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Assessing the Impact of Internet Adoption Levels on Competitive Advantage

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Abstract

This paper introduces a model for Internet adoption, namely: level 0 – e-mail adoption; level 1 – Web presence; level 2 – prospecting; level 3 – business integration; and level 4 – business transformation. Two broad Web site categories can be identified: informational Web site and transactional Web site. The competitive advantages in terms of differentiation, cost reduction, innovation, growth, and alliance that are affected by Internet adoption are examined.

A questionnaire survey of 553 firms was conducted, of which 159 usable responses were received, resulting in an effective response rate of 28.8%. The results show that proactive business strategy, firm size and competitive advantage are found to be positively related to Web adoption level. Implications of the results for researchers and practitioners are discussed, and directions for future research are proposed.

1. Introduction

In this decade, the Internet has become a new profit-enhancing tool for firms, and the adoption of Internet technology is especially important for firms if they are to do business on the Internet. However, there is a paradox in this mode of profit-enhancement since Internet adoption itself does not necessarily lead to financial growth. The role of Internet Web technology is more like a long-term strategic tool than a short-term profit generator. To what extent should firms adopt the Internet? How could Internet adoption enhance firms' competitive ability? These are the research questions that this paper attempts to answer.

2. Model for Internet Adoption

An extensive literature review is conducted pertaining to research streams on Internet-based commerce, technology adoption, and competitive advantage. A model of Internet adoption is proposed, namely: level 0 – e-mail adoption; level 1 – Web presence; level 2 – prospecting; level 3 – business integration; and level 4 – business transformation.

Level 0 – No Web Site, Only E-mail Account: A firm at adoption level 0 is one that has an e-mail account but does not have a Web site. The term "level 0" is used because the firm has not actually adopted the Web. The inclusion of level 0 is based on research done by Teo et al.

[8]. They classified Internet adoption into three groups: non-adopters (those without Internet account), adopters without Web sites but with Internet account, and adopters with Web sites. Through an extensive examination of Web sites in Singapore, we found that some firms do not have independent domain names and Web sites. These firms normally have an Internet e-mail account that they use to establish connectivity with customers and business partners. These firms are not strictly adopters because they do not have Web sites; hence they are classified as level 0 adopters.

Level 1 – Web presence: The first adoption level is Web presence. At this level, the firm has made the adoption decision but the implementation is still in process [6,7]. The purpose of adoption may be to occupy a domain name or simply to have Web presence. Generally, Web sites at this level provide mainly information and brochures, and tend to be non-strategic in nature.

Level 2 – Prospecting: The second level of adoption is named as prospecting. This is the limited use of the Internet without exploring the potential commercial opportunities provided by the Internet. Usually, Internet adoption initiatives at this stage are spearheaded by individual departments. Thus, they are with low strategic value and not tied to business strategy [4]. Most firms at this level establish Web sites to provide customers with product information, news, events, interactive content, personalized content, e-mail support, and simple search. This strategy is helpful in providing potential customers with access to the firm's products with minimal information distributing cost.

Level 3 – Business Integration: Business integration is the third level of adoption. At this level, Internet adoption is incorporated into the business model and integration of business processes is taking place. The value proposition is usually cost reduction and business support, and there are cross-functional links between customers and suppliers [4]. Moreover, Internet strategy is integrated with firm's business strategy.

Level 4 – Business Transformation: The fourth adoption level is business transformation. This is the highest level of adoption. At this level, Internet adoption will transform the overall business model throughout the organization. The focus is on building relationships and seeking new business opportunities.

3. Method

The sample was selected from the Singapore 1000 and SME500 directories. Only firms with Web sites and/or e-mail addresses were selected. Two rounds of pretests were conducted with students, faculty members and practitioners, and modified accordingly. The questionnaires were then sent by mail to IT managers or top executives (for firms without IT managers). A second mailing was carried out three weeks later. The final usable response was one hundred and fifty nine, resulting in a response rate of 28.8%.

The questionnaire captured data relating to Internet adoption level, impact of Web adoption level on competitive advantage, business strategy and demographic data.

4. Results

4.1. Respondents' Profile

About 40% of respondents came from the manufacturing industry (23.3%) and the retailing and trading industry (15.7%), followed by the architecture and engineering industry (11.3%), the finance, banking and insurance industry (10.1%), and the business services industry (8.8%). Nearly 50% respondents are either IT Managers or Managing Directors, followed by General Managers/ Vice Presidents/ Directors (12.6%) and Finance/ Accounting Managers (10.7%). The average number of years they have served the company is 6.6, and the average number of years they have spent in the industry is 11.1. The high hierarchical level of the respondents coupled with the years of tenure in the company and industry further strengthens the validity of the sample since management level respondents are more likely to be knowledgeable about the use and impact of the Internet.

