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Determinants of Electronic Commerce Usage in Small Business in New Zealand

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Abstract

This research attempted to investigate the significance of an electronic commerce (EC) use model in small enterprises (SMEs) in New Zealand. The research model hypothesised ten factors as influencing the extent of EC usage significantly in SMEs. The research findings indicated that: relative advantage, cost, compatibility, size, information intensity of product, competition, pressure from suppliers/buyers and CEO's involvement play an important role on the extent of EC usage. However, support from technology vendors and CEO's innovativeness did not appear to influence the extent of EC usage.

Keywords: eCommerce usage model, small businesses, New Zealand.

1   INTRODUCTION

The recent emergence of the Internet in general and the Web in particular has revolutionised business activities (Abell & Lim, 1996). The open standards of the Internet bring electronic commerce (EC) within the reach of the smallest of firms and help reduce the gap between large and small firms (Kalakota & Whinston, 1996; MOC, 1998).

Earlier EC research reported the high hype surrounding the EC phenomenon and the high adoption rate of EC technologies by businesses in different parts of the world. Most of these studies described the high adoption rate of EC technologies as an indication of EC capability and superiority in comparison with other businesses and countries that adopted low levels of EC technologies (MOED, 2000b). However, these studies did not show the extent of EC usage in the business environment of these enterprises, dominated mostly by Small to Medium-Sized Enterprises (ACNielsen, 2001; Deloitte, 2000; Waikato, 1999). For example, while the New Zealand Government reported the widespread adoption of the technologies that enable EC, it was suspicious of the depth of their penetration and ability to support fully integrated electronic business systems (MOED, 2000c).

Attempting to capture the depth of the adoption criteria of EC or its use in business through dichotomous adoption (yes/no) measures is inconclusive. Further, Teo et al. (1998) emphasised the importance of introducing new scales that would cater for the new and different characteristics of new innovations (EC). Measures developed in IS and IT research may not relate directly to EC, as EC has unique aspects (security, privacy, loss of intimacy with customers). Teo et al. (1998) also emphasised the importance of using continuous variables in the design of the dependent variable/s, which would allow for the use of complex statistical software models.

Accordingly, this research was interested in exploring the extent of the EC usage phenomenon in SMEs. Thus, the research endeavoured to provide answers to the following main research questions: "What are the factors that would influence the extent of EC-use in SMEs and how those factors influence the extent of EC-use in SMEs in New Zealand?" Accordingly, the research objectives were to differentiate between low and high EC-use amongst the SMEs and hence, to depict the depth of the EC usage phenomenon and to explain how the research factor influence the extent of EC-use in SMEs in New Zealand.

2   RESEARCH MODEL

In review of the available technological innovation literature in small businesses (Premkumar & Roberts, 1999; Thong, 1999; Thong & Yap, 1995, 1996) and EC research (Abell & Lim 1996; Abell & Black, 1997; Deloitte, 2000; Mehrtens et al., 2001; MOED, 2000a,b; Poon, 2000; Poon & Swatman, 1995, 1997, 1998, 1999a, 1999b; PWHC, 1999; Tan & Teo 1998), the researcher developed a model of EC-use that comprises the following potential factors (Figure 1) and attempted to test its significance in SMEs in New Zealand:

