

Factors Influencing the Adoption of the Internet

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ABSTRACT: The Internet has been given tremendous publicity in recent years. However, most research focuses on Europe or America rather than Asian countries. This study hopes to contribute to a better understanding of the Internet phenomenon in Asia by examining the factors influencing the adoption and nonadoption of the Internet among organizations in Singapore. A survey was carried out among business firms to examine the benefits of adopting the Internet, reasons for not adopting the Internet, and the criteria for selecting Internet access service providers. The results showed that key benefits are derived from the global nature of the Internet, which enables access to worldwide information and the creation of a worldwide electronic presence. Nonadopters of the Internet are concerned about whether staff will waste time surfing the Internet. Both access speed and technical support are viewed as important criteria in selecting an Internet access service provider (IASP). Implications of the results are discussed.

KEY WORDS AND PHRASES: adoption, Internet, Singapore.

The Internet is often described as an innovation that will transform the way we live and work. Many are convinced that the Internet is nothing short of a revolution. What the Internet has done is transform the way we communicate and access information. It enables us to communicate through electronic mail and discussion groups, either synchronously or asynchronously.

Since the extent of the Internet network increases by the square of the number of its members, the value of each node increases geometrically as more nodes are linked together. Easy worldwide communication will transform the global economy. However, the popularity in the new networked economy is also the focus of governments concerned about the free flow and form of undesirable information and content. Indeed, it is interesting to note that no other information technology has been the source of as much controversy as the Internet.

The Internet has its origins in the early 1960s in the ARPAnet, a network designed and used for defense purposes. The Internet is now considered a commercial global network [13]. It is expected that there will be 200 million users worldwide by the end of this century, a substantial jump from the 56 million users in 1995 and just 2 million users in 1990 [3]. Therefore, it is no wonder that an increasing number of organizations worldwide are tapping the potential of the Internet as a medium to boost their businesses in terms of advertising, selling, and buying [17, 19].

Telecommunication organizations and governments are making huge investments in developing the network infrastructure, and many programs are being written to enable the exchange of electronic communications, databases, and commercial transactions via the World Wide Web. Many organizations are undertaking initiatives to promote electronic commerce, or "e-commerce."

The government of Singapore is promoting electronic commerce with

Singapore ONE (One Network for Everyone), which was launched in July 1997. It is the world's first nationwide broadband network for accessing and transacting information for business, entertainment, and education. Singapore ONE provides interactive multimedia applications and services to homes, businesses, and schools throughout the island. Currently, these applications include news-on-demand, distance learning, online shopping, government services, and fast Internet access. However, the ultimate success of Singapore ONE hinges on how well Singaporeans embrace and keep up with the technology.

Internet Access Service Providers in Singapore

The Internet was introduced to the university academic community in the late 1980s and to secondary schools and junior colleges in 1993. Singapore, in line with its IT2000 plan [16], and to move a step closer to achieving its vision of becoming an intelligent island (or a fully networked country) by the end of this decade, launched the country's first commercial Internet access service provider (IASP), SingNet, in July 1994 to provide businesses and the general public with access to the Internet.

In September 1995, Technet, the original service provider for academics, was privatized and renamed Pacific Internet. It started an aggressive marketing campaign to attract subscribers. As a result of intense competition between the two IASPs, the Internet gained more publicity, which led to lower rates for subscribers. The launching of the third service provider, Cyberway, in March 1996, further accelerated the growth of the Internet. There are an estimated 150,000 Internet users in Singapore, including individuals and organizations, a substantial increase over the 52,000 users in early 1995 [27, 28]. It has been estimated that the number of Internet users in Singapore will reach 250,000 by the end of this decade [15].

In light of the popularity and exponential growth of the Internet, it is surprising that there are relatively few empirical studies on adoption of the Internet. This paper is an extension of our earlier papers, which provided an overview of Internet adoption in Singapore and proposed a contingency model of Internet adoption [24, 25]. In contrast, this paper examines the factors influencing Internet adoption by supplementing the quantitative results of the previous studies with qualitative comments from respondents.

