The Link Between e-Business Adoption and Business Efficiency:
A Case of Zimbabwe's Manufacturing Sector

[1]S. Mupemhi and [2]A. Muposhi
[1]Faculty of Commerce, Midlands State University, Private Bag, 9055 Gweru, Zimbabwe
[2]Department of Marketing and Sport Management, Vaal University of Technology,
Private Bag X021, 1900 Vanderbijlpark, South Africa

Abstract: In an increasingly competitive global marketplace, the adoption of electronic business tools by manufacturing companies is becoming a mega trend. Despite this, several manufacturing companies, especially in developing countries are still confronting challenges related to inefficiencies in terms of their business processes. Against this background, this study examined the relationship between e-Business adoption and business efficiency in the manufacturing sector in Zimbabwe. A quantitative research approach was utilised to test the hypothesised relationships as conceptualised in the research model. A sample size of 118 manufacturing firms was obtained from a systematic random sample of 180 firms in the Confederation of Zimbabwe industries database. The results of the study show that the number of e-Business applications adopted by the firm and their usage rate have positive impact on business efficiency. However, the relationship between the spread of e-Business tools adopted and business efficiency was shown to be statistically insignificant. The study has important implications for manufacturing companies intending to adopt e-Business as a strategy of creating sustainable competitive advantage.

Key words: e-Business adoption, e-Business tools, usage rate, manufacturing sector, spread of e-Business tools, business efficiency, Zimbabwe

INTRODUCTION

Globally, manufacturing firms are facing challenges of increased competition coupled with the pressure of managing costs and improving product quality (Barden *et al.*, 2013). In an attempt to create competitive advantage, several manufacturing firms are adopting electronic business (Barden *et al.*, 2013; Chang, 2010; Ranganathan *et al.*, 2004). As of 2013, the Eurostat statistics reports that, e-Business tools such as websites, customer relationship management and enterprise resource planning softwares were gaining in popularity (Anonymous, 2013a, b). This growth in popularity is motivated by associated benefits such as improved customer-supplier relationships and streamlined business processes (Lin and Lee, 2005). Consequently, the role of e-Business is viewed as critical in the context of cutthroat competition and economic challenges confronting business (Choong, 2013).

Although, the importance of e-Business is widely acknowledged, empirical evidence suggests that some firms are struggling to get value out of it (Panther, 2006; Peltier *et al.*, 2009). When e-Business became the buzz word at the end of the 20th century, it was expected that

its contribution to the global economy would reach US $400 billion by 2002 while the number of internet users would be 400 million by the same period (Panther, 2006). These expectations were far surpassed and by 2011, 33% of the world population had access to the internet (Anonymous, 2012) and 14% of the total turnover of firms was derived from e-Business (Anonymous, 2011). In fact, the new projection for the European Union (EU) is that e-Business will generate _578 billion and create 1.5 million jobs by 2018 (Anonymous, 2013a, b).

Problem statement: While the entire world was gripped by the dot.com euphoria in the late 1990s, there was minimum adoption of e-Business in Zimbabwe (Mupemhi and Mafuka, 2006). The low rate of e-Business adoption has continued to hamstring the country such that even with a high internet penetration of more than 50%, many sectors of the economy including the manufacturing sector are still reluctant to use the internet beyond e-Mails and basic websites (Mupemhi and Mafuka, 2006).

Although, there is general consensus on the benefits of adopting e-Business (Morabito *et al.*, 2010; Peltier *et al.*, 2009) there are no any known studies that

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Corresponding Author: A. Muposhi, Department of Marketing and Sport Management, Vaal University of Technology,
Private Bag X021 1900 Vanderbijlpark, South Africa

