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Exploring the roles of people, governance and technology in organizational readiness for emerging technologies

Research Paper

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ABSTRACT

The rapid development and release of emerging technologies have made their adoption challenging. Most often there are failing issues in organizational adoption of emerging technologies. It is yet unclear which component(s) of organization play the prominent role(s) in organizational readiness to adopt emerging technologies. Using a mixed method, this study conducted an online survey of 83 South African organizations for server virtualization adoption. Server virtualization is an emerging technology being widely adopted in most organizations in developed countries. IT executives rated server virtualization as the second-most important technology to help achieve cost reductions and optimize productivity in recent surveys. Very little is known about server virtualization adoption in organizations in developing countries. It was found that people and technology play prominent roles in South African organizational readiness to adopt server virtualization. Server virtualization has certain inhibitors such as lack of IT skill, and software and license costs that the IT industry and adopting organizations should consider.

Keywords

Server virtualization, emerging technologies, Green IT, globalization, IT adoption

INTRODUCTION

Emerging technologies are new technologies that have proven potential impacts (Fleischer et al., 2005). Emerging technologies are agents of global and local economic change and growth (Fu et al., 2010) and have the potential to change consumer habits in terms of “productivity, household production, consumption pattern, and socio-economic relationship” (Youtie et al., 2008, p. 315).

The global economic recession that caused a massive cut in its budget allocation world-wide, also caused a business process re-thinking and re-engineering (Luftman and Ben-Zvi, 2010a). Organizations now seek technologies to help achieve reduction of costs and optimization of productivity. One technology that IT executives and chief information officers (CIOs), are considering to help meet these demands is server virtualization (Luftman and Ben-Zvi, 2010a; McGee, 2010). In a 2009 survey, server virtualization was rated as the second-most important technology by IT executives (Luftman and Ben-Zvi, 2010a).

Server virtualization is a consolidating technology, which is being used to optimize server resources and to enhance productivity (Healey et al., 2008). However, globalization has made adoption of emerging technologies a challenge because of changing practices (El Sawy and Pavlou, 2008; Luftman and Ben-Zvi, 2010a). The challenges organizations encounter include lack of awareness, expertise, skills, change readiness, cost of adoption, and integration with existing technologies (Cetindamar et al., 2009; Hoving, 2007; Peansupap and Walker, 2006; Stewart and Mohamed, 2002).

This paper draws on these backgrounds and investigates the roles of people, governance and technology in South African organizations to adopt server virtualization. The objective is to understand the enablers and/or inhibitors of server virtualization adoption in organizations in developing countries. The research question is: do people, governance and technology contribute significantly to organizational readiness to adopt emerging technologies such as server virtualization?

The rest of the paper is as follows: literature was reviewed and a conceptual model to understand the roles of people, governance and technology in organizational readiness for emerging technologies was developed. A methodology was decided upon to test the model, data was gathered, and results analyzed, discussed and concluded.

THEORETICAL BACKGROUND

Innovation Diffusion

Rogers' (2003) theory of diffusion of innovations provides a holistic insight into organizational adoption of innovations (new ideas, concepts, or objects) and is appropriate to understand issues around adoption of emerging technologies such as server virtualization.

Innovation diffusion has five processes: knowledge is the first process where there is awareness of the innovation, intended users undergo learning of the innovation, and eventually understand how to use it; persuasion follows, where users consider the consequences of using the innovation, and then form attitudes towards such innovation. Attitudes may be favorable or otherwise. After persuasion, a decision is made whether to adopt or reject the innovation. Adoption of innovations leads to implementation where innovations are put into use. Finally adopters seek to reinforce their earlier decisions, in the confirmation stage (Rogers, 2003).

In addition to these processes, there are five characteristics of an innovation which tend to influence its adoption (Rogers, 2003).

- Relative advantage seeks to understand the extent to which an innovation is perceived to be a better alternative than the current practice. Adoption increases when innovation is perceived as better than the current ideas (Ashley, 2009; Premkumar, 2003).

- Compatibility is the extent to which innovations are perceived to be consistent with previous practices, existing values, and adopters' needs. The more compatible an innovation is, the higher the chance of its adoption (Ashley, 2009).
- Complexity is the extent to which an innovation can be understood and used. The less complex an innovation is, the more such an innovation is likely to be adopted (Ashley, 2009; Enfield et al., 2011)
- Trial ability is the degree to which an innovation can be experimented before its full adoption. Potential adopters then have a feel of the innovation and are able to make an adoption or rejection decision (Ashley, 2009; Lapointe and Rivard, 2005).
- Observability refers to the extent to which the use and benefits of an innovation are apparent to others. Adoption increases when the benefits of an innovation are achieved and are visible to future adopters (Ashley, 2009; Cotteleer and Bendoly, 2006).

By looking at the processes and characteristics of innovations adoption of Rogers (2003), it is plausible that adopters of server virtualization are aware of the technology or are prepared to learn how to use the technology. Moreover, such adopters form an attitude to accept or reject the use of server virtualization in their environments. Acceptance decision is possible provided that server virtualization's use offers better value than, and is consistent with, the current practice; users understand how to use server virtualization; users can use server virtualization in a test environment before actual deployment in a production environment; and future adopters can be motivated by the success of existing adopters.

This analysis suggests that Rogers' (2003) Theory of Diffusion of Innovation is relevant to understanding the adoption of server virtualization in South African (a developing country) organizations. It is unclear if these organizations are aware of the technology or if they are prepared to learn a new technology.