Research Method

A field study of 500 randomly selected companies was used to collect the data in two phases. In the first phase, a questionnaire was used to collect the quantitative data, and, in the second phase, telephone or e-mail were used to collect the qualitative data. Qualitative data is useful as it forms a rich source of information to describe the Internet adoption phenomenon to substantiate the responses to the questionnaire.

The questionnaire was derived from a review of research literature on

innovation adoption. The questionnaire was extensively pretested for comprehension with practitioners and faculty members. After several rounds of editing, the final questionnaire was sent to the company senior executives. The instrument collected data on the organizational profile, ranking of Internet applications, benefits of adopting the Internet, reasons for not adopting the Internet, and criteria for selecting the Internet access service providers.

A cover letter explaining the objective of the study was sent to the executives being surveyed and included a stamped reply envelope. A second mailing was sent to nonrespondents about three weeks later. Out of the 500 companies sent questionnaires, 30 companies declined participation. A total of 195 questionnaires were returned, of which 188 were usable. Hence, the final response rate was 37.6 percent, which was deemed adequate for the purpose of the study.

In order to supplement the above quantitative analysis, qualitative data was also used. The respondents were contacted via e-mail or telephone and asked to comment on the ways the Internet has benefited their company, their concerns about the Internet, and the desirable qualities of an IASP. Their responses enrich and explain some of the research findings.

Findings of the Study

The survey shows that 69.7 percent of the 188 respondents (131 organizations) have Internet accounts (here termed adopters). Among the remaining 30.3 percent that do not have Internet accounts (called nonadopters), 50.9 percent intend to adopt the Internet within the next six months. Among the adopters, 42 percent have Web sites.

Profile of Respondents

See Table 1 for a profile of the respondents. The high organizational position of the respondents should provide some assurance as to the validity of responses since these respondents can generally be expected to be knowledgeable about their organizations. More than 80 percent of the respondents hold managerial positions in their respective companies. They also have an average working experience of about 7 years in their companies and 11.5 years in their respective industries. Respondents come from a wide range of industries, with a predominance of manufacturing firms. More than 75 percent of the companies are large in size, with more than 300 employees and average annual revenue ranging from \$10 million to more than \$1 billion.

Internet Applications

For this study, six popular Internet applications were identified and the adopters were asked to rank these applications from 1 (most frequent) to 6 (least frequent) in terms of use. The results of the ranking are shown in Figure 1. A brief description of the applications follows:

	Number	Percent
<i>1. Job title of respondents</i>		
Chairman/CEO	3	1.6
Managing director	15	8.0
General manager	24	12.8
CIO/IT manager	84	44.7
Finance/HR manager	19	10.1
Marketing/operations manager	10	5.3
Others	24	18.8
Missing data	9	4.8
<i>2. Industry</i>		
Architecture/engineering	17	9.0
Finance/banking/insurance	12	6.4
Manufacturing	88	46.8
Services	29	15.4
Transportation	12	6.4
Travel/tourism/hotel	14	7.4
Others	16	8.5
<i>3. Number of employees</i>		
< 100	10	5.3
101-300	35	18.6
301-600	46	29.5
601-1000	35	18.6
1001-2000	19	10.1
> 2000	43	22.9
<i>4. Annual revenue (\$ million)</i>		
< 10	11	5.9
10-100	73	38.8
101-300	34	18.1
301-600	25	13.3
601-1000	14	7.4
> 1000	25	13.3
Missing data	6	3.2

Table 1. Demographic Profile.

- World Wide Web (WWW): a hypertext-based search tool that organizes data and information into a set of hypertext documents
- Electronic mail (e-mail): allows users to send and receive messages electronically
- UseNet News: facilitates sharing news, ideas and views with those of similar interests
- Chat: enables exchange of information in real time with users who are on the Internet at the same time