Table 1: Categories of e-Business activities

e-Business application	Activities
E-mail	Online communication via. the mail
Website	Web access, extranets, online product display, access to online company information, receiving orders, sending orders
Enterprise Resource Planning (ERP)	Online product planning, management of inventory, New Product Development (NPD), human resource planning
Customer Relationship Management (CRM)	Accessing online database, online customer feedback, online cooperation and collaboration
Supply Chain Management (SCM)	Online ordering, invoicing, payment and delivery. e-Procurement, online auctions and materials handling
Intra firm communication and collaboration	Intranets, online information sharing, cooperation and collaboration
Online marketing	Online marketing intelligence, information gathering, new product development, distribution, promotion, buying and selling

e-Business watch

have examined empirically the effect of e-Business tools on business efficiency in Zimbabwe's manufacturing sector. Consequently, this study sets out to bridge this research gap. In particular, this study seeks to answer the following research question: what is the link between e-Business adoption and business efficiency in the manufacturing sector in Zimbabwe?

Literature review

e-Business adoption: e-Business is a burgeoning concept that encompasses business processes that utilise electronic tools (Oliveira and Martins, 2010). In its basic form e-Business refers to the use of internet-related technologies to conduct business (Oliveira and Martins, 2010). e-Business is defined as the process of conducting business transactions along the value chain through the use of internet platforms and information technology infrastructure (Zhu *et al.*, 2006). In this study, e-Business is operationalised as the undertaking of normal commercial, government or personal activities by means of computers and telecommunications networks and includes a wide variety of activities involving the exchange of information, data or value-based exchanges between two or more parties. This operational definition captures the idea of doing business electronically using various tools such as the fax, telephone, cell-phones, intranets, extranets and the internet.

It is worth noting that, since, the adoption of the internet and its related technologies by companies in the 1990s, its applications in business have increasingly become diversified, ranging from industrial system automation, supply chain management, customer relationship management to collaboration for competitiveness. The major applications of e-Business include order taking, receiving payment, delivery, after sales service, inventory and non-inventory purchasing, recruitment, internal communication, external information search, connectivity and interactivity. With respect to the manufacturing sector, specific e-Business applications include the Enterprise Resource Planning (ERP), procurement and supply chain management, online

invoicing, e-Marketing and sales, e-Integration of the marketing process and online cooperation and collaboration. Table 1 summarises the major categories of e-Business applications.

e-Business efficiency and measurement: The successful implementation of e-Business translates to e-Business efficiency (Oliveira and Martins, 2010; Hinton and Barnes, 2009). e-Business efficiency denotes the speed of performing a task and the cost effectiveness associated with the use of e-Business tools (Choong, 2013). e-Business is also construed as the ratio of output to input (Hinton and Barnes, 2009). It follows that, e-Business applications or processes are said to be efficient if they produce more output with less input costs. Measurements of e-Business success focus on e-Business efficiency variables such as costs of production and transaction, coordination with supply chain partners, marketing and customer acquisition (Wu *et al.*, 2003), sales performance measures (market share, sales volume, number of new customers, customer retention), customer satisfaction and relationship development (Hinton and Barnes, 2009). As such organisations that fail to have clearly defined e-Business efficiency measures find it difficult not only to invest in e-Business but to manage the e-Business processes (Oliveira and Martins, 2010). It is important to note that there are different metrics used to assess e-Business efficiency and this according to Morabito *et al.* (2010) and Militaru and Romanoschi (2008) result in marked variations in evaluation of the effectiveness of e-Business e-Tools. Table 2 provides some of the metrics used to assess e-Business efficiency.

e-Business adoption level and e-Business efficiency: Given the cost of adopting and implementing e-Business in firms, there is increasing interest to understand the impact of e-Business on firm business efficiency. It is important to note, a stated by Oliveira and Martins (2010) that e-Business is only perceived as a strategic tool if it translates into improved efficiency and effectiveness.

Table 2: e-Business efficiency metrics

Financial metrics	Customer metrics	Internal processes metrics	Learning and growth metrics
Online revenue per customer	Number of satisfied customers	Availability of systems	Staff productivity
Cost per customer online	Number of customers retained	Volume of transaction processed	Number of staff trained in new services
Cost efficiency of e-Business	Number of new customers reached	Transaction processing time	Value delivery per employee
	Number of customers visiting website	Transaction processing accuracy	

Kaplan and Norton (1996)

According to Militaru and Romanoschi (2008), e-Business adoption level is defined by the number of e-Business applications adopted, the usage rate of such applications and the spread of e-Business applications across the firm's functional units.