Organizational Readiness

Adoption of emerging technologies such as server virtualization has been known to be associated with certain problems (Lucas, Jr. et al., 2007). Kwon and Zmud (1987) identified these problems and their resolutions as factor, process, and political research. These categories are closely related to the adoption of server virtualization as they consider people, governance, and technological factors that are imperative to achieve IT adoption success (Info-Tech, 2008; Lapointe and Rivard, 2005). Factor research considers individual, organization, and technology; process research fosters change management; and political research considers diversity of IT stakeholders' interest (Cooper and Zmud, 1990; Info-Tech, 2008). This study adopted these three stances in order to understand organizational readiness for emerging technologies (such as server virtualization).

People in an organization often exhibit resistance to adoption of new technologies (Lapointe and Rivard, 2005). Server virtualization adoption often fails because top executives, application owners and IT staff may not buy into the technology (Daniels, 2009; Info-Tech, 2008), and/ or a lack of change readiness (Kwahk and Lee, 2008; Peansupap and Walker, 2006). If potential users try an innovation and have a perception of loss of control, then these users often resist (Lapointe and Rivard, 2005). A lack of expertise to manage innovations and poor knowledge management and practice are other factors which cause adoption failure (Alavi and Leidner, 2001; Cetindamar et al., 2009; King and Marks Jr., 2008).

Governance is another consideration for adopting emerging technologies because of the enormous challenge associated with getting the right technologies to enhance business value (Hoving, 2007). In

some instances, organizations fail to consider the future of their businesses when adopting emerging technologies in terms of commoditization (interoperability and cost performance), integration and management of these technologies and achieving business value (Goodhue et al., 2009; Hoving, 2007). Innovators are often somewhat venturesome, and make rash decisions when adopting an innovation, and often encounter setbacks (Enfield et al., 2011). In other instances, innovations have inviting benefits that must be carefully weighed with business requirements (El Sawy and Pavlou, 2008; Ifinedo, 2005).

The existing IT infrastructure (technology) determines, in addition to the people and governance, the success of adoption of emerging technologies (Goodhue et al., 2009; Luftman and Ben-Zvi, 2010a). Before adopting server virtualization, organizations must assess their existing servers, platform integration, IT infrastructure, bandwidth, candidature, resource demand, and hardware requirements (Daniels, 2009; Uddin and Rahman, 2011). Server virtualization may provide a single point failure if an organization consolidates all its applications on a server, and fails to deploy failover service or provides for redundancy (Uddin and Rahman, 2011). These three major factors can be depicted as shown in Figure 1.

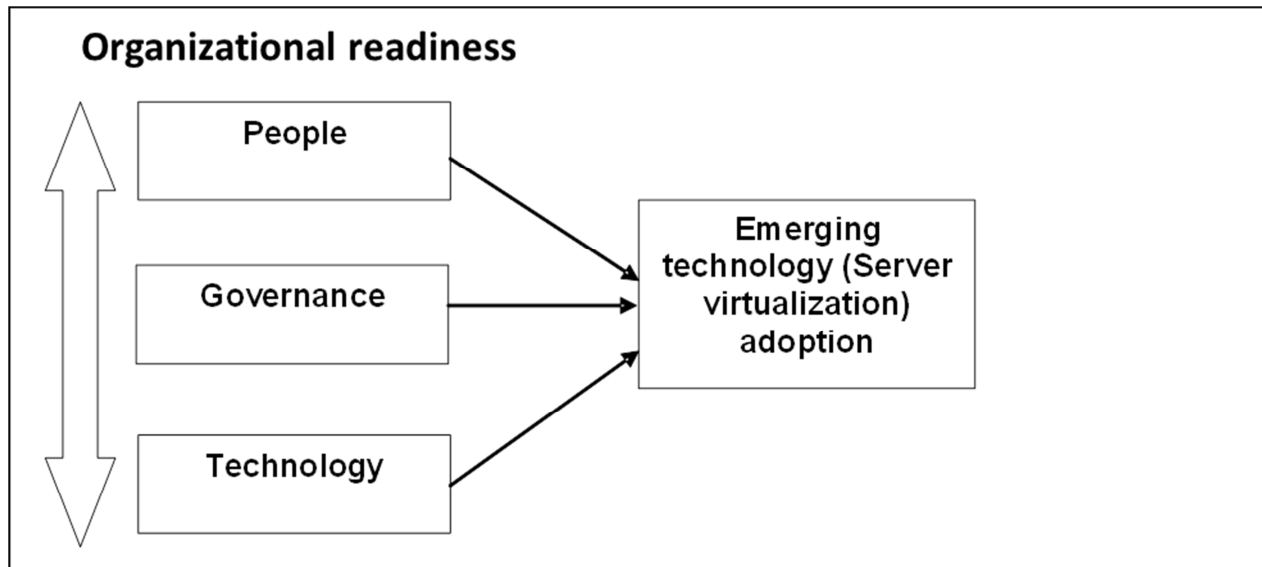


Figure 1. Conceptual framework for investigating roles organizational readiness for emerging technologies

IT ADOPTION ENABLERS AND INHIBITORS

This section discusses common enablers and inhibitors to the adoption of IT in organizations. The section serves to determine if factors that enable and, or inhibit generic IT adoption in organizations apply to server virtualization in South African organizations.

Enablers

Stakeholders' Support

Stakeholders in organizations include top executives such as the CEO, IT manager, IT staff, IT users, and the customers (Cotteleer and Bendoly, 2006). These stakeholders' decisions and support are crucial to successful adoption of IT in any organization (Sanad et al., 2010). The top executives make decisions

on adoption of technologies in their organizations; the IT department handles the technical operation and support of these technologies; users utilize IT for their routine business tasks; and the customers subscribe to the output service of the overall process (Caetano and Amaral, 2011; Premkumar, 2003).