- Technological (innovation) factors: relative advantage, cost, and compatibility.
- Organisational factors: size and information intensity of product/services.
- Individual factors: CEO's innovativeness and CEO's involvement.
- Environmental factors: competition, external support from technology vendors and pressure from supplier/buyer.
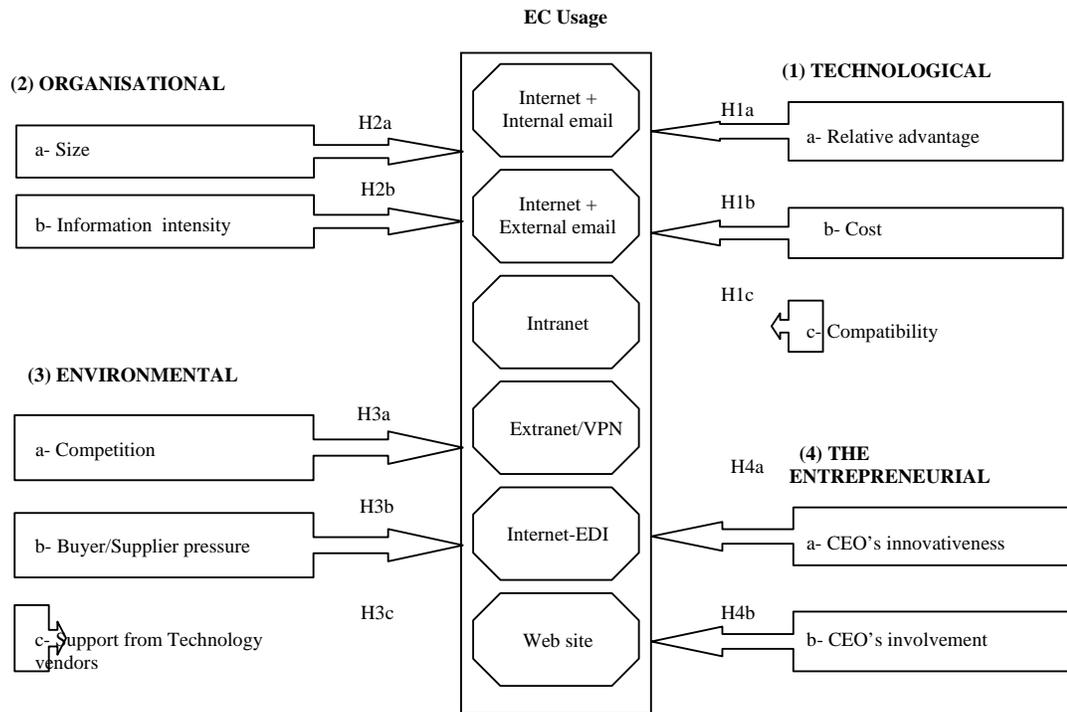
Figure 1.   A framework for EC-use in small businesses.

Mathieson (1991) and Moore and Benbasat (1991) adopted Likert scales to measure usage (dependent variable). EC-use by SMEs in this research was based on a continuous scale made of five-point Likert scales (1 → 5), representing a range from "very low use in business" to "very high use in business" of EC technologies. The research investigated EC usage across six communication tools, infrastructure and application technologies: (1) Internet + Internal email, (2) Internet + External email, (3) Intranet, (4) Extranet/VPN (Virtual Private Networks), (5) Internet based EDI and (6) web sites. The research was implemented from July, 2001 to November, 2003.

3   RESEARCH HYPOTHESES

3.1   Technological Factors

Innovation adoption and diffusion studies have found the relative advantage (perceived usefulness) characteristic influencing innovation adoption and usage significantly and positively (Kwon & Zmud, 1987; Mathiesen, 1991; Rogers, 1995; Tornatzky & Klein, 1982). This fact has been suggested by recent EC research in SMEs (Abell & Black, 1997; Abell & Lim, 1996; Deloitte, 2000; MOED, 2000b; Poon & Swatman, 1997; 1999a,b; PWHC, 1999).

Recent research found that scarce financial resources are one of the main inhibitors to IS and EC adoption and usage in small businesses (Blili & Raymond, 1993; Behrendorff & Rahman, 1999; Burgess, 1998; MOED, 2000b; Poon, 1999; Poon & Swatman, 1995; Poon & Swatman, 1999a,b; Soh et al., 1992, Thong, 1999) and hence would influence the adoption decision and the consequent use of EC negatively. EC would require continuous upgrades and modifications to cope with unremitting technological and environmental changes.

As EC represents new technological phenomena, recent EC research found the compatibility factor influences EC adoption and use negatively (Alexander, 1999; Behrendorff & Rahman, 1999; Geiger & Martin, 1999; Poon & Swatman, 1998; 1999a,b). The lack of security, privacy, legal-protection and standards over the Internet would influence EC-use negatively. Also, SMEs would be reluctant to sacrifice their earlier practices of seeing their buyers and suppliers in person (intimacy) rather than seeing them through the Internet.

Accordingly, the following hypothesis is introduced:

Hypothesis 1: The greater the perceived relative advantage (H1a) of EC, the greater the use of EC technologies in business by NZ SMEs. However, cost (H1b) and compatibility (H1c) would influence the extent of EC-use negatively.

