

Technological, Organizational, and Environmental Factors Affecting the Adoption of Cloud Enterprise Resource Planning (ERP) Systems

Full Paper

John Njenga Kinuthia

School of Management, Nazareth College of Rochester, NY

Jkinuth8@naz.edu

Abstract

The purpose of this study was to determine the differences between organizations that adopted Cloud Enterprise Resource Planning (Cloud ERP) systems and organizations that did not adopt Cloud ERP systems based on the Technological, Organizational, and Environmental (TOE) factors.

Using an online survey, data were collected from individuals throughout the United States of America who identified themselves as working in an Information Technology (IT) job. Analysis from 159 respondents indicated that all the proposed TOE factors were significant predictors of Cloud ERP systems. In comparison to organizations that did not adopt Cloud ERP systems, organizations that adopted Cloud ERP systems had the following characteristics: higher level of relative advantage, higher level of compatibility, higher level of security concern, higher top management support, higher level of organization readiness, bigger sizes, more centralized, more formalized, higher competitive pressure, and perceived Cloud ERP system vendors as offering more support.

Keywords

ERP, cloud computing, cloud Enterprise Resource Planning, ERP adoption, cloud ERP adoption

Introduction

The purpose of this paper is to present a descriptive research study of cross-sectional design with the aim of determining the differences between organizations that adopted Cloud Enterprise Resource Planning (Cloud ERP) systems and organizations that did not adopt Cloud ERP systems based on the Technological, Organizational, and Environment (TOE) factors. Technological factors used in this study include (1) Relative Advantage of Cloud ERP system, (2) Compatibility of Cloud ERP system with existing systems, and (3) Security Concern of Cloud ERP system environment. The organizational factors include (1) Top Management Support, (2) Organizational Readiness, (3) Size of the organization, (4) Centralization of the organization, and (5) Formalization of the organization. The environmental factors include (1) Competitive Pressure, and (2) Vendor Support. The above factors were adapted from existing studies of technology adoption which are covered in the sections that follow.

Study Background

Enterprise Resource Planning (ERP) systems sought to address the existence of fragmented legacy systems in organizations (Beretta 2002; Muscatello et al. 2003) by having a system that integrates all business functions into a single system, hence “creating value and reducing costs by making the right information available to the right people at the right time to help them make good decisions in managing resources productively and proactively” (Gunasekaran and McGaughey 2007, p. 2).

Over the years, ERP systems have continued to evolve due to changing technology and business requirements (Gunasekaran and McGaughey 2007). The systems evolved from Inventory Control Systems of the 1960s to Materials Requirements Planning (MRP), which became Manufacturing

Resources Planning (MRPII) in the later years. In yet another evolution of ERP systems, recent advances in Cloud computing technology have resulted in the development of Cloud ERP systems (Saeed et al. 2011). Since Cloud computing is an emerging technology, its definition is also still evolving. However, the National Institute of Standards and Technology (NIST) has defined Cloud computing as “a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” (Mell and Grance 2011, p. 6). In Cloud ERP systems, organizations may pay vendors a subscription fee in order to access the software over the internet. This is a marked departure from previous adoption paradigms where organizations had to pay, host, and maintain the acquired ERP system (otherwise referred to as traditional ERP systems) within company premises. With the Cloud computing technology, ERP vendors get to host and maintain ERP systems within their Cloud servers and offer the software as a service to organizations.

Organizations that subscribe for Cloud ERP services have the benefit of not spending the hefty amount of money that may be associated with acquisitions of the software, servers, and other hardware equipment that may be required if they purchased and installed the traditional ERP software within company premises. In addition, organizations may be attracted to the characteristics of Cloud computing, which include (Mell and Grance 2011) on-demand service where consumers can configure computing resources to suit their current needs; universal accessibility since organizations can access computing resources through the internet using different platforms such as laptops, tablets, and mobile phones; resource pooling where computing resources are brought together and shared among different consumers; rapid elasticity where computing resources can be increased and decreased based on the consumer needs; and measured service where use of resources can be metered in order to provide transparency on consumer usage and billings

Due to this emerging shift to Cloud ERP systems, a research question can be posed as to what are the factors that are significant predictors of Cloud ERP systems adoption and how do these factors differentiate organizations that adopt Cloud ERP systems and organizations that do not adopt?

Literature on Theory and Research Factors

Technology – organization – environment (TOE) framework.

According to Tornatzky and Fleischer (1990), adoption of technology is influenced by factors that can be identified through the technological, organizational, and the environmental contexts. According to the authors, the technological context refers to how organizations make the technology adoption decision based on the availability of the technology and how it fits with the firm’s current technology; organizational context looks at the characteristics of the organization such as its structure, quality of human resources, or the extent to which its size impacts the technology adoption decision; and environmental context refers to the arena of a firm’s business operation which may include such factors as its industry, competitive pressure, and government regulations.