Training

Provision for staff training by top management is one of the factors that enable adoption of IT in organizations (Bruque and Moyano, 2007; Cetindamar et al., 2009). In addition, knowledge sharing is facilitated when staff exhibit good working relationships and socialize together (Alavi and Leidner, 2001). This suggests that training can either take a form of informal knowledge sharing among employees or a more formal training offered by technical groups or product vendors (King and Marks Jr., 2008).

IT and Business Integration

Although IT and business alignment has been a conundrum for a long time, leveraging IT and business enhances strategic relationship between IT and businesses, and helps organizations achieve success (Bhatt et al., 2010; Luftman and Ben-Zvi, 2010b). Organizations that make IT an integral part of business requirements often facilitate adoption of technologies in their environments (Kunneke et al., 2010). In this case, IT is seen as inclusive of business and business as part of IT (Luftman and Ben-Zvi, 2010b). However, adequate planning of technologies is required for organizations to effectively integrate technology into business (Caetano and Amaral, 2011). Teams are more efficient when they form a synergy as a result of using IT, because IT capabilities enhance knowledge sharing and management among team members (Caetano and Amaral, 2011).

Strategic IT Planning Capability

IT Strategic planning has continued to be among the top ten priorities of IT executives as it helps to deliver business improvements rapidly (Luftman and Ben-Zvi, 2010a). Since the commencement of economic downturn, IT executives have been working hard to discover strategic opportunities for using IT to achieve cost reductions and enhanced productivity (Luftman and Ben-Zvi, 2010a; Uddin and Rahman, 2011). It is common for organizations to consolidate their IT infrastructures using technologies such as virtualization (Daniels, 2009). Organizations that have strong strategic IT planning capabilities are able to adopt new technologies faster than those who do not (Bajgoric, 2006).

Flexible IT Infrastructure

Flexible IT infrastructure relates to the extent “to which the IT infrastructure is scalable, compatible, modular, and can handle multiple business applications” (Bhatt et al., 2010, p. 342). Organizations are able to react to change faster when they have flexible IT infrastructure (Peansupap and Walker, 2006). However, organizations must have standard IT policies that will enhance adoption and upgrade to new systems to meet changing business needs (Cetindamar et al., 2009).

Effective Technical Support

Technical support (in-house and from external vendors) is crucial to adoption of IT (Debreceeny, 2006). Support covers online assistance, product updates and upgrades, user training, and maintenance (Wang et al., 2008).

Inhibitors

Lack of Technology Awareness

Lack of technology awareness remains one of the inhibitors to adoption of IT in organizations (Molla and Licker, 2005). As a result, organizations often fail to seek opportunities that can be achieved with adoption of IT (Stewart and Mohamed, 2002). In most cases, the decision to invest in, and adopt, IT is difficult to arrive at when organizations are unaware of the potential benefits they can derive from such adoption (Peansupap and Walker, 2006).

Fear of Job Loss and Insecurity

Implementation of new technologies often requires changes in users' behaviors (Peansupap and Walker, 2006), and users often exhibit fear of losing jobs, responsibilities or other controls (Bruque and Moyano, 2007).

Lack of Skilled Staff

The expert skills required to adopt and support IT are motivated by provisions for IT training in organizations, and adequate IT staff with requisite experience (Stewart and Mohamed, 2002). Lack of skilled personnel to implement, use and support IT is one of the biggest inhibitors to IT adoption (Bruque and Moyano, 2007; Gilham and Van Belle, 2005).

IT Adoption Policy

The trial ability characteristic of an innovation helps to understand why some organizations are early adopters of an innovation (a new technology) and others are late adopters (Rogers, 2003). Trial ability has been found in recent studies to have significant influence on adoption of IT (Gilham and Van Belle, 2005; Peansupap and Walker, 2006). Adoption policy specifies when and why an innovation should be adopted (Ashley, 2009). Generally, organizations appear to adopt an innovation early, when the organizations are fully aware of the innovation, and such an innovation proves to be a better replacement of the existing practice (Lapointe and Rivard, 2005).

Cost

High cost associated with initial setup and maintenance is responsible for low level IT adoption in some organizations (Stewart and Mohamed, 2002). For example, many virtualization vendors often offer "cost per instance" licensing instead of "cost per processor," thus making cost of virtualization license huge and unaffordable for many organizations (Daniels, 2009).

SERVER VIRTUALIZATION ARCHITECTURE

Server virtualization is a hardware virtualization technique that allows multiple instances of virtual machines to run on an x86 physical server computer (Luftman and Ben-Zvi, 2010a; Uddin and Rahman 2011). Virtual machines behave as physical computers and improve utilization of hardware resources such as memory, processor and central processing unit (CPU) (Uddin and Rahman, 2011). A typical server runs at 15-20% utilization, and this is increased to 70% utilization in a virtualized environment (Luftman and Ben-Zvi, 2010a). Furthermore, there is no significant difference in the amount of energy consumed by a server when it is running as a stand-alone and when it is virtualized (Rasmussen 2006, Uddin and Rahman, 2011). A stand-alone server requires 50% of its cost of purchase to meet power and

cooling demands (Healey et al., 2008). Thus, server virtualization offers more utilization benefits in this regard.

Figure 2 shows a virtualized physical server hosting three applications on three virtual servers. The hypervisor or virtual machine monitor inserts a thin layer of abstraction between the physical server (host) and the virtual machines (guest) (Colivet, 2008). The architecture of server virtualization follows hardware virtualization in which the virtual machine operates a layer below the host computer operating systems (Colivet, 2008).