3.2 Organisational Factors

Size emerges as a potential determinant of EC adoption and use in SMEs, as this would imply having excess financial and human resources to invest in (and even experiment with) EC (Alpar & Reeves, 1990). On the other hand, larger SMEs possess more employees than smaller SMEs and hence, EC usage might be perceived by larger SMEs to enhance coordination and collaborations amongst their employees.

Recent literature tackling EC points to the information part pertaining to organisational products, processes and delivery agent (Choi et al., 1997). The preceding functions would provide great opportunities for the SMEs in streamlining the whole selling and the delivery processes (e.g., music, video, etc.) or at least to supplement the selling of the physical products at various sophistication levels (Poon, 2000; Poon & Swatman, 1997; Teo et al., 1998). Interestingly, Teo et al. (1998) found the information intensity factor insignificant on Internet adoption and on web site adoption and hence, both adopters and non-adopters retained equal perceptions about the suitability of the Internet and web sites to their products and services. Accordingly, the following hypothesis is formulated:

Hypothesis 2: The greater the (H2a) organisation size (number of employees) of the SMEs and the (H2b) information-intensity of their products and services, the more likely EC technologies will be used by SMEs in NZ.

3.3 Environmental Factors

SMEs that exist within an intensive-competitive environment would perceive EC a competitive necessity to sustain their existence or to gain competitive advantage (Poon, 2000; Teo et al., 1998). Hence, if SMEs were confronted with a high percentage of customers and competitors online, this would increase the chances of using EC strategically (Poon & Swatman, 1999a).

Issues concerning buyer/supplier pressure were also emphasised as important determinants of EC success in SMEs (Poon, 2000; Poon & Swatman, 1998; 1999a). If an SMEs was confronted with intensive online demand from their suppliers or buyers, this could result in an increased use of the EC initiative.

Due to the scant in-house IT expertise in SMEs, the extent of EC usage would depend on the availability of external support from vendors and consultants (Alexander, 1999; Blili & Raymond, 1993; Mcdonagh & Prothero, 2000; MOED, 2000b; Poon & Swatman, 1995). EC represent a new phenomenon and considered to be a radical innovation and dynamic in nature and hence, the availability of continuous support is essential for the extensive use of EC. Accordingly, the following hypothesis is introduced:

Hypothesis 3: The greater the (H3a) competition amongst the SMEs in NZ, the (H3b) pressure from suppliers/buyers to use EC, and the (H3c) availability of external support from technology vendors for EC, the more likely EC-technologies will be used by NZ SMEs.

3.4   Entrepreneurial (individual) Factors

Most of the IS/EC literature in small business demonstrates the importance of the manager's role (CEO) (usually the owner) as a product champion (Cragg & King, 1993; Poon & Swatman, 1998, 1997, 1999a, 1999b) and the entrepreneur as a change agent (Hailey, 1987). Thus, emphasising the importance of the CEO's innovativeness and involvement only on EC success (Poon & Swatman, 1998) would provide more insight. The CEO's innovativeness was found to influence IS adoption significantly and positively in SMEs (Thong, 1999; Thong & Yap, 1996, 1995). Poon and Swatman (1998, 1999a) found the CEO's involvement influencing EC success significantly and positively in SMEs. Due to the dominant role of the CEOs in SMEs, their innovativeness and involvement is essential to the ongoing use of EC. Accordingly, the following hypothesis is introduced:

Hypothesis 4: The greater the (H4a) CEO's innovativeness and his/her involvement (H4b) with EC-use, the more likely EC will be used by NZ SMEs.

4   METHODOLOGY

Data for the study was collected by means of a survey questionnaire based on the research model in Figure 1. Due to the unique features of EC technologies, some of the measures in this research were adapted from previous innovation studies. Others were specifically designed for this study, guided by the EC literature above.