Many studies have used the TOE framework to study technology adoption. However, specific variables within the technological, organizational, and environmental contexts varied from one study to the other. Such an approach of tailoring and refining theoretical frameworks in order to fit a specific study was considered appropriate since, “innovation adoption decisions must be studied within appropriate contexts and with variables tailored to the specificity of the innovation” (Chau and Tam 1997, p. 3). Consistent with this approach, factors specific to this study were explored within the technological, organizational, and environmental factors.

Technological context.

Relative Advantage.

Relative advantage is defined as “the degree to which an innovation is perceived as being better than the idea it supersedes” (Rogers 2003, p. 229). Relative advantage and perceived benefits of an

innovation are used interchangeably in reviewed literature. Innovations that are perceived to be better than their predecessors will be more likely to be adopted.

This view was empirically supported by the majority of studies reviewed (Chwelos et al. 2001; Dedrick and West 2003; Duan et al. 2012; Iacovou et al. 1995; Kevin K.Y. Kuan and Chau 2001; Oliveira and Martins 2010; Ramdani et al. 2009; Thong 1999). In one study however, relative advantage was found to have a negative relationship with cloud adoption technology adoption (Low et al. 2011a). In other studies, no significant relationship was found between relative advantage and studied technology (Chau and Tam 1997; Nelson and Shaw 2003; Yoon and George 2013).

Compatibility.

Compatibility is defined as “the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters” (Rogers 2003, p. 240). Innovations that are perceived as compatible with organization’s values and needs are more likely to be adopted.

Indeed, in various technology adoption studies, compatibility of an innovation was found to positively influence its adoption (Dedrick and West 2003; Thong 1999). Other studies didn’t find any significant influence of innovation compatibility (Low et al. 2011a; Nelson and Shaw 2003; Ramdani et al. 2009; Yoon and George 2013).

Security Concerns.

In a study of Cloud ERP adoption (Saeed et al. 2011), perceived security vulnerabilities and lack of data privacy were considered as some of the factors influencing the system’s adoption. Consistent with available literature (Kraemer et al. 2006; Yoon and George 2013), security concern is defined in this study as the degree to which cloud ERP system is perceived as an insecure system for data storage, exchanging data, and performing other business transactions.

For example, potential adopters may perceive the idea of running their ERP system on the cloud platform as a major system vulnerability that can be exploited by hackers. Potential adopters may also be unwilling to let vendors of ERP Cloud systems host data containing their customer’s personal records or the organization’s business secrets. Some studies however, have found no empirical support regarding the influence of security concern to technology adoption (Chang et al. 2007; Yoon and George 2013).

Organizational Context

Top Management Support.

Top Management Support has a positive influence on adoption of technology in an organization (Duan et al. 2012; Low et al. 2011a; Nelson and Shaw 2003; Ramdani et al. 2009). Adopting new technology may lead to many changes in an organization. Such changes may be met with resistance within the organization. However, such resistance can be reduced if there is a top management that has a positive attitude towards the technology adoption (Duan et al. 2012). In addition, Top management support is important since they can allocate the resources needed for technology adoption (Ramdani et al. 2009, 2009).

Organizational Readiness.

Organizational readiness refers to the financial and technological resources that are available to an organization (Iacovou et al. 1995). In the context of the present study, organizational readiness is the measure of financial and technological resources available to the organization that can be used towards the adoption of cloud ERP systems. Empirical studies (Chwelos et al. 2001; Iacovou et al. 1995; Ramdani et al. 2009; Yoon and George 2013), have found Organization readiness to be significant predictors of technology adoption.

The reviewed empirical studies measured organizational readiness along two sub-constructs: financial readiness and technological readiness. Financial readiness may be an indication of whether the

organization has the finances to pay for cloud ERP technology implementation and subsequent costs that may arise after implementation. Technical readiness on the other hand, is a measure of the level of IT sophistication in terms of usage and management (Iacovou et al. 1995). Organizations with more sophisticated IT systems are likely to have the competency and confidence to adopt cloud ERP systems.

Organization Size.

Size is usually included in studies of technology adoption in organizations, and is “probably a surrogate measure of several dimensions that lead to innovation: total resources, slack resources...employee’s technical expertise, organizational structure” (Rogers 2003, p. 411). It is therefore possible to interpret the impact of organization size on technology adoption through multiple dimensions.