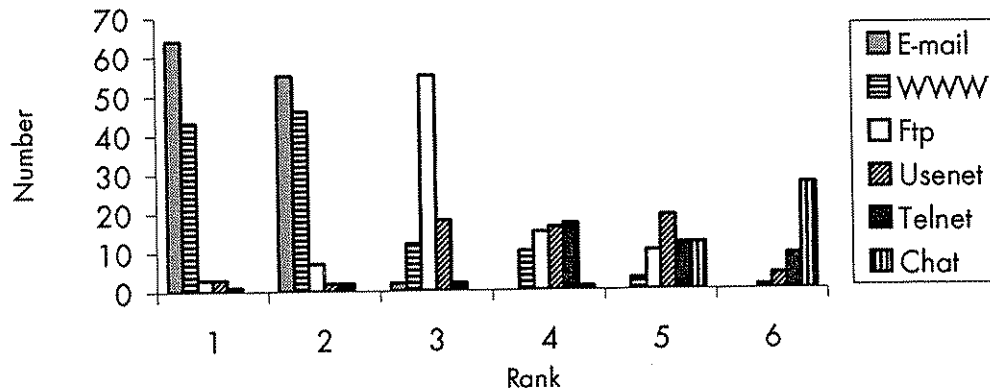


Figure 1. Ranking of Internet Applications (1 = most frequent; 6 = least frequent).

- File transfer protocol (FTP): enables log-in to remote sites to retrieve and transfer files
- Telnet: allows the user to log in to a remote computer and run programs on it

It is not surprising that e-mail is the most widely used Internet application, consistent with Cockburn and Wilson's findings [5]. Indeed, electronic communication is the very basis of the Internet. The next two common uses of the Internet applications are the World Wide Web and FTP, results that are also expected. The reason for their popularity is that these three Internet applications are most useful to individuals as well as businesses: E-mail facilitates global communication, the WWW enables easy access to world information, and FTP provides easy retrieval and transfer of files between remote and geographically dispersed sites. Businesses can make use of e-mail (via mailing lists), the WWW, and FTP to disseminate timely information about corporate events, product announcements, press releases, and other information of interest to current and potential customers [15]. The advantages of the FTP facility are evident from the following comment by a manufacturing firm: "We make use of the FTP facility to transfer CAD [computer-aided design] files to and from our customers/suppliers. Before we embark[ed] on the Internet, our data transmission alone work[ed] out to be more than S\$150,000 per year (or about US\$100,000). Now we are paying only about 20-30 percent."

Such significant savings make the FTP facility more popular compared to other applications, such as UseNet News, chat and Telnet, which are used mainly by specific groups for educational and recreational purposes.

Reasons for Internet Adopters to Create Web Sites

The adopters were asked to evaluate the benefits on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). They were also asked whether they have Web sites and, if so, to state the objectives for establishing them. Figure 2 shows the findings of the benefits of adopting the Internet.

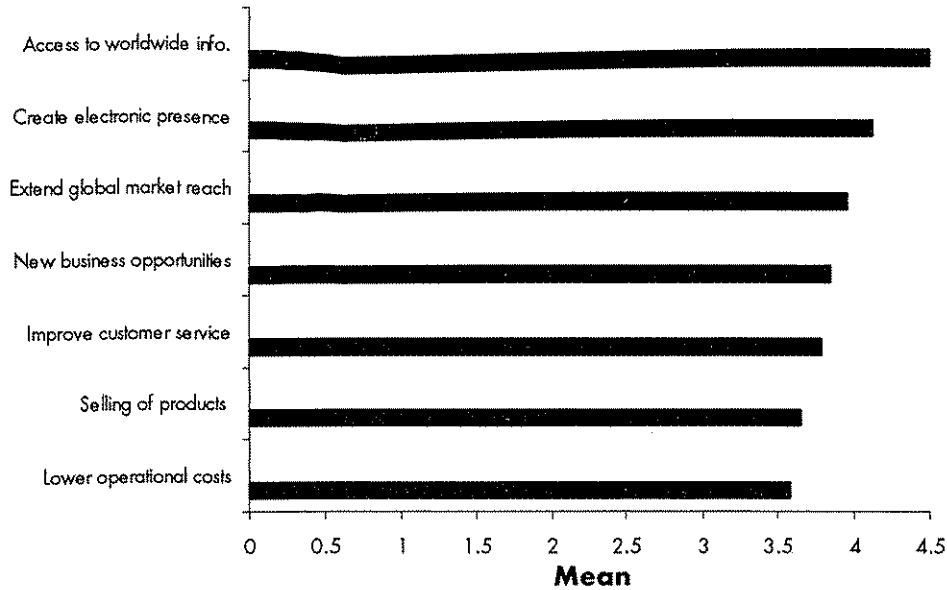


Figure 2. Benefits of Internet Adoption (1 = strongly disagree; 5 = strongly agree).

