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E-Business Processes and Factors of Influence: One Model does not Fit All

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Abstract

This empirical study of organisational e-business adoption, utilising both qualitative and quantitative data collection methods, examines four major factors influencing adoption in multiple e-business process domains. Support is found for the proposition that factors influencing e-business adoption behaviour have different levels of impact across different e-business process domains. Different combinations of factors influence different e-business processes and for the most part this occurs independently of organisation size/resource capacity. Governments and powerful supply chain organisations have strong influence over some e-business strategy. In particular, e-government influence is strong with regard to use of e-mail and external web sites due to government's regulatory compliance power, but weak with regard to operation of an organisation's web sites. The implication of this research is that frameworks and models for e-business adoption will have greater relevance if they are developed for specific process domains rather than attempting to fit all areas of e-business.

Keywords: e-business, adoption factors, e-government, supply chain

1. Introduction

This paper reports on quantitative research into factors which influence e-business adoption, and investigates the proposition that factors influencing e-business adoption have different levels of impact across different e-business process domains. Findings from this research have significance in the development of explanatory e-business models and frameworks. The empirical study was conducted within the Australian wine industry in 2003. The level of influence of four factors over different e-business types is compared. The four factors were identified and selected after a review of literature investigating organisational e-business adoption and diffusion and after a qualitative pilot study involving interviews with winery staff which, among other things, helped to identify two major factors from external environment sources. For the purpose of this research e-business is divided into separate process domains based upon a combination of technology type, ownership and users: use of e-mail; use of web sites operated by groups external to the wineries (external web sites); and three possible types of web sites operated by each winery – a) their own web site designed for the general public (public web sites); b) their own web site designed for access by relevant business groups (extranets); and c) their own web site designed for access by the winery's own staff (intranets) (Roberts et al. 2003).

The four factors selected for further detailed study are: 1) perception of relative advantage; 2) organisational size/resource capacity; 3) supply chain influence; and

4) government influence. The first two factors are well recognised as important influences on adoption of innovations, and are identified in Diffusion of Innovation (DOI) theory (Rogers 1995) and various TAM variants (Mathieson et al. 2001; Venkatesh et al. 2003) under equivalent labels. Analysis of the pilot study interview data confirmed that the first two factors do influence some e-business adoption, but by no means all adoption. For example, the adoption of EANnet by wineries to provide online product data to large retail customers (e.g. Coles and Woolworths) occurs as a result of pressure and direction from these powerful customers, and occurs despite wineries having no perception of direct relative advantage or obvious spare resource capacity (Roberts et al. 2004). Powerful supply chain organisations and government effectively dictate some e-business strategy and adoption patterns, for example online customs adoption is now virtually mandatory as a result of the roll out of Australian Customs's new Integrated Cargo System (ICS) which requires all imports and exports to be administered online to enhance security, efficiency and accuracy (Australian Customs Service 2004).

2. Background Literature Review

Diffusion of Innovation theory (Rogers 1995) identified a large range of factors influencing adoption of innovations from two major sources: 1) characteristics of the innovation itself; and 2) characteristics of the adopting organisation. The major limitation of DOI theory with respect to e-business adoption is the lack of acknowledgement of the external environment as a rich source of factors influencing adoption and diffusion patterns. Culture, government and legal regulations, and government policy initiatives all appear to have strong explanatory power in improving understanding of e-business adoption and diffusion behaviours (Chen 2003; Gibbs et al. 2003; Palacios 2003; Wong 2003).

The effectiveness of most types of e-business increases as user numbers increase, and thus e-business has network externality characteristics. For example, the lack of readiness of customers and suppliers has been identified as a key barrier to e-business adoption (Barua et al. 2000). As benefits rise with increasing numbers, so too do normative pressures for other supply chain organisations to adopt (Wu et al. 2003).

Influence from the competitive marketplace environment is also acknowledged as important. In particular, customer power is singled out as having particular influence (Christensen et al. 1996; Wu et al. 2003). A useful conceptual framework of the antecedents and performance outcomes of e-business adoption has been developed by Wu et al. (2003). This research continues the investigation into e-business antecedent factors and examines four factors to compare their levels of influence in different e-business process domains.

3. Method

This paper reports on part of a larger study which employed a multi-method, two-stage approach. First, qualitative interviews were used in a pilot study designed to explore issues and collect empirical data from industry sources. Second, a census survey (excluding micro size wineries) gathered quantitative and descriptive data. Pilot study

interviews were conducted in July 2003 in nine Australian wineries. See Roberts et al. (2003) for background details of the study, the winery participants, and findings.