For example, unlike small organizations, large organizations may have more available resources that can be used to implement new technologies (Tornatzky and Fleischer 1990), especially financial and technical resources. However, compared to small organizations, large organizations may suffer from inertia (Zhu and Kraemer 2005), a situation whereby they become less agile and inflexible to adapt quickly (Hitt et al. 1990). In that regard, small and medium enterprises (SMEs) may be more likely to adopt new technology than large organizations. However, even in those SMEs, they need to have the resources (such as financial resources and human skills) to be able to adopt new technologies (Thong 1999).

Centralization.

Tornatzky and Fleischer (1990) had suggested that centralization was related to adoption of innovation but its measurement was somewhat ambiguous in terms of whether it was a measure of process or structure. The authors’ analysis had mentioned prior studies that viewed centralization in terms of how decisions were made which is a process interpretation, but the variable was measured in terms of hierarchy and delegation of responsibility which is a structural measurement. In this study, centralization is defined as “the degree of decision making concentration” (Grover and Goslar 1993, p. 4).

Centralization was identified as a dimension of organization structure in a study of organization bureaucracy by Hinings, Pugh, Hickson, and Turner (1967). Other dimensions of structure identified in the study included specialization, standardization, configuration, flexibility, and formalization. These dimensions can be explained as follows (Hinings et al. 1967):

1. Specialization, which refers to how labor is divided within the organization.
2. Standardization, which refers to the extent of how roles and activities in the organization are subjected to rules and procedures.
3. Formalization, which indicates the extent of how communications and procedures are written and filed in the organization.
4. Centralization, which refers to how the authority of decision making is concentrated in the organization.
5. Configuration, which refers to the organization’s shape, such as seen in the organization’s chart.
6. Flexibility, which refers to the ability of effecting change in the organization structure.

In terms of the structural dimensions, this research will only study the influence of centralization and formalization on the adoption of Cloud ERP systems.

In highly centralized organizations, decision making tend to be referred towards the top level management (Pugh et al. 1968). Such a centralized structure may lead to a situation where the decision makers are not aware of the daily operational needs of the various organizational units. In

addition, it may become harder to disseminate innovative ideas to the top level management in highly centralized organizations. The view that centralization has a negative influence on technology adoption is supported by prior study (Grover and Goslar 1993), that also suggested that decentralized organizations are less autocratic and may encourage innovative behavior as compared to highly centralized organizations.

Formalization.

As one of the structural dimensions of an organization, formalization indicates the extent of how communications and procedures are written and filed in an organization (Hinings et al. 1967). It was also defined as the “degree of reliance an organization places on formal rules and procedures” (Grover and Goslar 1993, p. 5). Some empirical studies have found no impact of formalization on technology adoption (Chau and Tam 1997; Grover and Goslar 1993). Such finding is inconsistent with previous empirical study that found formalization to have a positive relationship with technology adoption (Zmud 1982).

However, it is the researcher’s view that instead of encouraging individuals to be more innovative, a high level of formalization may discourage employees from disseminating important information that may positively influence the decision to adopt Cloud ERP systems.

Environmental context.

Competitive Pressure.

Competitive pressure can be defined as the level of pressure that an organization experiences from competitors in the same industry (Zhu and Kraemer 2005). This study argues that adopting Cloud ERP systems can offer organizations a vital strategic tool that can allow them to be competitive. Organizations that use information technology can change the rules of competition by altering the rules of the industry as well as be able to outperform their competitors, thus creating a competitive advantage (Porter and Millar 1985).

Vendor Support.

Vendor support refers to the availability of such things as vendor training regarding their systems and technical support on implementation and usage of cloud ERP system. Vendor support has been found to have a positive influence on technology adoption (Chang et al. 2007; Dedrick and West 2003).

Hypotheses

Based on the literature review, the following hypotheses were proposed:

H1: Organizations that adopted Cloud ERP systems will have a higher level of Relative Advantage than organizations that have not adopted Cloud ERP systems.

H2: Organizations that adopted Cloud ERP systems will have a higher level of Compatibility than organizations that have not adopted Cloud ERP systems.

H3: Organizations that have adopted Cloud ERP systems will have a lower level of Security Concern than organizations that have not adopted Cloud ERP systems.

H4: Organizations that have adopted Cloud ERP systems will have a higher level of Top Management Support than organizations that have not adopted Cloud ERP systems.

H5: Organizations that have adopted Cloud ERP systems will have smaller size than organizations that have not adopted Cloud ERP systems.

H6: Organizations that have adopted Cloud ERP systems will have a higher level of Organizational Readiness than organizations that have not adopted Cloud ERP systems.

H7: Organizations that have adopted Cloud ERP systems will have a lower level of Centralization than organizations that have not adopted Cloud ERP systems.

H8: Organizations that have adopted Cloud ERP systems will have a lower level of Formalization than organizations that have not adopted Cloud ERP system.