The names, telephone numbers and addresses of five hundred businesses have been selected randomly from the North Shore City local business telephone directory (NSTBD). After screening for duplicate listings and for the size factor, this resulted in having 324 SMEs. Responses from six companies were excluded from the final sample because those companies provided incomplete information, resulting in 129 usable questionnaires (one case was removed from the multivariate analysis as it was an outlying case). The effective response rate was 40.5% (129 / (324-6)) and this seemed adequate in line with prior adoption research (Thong, 1999, Thong & Yap, 1995, 1996). Figure 2 shows statistical details about the industries involved in the sample and the different adopted EC technologies.
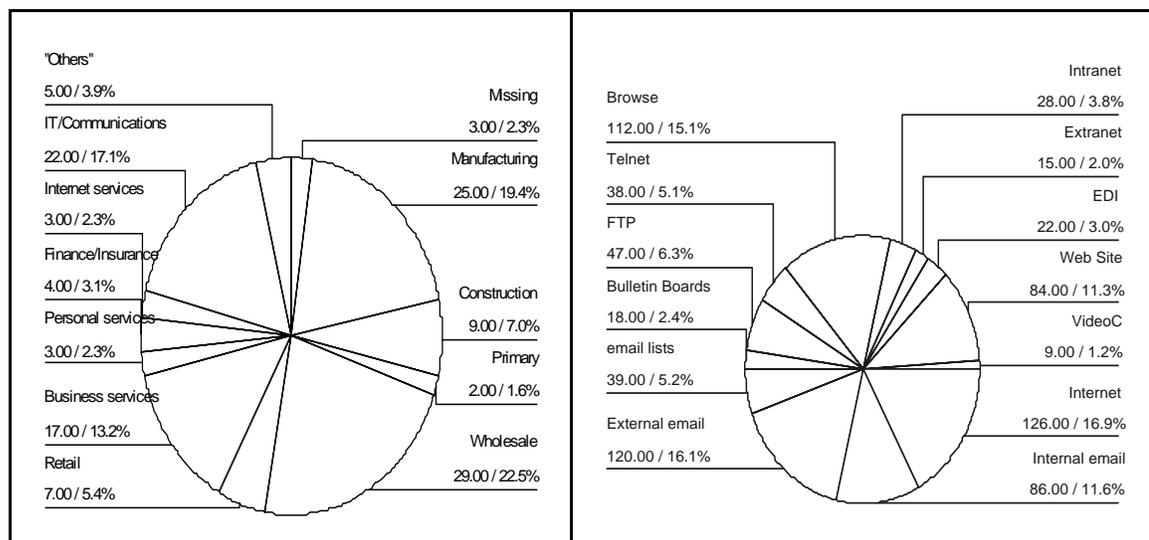

Figure 2:   (a) Statistical details about the industries in the sample; (b) the adopted EC.

As expected from a New Zealand survey, SMEs with five or fewer employees (micro) represented almost half of the surveyed sample (47.3%), followed by 6-19 employees (medium-sized) (39.5%),

20-50 FTEs (9.3%), and 51-100 (2.3%). The last two categories were introduced for comparison purposes with other countries that have different definitions for their SMEs. Non-response bias was tested by comparing early participants with late participants in terms of the basic data of participants (business size (FTEs), age, type, and turnover) using T-test statistics at the five percent significance level (p<0.05). The underlying principle for this test is that late participants are likely to have similar characteristics to non-participants (Coakes & Steed, 2001; Hair et al., 1998; Thong, 1999; Thong & Yap, 1995, 1996). Non-response bias was not a problem in this research as the two-tail test was found to be insignificant (p>0.05).

Reliability is the degree to which the observed variable measures the true value and is error free (Hair et al., 1998). Testing for reliability could be achieved by calculating the Cronbach alpha. All the constructs were found to have adequate alpha value (>0.6) (Premkumar & Roberts, 1999).

Validity is the degree to which a measure accurately represents what is supposed to. Validity will be assessed through content (during questionnaire design/testing), convergent and discriminant validity. Convergent and discriminant validity will be evaluated using factor analysis. The standard criteria of eigen value greater than 1.0 and factor loading greater than 0.5 was used during the analysis phase (Premkumar & Roberts, 1999; Teo et al., 1998). Thus, items were dropped where they have a loading of less than 0.5 or where their loadings are greater than 0.5 on two or more factors. Nine factors were identified as explaining the phenomena (the size factor was not included in factor analysis) under consideration by the current research (having eigen values greater than 1) and hence, convergent and discriminant validity were confirmed and validated.

The Pearson correlation matrix for the different adopters (starters, adopters, and extended adopters) was examined for the Multicollinearity problem. Multicollinearity is considered problematic if any of the squared correlations among the different independent variables is close to 0.8 (Hair et al., 1998). The highest squared correlation among the different independent variables was 0.36 between the CEO's innovativeness and the CEO's involvement, which is well below 0.8.

