
Overall Performance (R^2 = 0.335 / Q^2 = 0.269)						
ROT (b_1)	0.151 ***	5.746	6.87%	0.099	0.201	Sig.
INF (b_2)	0.470 ***	19.633	26.65%	0.423	0.515	Sig.

Notes: 1) EU: Extent of Use; ROT: Routinization; INF: Infusion; OP: Overall Performance. 2) *** p < 0.001, (based on t(4999), one-tailed test), t(0.001, 4999) = 3.09. Sig. denotes a significant direct effect at 0.05

Table 4. Effects on endogenous variables.

Finally, a post-hoc indirect effect analysis is presented. In this way, we have followed the analytical approach proposed by Preacher and Hayes (2008) to test the following mediated relationships: a_1b_1, a_2b_2, and $a_1a_3b_2$. Chin (2010) proposes a two-step procedure for testing mediation in PLS: (1) use the specific model in question with both direct and indirect paths included and perform N bootstrap resampling and explicitly calculate the product of the direct paths that form the indirect path being assessed. (2) Estimate the significance using percentile bootstrap (Williams & MacKinnon, 2008). This generates a 95% confidence interval (CI) for the indirect relationships. As Table 5 shows, all the indirect relations are significant. This means that the routinization and infusion dimensions mediate the influence of use on overall performance.

Indirect effect	Point estimate	Percentile bootstrap 95% confidence interval	
		Lower	Upper
a_1b_1 = EU → ROT → OP	0.149	0.073	0.149
a_2b_2 = EU → INF → OP	0.089	0.040	0.089
$a_1a_3b_2$ = EU → ROT → INF →OP	0.218	0.162	0.218
Total	0.396	0.334	0.396

Note: 1) EU: Extent of Use; ROT: Routinization; INF: Infusion; OP: Overall Performance.

Table 5. Indirect effects of extent of use on overall performance

Discussion

Theoretical Implications

This study addresses the behavior and interrelationships of different types of use – extent of use, routinization and infusion – contributing to a growing research interest in understanding different types of IST use (e.g., Burton-Jones & Straub, 2006; Gharavi & Carter, 2009; Jones et al., 2002;McLean et al., 2011; Sundaram et al., 2007; Schawartz & Chin, 2007; Tennant et al. 2011; Venkatesh et al., 2008). The results of the study conform with the work of Sundaram et al. (2007), demonstrating that the higher the level of use of the EDMS by a user is, the better the results obtained with its use are – such as an increase in overall performance. In fact, infusion represents the best predictor of overall performance (explaining 26.65% of its explained variance) compared to routinization. The possibility – mentioned by Cooper and Zmud (1990) and Saga and Zmud (1994) – of verifying the parallel relationships between extent of use and infusion was empirically supported, as well as the indirect relationship between extent of use and infusion via routinization. Furthermore, the research results showed that routinization and infusion mediate the influence of extent of use on overall performance. This study also presents significant support for the relations in the model of success of DeLone and McLean (2003) by verifying the relationships between post-adoption behaviors and the net benefit of use (overall performance). This contributes to the consolidation of work in this area of Information Systems Success studies. It is also noted that the values obtained for the measures used to study the use of EDMS in the municipalities have proved to be adequate.

Practical Implications

This research also provides implications for information systems and management professionals in charge of EDMS. These professionals have the important aim of increasing the use of EDMS and the resulting value. Despite the high investments in IST, the expectations of use are often inconsistent with the rate of actual use. In this sense, these professionals need to understand the uses and results of employees using the EDMS, producing the creation of measures to be applied to the development of new EDMS or to correct existing EDMS. With this in mind, this work provides the professionals with a model that can be applied within an organization and is therefore useful toward having a better understanding regarding EDMS use.

The results suggest that managers should promote the increasing of EDMS use in order for users to integrate the EDMS into their work routine. For this purpose, managers should employ training in the workplace tailored to users' specific needs. Also, after EDMS integration into the work routine, we recommend monitoring (using a log system to measure actual use) the EDMS use by developing use encouragement actions. With these actions, employees should use EDMS more frequently and efficiently, thus achieving and supporting an infusion level, which brings about a higher productivity (Jones et al., 2002; Sundaram et al., 2007). The level of infusion may also be achieved by training which is specially designed for this purpose.