H9: Organizations that have adopted Cloud ERP systems will have a higher level of Competitive Pressure than organizations that have not adopted Cloud ERP systems.

H10: Organizations that have adopted Cloud ERP systems will have a higher level of Vendor Support than organizations that have not adopted Cloud ERP systems.

Research Design

A descriptive research study of cross-sectional design was performed utilizing a survey to collect data. Constructs operationalization of the survey items were based on existing studies of information systems adoption (Chwelos et al. 2001; Grover and Goslar 1993; Premkumar and Roberts 1999; Son and Benbasat 2007; Teo and Pian 2003; Thong and Yap 1995; Tweel 2012; Yoon and George 2013), and adapted for this study.

The sample included five hundred and eighty individuals in the United States, who were over the age of eighteen years old and had indicated their job function to be in information technology. After sending out the online survey to the participants, 213 responses were received back. Out of these 213 responses, a total of 159 cases were deemed usable for data analysis. As shown in the table below, the demographic of the respondents varied by their job classifications, number of employees in their organizations, and their geographic locations in the United States.

	Frequency	Percent
Job Title Classification		
IT Manager/ Other Manager	33	20.8
IT Support/ Technician	28	17.6
Director/ Administrator	21	13.2
IT Analyst/ System Analyst/ Business Analyst	17	10.7
Other	16	10.1
Software Developer/ Web developer	16	10.1
Network Engineer/ Infrastructure Engineer/ Other Engineer	15	9.4
Consultant	5	3.1
Owner/ CTO/ CFO/ Principal	4	2.5
Undisclosed	4	2.5
Total	159	100.0
Number of Employees		
> 10,000	55	34.6
1 – 50	33	20.8
101 – 500	26	16.4
1001 - 5,000	15	9.4
501 - 1,000	10	6.3
51 – 100	9	5.7
5001 - 10,000	9	5.7
Undisclosed	2	1.3
Total	159	100.0
Location of Respondents		
South Atlantic	39	24.5
East North Central	27	17.0
Pacific	24	15.1
West North Central	16	10.1
West South Central	14	8.8
Mountain	13	8.2
New England	10	6.3
Middle Atlantic	8	5.0
East South Central	5	3.1
Undisclosed	3	1.9
Total	159	100.0

Table 1. Demographic Characteristics of Survey Respondents

Data Analysis

First, a test of scale reliability was performed by determining the Cronbach alpha's internal consistency coefficient. A Cronbach's alpha value of 0.7 is the generally accepted threshold for scale reliability test. All the factors had a Cronbach's alpha value greater than 0.7.

Second, to verify construct validity on the various scales, factor analysis was run. Values that were analyzed in this procedure included: Communalities values, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, Bartlett's test significance, Percent of variance, and the Factor loadings values. Except for one item in Organization Readiness scale (although the scale average was .717), all the items in all scales had Communalities value of greater than 0.6. Performing factor analysis can be justified if the item has communalities values of more than 0.6 or all the items have average communalities of 0.7 (MacCallum et al. 1999).

In addition to the communalities, the KMO values for the scales should exceed the acceptable values of 0.6 (Kaiser and Rice 1974; Kaiser 1974) and have Bartlett's test significance at 0.05 level. Except for the Formalization and Competitive Pressure scales, all items had high KMO values with a 0.00 level of significance. Factor loadings exceeded the acceptable threshold of 0.45, which is the suggested value for a sample size of about 150 (Hair et al. 2010).

Finally, independent sample t-test was performed on the data in order to determine the differences between the organizations that adopted Cloud ERP systems and the organizations that did not adopt Cloud ERP systems based on the TOE factors. The table below shows the results of that analysis.

Adopted Cloud ERP	Mean		T	df	std. Error Difference	Sig (2-tailed)
	Yes	No				
S_RADV	19.9048	14.837	7.208	153	0.70306	0.000
S_COMPAT	20.9844	14.9894	7.309	156	0.82021	0.000
S_SCONC	15.0156	11.2553	6.32	156	0.595	0.000
S_TOPMNG	15.2373	9.8462	7.468	148	0.72188	0.000
S_SIZE	4.9194	3.9789	2.456	155	0.3829	0.015
S_ORGREAD	47.8621	43.6593	3.563	144	1.1037	0.000
S_CENTR	28.3115	24.8495	3.606	152	0.96006	0.000
S_FMLZ	10.4921	9.0745	3.129	155	0.45309	0.002
S_CPRESS	8.9524	6.1383	6.269	155	0.44888	0.000
S_VSUPP	15.1452	12.4211	5.511	155	0.49431	0.000