5   HYPOTHESES TESTING

The research variables together (within each EC technology) explain (R square) 10.4%, 17%, 27.3%, 55%, 46.1%, 22.6%, respectively, of the variance in the dependent variable, which was highly significant as indicated by the F-values in Table 2. This outcome meant that, considering the sample used for estimation, we could explain F times more variation than when using the average, and that this was not likely to happen by chance (less than one or five or ten percent of the time (by the significant levels shown in Table 2)). Thus, the null hypothesis (H_0) could be rejected for only these (significant) variables shown in Table 2. The null hypothesis (H_0) could not be rejected for the remaining (insignificant) factors in the research model. Hence, this insignificance meant that theses factors did not play any important role on the extent of EC-use with respect to each of the different EC technologies in the research model.

The regression model	Sum of Squares	df	Mean Square	F	R square	Adj. R square	Std. error of the estimate	Coefficients	T
Internal email:	18.306	2	9.153	4.3**	.104	.080	1.45		
i. Size								.24**	2.100
ii. Relative Advantage								.28**	2.464
External email:	20.007	2	10.003	11.1***	.170	.155	.95		
i. Information Intensity of products								.29***	3.094
ii. CEO's involvement								.22**	2.382

Intranet: i. Relative Advantage	11.559	2	5.780	4.3**	.273	.210	1.16	.58***	2.893
ii. CEO's involvement								-.37*	-1.83
Extranet/VPN: i. Compatibility	11.201	3	3.734	4.1**	.550	.415	.96	-.82**	-2.50
ii. Competition								.75**	2.816
iii. CEO's involvement								-1.1***	-3.01
EDI: i. Cost	19.280	3	6.427	5.4***	.461	.376	1.09	-.56***	-3.21
ii. Compatibility								-.47**	-2.49
iii. Supplier /Buyer pressure								.45**	2.440
Web site: i. Size	26.061	3	8.687	6.9***	.226	.194	1.12	.21**	1.983
ii. Relative Advantage								.42***	3.919
iii. Cost								-.23**	-2.18

* $p<0.1$, **$p<0.05$, *** $p<0.01$

Table 1:   Summary results of the multivariate analysis.

6   DISCUSSION AND CONCLUSION

6.1   EC-use in SMEs in New Zealand

6.1.1   Internal email and Intranet use

In discussing the research results (Table 2), the relative advantage factor seemed to influence the extent of internal email, Intranet and web site technologies significantly. Thus, respondent perceived realising different advantages from using these EC technologies. The use of internal email between employees in the same SME represents a convenient technology and increases the efficiency of operations and assist in streamlines many of the communication channels in the same SME. However, the extensive use of internal email and Intranets entails having large number of employees. Such large number of employees would require the efficient use of these two particular technologies to coordinate activities and transactions. This assertion was further endorsed by the significance of the size factor on the extent of internal email use. However, the size factor did not appear to be significant in Intranet use. Further, the CEO's involvement appeared to influence the extent of Intranet use significantly but negatively (negative coefficients in Table 2) not positively as it was hypothesised originally in the model. However, despite the weak significance of the CEO's involvement, the implication here is twofold. This finding suggests that respondents did not perceive the CEO to be involved in prompting and using the Intranet or at an extreme case, to hinder Intranet usage.

6.1.2   External email use

The extent of external email usage was influenced by the information intensity of products and services. This was an expected result, as the SMEs would look at the information nature of their products and services when attempting to communicate with external parties for business purposes. Thus, working in an industry that possesses products and services with high information content could motivate the extensive use of external email. It is worth investigating this justification further from the

perspective of the different industries. CEO's involvement seemed to play a crucial role in using this technology. Due to the dominant role of the CEO in SMEs, this may suggests that the CEO was directly involved in using external email.

6.1.3   *Extranet/VPN use*

Competition seemed to influence the extent of Extranet/VPN use significantly. Hence, respondents that perceived existing in a stiff competition, would be encouraged to use Extranets/VPNs extensively to link with different clients and partners. Building such (secure, VPN) interrelationships whether locally or internationally between close trading partners enhance the SME's completive position in the marketplace or cyberspace.