Limitations and Future Research

The first limitation is related to the object of study, which does not differentiate between the various EDMS software solutions. Second, the present study is limited to not being longitudinal, which does not allow having values that reflect the dynamics of the variables and the relationships between them over

time – perceptions vary over time and users will also gain experience. Third, extent of use, which is measured in a self-reported way, is also a limiting feature of many studies of Acceptance. Finally, derived from the object of study, the EDMS can be a tool to be used to perform various tasks, and this study is vague at this task level. The study of the EDMS associated with a specific task and not the tool itself is recommended.

Acknowledgements

This research was supported by the Junta de Andalucía (Consejería de Economía, Innovación y Ciencia) Spain (Proyecto de investigación de excelencia SEJ-6081).

REFERENCES

Bhansali, S., and Brynjolfsson, E. 2007. "Digitizing Work: Driving and Measuring Changes in Information Worker Time Use and Performance Via a Longitudinal Quasi-Experiment," in *ICIS 2007 Proceedings*, , December 31, p. Paper 26.

Bhattacherjee, A., Perols, J., and Sanford, C. 2008. "Information technology continuance: A theoretical extension and empirical test," *Journal of Computer Information Systems* (49:1), pp. 17–26.

Borglund, E. A. M., and Sundqvist, A. 2007. "The role of EDM in information management within SMEs," in *2nd International Conference on Digital Information Management, 2007. ICDIM '07*, (Vol. 1) Presented at the 2nd International Conference on Digital Information Management, 2007. ICDIM '07, , October, pp. 31–36.

Burton-Jones, A., and Straub, D. W. 2006. "Reconceptualizing System Usage: An Approach and Empirical Test," *Information Systems Research* (17:3), pp. 228–246.

Chin, W. 2010. "How to Write Up and Report PLS Analyses," in *Handbook of Partial Least Squares*, Springer Handbooks of Computational Statistics, V. Esposito Vinzi, W. W. Chin, J. Henseler, and H. Wang (eds.), Springer Berlin Heidelberg, pp. 655–690.

Chin, W. W. 1998. "The partial least squares approach for structural equation modeling," in *Modern methods for business research*, Methodology for business and management, Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers, pp. 295–336.

Cho, V. 2007. "A Study of the Impact of Organizational Learning On Information System Effectiveness," *International Journal of Business and Information* (2:1), pp. 127–158.

Cooper, R. B., and Zmud, R. W. 1990. "Information Technology Implementation Research: A Technological Diffusion Approach," *Management Science* (36:2), pp. 123–139.

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.

Gharavi, H., and Carter, L. 2009. "A Reflection on the Use of Structured Case Analysis: Infusion of Information Systems in a Regulated Sector," in *AMCIS 2009 Proceedings*, January 1, Paper 475.

Green, S. B. 1991. "How many subjects does it take to do a regression analysis?" *Multivariate Behavioral Research* (26:3), pp. 499–510.

Gunnlaugsdottir, J. 2008. "Registering and searching for records in electronic records management systems," *International Journal of Information Management* (28:4), pp. 293–304.

Hair, J. F., Ringle, C. M., and Sarstedt, M. 2011. "PLS-SEM: Indeed a Silver Bullet," *The Journal of Marketing Theory and Practice* (19:2), pp. 139–152.

Hall, G., and Loucks, S. 1977. "A developmental model for determining whether the treatment is actually implemented," *American Educational Research Journal* (14), pp. 263-276.

Hjelt, M., and Björk, B. 2007. "End-User Attitudes toward EDM Use in Construction Project Work: Case Study," *Journal of Computing in Civil Engineering* (21:4), pp. 289–300.

Ifinedo, P., Rapp, B., Ifinedo, A., and Sundberg, K. 2010. "Relationships among ERP post-implementation success constructs: An analysis at the organizational level," *Advancing Educational Research on Computer-supported Collaborative Learning (CSCL) through the use of gStudy CSCL Tools* (26:5), pp. 1136–1148.

Johnston, G. P., and Bowen, D. V. 2005. "The benefits of electronic records management systems: a general review of published and some unpublished cases," *Records Management Journal* (15:3), pp. 131–140.

Jones, E., Sundaram, S., and Chin, W. 2002. "Factors leading to sales force automation use: A longitudinal analysis," *The Journal of Personal Selling and Sales Management* (22:3), pp. 145–156.