More than 40% of responding firms have average annual revenues of S\$100 million to S\$600 million, while about one-third have average annual revenues of less than S\$100 million. About 65% have less than 600 employees. Data show that establishing a Web site is relatively easy and inexpensive, because 44% of the participating firms spent less than S\$30,000 when they first created their Web sites. However, the maintenance of a Web site is more expensive compared with its establishment. About 45% of the participating firms invest up to S\$100,000 into Internet technology annually, and another 18% invest S\$100,000 to S\$300,000. Interestingly, it seems that a Web site can be easily maintained, because 60.4% of the participating firms have less than ten IT/ IS employees. One possible reason is that firms may have outsourced their Web sites maintenance to specialized Web service providers rather than increase the number of IT/IS employees.

4.2. Adoption Level

Among the 159 respondents, the distribution of Web adoption levels is as follows: twenty-seven in level 0, forty-eight in level 1, fifty-two in level 2, eighteen in level 3, and fourteen in level 4.

4.3. Firm Size and Adoption Level

A post hoc test was conducted using Tukey procedures on mean scores of the three indicators of firm size (number of employees, number of IT employees and revenue turnover) among the five adoption levels (Table 1). The results show that there is no significant difference on number of employees, number of IT employees and revenue turnover among adoption levels 0, 1 and 2, as well as among adoption levels 3 and 4. However, significant differences exist between pairs of Web adoption levels, i.e., levels 0, 1 and 2 from levels 3 and 4. These results indicate that there is a relationship between firm size and adoption level. It seems that two different types of adoption activities exist between larger and smaller firms, with larger firms being more involved in adoption levels 3 and 4, and smaller firms being more involved in adoption levels 0, 1, and 2.

4.4. Business Strategy and Adoption Level

In the questionnaire survey, data of an organization's business strategy were collected in relation to whether it is a proactive strategy or a reactive strategy. Chi-square test ($\chi^2=23.24$, $\text{dof}=4$, $p < .005$) indicates that Internet adoption level is related to business strategy (Table 2). The results indicate that there are nearly equal number of proactive strategies and reactive strategies in this study, with frequencies of 84 and 75 respectively. In adoption levels 0 and 1, 66.7% and 64.6% of the organizations are reactive strategy takers respectively, while in adoption levels 2, 3, and 4, proactive strategy takers emerge as the dominant party, with proportions reaching 61.5%, 72.2%, and 92.9% respectively. This suggests that the more proactive an organization's strategy is, the higher the adoption level it will have.

4.5. Firm Size and Business Strategy

Results show that except for the number of employees, both revenue and the number of IT employees are significantly correlated with business strategy, indicating that higher revenue turnover and more IT employees are more related with proactive business strategy (Table 3). This is consistent with Kowtha and Choon's [2] findings that firm size substantially influence the strategic commitment of a firm to e-commerce.

4.6. Adoption Level and Competitive Advantage

The relationships between adoption levels and various dimensions of competitive advantage were assessed using one-way ANOVA and post-hoc Tukey procedures. Results indicate an increasing trend across adoption levels (Figure 1). As expected, the competitive advantage at adoption levels 3 and 4 are greater than levels 1 and 2. Results indicate that alliance, differentiation, innovation and growth advantages are affected more than cost advantages.

5. Discussion and Implications

The results indicate that there exist some relationships between Internet adoption level and firm size as well as firm's business strategy. Larger firms are

involved more in transactional Web site adoption, i.e., in adoption levels 3 and 4, while smaller firms are involved more in informational Web site adoption, i.e., in adoption levels 0, 1, and 2. This could be that to support transactional Web site, more technology investment, including capital and personnel, is required, which could be quite challenging to small businesses with relatively lower revenue income and resources. At the same time, firm size is positively related to business strategy, implying that larger firm size, which is represented by higher revenue turnover and more IT employees, tend to advocate a more proactive business strategy, and thus be related to higher adoption levels. In contrast, firms with relatively low revenue turnover, tend to prefer a reactive business strategy, leading to lower adoption levels. This result is important in terms of relating firms' Internet adoption activities with their strategic positions. Further research can be done to examine the relationship between business strategy and the two Web site categories. Moreover, researchers can use Miles and Snow's [5] typology of organizations, and examine the relationships between different strategic postures and adoption levels.

The results also indicate significant relationships between Internet adoption level and the five dimensions of competitive advantage. This is consistent with Lederer et al.'s [3] findings that the Web and electronic commerce improves firms' competitiveness. Among the five dimensions, alliance, differentiation, innovation and growth are affected the most by Internet adoption level. This suggests that the Internet offers an interactive channel for direct communication with customers and business partners thereby facilitating the formation of alliances and enhancing differentiation and growth. Further, firms have used the Internet for innovation and knowledge transfer rather than simply as a mechanism to lower costs [1]. Cost advantages appear to be least affected by Internet adoption level probably because cost advantages can be offset by high development costs of Web sites. Future research can further examine the sustainability of these competitive advantages resulting from Internet adoption. In addition, researchers can also examine whether predominant competitive advantages associated with different Internet adoption levels exist.

This study also has important implications to practitioners. Top management of firms should realize that the most basic function of a Web site is communication. It is a new channel to establish effective interactivity with customers and business partners. A firm deciding to adopt this technology should remember to provide their contact information on the Web site at least.