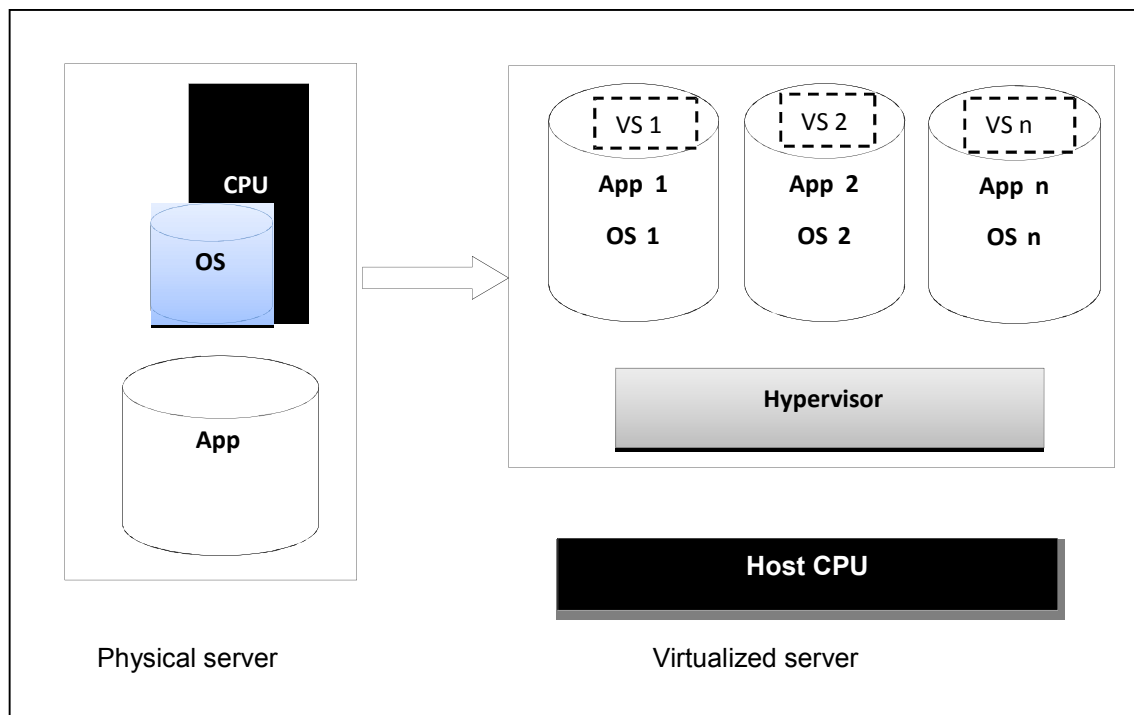


Figure 2. A typical Virtualized Server Environment (HP 2009, p. 3)

RESEARCH METHODOLOGY

This study was quantitative by method and adopted a positivist stance (Orlikowski and Baroudi, 1991). The study was exploratory and predictive. Positivist research tries to test “theory” in a bid to widen “the predictive understanding of phenomena” (Myers, 2010, p. 2).

Data were gathered through an online survey and a questionnaire. Questions were drawn based on the literature using a 7-point Likert scale after a factor analysis for grouping of questions (Bell, 2005; Hussey and Hussey, 1997). A 7-point Likert scale allows respondents a broad range of options, ensures responses are not unnecessarily skewed, and allows for rigorous analysis (Hussey and Hussey, 1997).

The study was conducted in South Africa, and the data sample comprised small to large-sized organizations located across the three major cities in South Africa. Respondents were selected based on their relevant knowledge of the phenomena being investigated (Hussey and Hussey, 1997).

Organizations in sectors such as IT, banking and finance, retail, telecommunication, manufacturing, government service, oil and gas/energy, internet services, and software development formed the sample of this study. The target respondents were the IT executives in these organizations.

The questionnaire was made available online between November 10, 2010 and April 30, 2011, after an initial pilot survey was conducted. A total of 1,500 invites were sent out to various individuals and organizations. Poor response rate has been a major limitation to quantitative survey studies (Cycyota and Harrison, 2006).

A total of 124 out of the 1,500 organizations responded, accounting for an 8% response rate. Eighty three responses were useful and 41 incomplete questionnaires were dropped. In addition, several emails were received from organizations that did not participate.

Responses from all the respondents were transferred to Microsoft Excel spread sheets and coded as 1 for Strongly Disagree, 2 for Disagree, 3 for Disagree somewhat, 4 for neutral, 5 for Agree somewhat, 6 for Agree, and 7 for Strongly Agree.

Where less than 25% of a questionnaire was returned blank, the blank responses were coded as 4. Forty-seven incomplete responses were received and only six incomplete responses were less than 25% of the entire questionnaire, used and formed part of the 83 valid responses.

Because of the limitations of first-generation techniques, structural equation modeling (SEM) was used to analyze the data using the WarpPLS 2.0 software. The bootstrapping technique resampling method, and the Warp3 PLS regression analysis algorithm in partial least squares (PLS) were used to test the significance of factors contributing to organizational readiness for emerging technologies

To test the convergent and discriminant validity of our instrument, the WarpPLS 2.0 analysis tool was used. Variance-based SEM produces “robust results even in the presence of small samples and multivariate deviations from normality” as it uses “robust statistics” to establish the confidence level of path relationships between latent variables (Kock, 2011, p. 2).

To answer the first research question, the magnitude and algebraic signs of the beta coefficients and the p values were examined. A factor was accepted to contribute significantly if the resultant p value was less than or equal to 0.05. Beta coefficients help to determine more importantly if there is a positive or negative path relationship between an independent variable and a dependent variable (Urbach and Ahlemann, 2010).