Convenient access to worldwide information, establishing a global presence, and extending world market reach are the three top reasons for Internet adoption. This is perhaps expected since the Internet is a global network interlinking millions of computers worldwide. According to Kevin Kelly, executive editor of *Wired* magazine, "Those who play by the new rules will prosper, those who ignore them will not" [7]. It has become apparent that the new rules include being connected, so getting on to the Internet is the most natural way to compete and survive.

It is thus not surprising to find that, according to these results, the most prominent objective of establishing a Web presence is providing information to customers. Of the 55 adopters with Web sites, 92.7 percent use their Web sites to inform customers of their products and services as well as provide other corporate information. The rationale is that an around-the-clock corporate presence on the Internet provides visibility and awareness in the marketplace, which in turn helps enhance the company's image and reputation [23]. One respondent wrote, "There is no better way to provide a corporate presence than having a Web site that reaches millions of people in the world at very modest costs. Being constantly connected in a virtual way will give us an advantage over our competitors. This is especially [true] when we have a small market in Singapore."

The Internet has also helped companies improve customer services by providing easy access to information about products and services. This can have a tremendous impact on information dissemination, as illustrated by one business systems development manager: "Our customers can track their shipments on our Internet site, and this has meant that we can give customers this ability without having to install equipment or software in their offices. We also use the Internet to research products and services we want to buy, so that by the time we actually contact potential suppliers, we already know what we want and what it will do."

The Internet removes many barriers to communication with customers by eliminating obstacles created by geography, time zones, and location. For example, several airlines allow customers to access information about flight schedules and make bookings 24 hours a day, 7 days a week, and 52 weeks a year. Users of travel sites can also make reservations for transportation and hotels. With a click of the mouse button, customers can gain access to the relevant product or services from anywhere and at any time. One respondent expressed his satisfaction with the Web site as follows: "We are very happy that our customer ratings have gone up as they no longer have to wait on the telephone for a long time to get a response from us. Besides, they have more control over what they want, when they want it, and how they want their products and services delivered."

Another respondent commented: "My business efficiency has improved even though this is only a trial period of putting my shop on the Web. My people no longer waste time as we used to, using telephone orders. My customers just click on the orders or services they want at any time, and we turn around very quickly. It is interesting to note that we have customers visiting us even in the night. Certainly this would not be possible with our current operation." The use of the Internet as a vehicle for customer communication with the firm at any hour certainly offers an attractive opportunity to enhance customer satisfaction. Customers stand to gain from Internet advancements, especially in the development of cybershopping.

Another commonly cited benefit of the Internet is that firms need no longer be restricted by physical locations and boundaries in the creation of new business opportunities. They can now advertise and sell goods and services around the world at relatively low cost. Setting up offices and distribution channels and advertising in the physical world is not only costly but requires complex logistics. Indeed, only very large corporations have such resources. However, with the Internet, smaller organizations now have the ability to reach out to new international markets that otherwise would have been closed to them. Some firms in Singapore have reported that the Internet has helped them boost business regionally and globally; they have experienced about a 20 percent rise in transactions since venturing onto the Internet [8].

Thus, it is not surprising that 61.8 percent of adopters with Web sites were used to advertise products and services. The Internet represents an alternative form of advertising and is certainly cheaper than advertising on television and radio and at the cinema [18]. One marketing manager commented, "Web site advertising may easily take over the traditional form especially [for] those in the knowledge and information industry. The beautiful part of this form of advertising is that it provides interaction with the potential customers through electronic communication. Further, customers could determine the details of what interests him or her through interlinking information using hypertext. It is interesting that such advertising allows us to customize to the requirements of the customers. Think of the conventional world of advertising and consider the waste [in printing an enormous number of brochures and seeing them being thrown out by customers]. No wonder the cost of operations has gone up!"