Number of e-Business applications: The number of e-Business applications adopted by the organisations denotes the level of business involvement and commitment to e-Business strategy (Michaelidou and Dibb, 2008). The influence of e-Business applications on organisation performance largely depends on their extent of e-Business tools integration (Hinton and Barnes, 2009). According to Oliveira and Martins (2010), a seamless integration of e-Business applications translates into operational synergies. Consistent with this view, this study posits that:

- H_1: there is a significant positive relationship between the number of e-Business applications adopted by the firm and e-Business efficiency

Usage rate of e-Business applications and e-Business efficiency: e-Business efficiency measures the extent to which the deployed electronic resources are utilised to meet organisational goals (Wu *et al.*, 2003). According to Barnes and Vidgen, pertinent questions that e-Business tools adopters need to answer include: "how well are the e-Business tools utilised? and how often are they utilised?" There is empirical evidence that suggests that usage rate of e-Business applications is positively related to organisational and strategic competitive advantage (Wu *et al.*, 2003). Based on the foregoing discussion it is hypothesised that:

- H_2: usage rate of e-Business applications is positively related to e-Business efficiency

Spread of e-Business applications: The spread of e-Business in the firm is measured by the number of units within the firm that have adopted e-Business (Oliveira and Martins, 2010). The high initial investment cost associated with e-Business significantly influences an organisation's e-Business strategy (Wu *et al.*, 2003). Companies that adopt a piecemeal approach of adopting selected e-Business applications tend to perform less
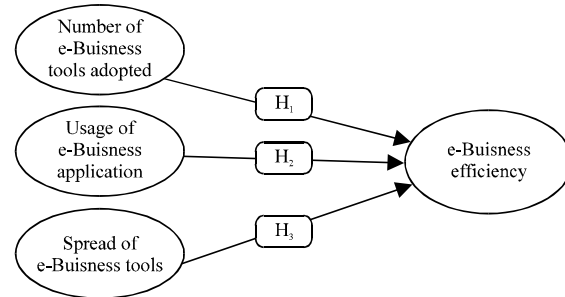

Fig. 1: Research model

efficient as compared to those that pursue a holistic company wide approach (Hinton and Barnes, 2009). Based on the preceding discussion, it is hypothesised that:

- H_3: there is a positive relationship between the spread of e-Business in the firm and e-Business efficiency

Based on the posited hypothesis, Fig. 1 presents the research model for the study. The independent variables are the number of business tools adopted, usage rate of e-Business tools adopted and the spread of e-Business tools in the firm's functional units. e-Business efficiency is the dependent variable. Our model is derived from the theory and hypothesis described in the preceding sections.

MATERIALS AND METHODS

The research design and sampling procedure: A descriptive cross sectional research design was used to test the hypothesised relationships in the research model. A sample of 118 firms was selected from 180 firms on the confederation of Zimbabwe industries membership list as of March, 2014. Sample size determination was computed using Krejcie and Morgan (1970)'s sample estimation table. Manufacturing companies surveyed in this study were in different manufacturing sectors and stratified sampling was used to account for differences in the use of business activities, type of customers served and e-Business applications. Within each stratum, simple random sampling with the aid of a statistical table for random numbers, provided by Kumar (2010) was carried out.

Measurement instrument: Data was collected using a respondent administered structured questionnaire from March-June 2014. Following the suggestions by Saunders *et al.* (2012), Cerswell (2007) and Kumar (2010), the questionnaire contained categorical and scale questions to assess each of the constructs in the research model.