Table 2. Results of the Independent Sample T Test Analysis for All Scale Items

Discussion of Results

Relative Advantage

In support of proposed hypothesis, organizations that adopted Cloud ERP systems had a higher score of relative advantage than organizations that did not adopt Cloud ERP systems. These results are consistent with prior research (Chwelos et al. 2001; Dedrick and West 2003; Duan et al. 2012; Iacovou et al. 1995; Kevin K. Y. Kuan and Chau 2001; Oliveira and Martins 2010; Ramdani et al. 2009; Thong 1999), which had found relative advantage to be a significant predictor of technology adoption. The results of the current study indicate that organizations that adopted Cloud ERP systems had higher perception regarding the benefits of adopting the systems. The perceived benefits included enhanced communication with customers, increased profitability, reduced cost of implementation compared to other ERP systems, and ability to access new markets.

Compatibility

The hypothesis that organizations that adopted Cloud ERP systems will have a higher level of Compatibility than organizations that have not adopted Cloud ERP systems was supported. The results of compatibility in this study are also consistent with prior research findings (Dedrick and

West 2003; Thong 1999), where the factor was found to have a positive relationship with technology adoption.

Security Concern

Surprisingly, the security concern hypothesis was not supported. The study results showed the opposite; where security concern was actually higher for the organizations that adopted Cloud ERP systems than for organizations that did not. Prior studies on the impact of security concern on technology adoption have had mixed results. In a study of electronic healthcare in Taiwan, the issue of security concern was not considered to have any significant relationship on the technology adoption (Chang et al. 2007). However, this study was specific to electronic healthcare adoption in Taiwan and the results may have been different if the study was in a different country. Another study did not find any significant influence of security concern while adopting virtual worlds (Yoon and George 2013). As stated by the author, respondents may have viewed virtual worlds more as a social community than a business technology, which may have altered their perception. It is likely that respondents have a different perception of Cloud ERP systems as opposed to other web based systems.

Security concern has been suggested as a barrier to Cloud ERP system adoption (Saeed et al. 2011). Since the Cloud ERP systems are hosted and accessed over the internet, data and transactions may be perceived to be vulnerable to unauthorized access and use. However, such concerns are not supported in this study. The results may be explained by the fact that Cloud ERP systems vendors provide technical expertise, which include ensuring the safety and availability of the systems. In addition, Cloud computing services allow organizations to better control their network access, using web based interfaces (Marston et al. 2011). With this perspective, it makes sense that organizations that have a higher security concern would adopt Cloud ERP systems.

Top Management Support

The Top Management hypothesis was supported in the current study, which is consistent with prior studies which have shown Top Management Support to have a positive influence in the adoption of technology (Duan et al. 2012; Low et al. 2011b; Nelson and Shaw 2003; Ramdani et al. 2009). The obvious reasons for this is because top management usually have the final say on what technology the organization will adopt, they can allocate the necessary resources that are needed for the adoption, and may ensure that there is less resistance to organization changes that the new technology may bring.

Organization Readiness

Organization Readiness hypothesis was also supported in the study. Previous research had shown organization readiness to have a positive relationship with technology adoption (Chwelos et al. 2001; Iacovou et al. 1995; Ramdani et al. 2009; Yoon and George 2013). The results from this study confirm the expectation that organizations that have more financial resources, IT sophistication, and knowledge to use Cloud ERP systems, would adopt the technology.

Size

Contrary to the proposed hypothesis, organizations that adopted Cloud ERP systems had larger Mean sizes than organizations that did not adopt Cloud ERP systems. Literature on the impact of organization size on technology adoption has shown mixed results. In one study, organization size was found to negatively influence the adoption of new innovations (Zhu et al. 2006), while others found size to have a positive relationship with technology adoption (Chang et al. 2007; Jang and Pan 2008; Low et al. 2011b; Ramdani et al. 2009; Thong 1999; Zhu and Kraemer 2005). Size may be an indication of other characteristics of an organization such as availability of resources, which allow the organization the ability to adopt Cloud ERP systems. However, size is also “likely to lead directly to economies of scale which enhance the feasibility of innovation adoption. Larger organizations process input in sufficient volume to justify adoption of new technology to accommodate variations in input

even when variations occur infrequently (Moch and Morse 1977, p. 3). This direct impact of size on technology adoption may explain why organizations that adopted Cloud ERP systems had a higher Mean size than organizations that did not adopt Cloud ERP systems.

Organization size can also impact structure (measured in this study as level of centralization and formalization of the organization), since it "...allows organizations to more finely differentiate tasks (functional differentiation) and personnel (specialization)" (Moch and Morse 1977, p. 3). Larger organizations may be able to afford and encourage their employees to specialize on specific skills such as accounting, sales, finance, or inventory control. The organizations may also establish departments around these functions such as accounting, finance, or inventory control. Interestingly, ERP systems were designed with this kind of structure in mind, where it integrates the different kinds of organization's functional department into a single information system (Muscatello et al. 2003), and hence ensuring availability of accurate and timely information that can be used by decision makers.