Lin, C.-P., and Anol, B. 2008. "Learning Online Social Support: An Investigation of Network Information Technology Based on UTAUT," *CyberPsychology & Behavior* (11:3), pp. 268–272.

March, J. G. 1991. "Exploration and exploitation in organizational learning," *Organization Science*, (2), pp. 71–87.

McLean, E., Sedera, D., and Tan, F. T. C. 2011. "Reconceptualizing System Use For Contemporary Information Systems," in *PACIS 2011 Proceedings*, July 9, Paper 130.

Moon, J. W., and Kim, Y. G. 2001. "Extending the TAM for a World-Wide-Web context," *Information & Management* (38:4), pp. 217-230.

Myers, B. L., Kappelman, L. A., and Prybutok, V. R. 1997. "A comprehensive model for assessing the quality and productivity of the information systems function: toward a theory for information systems assessment," *Information Resources Management Journal (IRMJ)* (10:1), pp. 6–26.

Po-An Hsieh, J. J., and Wang, W. 2007. "Explaining employees' extended use of complex information systems," *European Journal of Information Systems* (16), pp. 216–227.

Po-An Hsieh, J. J., and Zmud, R. W. 2006. "Understanding post-adoptive usage behaviors: A two-dimensional view," *Diffusion Interest Group in Information Technology (DIGIT) Proceedings*. Paper 3. Retrieved from http://aisel.aisnet.org/digit2006/3

Polites, G. L., Roberts, N., and Thatcher, J. 2011. "Conceptualizing models using multidimensional constructs: a review and guidelines for their use," *European Journal of Information Systems* (21:1), pp. 22–48.

Preacher, K. J., and Hayes, A. F. 2008. "Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models," *Behavior Research Methods* (40:3), pp. 879–891.

Reinartz, W., Haenlein, M., and Henseler, J. 2009. "An empirical comparison of the efficacy of covariance-based and variance-based SEM," *International Journal of Research in Marketing* (26:4), pp. 332–344.

Ringle, C. M., Wende, S., and Will, A. 2005. *SmartPLS 2.0 (beta)*, Hamburg, Germany: SmartPLS.

Roldán, J. L., and Sánchez-Franco, M. J. 2012. "Variance-Based Structural Equation Modeling: Guidelines for Using Partial Least Squares in Information Systems Research," in *Research Methodologies, Innovations and Philosophies in Software Systems Engineering and Information Systems*, M. Mora, O. Gelman, A. Steenkamp, and M. Raisinghani (eds.), Hershey PA: Information Science Reference, pp. 193–221.

Saga, V. L., and Zmud, R. W. 1994. "The Nature and Determinants of IT Acceptance, Routinization, and Infusion," in *Diffusion, Transfer and Implementation of Information Technology*, L. Levine (ed.), North Holland, New York, pp. 76–86.

Sánchez-Franco, M. J., and Roldán, J. L. 2010. "Expressive aesthetics to ease perceived community support: Exploring personal innovativeness and routinised behaviour as moderators in Tuenti," *Computers in Human Behavior* (26:6), pp. 1445–1457.

Schwarz, A., and Chin, W. W. 2007. "Looking forward: Toward an understanding of the nature and definition of IT acceptance," *Journal of the Association for Information Systems* (8), pp. 230–243.

Smyth, Z. A. 2005. "Implementing EDRM: has it provided the benefits expected?," *Records Management Journal* (15:3), pp. 141–149.

Sprague, R. H. 1995. "Electronic Document Management: Challenges and Opportunities for Information Systems Managers," *MIS Quarterly* (19:1), p. 29.

Sprehe, J. T. 2000. "Integrating records management into information resources management in U.S. government agencies," *Government Information Quarterly* (17:1), pp. 13–26.

Sprehe, J. T. 2005. "The positive benefits of electronic records management in the context of enterprise content management," *Government Information Quarterly* (22:2), pp. 297–303.

Straub, D., Boudreau, M.-C., and Gefen, D. 2004. "Validation guidelines for IS positivist research," *Communications of the Association for Information Systems* (13:24), pp. 380–427.

Sundaram, S., Schwarz, A., Jones, E., and Chin, W. W. 2007. "Technology use on the front line: how information technology enhances individual performance," *Journal of the Academy of Marketing Science* (35:1), pp. 101–112.