Number of e-Business applications: The e-Business literature identifies e-Mail, website, supply chain management, customer relationship management, enterprise resource planning, communication, collaboration and online marketing as the most common e-Business applications. To measure this construct, respondents were asked to choose from a list of 7 e-Business applications their firm had adopted. Each e-Business application adopted was given a value of one. Thus, a firm which had adopted one application was given 1 that which had two was given 2 and so on. Firms were then classified according to the number of e-Business applications adopted as having low e-Business involvement (if they had 1-2 e-Business applications only), moderate e-Business involvement (for those with 3-4 e-Business applications) and high e-Business involvement (if they had 5-7 e-Business applications).

Spread of business tools: The spread of e-Business applications in the firm was also used to measure e-Business adoption or involvement level. The respondents were asked to indicate how many of their business units had adopted the e-Business applications. They were given options of 0-25, 26-50, 51-75 and 76-100%. The intervals were given scores or values of 1-4, respectively.

Usage rage of e-Business applications: With respect to usage rate of e-Business applications, the respondents were asked to indicate the frequency of use of the e-Business applicationon a semantic scale from seldom to very often. Corresponding values ranging from 1-5 were given, 1 being for seldom and 5 for very often.

e-Business efficiency: The construct 'business efficiency' was measured using seven items developed by Wu *et al.* (2003). These were also used by Biloslavo *et al.* (2013) and Anonymous (2013a, b). The items measure the extent to which: transaction processing time decreased, transaction accuracy increased, volumes of transactions increased) transaction cost per customer decreased, order fulfilment time decreased, coordination with suppliers improved and number of satisfied customers increased as a result of e-Business adoption. The items were assessed

for internal consistency and reliability and produced a Cronbach alpha of 0.90. Respondents were asked to indicate the extent to which they agreed or disagreed on a 5-point Likert-scale that their firm had gained on the listed efficiencies. Their responses were given scores ranging from 1 (strongly disagree) to 5 (strongly agree).

RESULTS AND DISCUSSION

The hypothesised relationships between variables in the research model were tested using regression analysis with the aid of STATA Version 11. STATA was used because it is recommended for ordinal and continuous data (Saunders *et al.*, 2012) which was the case in this study. The results of the study are discussed as follows:

- H_1: predicted a significant positive relationship between the number of e-Business applications adopted and the e-Business efficiency of the firm. Results of the regression between these two variables are presented in Table 3

As shown in Table 3, the results show a statistically significant positive relationship between the number of e-Business applications adopted and e-Business efficiency. The results also show that almost 35.25% variance of the firm's business efficiency is accounted for by the number of e-Business applications adopted. A positive coefficient value of 36.8 implies that for every unit increase in the number of e-Business tools adopted, there will be an increase in e-Business efficiency by 0.37 units. Overall, the results imply that a firm which adopts more e-Business applications is likely to have more e-Business efficiency gains. It is important, though to note that the adoption of many e-Business tools does not always translate to improved organisation performance. For instance, Michaelidou and Dibb (2008) note that e-Business tools need to be synchronised with business operations for them to deliver value:

- H_2: posited a significant positive relationship between usage rate of e-Business applications and the firm's business efficiency. Results of the regression between these two variables are presented in Table 4

As shown by the results in Table 4, there is a statistically significant relationship between usage rate of e-Business applications and the firm's business efficiency. Although, the magnitude of the relationship between the two variables seems to be weak given the coefficient value of 0.407, the RMSEA of 0.7593

Table 3: Number of e-Business applications and e-Business efficiency

Sources	SS	df	MS	No. of observation = 32		R² = 0.3525
Model	11.1744	1	11.17	F (1, 30) = 16.34		Adj. R² = 0.33
Residual	20.5218	30	0.684	Prob>F = 0.0003		RMSEA = 0.8271
Total	31.6960	31	1.022			
Efficiency	**Coefficient**	**SE**	**t-values**	------------p>|t|----------		**(Confidence 95%)**
Number of e-Business applications	0.368	0.911	4.04	0.000	0.182	0.554
Constant	1.979	0.455	4.35	0.000	1.050	2.929