Centralization

Centralization, as a measure of the degree of decision making concentration, have been found to have a negative relationship with technology adoption (Grover and Goslar 1993). In the present study however, and contrary to the proposed hypothesis on centralization, organizations that adopted Cloud ERP systems had a higher level of centralization than organizations that did not adopt Cloud ERP systems. This result may be due to the design nature of ERP systems, which complements a more centralized organizational structure. Organizations that have a higher level of centralization, may have found Cloud ERP systems to be a better fit for their existing organization structure.

Formalization

Some studies have found no statistical significance of formalization and technology adoption (Chau and Tam 1997; Grover and Goslar 1993), while another found formalization to have a positive relationship with technology adoption (Zmud 1982). The statistical significance of formalization in latter study is consistent with the findings in the present study. However, contrary to the proposed hypothesis that adopting organization will have less level of formalization, the results showed the opposite to be the case. Similar to centralization, the nature of ERP system design may offer an explanation as to why this is the case. One key element of ERP systems is its ability to integrate firm wide processes and standardize common data and business practices across the organization (Nah et al. 2001). For organizations that emphasize on having rules and procedures, adopting a Cloud ERP system will therefore be a good fit since such capabilities are embedded into the system.

Competitive Pressure

Competitive pressure has previously been shown to influence the adoption of technology (Iacovou et al. 1995). Organization may adopt Cloud ERP systems with the view that the technology will be a vital strategic tool that can help them compete in the market. Indeed, when organizations use information technology, they can gain a competitive advantage by changing the rules of competition in the industry and may be able to outperform their competitors (Porter and Millar 1985). To avoid being outperformed, organizations may also adopt the technologies that are being adopted by the competitors. With this view, it is therefore not surprising that organizations that adopted Cloud ERP systems had a higher level of competitive pressure.

Vendor Support

The result of this study is consistent with prior research that had a significant relationship between vendor support and technology adoption (Chang et al. 2007; Dedrick and West 2003). In the current study, respondents were asked whether they thought Cloud ERP system vendors offered free training sessions, technical support, or incentives for Cloud ERP systems adoption. Since Cloud ERP systems is a relatively new technology, vendor support can be a vital factor that encourages adoption. Through free training sessions, vendors can take the opportunity to showcase their system capabilities. They

can also use the opportunity to show their deep technical knowledge, which can convince potential adopters of the available vendor support during implementation and ongoing basis in case they adopted the systems.

Conclusion and Future Research

First, the study confirms the relevancy of the TOE theory in the study of Cloud ERP systems adoption. Although this theory has been in numerous other studies of adoption of various technologies, the researcher could only find one prior instance where it was used to study Cloud ERP system adoption (Saeed et al. 2011). The present study therefore, adds to this scant literature. Second, the study offered a discovery of statistically significant factors that are relevant to Cloud ERP systems adoption. These factors can be incorporated in future Cloud ERP systems adoption studies.

The study concluded that all the identified factors were statistically significant in the adoption of Cloud ERP systems. Organizations that adopted Cloud ERP systems were found to have the following:

1. Higher score of relative advantage than non-adopting organizations.
2. Higher compatibility than non-adopting organizations.
3. Higher level of security concern than non-adopting organizations.
4. Higher top management support than non-adopting organizations.
5. Higher organization readiness than non-adopting organizations.
6. Bigger sizes than non-adopting organizations.
7. Higher level of centralization than non-adopting organizations.
8. Higher level of formalization than non-adopting organizations.
9. Higher competitive pressure than non-adopting organizations.
10. Higher vendor support than non-adopting organizations.

These results offer more insight on Cloud ERP system adoption. It contributes to existing scant literature on the subject, and provides areas for future research. For example, future researchers could investigate security concern and size of organizations to determine whether they get similar results. They may also gain a better understanding of the underlying reasons that would explain why organizations that are concerned with security and are larger in size would opt to adopt Cloud ERP systems.