In addition, the positive relationships between Internet adoption level and competitive advantage should provide some assurances to practitioners that Internet investment is worthwhile. While firms may hesitate to invest in Internet technologies due to fear of rapid technological obsolescence, such firms may also risk losing their competitive edge by failing to leverage Internet technologies in their business strategies.

6. Conclusions

This study proposes a model of Internet adoption with five levels: level 0 – e-mail adoption; level 1 – Web presence; level 2 – prospecting; level 3 – business integration; and level 4 – business transformation. Higher Internet adoption levels tend to provide more extensive information and more transactional functions. The high extent of information and transaction features require technological support for advanced Web site features such as detailed and personalized information, advanced customer services and online business transactions. Thus possessing an advanced technology infrastructure could facilitate higher level Internet adoption.

Further, high level adoption is more prevalent among larger firms and those with a proactive strategic posture for the Web. This implies that as firms grow and become more familiar with the Internet, the features found on Web sites are likely to evolve over time, reflecting their changing objectives of Web sites.

The results also show that firms adopting Internet technology view innovation, alliance, differentiation and growth as more salient benefits than cost reduction. To achieve competitive edge, a firm needs to integrate its business activities with Internet adoption. In other words, the Web site's functions should be consistent with the firm's business strategy. Firms adopting Internet technology should view Web sites as a strategic move rather than a simple Web presence in order to derive greater benefits from Internet adoption.

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Table 1
Firm size and adoption level

Firm Size	Adoption Level									
	0		1		2		3		4	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
No. of Employees	2.04 _a	1.22	2.68 _b	1.53	3.18 _a	1.85	3.89 _a	2.14	4.21 _{a, b}	1.89
No. of IT Employees	1.11 _a	.32	1.51 _b	1.08	1.96 _c	1.43	3.28 _{a, b, c}	2.16	3.71 _{a, b, c}	2.37
Revenue	1.93 _a	1.04	2.02 _b	1.14	2.30 _c	1.54	3.39 _{a, b}	2.09	4.23 _{a, b, c}	2.05

Note: Means in a row sharing subscripts are significantly different at $p < .05$
For all measures, higher means indicate higher value

Table 2
Business strategy and adoption level

Business Strategy	Adoption Level					Total
	0	1	2	3	4	
Proactive	9	17	32	13	13	84
	33.3%	35.4%	61.5%	72.2%	92.9%	
Reactive	18	31	20	5	1	75
	66.7%	64.6%	38.5%	27.8%	7.1%	
Total	27	48	52	18	14	159
	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 3
Business strategy and firm size

	Business Strategy	No. of Employees	No. of IT_Employees	Revenue
Business Strategy	1.000	-.145	-.205*	-.271**
No. of Employees	-.145	1.000	.763**	.653**
No. of IT_Employees	-.205*	.763**	1.000	.710**
Revenue	-.271**	.653**	.710**	1.000

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

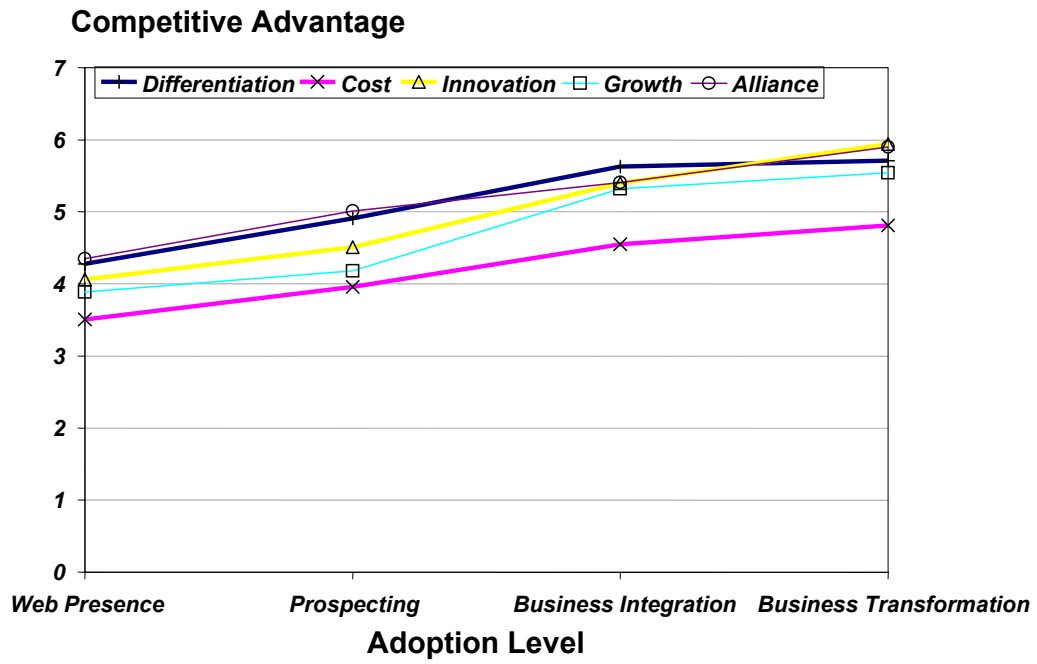


Figure 1. Adoption level and competitive advantage