Table 4: Usage rate of e-Business applications and e-Business efficiency

Sources	SS	df	MS	No. of observation = 30		R² = 0.3123
Model	7.3300	1	7.330	(1, 28) = 12.71		Adj. R² = 0.2877
Residual	16.144	28	0.576	Prob>F = 0.0013		RMSEA = 0.7593
Total	23.470	29	0.809			
Efficiency	**Coefficient**	**SE**	**t-values**	------------p>|t|----------		**(Confidence 95%)**
Usage rate of e-Business applications	0.407	0.1141	3.57	0.001	0.173	0.640
Constant	2.305	0.4440	5.20	0.000	1.398	3.218

Table 5: Spread of e-Business in the firm and e-Business efficiency

Sources	SS	df	MS	No. of observation = 30		R² = 0.0423
Model	0.993	1	0.993	F (1, 28) = 1.24		Adj. R² = -0.0810
Residual	22.48	28	0.803	Prob>F = 0.2755		RMSEA = 0.8961
Total	23.47	29	0.809			
Efficiency	**Coefficient**	**SE**	**t-values**	------------p>|t|----------		**(Confidence 95%)**
Spread of e-Business	0.254	0.228	1.11	0.276	-0.214	0.722
Constant	3.245	0.336	6.05	0.000	2.140	4.340

suggests a fit between these two variables and R_2 of 0.312 demonstrates that 31.2% of business efficiency variance is explained by usage rate of e-Business applications. The coefficient value of 0.407 suggests that for every increase in e-Business application usage rate by a unit, the firm's business efficiency is likely to increase by 0.41 units. Overall, these results seem to suggest that firms with a high usage rate of e-Business applications have a higher propensity to gain more business efficiencies than those with a low usage rate:

- H_3: posited a significant positive relationship between spread of e-Business in the firm and e-Business efficiency. Results of the regression between these two variables are presented in Table 5

The results of this regression presented in Table 5 show that there is no statistically significant relationship between the spread of e-Business applications across the firm's business units and the business efficiency. The implication of this result is that manufacturing firms may not need to invest in e-Business for all their units. This result suggests the need to identify critical business units and increase the number of e-Business applications and usage rate.

CONCLUSION

The primary objective of the study was to examine the link between e-Business adoption and business efficiency in Zimbabwe's manufacturing sector. The study gives insights into how firms can increase e-Business efficiency through e-Business adoption. In essence to enhance efficiency the study suggests the need to increase the

number of e-Business applications adopted by the firm coupled with an increased usage rate of such applications. To be effective e-Business applications need to be integrated and sychronised with business processes and operations. This study contributes to new knowledge on e-Business adoption by identifying number of e-Business applications adopted and the usage rate of the e-Business applications as key constructs of e-Business involvement.

LIMITATIONS

The cross-sectional nature of the study restricts the determination of the long-term effect of e-Business adoption on business efficiency. Business efficiency would need a long time to be evaluated, considering that e-Business technologies have to be learned and adapted (Abu-Bakar, 2004). As such, this study needs to be seen as an ongoing search for new knowledge on e-Business adoption and business efficiency in developing countries. To improve on the findings of this study, further research could focus on testing the model in different business sectors. It is further recommended that longitudinal testing on a larger sample targeting more than one respondent per firm could be done to further confirm the relationships posited in the research model.

IMPLICATIONS

The findings of the study show that nearly all firms are connected but have a limited number of e-Business applications. The implication is that policy measures should shift from connectivity to uptake of e-Business

applications. The limited uptake of e-Business applications in Zimbabwe could be a result of limited knowledge of the importance of adopting e-Business tools. Thus, manufacturing industry policy measures could focus on stimulating increased usage of e-Business tools as part of an integrated e-Business strategy. Policy measures to encourage e-Business adoption may include facilitating access to information, promoting intra and inter-sector networking, supporting research and development in information communication technology. Additionally, workshops may be used to expose firms to various advanced information communication technologies such as internet related technologies, mobile data communication, broadband applications and office automations.

REFERENCES

Abu-Bakar, A.R., 2004. The antecedents and consequences of E-business adoption in Malaysian manufacturing firms. Ph.D Thesis, Aston University, Birmingham, England, UK.