References

- Beretta, S. 2002. "Unleashing the integration potential of ERP systems: The role of process-based performance measurement systems," *Business Process Management Journal* (8:3), pp. 254–277 (doi: 10.1108/14637150210428961).
- Chang, I.-C., Hwang, H.-G., Hung, M.-C., Lin, M.-H., and Yen, D. C. 2007. "Factors affecting the adoption of electronic signature: Executives' perspective of hospital information department," *Decision Support Systems* (44:1), pp. 350–359 (doi: 10.1016/j.dss.2007.04.006).
- Chau, P. Y. K., and Tam, K. Y. 1997. "Factors affecting the adoption of open systems: An exploratory study," *MIS Quarterly* (21:1), pp. 1–24.
- Chwelos, P., Benbasat, I., and Dexter, A. S. 2001. "Research report: Empirical test of an EDI adoption model," *Information Systems Research* (12:3), pp. 304–321.
- Dedrick, J., and West, J. 2003. "Why firms adopt open source platforms: a grounded theory of innovation and standards adoption," in *Proceedings of the workshop on standard making: A critical research frontier for information systems*, pp. 236–257 (available at http://www.joelwest.org/misq-stds/proceedings/145_236-257.pdf).
- Duan, X., Deng, H., and Corbitt, B. 2012. "Evaluating the critical determinants for adopting e-market in Australian small-and-medium sized enterprises," *Management Research Review* (35:3/4), pp. 289–308 (doi: <http://dx.doi.org.ezproxy.emich.edu/10.1108/01409171211210172>).
- Grover, V., and Goslar, M. D. 1993. "The initiation, adoption, and implementation of telecommunications technologies in U.S. organizations," *Journal of Management Information Systems* (10:1), p. 141.
- Gunasekaran, A., and McGaughey, R. E. 2007. "Enterprise Resource Planning (ERP): Past, Present and Future," *International Journal of Enterprise Information Systems* (3:3), p. 23.
- Hair, J. F., Black, W. C., Babin, B. J., and Anderson, R. E. 2010. *Multivariate Data Analysis* (Seventh Edition.), Upper Saddle River, New Jersey: Pearson Education Inc.
- Hinings, C. R., Pugh, D. S., Hickson, D. J., and Turner, C. 1967. "An Approach to the Study of Bureaucracy," *Sociology* (1:1), pp. 61–72 (doi: 10.1177/003803856700100104).
- Hitt, M. A., Hoskisson, R. E., and Ireland, R. D. 1990. "Mergers and acquisitions and managerial commitment to innovation in M-form firms," *Strategic Management Journal* (11:4), pp. 29–48.
- Iacovou, C. L., Benbasat, I., and Dexter, A. S. 1995. "Electronic Data Interchange and Small Organizations: Adoption and Impact of Technology," *MIS Quarterly* (19:4), pp. 465–485 (doi: 10.2307/249629).
- Jang, W.-Y., and Pan, M.-J. 2008. "Determinants of the Adoption of Enterprise Resource Planning within the Technology-Organization-Environment Framework: Taiwan's Communication Industry," *The Journal of Computer Information Systems* (48:3), p. 94.
- Kaiser, H. F. 1974. "An index of factorial simplicity," *Psychometrika* (39:1), pp. 31–36.
- Kaiser, H. F., and Rice, J. 1974. "Little Jiffy, Mark Iv," *Educational and Psychological Measurement* (34:1), pp. 111–117 (doi: 10.1177/001316447403400115).

- Kraemer, K. L., Dedrick, J., Melville, N. P., and Zhu, K. 2006. *Global e-commerce: impacts of national environment and policy*, Cambridge University Press (available at <http://books.google.com/books?hl=en&lr=&id=uDvPfcV2yFgC&oi=fnd&pg=PA13&dq=Global+E-Commerce:+Impacts+of+National+Environments+and+Policy&ots=EO9czjP6Jz&sig=8UiVBbiJJEoOLSw8F36UX5NkdhM>).
- Kuan, K. K. Y., and Chau, P. Y. K. 2001. "A perception-based model for EDI adoption in small businesses using a technology–organization–environment framework," *Information & Management* (38:8), pp. 507–521 (doi: 10.1016/S0378-7206(01)00073-8).
- Kuan, K. K. Y., and Chau, P. Y. K. 2001. "A perception-based model for EDI adoption in small businesses using a technology–organization–environment framework," *Information & Management* (38:8), pp. 507–521 (doi: 10.1016/S0378-7206(01)00073-8).
- Low, C., Chen, Y., and Wu, M. 2011a. "Understanding the determinants of cloud computing adoption," *Industrial Management & Data Systems* (111:7), pp. 1006–1023 (doi: 10.1108/02635571111161262).
- Low, C., Chen, Y., and Wu, M. 2011b. "Understanding the determinants of cloud computing adoption," *Industrial Management + Data Systems* (111:7), p. 1006.
- MacCallum, R. C., Widaman, K. F., Zhang, S., and Hong, S. 1999. "Sample size in factor analysis," *Psychological Methods* (4:1), pp. 84–99 (doi: 10.1037/1082-989X.4.1.84).
- Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J., and Ghalsasi, A. 2011. "Cloud computing — The business perspective," *Decision Support Systems* (51:1), pp. 176–189 (doi: 10.1016/j.dss.2010.12.006).
- Mell, P., and Grance, T. 2011. "The NIST definition of cloud computing," *National Institute of Standards and Technology* (800), p. 145.
- Moch, M. K., and Morse, E. V. 1977. "Size, Centralization and Organizational Adoption of Innovations," *American Sociological Review* (42:5), pp. 716–725 (doi: 10.2307/2094861).
- Muscatello, J. R., Small, M. H., and Chen, I. J. 2003. "Implementing enterprise resource planning (ERP) systems in small and midsize manufacturing firms," *International Journal of Operations & Production Management* (23:8), pp. 850–871 (doi: 10.1108/01443570310486329).
- Nah, F. F.-H., Lau, J. L.-S., and Kuang, J. 2001. "Critical factors for successful implementation of enterprise systems," *Business Process Management Journal* (7:3), pp. 285–296.
- Nelson, M. L., and Shaw, M. J. 2003. "The adoption and diffusion of interorganizational system standards and process innovations," *Urbana* (51), p. 61801.
- Oliveira, T., and Martins, M. F. 2010. "Understanding e-business adoption across industries in European countries," *Industrial Management & Data Systems* (110:9), pp. 1337–1354 (doi: 10.1108/02635571011087428).
- Porter, M. E., and Millar, V. E. 1985. "How information gives you competitive advantage," *Harvard business review* (63:4), pp. 149–160.
- Premkumar, G., and Roberts, M. 1999. "Adoption of new information technologies in rural small businesses," *Omega* (27:4), pp. 467–484 (doi: 10.1016/S0305-0483(98)00071-1).