A mail questionnaire, highly customised for the wine industry, was developed as the survey instrument. The major objectives of the questionnaire were: 1) to collect data on the level of activity in the five e-business process domains (e-mail, external web sites, winery's public web site, intranet and extranet), and 2) to collect perceptions on the degree of influence of the identified factors on activity in each area by including statements to which respondents indicated their level of agreement. The questionnaire included separate sections for each process domain in order to gather data on the level and extent of the e-business activity within that domain, and each section included eight statements (two statements for each of the four factors) to which respondents showed their level of agreement by selecting from a 5-point scale ranging from strongly disagreeing to strongly agreeing. An extra "Do not know" option was also provided. An extra section on e-business in general was included which also included eight factor statements. Analysis of the survey's factor statements enabled the proposition that factors influencing e-business adoption behaviour have different levels of impact across different e-business process domains to be tested.

4. Survey Responses by Winery Size

Of the 1065 questionnaires sent out, 198 responses were received - a response rate of 18.6%. Given that winery size (measured by production) helps determine a winery's market focus and position (ACIL 2002), organisation size is likely to act as a moderating factor on a range of e-business behaviours. The size categories build on a system employed by other wine industry analysts using quantity of tonnage processed rather than employer numbers (ACIL 2002; Sellitto et al. 2003). An extra category for 'very large' wineries was introduced in order to differentiate this group from the other large wineries due to the sheer dominance of the top 20 or so wineries of the Australian wine industry. Therefore for analysis purposes the wineries are grouped into four size categories as shown:

- Small – processing between 20 and 249 tonnes annually;
- Medium - processing between 250 and 999 tonnes annually;
- Large – processing between 1 000 and 9 999 tonnes annually; and
- Very Large – processing more than 10 000 tonnes annually.

Note that the tonnage range of the very large size category is extremely large and open-ended, and covers a much wider range of size by tonnage processed than the other size categories. In 2002 for example, BRL Hardy processed over 270 000 tonnes while Orlando Wyndham processed over 160 000 tonnes (Winetitles 2003, p. 21). Table 1 summarises the population and response numbers using these size categories. The increase in proportion of responses from wineries as the winery size increases is self-evident from Table 1, and the difference is significant ($\chi^2(3) = 32.28, p < .001$).

Table 1 Winery size categories, population and response numbers

Winery Size Category	Annual Tonnage Range	Number in Population	Population %	Number of Responses	Responses as % of Population in Range	Responses as % of Total Responses
Small	20-249	801	75.2%	120	15.0%	60.6%

Medium	250-999	150	14.1%	35	23.3%	17.7%
Large	1000-9999	88	8.3%	31	35.2%	15.7%
Very Large	10000 and over	26	2.4%	12	46.2%	6.1%
Total		1065	100%	198		100%
Survey Response %				18.6%		

5. Data Analysis

To test the proposition that factors influencing e-business adoption do not impact in the same way in different e-business process domains, the responses to the factor statements in the different domains are treated as repeated observations from the same respondent and compared for differences. The “Do not know” factor statement responses are treated as missing values. The process domains of intranets and extranets are excluded due to their low response numbers. This leaves e-mail, external web sites, and the winery’s own public web sites as the three major process domains to be compared. The responses to factor statements on e-business in general are included as an extra point of comparison. The non-parametric Friedman test for K-related samples is used, for which no assumptions about the distribution of the data are made. Small p-values for this test ($p < 0.05$) provide evidence that there is significant difference between the repeated scores for each e-business domain. Due to space limitations the factor statements are not included in this paper. Interested readers can contact the first named author for a copy of the factor statements.

The responses to the factor statements for e-mail, use of external web sites, use of the winery’s public web site and e-business in general provide four different observations of the same factor for each respondent. A score for each factor/domain combination is computed by adding the responses from the two statements for that factor and dividing the result by two. Where expected frequencies in contingency tables are less than five per cell the significance levels of Fisher’s Exact Test were compared with Pearson Chi-square values: no cases of non-equivalence were found, and thus Pearson Chi-square test results are reported in all cases. For reliability testing purposes the statements were grouped by factor rather than by process domain. Reliability test results carried out on the eight statements relating to the same factor are shown in Table 2. While the low alpha score for the supply chain factor is acknowledged as a limitation to this research, the other reliability scores are acceptable.