Tennant, V., Mills, A., and Chin, W. 2011. "Investigating Information System Infusion At The Individual Level: Re-Conceptualisation And Operationalization," in *PACIS 2011 Proceedings*, July 9, Paper 189.
Urbach, N., and Ahlemann, F. 2010. "Structural Equation Modeling in Information Systems Research Using Partial Least Squares," *Journal of Information Technology Theory and Application (JITTA)* (11:2).
Venkatesh, V., and Davis, F. D. 2000. "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies," *Management Science* (46:2), pp. 186–204.
Venkatesh, V., Brown, S. A., Maruping, L. M., and Bala, H. 2008. "Predicting Different Conceptualizations of System Use: The Competing Roles of Behavioral Intention, Facilitating Conditions, and Behavioral Expectation," *MIS Quarterly* (32:3), pp. 483–502.
vom Brocke, J., Simons, A., and Cleven, A. 2011. "Towards a business process-oriented approach to enterprise content management: the ECM-blueprinting framework," *Information Systems and e-Business Management* (9:4), pp. 475–496.
Wandryk, K. L. 1995. "The benefits of using electronic document software," *Computer Communications* (18:6), pp. 435–446.
Wilkins, L., Swatman, P. M. C., and Holt, D. 2009. "Achieved and tangible benefits: lessons learned from a landmark EDRMS implementation," *Records Management Journal* (19:1), pp. 37–53.
Williams, J., and MacKinnon, D. P. 2008. "Resampling and Distribution of the Product Methods for Testing Indirect Effects in Complex Models," *Structural Equation Modeling: A Multidisciplinary Journal* (15:1), pp. 23–51.
Wright, R., Campbell, D., Thatcher, J., and Roberts, N. 2012. "Operationalizing Multidimensional Constructs in Structural Equation Modeling: Recommendations for IS Research," *Communications of the Association for Information Systems* (30:1).
Zantout, H., and Marir, F. 1999. "Document management systems from current capabilities towards intelligent information retrieval: an overview," *International Journal of Information Management* (19:6), pp. 471–484.
Zmud, R. W., and Apple, L. E. 1992. "Measuring technology incorporation/infusion," *Journal of Product Innovation Management* (9:2), pp. 148–155.

Appendix A. Measurement Items for Constructs

Construct	Items	Source
Extent of Use	eu1: How many hours do you use EDMS every week? eu2: How frequently do you use EDMS? eu3: How many times do you use EDMS during a week?	Moon and Kim (2001)
Routinization	rot1: My use of EDMS has been incorporated into my regular work schedule. rot2: My use of EDMS is pretty much integrated as part of my normal work routine. rot3: My use of EDMS is a normal part of my work.	Sundaram et al. (2007)
Infusion	inf1: I am using EDMS to its fullest potential for supporting my own work. inf2: I am using all capabilities of EDMS in the best fashion to help me on the job. inf3: I doubt that there are any better ways for me to use EDMS to support my work. inf4: My use of EDMS on the job has been integrated and incorporated at the highest level.	Jones et al. (2002)
Overall Performance (superordinate multidimensional construct)		Ifinedo et al. (2010)
II: Individual Impact	ii1: Our EDMS enhances individual creativity. ii2: Our EDMS enhances organizational learning and recall for individual worker. ii3: Our EDMS improves individual productivity. ii4: Our EDMS is beneficial for individual's tasks.	

	ii5: Our EDMS enhances higher-quality of decision making. ii6: Our EDMS saves time for individual tasks/duties.	
WI: Workgroup Impact	wi1: Our EDMS helps to improve workers' participation in the organization. wi2: Our EDMS improves organizational-wide communication. wi3: Our EDMS improves inter-departmental coordination. wi4: Our EDMS create a sense of responsibility. wi5: Our EDMS improves the efficiency of sub-units in the organization. wi6: Our EDMS improves work-groups productivity. wi7: Our EDMS enhances solution effectiveness.	
OI: Organizational Impact	oi1: Our EDMS reduces organizational costs. oi2: Our EDMS improves overall productivity. oi3: Our EDMS enables e-business/e-commerce. oi4: Our EDMS provides us with competitive advantage. oi5: Our EDMS increases customer service/satisfaction. oi6: Our EDMS facilitates business process change. oi7: Our EDMS supports decision making. oi8: Our EDMS allows for better use of organizational data resource.	