- Pugh, D. S., Hickson, D. J., Hinings, C. R., and Turner, C. 1968. "Dimensions of Organization Structure," *Administrative Science Quarterly* (13:1), pp. 65–105 (doi: 10.2307/2391262).
- Ramdani, B., Kawalek, P., and Lorenzo, O. 2009. "Predicting SMEs' adoption of enterprise systems," *Journal of Enterprise Information Management* (22:1/2), pp. 10–24 (doi: 10.1108/17410390910922796).
- Rogers, E. M. 2003. *Diffusion of Innovations* (Fifth Edition.), New York, NY: Free Press.
- Saeed, I., Juell-Skielse, G., and Uppström, E. 2011. "Cloud Enterprise Resource Planning Adoption: Motives & Barriers," *Proceedings from CONFENIS 2011: Fifth International Conference on Research and Practical Issues of Enterprise Information Systems*, pp. 99 – 122.
- Son, J.-Y., and Benbasat, I. 2007. "Organizational Buyers' Adoption and Use of B2B Electronic Marketplaces: Efficiency- and Legitimacy-Oriented Perspectives," *Journal of Management Information Systems* (24:1), pp. 55–99 (doi: 10.2753/MISO742-1222240102).
- Teo, T. S., and Pian, Y. 2003. "A contingency perspective on Internet adoption and competitive advantage," *European Journal of Information Systems* (12:2), pp. 78–92.
- Thong, J. 1999. "An integrated model of information systems adoption in small businesses," *Journal of management information systems* (15:4), pp. 187–214.
- Thong, J. Y. L., and Yap, C. S. 1995. "CEO characteristics, organizational characteristics and information technology adoption in small businesses," *Omega* (23:4), pp. 429–442 (doi: 10.1016/0305-0483(95)00017-1).
- Tornatzky, L. G., and Fleischer, M. 1990. *The Processes of Technological Innovation*, Lexington, Massachusetts: Lexington Books.
- Tweel, A. 2012. "Examining the Relationship between Technological, Organizational, and Environmental Factors and Cloud Computing Adoption," Ph.D., , Ann Arbor, United States: Northcentral University (available at http://search.proquest.com.ezproxy.emich.edu/cv_728024/docview/1101947090/abstract/13CBFB5A2B9306AD2Fo/4?accountid=10650).
- Yoon, T. E., and George, J. F. 2013. "Why aren't organizations adopting virtual worlds?," *Computers in Human Behavior* (29:3), pp. 772–790 (doi: 10.1016/j.chb.2012.12.003).
- Zhu, K., and Kraemer, K. L. 2005. "Post-adoption variations in usage and value of e-business by organizations: cross-country evidence from the retail industry," *Information Systems Research* (16:1), pp. 61–84.
- Zhu, K., Kraemer, K. L., and Xu, S. 2006. "The process of innovation assimilation by firms in different countries: a technology diffusion perspective on e-business," *Management Science*, pp. 1557–1576.
- Zmud, R. W. 1982. "Diffusion of Modern Software Practices: Influence of Centralization and Formalization," *Management Science* (28:12), p. 1421.