Table 2 Cronbach’s Alpha scores for the factor items

Factor	Cronbach’s Alpha N of items = 8
Relative advantage	.805, N = 150
Resources	.657, N = 137
Supply chain	.481, N = 126
Government	.654, N = 102

The Friedman test results are computed for each winery size separately, and also for all respondents regardless of winery size in order to investigate whether winery size alters the trend in differences between different e-business categories. The Friedman test results shown in Table 3 provide strong evidence that the four factors impact in significantly

different ways between different e-business categories and this difference occurs regardless of winery size – that is, winery size has no or very little effect.

Table 3 Friedman test results for responses to factor statements

Friedman test results Df = 3	E-mail	External Sites	Public Web sites	E-business in general	N	Chi-Square	Significance
Factor	Relative Advantage						
All wineries	3.28	2.81	1.65	2.26	150	158.7	0.000
Small	3.35	2.68	1.74	2.24	85	83.2	0.000
Medium	3.24	2.95	1.66	2.15	31	39.5	0.000
Large	3.25	2.98	1.42	2.35	24	32.4	0.000
Very large	2.85	3.10	1.50	2.55	10	11.0	0.012
Factor	Resource capacity						
All wineries	3.42	2.53	1.80	2.25	137	133.4	0.000
Small	3.36	2.54	1.83	2.27	78	68.0	0.000
Medium	3.31	2.60	1.72	2.36	29	25.8	0.000
Large	3.57	2.52	1.74	2.17	21	27.4	0.000
Very large	3.89	2.28	1.89	1.94	9	15.8	0.001
Factor	Supply Chain						
All wineries	2.76	2.93	2.23	2.08	126	44.5	0.000
Small	2.88	2.81	2.09	2.21	69	23.5	0.000
Medium	2.73	3.17	2.17	1.92	26	18.5	0.000
Large	2.52	3.00	2.52	1.96	23	8.9	0.031
Very large	2.50	2.94	2.69	1.88	8	3.4	0.336
Factor	Government						
All wineries	2.65	2.80	1.41	3.14	102	121.9	0.000
Small	2.66	2.68	1.52	3.15	60	60.3	0.000
Medium	2.68	3.03	1.32	3.00	19	26.2	0.000
Large	2.63	2.94	1.19	3.25	16	27.3	0.000
Very large	2.57	3.00	1.21	3.21	7	11.7	0.009

Charts based upon the Friedman test results effectively illustrate the different levels of impact that each factor plays in the different e-business process domains, and show the high level of consistency of response across all winery sizes. Figure 1 shows the marked difference in levels of influence that the perception of relative advantage plays in different areas of e-business: for example, relative advantage is associated with e-mail to a much higher degree than with the winery's public web sites. These differences are consistent across all winery sizes and highly significant. Figure 2 illustrates that the perception of resource capacity also operates differently in different e-business process domains, and has more influence on e-mail use than the use of web sites.

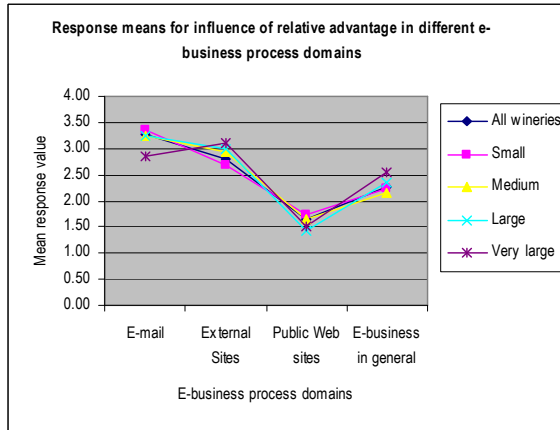


Figure 1 Relative advantage factor

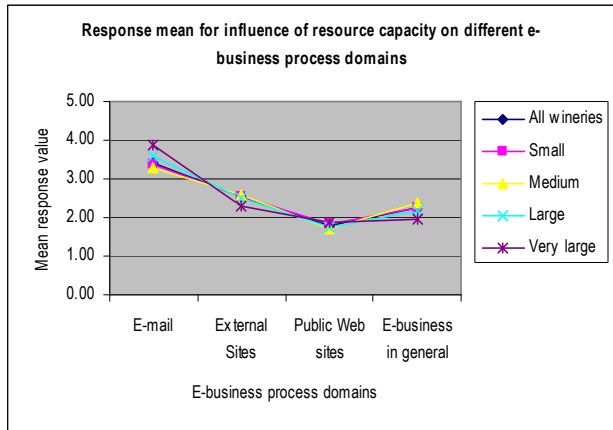


Figure 2 Resource capacity factor

Figure 3 shows the results for the supply chain factor while Figure 4 shows the responses for the government factor. The very large wineries provide the only exception to the otherwise consistent significant difference between responses to the supply chain statements for the different e-business process domains, but even so the trend here is similar.