Only 29.1 percent of adopters with Web sites use their Web sites for direct

selling or marketing of their products and services. This finding is generally consistent with King [14], who found that most Web sites of Fortune 500 firms are used for providing information rather than for transacting business activities, that is, online buying and selling or trading. Similarly, Soh et al. [21] found that the Internet is usually used for marketing and advertising, customer service and support, information gathering, and, to a lesser degree, electronic transactions. As the Internet is a relatively new technology, the nature, process, and the security of commercial transactions on the Internet are still being debated, and many firms are currently hesitant to expose themselves to such risks [5, 12]. Perhaps it is too early to estimate some of the Internet benefits regarding electronic commerce as this has not been fully accepted and implemented.

The reason the Internet has not been fully exploited in electronic commerce may be the uncertainty surrounding the security of electronic transactions. Indeed, many issues have to be addressed before electronic commerce becomes more widespread. For example, the legal concerns of offer and acceptance in a simple sale of goods can become complicated in the cyberworld. The laws for the physical world may be inappropriate for the cyberworld. Issues like authentication and repudiation of transactions have to be fine-tuned. Another concern that still worries many consumers and is often debated is the payment scheme. Further, there remains a lack of clear rules of legal jurisdiction and guidelines governing how electronic transactions should be carried out [21]. A global government-endorsed infrastructure must be set up to support electronic payment instruments, such as credit and debit cards, e-cash, and checks, and letters of credit.

Another possible deterrent to transacting business in cyberspace is that consumers still prefer to purchase from physical stores where they can examine the quality of products purchased. Changing the mindset of conventional consumers or shoppers is important for enhancing electronic commerce. Furthermore, existing electronic shopping systems offer low levels of product differentiation and product comparability [1].

Reasons for Not Adopting the Internet

If the Internet is to become a pervasive technology in the twenty-first century, we need to understand why some companies still hesitate to adopt the Internet. In this study, the nonadopters were asked to identify the reasons for not adopting the Internet on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The results are shown in Figure 3.

One of the main reasons given for nonadoption of the Internet is management's fear that staff may waste too much time surfing the Internet instead of performing their normal duties thus adversely affecting organizational productivity [6]. The slow downloading of information from the Internet is yet another problem, giving rise to a valid debate over whether use of the Internet will decrease rather than increase employees' productivity. Fortunately, Singapore ONE's broadband network is currently improving the speed of Internet access.

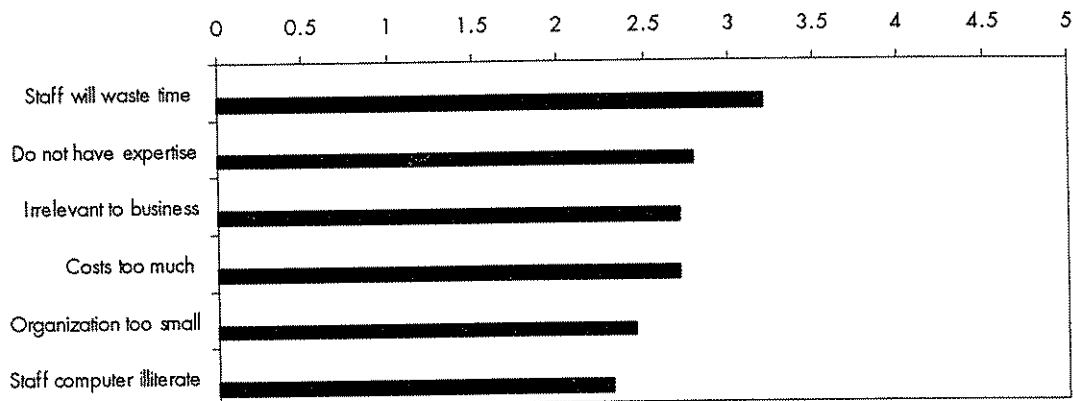


Figure 3. Reasons for Not Adopting Internet (1 = strongly disagree; 5 = strongly agree).

Using the Internet is relatively easy, yet nonadopters claimed that they may not possess the relevant expertise to adopt the Internet in their organizations. Adapting to the new technology may require changes in employees' work attitudes, skills, and performance levels, and learning what information technology can offer these organizations. It is, therefore, conceivable that nonadopters may perceive the Internet as irrelevant to their businesses. One respondent commented: "We provide transportation, and I do not think we need to use the Internet. Besides, most of my employees are not familiar with computers. Although the Internet is easy to use, we have [inadequate] resources [for] IT each time there is a new product."