In order to answer understand how people, governance and technology in organizations enable, and/or inhibit, adoption an open-ended question was analyzed using the Thomas (2006) general inductive approach for data analysis to group themes into categories. Furthermore, the contribution of Kwon and Zmud (1987) was used to understand and group factors that affect adoption of server virtualization in South African organizations into different sub-categories. Finally, Rogers Everest's (2003) Diffusion of Innovations Theory was used to analyze and discuss these factors.

ANALYSIS AND FINDINGS

Demographic Profiles

One hundred and twenty four responses were received and 83 organizations used server virtualization.

Roles of Respondents

Thirty three percent of the 83 respondents from the organizations using server virtualization were IT Managers, 17% Senior IT Officers, and 11% Chief Information Officers. Thirty four percent (the others) were comprised of Software Test Analysts, IT Architects, Installation and Support Engineers, and Systems Engineers. These roles are relevant to the understanding of server virtualization adoption in these organizations. For example, the IT Architects were from the large organizations.

Interestingly, 56% of respondents that did not complete the survey were CEOs, 22% were IT Managers, and 11% each were Network Administrators and Software Analysts. Also, all the CEOs, IT Managers and Software Analysts were from small organizations. Only the Network Administrators were from large organizations.

Fifty-one percent of the 83 organizations using server virtualization have implemented extensively. The full results are shown in Figure 3.

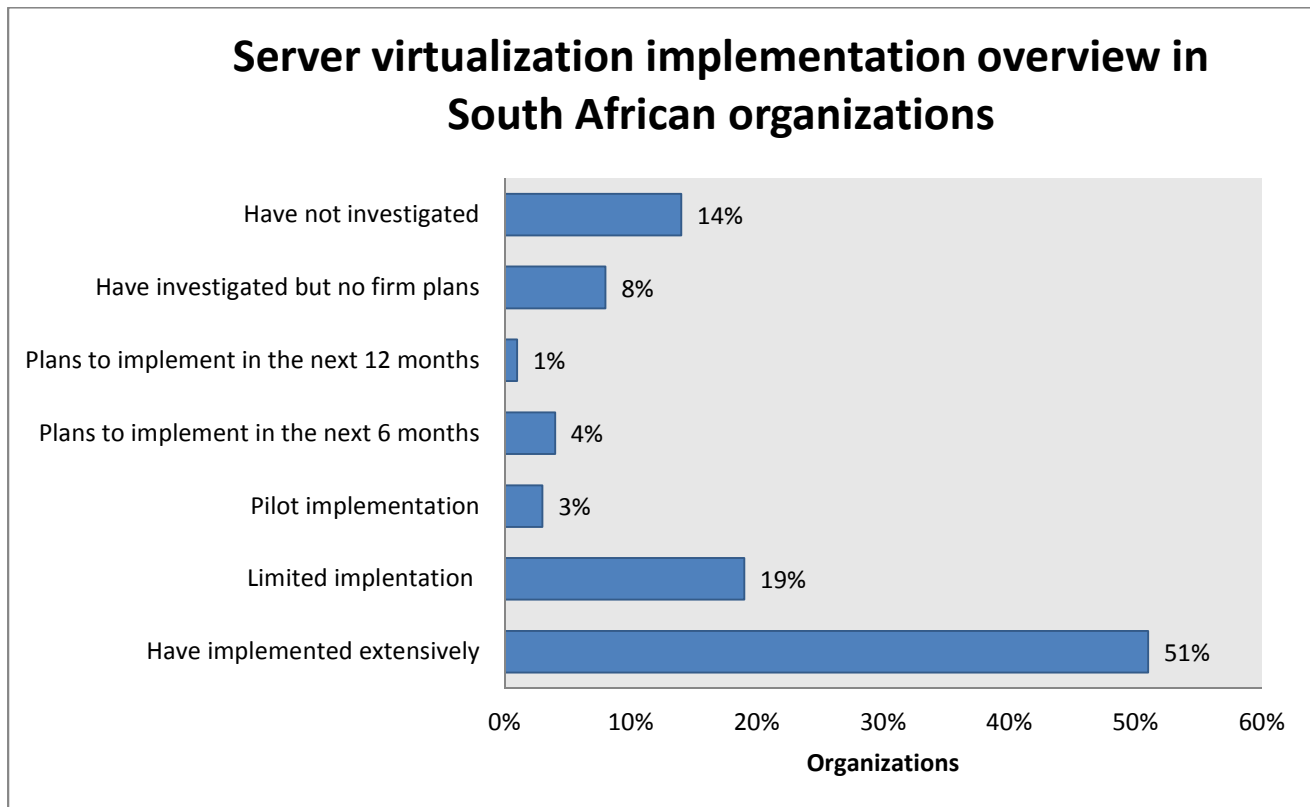


Figure 3. Overview of Server Virtualization Implementation in South African Organizations

Adoption of an innovation increases when future adopters can see (observability) the benefits. In relation to the results in Figure 3, it appears that server virtualization adoption is likely to increase in South African organizations, as 19% have made limited implementation and 5% are likely to implement within 12 months from the time they were surveyed.

Research Model Assessment

The research instrument was tested for reliability, convergent validity, and discriminant validity. The three tests have been widely used in IS research to ensure that research instruments are dependable and consistent (Henseler et al., 2009; Urbach and Ahlemann, 2010).