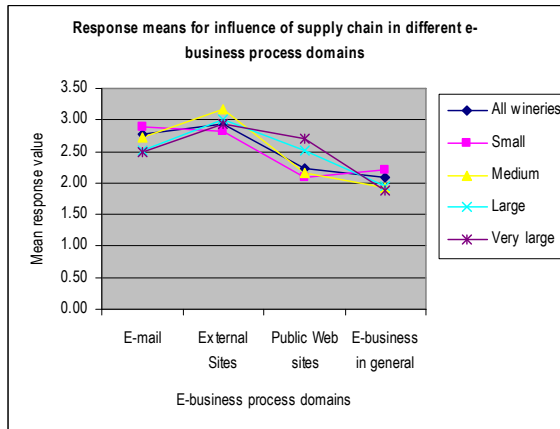


Figure 3 Supply chain factor

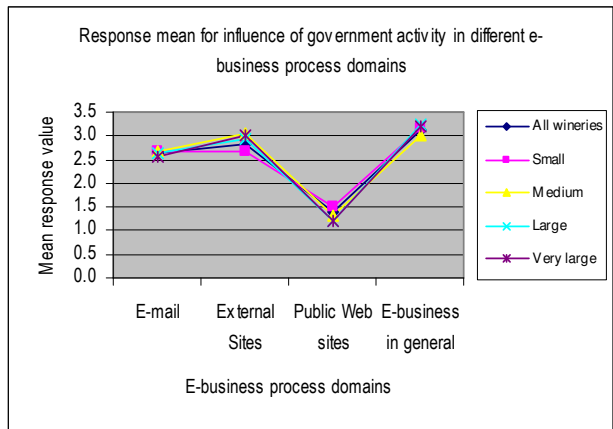


Figure 4 Government factor

The supply chain factor has greater influence on the public web sites of the large and very large wineries than it does over the small and medium size wineries as expected because of the greater power of their large retail customers. These customers are able to dictate that their winery suppliers do not compete for wine sales by offering online sales via the winery's public web site (Roberts et al. 2003). Variable customer power is likely to account for the greater spread in responses for the public web site domain, but the response mean differences for the supply chain factor are still significant and illustrate that the factor has different levels of impact between the different domains and that this occurs regardless of winery size. However the lack of adequate reliability for the supply chain statements limits interpretation of this result. Figure 4 shows high level of agreement between the responses for the government statements regardless of size, and it is interesting to note that government influence is perceived to have a stronger influence over e-business in general than the other factors investigated (Roberts et al. 2004).

6. Conclusions

The Friedman test results provide strong evidence that factors influencing e-business adoption behaviour do not impact in the same way for different e-business process domains, and thus the proposition that factors do not impact in the same way in different e-business process domains is supported. Relative advantage, for example, has significantly less influence in the use of winery B2C web sites than it does for e-mail or the use of external web sites. Resource capacity affects usage of e-mail more than web sites, while the activities of supply chain organisations have less impact on winery B2C web sites than on e-mail and external web sites. E-government influence has little impact for winery B2C web sites, but is much higher with regard to winery use of e-mail and external web sites. Overall, online government activity is considered a stronger influence on e-business activity in general than either relative advantage, internal resource capacity or the actions of other organisations in the winery supply chain. This work confirms the important role of government in enabling conditions supportive of e-business uptake and e-government services driving adoption (Gibbs et al. 2003; Palacios 2003; Wong 2003).

Theoretical implications of variable impact levels for factors in different e-business process domains exist in relation to complexity of models and frameworks. The conceptual models covering e-business adoption tend to collect all influential factors that are indicated in any e-business situation (Chau et al. 2001; Chong et al. 2000; Daniel et al. 2002; Gibbs et al. 2003; van Akkeren et al. 1999; Wu et al. 2003), and the models risk decreasing relevance as a result. One possible solution to this problem is to customise theoretical frameworks for specific e-business process domains, rather than to continue developing ever more complex models which include factors for all possible situations and outcomes. However further research in specific domains is needed before customised frameworks can be reliably developed, and similar research in different countries and in different industry settings is needed before these findings can be generalised. In conclusion, the forces that drive e-business adoption are complex and variable. Customising theoretical models of antecedent adoption factors for particular e-business process domains is likely to increase their relevance and improve the level of 'fit' between theory and practice, as one model does not fit all types of e-business.

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