However, CEO's involvement seemed to impede the extent of Extranet use in SMEs in New Zealand, where the earlier justification made in Intranet may apply here as well. It would be interesting to identify the reasons behind the impeding effect of the CEO's involvement on Extranet and Intranet use by any future research. Such SMEs highlighted the compatibility of this new technological innovation with their current business practices and traditions and hence, was found to contradict hypothesis H1c. The measures for the compatibility factors were worded negatively in the survey questionnaire. As the coefficient of the compatibility factor appeared with negative effect, it would influence the extent of Extranet use positively not negatively as hypothesised in the research model. Thus, respondent rejected the notion that Extranet was not compatible with them. It seems that the extensive use of Extranet combated the negative effect of issues such as fear from security breaches and privacy of personal/business information, and legal protection over the cyberspace.

6.1.4   *Internet-EDI use*

Pressure from suppliers/buyers seemed the only driver for EDI usage in this research. There has been an abundance of research explaining EDI adoption and use by SMEs using Value-Added Networks (VANs) rather than the Internet as a communication medium between business applications (Iacovou et al., 1995; McGowan & Madey, 1998; Niederman, 1998; Premkumar et al., 1994; Premkumar & Ramamurthy, 1995; Premkumar & Roberts, 1999; Senn, 1998). Most of these studies demonstrated that the adoption and use of such technology is a complex and an expensive endeavour for SMEs and usually dictated by a larger supplier/customer. However, These studies reported low adoption rates of EDI among SMEs and high failure rates in using the EDI system among the SMEs. Cost would influence the extent of EDI use negatively as hypothesised originally in the research model and compatibility would influence its usage positively as explained above.

6.1.5   *Web site use*

The relative advantage and SME's size seemed the only drivers for web site use in SMEs in the sample. Thus, larger SMEs are more capable than smaller SMEs in using the web sites extensively. The more the perceived advantages from using web sites, the more likely it will be used by SMEs. Cost would impede the extent of web site usage by SMEs in New Zealand as explained above.

Factors such as support from technology vendors and CEO's innovativeness did not appear to influence the extent of EC usage in this research.

6.2   Theoretical significance and implications

Looking at the significant level of the different research factors across the different EC technologies in this research, it was observed that each of the relative advantage and the CEO's involvement appeared significant three times in Table 2. Cost, compatibility and size each appeared 2 times. Information intensity, competition and pressure from suppliers and buyers each appeared significant once in Table 2. Due to the significant level and direction of the cost, compatibility and CEO's involvement in this

research, this makes the relative advantage the most influential factor on EC usage followed by the size factor. This is followed by the information intensity of products and services, competition and pressure from suppliers and buyers as positively influencing the extent of EC usage.

According to the research findings in New Zealand, the implications arising from the significant and insignificant factors and anomalies (CEO's involvement) are twofold. Initially, these implications have further suggested the uniqueness of the EC usage phenomenon in SMEs in New Zealand. Most importantly, SMEs viewed using EC as compatible with them, which is a key cultural issue in the New Zealand context. In comparison with other countries, the uniqueness of the New Zealand perspective however, stems from several facts: that 84 percent of the New Zealand sector is dominated by micro-enterprises employing up to five employees only (MOED, 2000a); from the country's geographical isolation and from the time differences which separate New Zealand from the rest of the world. The population in New Zealand is relatively small (3.82 million) and dominated by low-income families (NZStat, 2001). This leads to a conclusion that the local market in New Zealand is limited in terms of scope and growth. Secondly, the insignificance of factors across the different EC technologies, as discussed in the preceding section, suggested the weakness of the EC phenomenon in SMEs in New Zealand. The EC literature also suggested this weakness as well. For example, users of Extranet and EDI reported no advantages from these technologies which may marginalise the impact of these technologies in the business environment of these SMEs. The general insignificance of support from technology vendors and CEO's innovativeness may point our attention to the above interpretation about the weakness and the simple EC usage phenomenon in SMEs in New Zealand in that SMEs would seek minimal (insignificant) support from technology vendors for the ongoing utilisation of these EC technologies. As for CEO's innovativeness, Thong (1999) and Thong and Yap (1996) suggested that the CEO's role was confined to his/her innovativeness in adopting technological innovations and it was left to other people in the organisation to make further adoption decisions.

This research provided justifications to significant and insignificant findings and to anomalies but due to the cross-sectional nature of the survey research, knowing about the actual reasons behind such findings was not possible in this research and indeed, future qualitative or longitudinal research could shed more light and rich interpretations to the implications highlighted in this research.

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