Reliability Test

Table 1 shows the results of our framework construct reliability test. A reliability test helps to ensure that measures are free from error and therefore yield consistent results (Fornell and Larcker, 1981). Cronbach's alpha is weak for its underestimation of internal consistency reliability of latent variables in PLS-based SEM, as it assumes that all indicators have equal reliability (Urbach and Ahlemann, 2010). Composite reliability on the other hand, takes the Cronbach's alpha deficiency into consideration by treating indicators as having different loadings, and is recommended (Henseler et al., 2009). A measurement instrument has good reliability if either the composite reliability or Cronbach's alpha coefficient is equal to or greater than 0.7 (Fornell and Larcker, 1981; Urbach and Ahlemann, 2010).

Composite Reliability Coefficients			
Server Virtualisation	People	Governance	Technology
0.915	0.712	0.808	0.976

Table 1. Reliability Test

The results in Table 1 demonstrate that the research instrument passed the reliability assessment as the latent variables all loaded above 0.7.

Discriminant Validity Test

Discriminant validity is the extent to which items in a measurement instrument differentiate among measures or measure distinct concepts (Fornell and Larcker, 1981). If the items associated with a measure correlate more highly with other items of the same measure in the model, then the measure is said to have adequate discriminant validity (Fornell and Larcker, 1981). The values on the diagonal exceed values below them in the same column and in the same row in Table 2, and the associated p values indicate that the inter-correlations of most of the latent variables are significant at $p < 0.05$, and highly significant at $p < 0.001$. Thus, the research instrument is determined to have adequate discriminant validity.

	SERVER VIRTUALISATION	PEOPLE	GOVERNANCE	TECHNOLOGY
SERVER VIRTUALIZATION	0.689			
PEOPLE	0.423 p<.001***	0.674		
GOVERNANCE	0.22 p=0.045*	0.439 p<.001***	0.719	
TECHNOLOGY	0.437 p<.001***	0.261 p=0.017*	0.134 p=0.229	0.976

Table 2. Discriminant Validity Test

Note: Significance at: $p < 0.05^*$, $p < 0.01^{**}$, $p < 0.001^{***}$

Convergent Validity Test

Convergent validity is the extent to which items forming a construct combine together when compared to “items measuring different constructs” (Urbach and Ahlemann, 2010, p 19). Table 3 provides the results of the convergent validity test. An instrument has good convergent validity if the respondents answered the research questionnaire in the same way and in the way intended by the researcher (Hair et al., 1987).

Our research instrument comprised a total of 31 indicators. Seventeen items measure Server Virtualization, 4 items measure People, 6 items measure Governance, and 4 items measure Technology. The loadings in each latent variable were examined and loadings that were equal to or greater than 0.5 were determined to have good convergent validity and selected (Hair et al., 1987). All indicators loaded below the 0.5 threshold were rejected and removed. Twelve items in the Server Virtualization variable, 3 items in the People variable, 4 items in the Governance variable, and 2 items in the Technology variable met the convergent threshold of 0.5 and were selected for analysis. Thus, 21 indicators were selected for framework analysis as shown in Table 3. The results demonstrated that since most of the items loaded the constructs were to a reasonable extent valid.

Indicators	Server Virtualization	People	Governance	Technology
SV 1	0.798			
SV 2	0.775			
SV 3	0.736			
SV 4	0.697			
SV 5	0.745			
SV 6	0.653			
SV 7	0.684			
SV 8	0.657			
SV 9	0.707			
SV 10	0.503			
SV 11	0.596			
SV 12	0.665			
PE 6		0.707		
PE 7		0.731		
PE 12		0.575		
GV 8			0.538	
GV9			0.744	
GV10			0.765	
GV 14			0.800	
TE 2				0.976
TE 3				0.970

Table 3. Convergent Validity Test

Figure 4 reveals that people and technology in organizations are highly significant in organizational readiness to adopt server virtualization.

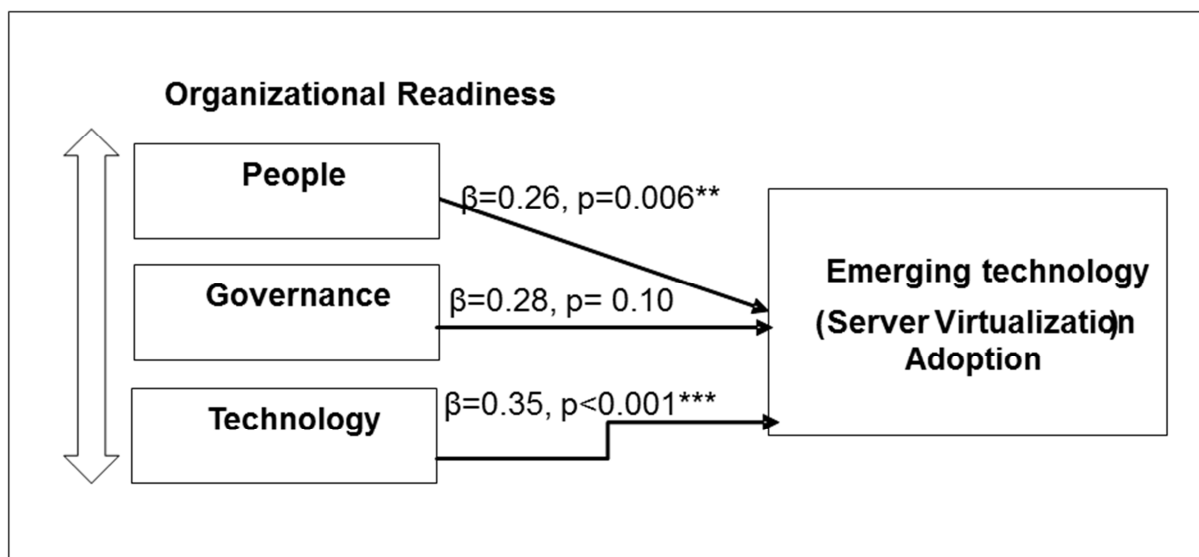


Figure 4. People, Governance and Technology as Contributors to Organizational Readiness