Anonymous, 2012. The World Bank annual report. World Bank, Washington, USA.

Anonymous, 2013a. E-commerce Europe e-payment report, Brussels. Eurostat, Luxembourg.

Anonymous, 2013b. Opportunities to business of improving resource efficiency, European Commission Report, 2013. AMEC, London, England, UK.

Barden, T., V. Whitaker and K. Mithas, 2013. Exploring competitive advantages in the manufacturing sector. Ind. Manage. Data Syst., 113: 476-491.

Biloslavo, R., C. Bagnoli and R.R. Figelj, 2013. Managing dualities for efficiency and effectiveness of organisations. Ind. Manage. Data Syst., 113: 423-442.

Cerswell, J.W., 2007. Qualitative Inquiry and Research Desing: Choosing Among Five Apporaches. 2nd Edn., SAGE Publications, USA.

Chang, H.L., 2010. A roadmap to adopting emerging technology in E-business: An empirical study. Inf. Syst. E. B. Manage., 8: 103-130.

Choong, K.K., 2013. Understanding the features of performance measurement system: A literature review. Meas. Bus. Excellence, 17: 102-121.

Hinton, M. and D. Barnes, 2009. Discovering effective performance measurement for E-business. Intl. J. Prod. Perform. Manage., 58: 329-345.

Kaplan, R. and D. Norton, 1996. The Balanced Scorecard: Translating Strategy into Action. Harvard Business Press, Brighton, Boston, Massachusetts,.

Krejcie, R.V. and D.W. Morgan, 1970. Determining sample size for research activities. Educ. Psychol. Meas., 30: 607-610.

Kumar, R., 2010. Research Methodology: A Step-by-Step Guide for Beginners. 3rd Edn., Sage Publications, India, ISBN:978-1-84920-301-2, Pages: 331.

Lin, H.F. and G.G. Lee, 2005. Impact of organizational learning and knowledge management factors on E-business adoption. Manage. Decis., 43: 171-188.

Michaelidou, N. and S. Dibb, 2008. Consumer involvement: A new perspective. Marketing Rev., 8: 83-99.

Militaru, G. and C. Romanoschi, 2008. A strategic analysis of E-business adoption and energy company performance. UPB. Sci. Bull., 70: 75-84.

Morabito, V., M. Themistocleous and A. Serrano, 2010. A survey on integrated IS and competitive advantage. J. Enterp. Inf. Manage., 23: 201-214.

Mupemhi, S. and A. Mafuka, 2006. Critical constraints in the adoption of E-commerce as a business tool in Zimbabwe. Dyke., 2: 250-264.

Oliveira, T. and M.F. Martins, 2010. Understanding E-business adoption across industries in European countries. Ind. Manage. Data Syst., 110: 1337-1354.

Panther, S., 2006. E-Commerce Information Systems success (ECIS): A South African study. Ph.D Thesis, Cape Pennisula University, Cape Town, South Africa.

Peltier, J.W., J.A. Schibrowsky and Y . Zhao, 2009. Understanding the antecedents to the adoption of CRM technology by small retailers: Entrepreneurs vs owner-managers. Intl. Small Bus. J., 27: 307-336.

Ranganathan, C., J.S. Dhaliwal and T.S.H. Teo, 2004. Measuring the business value of information technology in E-business environments. Intl. J. Electron. Commerce, 9: 127-161.

Saunders, M., P. Lewis and A. Thornhill, 2012. Research Methods for Business Students. 6th Edn., Pearson Education Limited, Edinburgh, Scotland, ISBN:9780273750802, Pages: 728.

Wu, F., H. Mahajan and S.H. Balasubramanian, 2003. E-business adoption antecedents in the manufacturing industry. J. Acad. Marketing Sci., 12: 567-591.

Zhu, K., S. Dong, S.X. Xu and K.L. Kraemer, 2006. Innovation diffusion in global contexts: Determinants of post-adoption digital transformation of European companies. Eur. J. Inform. Syst., 15: 601-616.