Nonadopters are also concerned about the costs involved in adopting the Internet, such as subscription fees, design and development expenses, hardware and software costs, time access costs, and maintenance costs. Although competition among the IASPs has reduced costs, they may still be too high for companies with inadequate resources. Furthermore, Web sites need to be updated periodically to be useful and encourage repeat visits. The costs of such maintenance may also be a deterrent. These problems are aggravated by slow Internet access speeds.

The nonadopters generally disagree over whether the size of their firm is too small to adopt the Internet. This is perhaps expected since most firms in our sample have more than 100 employees and can hardly be considered small. It is interesting to note that while firms agree that they may not have the technical expertise to adopt the Internet, they disagree over whether their staff is computer illiterate. Although it is true that the Internet is relatively simple to use, the creation of Web pages with Java script programming and elaborate graphics and multimedia features do require specific new computer expertise.

Some firms have commented specifically that another reason for not adopting the Internet is concern over security. One IT manager commented: "In addition to the concern that staff will waste time browsing the Web, we are also concerned about security and this stops us from buying and selling on the Internet. Until the technical issues of security are addressed adequately, I do not think that we will embark on electronic commerce just yet."

Unless the lack of security, arising from weaknesses in encryption tech-

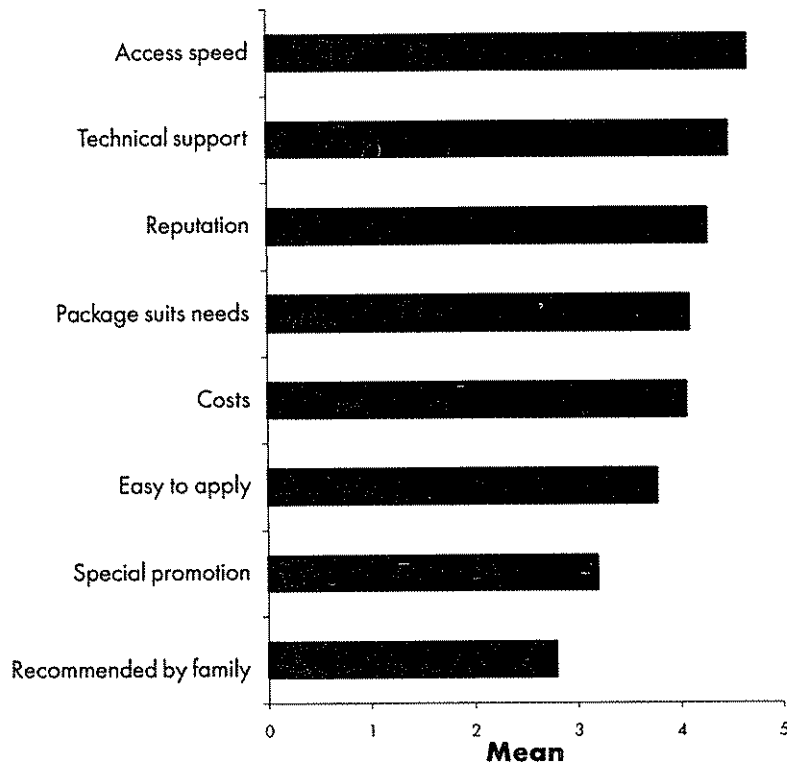


Figure 4. Criteria for Selecting IASPs (1 = not important; 5 = very important).

nology, inadequate firewalls, and threats from computer viruses, are resolved, firms will be hesitant to adopt electronic commerce. Hence, there is an urgent need to establish appropriate protocols to support electronic ordering and payment as well as to restrict unauthorized access to preserve confidentiality of company and customer information.

Criteria for Selecting Internet Access Service Provider

Because organizations are becoming dependent or reliant on the computer network infrastructure for most activities and transactions, adopters were asked to evaluate their criteria for selecting Internet access service providers. A 5-point Likert scale was used, ranging from 1 (not important) to 5 (very important). The results are shown in Figure 4.

The most important criterion, according to the respondents, is the access speed to the Internet. With the escalating number of users, as well as the tendency for users to "spice up" their Web pages with big graphics files, the access speed slows down and it takes more and more time to download or transfer documents. While speedy access on the Internet is currently limited by physical bandwidth, cyberspace congestion may not be an issue in the near future because advancing telecommunication technologies will resolve this problem.