Note: Significance at: $p<0.05^*$, $p<0.01^{**}$, $p<0.001^{***}$

As shown in Table 3, only four indicators in the organizational readiness variables met the convergent validity criterion. PE 6, PE 7 and PE 12 assess IT staff skills to support virtual servers, top executives' IT skills to support adoption decision, and organizational provision for personnel training and development. GV 8, GV 9, GV 10, and GV 14 assess strategic alignment, disaster recovery, change management, and service level requirements. TE 2 and TE 3 assess server candidature for virtualization, and the existing IT platform for implementing virtualization respectively. These indicators are tested against the dependent variable (server virtualization) and the result (Figure 3) shows that people and technology in organizations contribute more significantly and positively to the overall organizational readiness.

Indicators tested against the dependent variable (server virtualization) (Figure 4) shows that people and technology in organizations contribute more significantly and positively to the overall organizational readiness.

It is surprising to see that governance is less significant, as in previous studies, governance was found to be highly contextual, and highly significant to organizational readiness to adopt innovations (Teo and Ranganathan, 2004; Tsao et al., 2004). In a study by Kaynak et al. (2005), governance is found to be insignificant to organizational readiness. This suggests that governance may be contextual or based on organizational policies and culture (Peansupap and Walker, 2006).

Overall, these results suggest that people, and technology play the major roles in the adoption process. The result is consistent with the existing knowledge on IT adoption in organizations in developing countries (Hourali et al., 2008; Molla and Licker, 2005).

Analysis of enablers and inhibitors of server virtualization adoption

We also attempted to understand how people, governance and technology in organizations enable, and or inhibit adoption. Table 4 provides a list of enablers and inhibitors of server virtualization adoption. As revealed in Figure 4, people, and technology have strong positive impacts on organizational readiness for server virtualization (an emerging technology).

People

Only one respondent indicated that ease of use (relative advantage) enables the adoption of emerging technologies. This result was surprising because 'lack of IT skill' was identified by 51 respondents as the main inhibitor for individuals (people) to support adoption of emerging technologies. This finding suggests that individuals (people) will support adoption of emerging technologies provided that such technologies are well-understood and can be used (Enfield et al., 2011).

Lack of stakeholders' support was identified by 17 respondents as another major inhibitor to the adoption of server virtualization in organizations. Lack of confidence was identified by only one respondent as another inhibitor to the adoption of emerging technologies in organizations in developing countries. Lack of IT skills and lack of stakeholders' support confirm existing literature (Bruque and Moyano, 2007; Sanad et al., 2010).

CATEGORY	ADOPTION FACTORS	COUNT	TOTAL	PERCENTAGE
ENABLERS	People: sum total	1	1	4.4%
	<i>Ease of use</i>	1		
	Governance: sum total	7	7	30.6%
	<i>Training & certification</i>	5		
	<i>Business demand</i>	2		
	Technology: sum total	15	15	65%
	<i>Licensing flexibility</i>	1		
	<i>Cost saving</i>	4		
	<i>Consolidation</i>	3		
	<i>Standardisation of infrastructure</i>	1		
	<i>Open source and free product</i>	2		
	<i>Compatible hardware</i>	1		
	<i>Power backup systems</i>	1		
	<i>Ease of use</i>	1		
	<i>Fast entry into market</i>	1		
		Group Total		23
INHIBITORS	People: sum total	69	69	41.1%
	<i>Lack of IT skill</i>	51		
	<i>Lack of stakeholders' support</i>	17		
	<i>Lack of confidence</i>	1		
	Governance: sum total	20	20	11.9%
	<i>Bandwidth and broadband</i>	13		
	<i>Process maturity</i>	4		
	<i>IT adoption policy</i>	3		
	Technology: sum total	79	79	47%
	<i>Software and license costs</i>	40		
	<i>Product license</i>	5		
	<i>IT infrastructure / Hardware</i>	15		
	<i>Lack of product awareness</i>	5		
	<i>Product security</i>	1		
	<i>Vendor support</i>	8		
	<i>Power supply</i>	4		
<i>Network complexity</i>	1			
	Group total		168	100%
	Overall Total (Enablers and Inhibitors)		191	

Table 4. Server virtualization enablers and inhibitors

Governance

Training and certification, and business demand were identified as enablers of governance in organizations. Training and certification help IT support teams to master technologies and to acquire the requisite skills needed to support organizational use of such technologies. One of the organizations using server virtualization reported:

“Ensure that training is available, certify as many employees as possible which will be of huge benefit to any company.”

Business demand on the other hand is perceived by two respondents to be facilitated by IT, as one of the respondents pointed out:

“IT can be responsive to new business requirements and infrastructure requests.”

However, 13 respondents indicated that costs of bandwidth and broadband may inhibit the adoption of emerging technologies in organizations in developing countries. This finding is consistent with existing literature on IT adoption in organizations in developing countries (Hourali et al., 2008; Molla and Licker, 2005). A respondent reported:

“Bandwidth issues could hinder from a disaster recovery / business continuity management perspective.”

Four respondents indicated that process maturity hinders the adoption of emerging technologies. Process maturity enhances business demands and is essential for organizations to institutionalize through standards, policies, and organizational structures (McCormack et al., 2009).

Finally, three respondents identified IT adoption policy as another inhibitor to the adoption of emerging technologies in organizations in developing countries. Adoption of an innovation is only likely to increase when such an innovation has a relative advantage, and IT adoption policy may support a late adoption if the innovation is not better than the existing practice (Molla and Licker, 2005). However, a lack of awareness (observability) may trigger a late adoption even when the innovation offers potential benefits (Ashley, 2009).

Technology

Nine respondents identified cost saving, consolidation, and open source and free software as the main enablers to server virtualization adoption in organizations in developing countries. Server virtualization adoption provides cost savings and consolidation benefits to organizations (Uddin and Rahman, 2011). Open source software (OSS) is considered to provide improved cost effectiveness (Rahim, Alias, and Carroll, 2010). However, OSS has many challenging factors such as competition from proprietary software vendors, lack of technical support, and incompatibility with legacy applications, and these factors cause adoption failure (Rahim et al., 2010). One of the respondents reported:

“Lack of support for open source virtualization products limits adoption.”

Software and license costs were identified as the major technological inhibitor to the adoption of emerging technologies in organizations in developing countries. Cost is a conundrum in the adoption of technologies in developing countries (Rahim et al., 2010). For example rates of foreign exchange influence the cost of purchases, as the US dollar remains the standard currency for foreign exchange (Zhu and Kraemer, 2005). Another reason may be due to the fact that the economic recession affects developing countries more than the developed (Naude, 2009).

IT infrastructure / hardware, lack of product awareness, vendor support, and power supply were identified as other technological inhibitors to server virtualization adoption. Lack of product awareness as indicated by five respondents also confirmed the existing knowledge, as adopters have to be aware of the innovation they are adopting (Rogers, 2003).

Vendor support is very important to organizations in developing countries for adoption of emerging technologies, especially to provide product awareness, make cost and licensing affordable, and provide technical assistance (Molla and Licker, 2005). Power supply (electricity) appears to be peculiar to developing countries (Stewart and Mohamed, 2002).

Using Table 1, the computation of the percentage of the relative frequencies (factor sum total divided by group total) of each Category/factor are thus:

- Enablers: people 4.4%, governance 30.6%, and technology 65%
- Inhibitors: people 41.1%, governance 11.9%, and technology 47%
- In all, technology appears to be playing the major role in organizational readiness for a technology adoption.
- The major factors influencing innovation adoption are:
- People: Ease of use (enabler) and lack of IT skill, and lack of stakeholders' support (inhibitors).
- Governance: Training and certification (enablers), and bandwidth and broadband, and process maturity (inhibitors).
- Technology: Cost saving, consolidation, and OSS (enablers), and software and license costs, IT infrastructure/hardware, lack of product awareness, and vendor support (inhibitors).

Thus, the server virtualization adoption process is such that cost saving and consolidation benefits may trigger an increase in adoption (observability). Furthermore, use of server virtualization (complexity) may be facilitated (relative advantage) through training and certification (trial ability).

However, lack of skill (complexity), software and license costs (relative advantage), IT infrastructure/hardware (compatibility), and lack of stakeholders' support (observability) may constitute the major inhibitors to sever virtualization adoption in organizations in developing countries.

DISCUSSION AND CONCLUSION

People and technology were found as significant and positive contributors to organizational readiness. Governance as a factor in organizational readiness remains contextual based on organizational policies, culture, and the innovation being adopted.

One of the enablers to server virtualization adoption, as seen in Table 4, is open source and free products. Forty respondents indicate that the costs of software and license for server virtualization are major inhibitors. Thus, open source and free licensed products may encourage an increase rate of server virtualization adoption in developing countries. However, organizations need to understand certain challenges with OSS such as its lack of technical support and incompatibility with the existing IT infrastructure (Rahim et al., 2010).

Lack of IT skills was reported as an inhibitor for adopting server virtualization in South African organizations. The lengthy duration of training, as reported by respondents, suggests that organizations should make continuous training part of their business process.

The cost of bandwidth and the affordability of high broadband connectivity are still inhibiting the adoption of emerging technologies such as server virtualization in organizations in developing countries (Hourali et al., 2008). This issue may affect organizations which strive "to pursue value creation

opportunities facilitated by the use of the internet,” which organizational readiness should achieve (Choucri et al., 2003, p. 4).

Market monopolies such as Telkom (the major telecommunication provider in South Africa) have been affecting IT investments in Africa (Bollou and Ngwenyama, 2008). Thus, there is a need for a competitive telecommunication market in South Africa in order to bring down the costs of bandwidth and broadband.

Lack of product awareness may also be inhibiting the adoption of server virtualization in South African organizations, and this is consistent with the existing literature on IT adoption in organizations in developing countries (Molla and Licker, 2005). It is common for an organization to outsource part or all of its IT functions due to lack of product awareness and inability to see the full potentials of existing IT/IS systems. As a result, investment decisions for new or emerging technologies become challenging.

The major limitation to this study was the low response rate, which is synonymous with survey studies.

The theoretical implication our study can provide is that factor research at organizational level should take cognizance of factors that enable, and/or inhibit, adoption of innovations and especially emerging technologies.

The learning curve associated with every innovation tells how quickly and easily the innovation can be understood and implemented (Ashley, 2009). Thus, there is a need to determine the complexity associated with server virtualization before adoption takes place.

It is, however, pertinent to note that adopters may seek to try innovations before the full adoption decision is made or the implementation is conducted (Enfield, et al., 2011). Thus, supporting industries (vendors) should make virtualization software available to organizations for test implementations. In addition, the trial ability characteristic of innovations suggests that it is advantageous to implement server virtualization in a test environment before actual deployment in a production environment (Uddin and Rahman, 2011).

We recommend that organizations review their business and IT needs, and IT infrastructures, and take cognizance of stakeholders in organization such as top executives, IT staff, and customers, before adopting emerging technologies. Further study is suggested on other antecedents for organizational adoption of emerging technologies.

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