In Singapore, proxy servers were initially used to speed up access by caching popular Web pages on local servers. However, because of objections to undesirable and pornographic materials on the Internet, the use of proxy

servers was extended to include screening and restricting access to banned sites [6, 20]. As a result, the access speed is much reduced [2]. Currently, various IASPs are investing in developing more advanced infrastructure to increase the capacity of proxy servers and the bandwidth. Internet users "do expect a high quality of service that includes a reliable network, good customer support, and value for money service" [10]. For example, SingTel recently launched asymmetrical digital subscriber line (ADSL) technology, which allows modems to transmit as much as 5.5 megabytes per second (mbps) [4]. Thus, it can send and retrieve information 200 times faster than an ordinary modem. SingTel is also currently at a testing stage to use IPv6, a server system that allows it to handle 128-bit Internet addresses while the current IPv4 offers 32-bit addresses. With the new system, access would be faster as the system is able to chunk greater amounts of data and information over the bandwidth. Singapore is the first Southeast Asian country to connect to the IPv6 network, called 6Bone, which is a very rapid bandwidth network connected to the United States [26]. Thus, we can see that Singapore is intent upon implementing electronic commerce on the Internet by adopting sophisticated technologies to overcome the technical hiccups.

Good technical support and services are also viewed as important criteria for selecting IASPs. The Telecommunications Authority of Singapore (TAS) has set as a benchmark that the service level provided by the IASPs must not fall below 98 percent. In a recent case, one IASP was fined for failing to meet this standard [9]. Those IASPs that do not possess the infrastructure to provide the access speed and the technical support to satisfy customers' needs for quality services are likely to lose out.

A package that includes features to suit the needs of the user is also an essential criterion for selecting the IASP. The application procedure for Internet services provided by the IASP should be simple and convenient. Special promotions and personal recommendations from family, friends, or associates are shown to have relatively little influence on potential subscribers' choice of IASP. Promotions based on cost have little effect because there is little difference among the IASPs in terms of subscription cost.

Conclusion

Despite the rapid growth of the Internet in Singapore, about a third of firms sampled do not have an Internet account. Of the remaining two-thirds, only about 40 percent of the respondent firms have Web sites. Despite the Singapore government's many programs to encourage use of the Internet, adoption of the technology is still in its infancy. The island has one of the best broadband telecommunication infrastructures. Further research is needed to examine in greater detail the reasons firms do not adopt the Internet and, among those with an Internet account, their reasons for not creating Web home pages.

Internet adopters have found the Internet useful for connecting with their customers as well as suppliers. It may well be that the Internet will provide a new form of organization in the twenty-first century, emphasizing the stra-

tegic value chain approach with customers and suppliers as a way to compete and sustain competition.

Employees and individuals who use the Internet should work to convince top management of its potential in helping them perform their tasks better and more effectively. However, they must ensure that the many hours of Internet browsing will add to their productivity.

The IASPs will play an important role in the diffusion of the Internet, as they help resolve some of the concerns about security and integrity of transactions and payments as well as the issue of privacy. IASPs must provide the highest level of quality in terms of technical support and services to organizations that are becoming more dependent on the networked infrastructure. This study provides insights as to why some firms do not adopt the Internet. Policy-makers can thus examine such inhibitors to Internet adoption and formulate appropriate policies to mitigate them.

The study also examines the criteria for selecting IASPs, which policy-makers can use to evaluate the suitability of these providers of Internet services. To retain customers and attract new customers, IASPs should continue to provide competitive price, high reliability, excellent customer service, and technical support. In addition, they should invest in appropriate telecommunications infrastructures for delivering high-speed access, and they may need to provide customized Internet subscription packages that suit different corporate needs.

Further longitudinal and cross-cultural studies are needed to investigate the growth stages of Internet adoption across industry sectors and application types. In addition, studies investigating the adoption of intranets and extranets of organizations will provide further insights on the diffusion and adoption of the new technology. In particular, researchers should also investigate whether factors important to the adoption of interorganizational systems are also applicable to the Internet [11].

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