

## Are we ready? The state of wireless e-business in the USA\*

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**Abstract.** Recent evidence shows that in the United States, electronics and information technology (IT) businesses generate nearly one-third of their revenues from e-business, yet spend less than 5% on IT. While there have been many published studies on the adoption of e-business using wired Internet technologies, the adoption of wireless e-business by US firms remains relatively unexplored. The purpose of this study is to report on the current state of adoption of wireless e-business technologies in the US Information and Communication Technologies (ICT) sector and the factors likely to affect the utilization of these technologies in the future. Survey results show that the US ICT sector is not very far along in its use and application of wireless e-business technologies.

**Key words:** innovation, readiness, wireless e-business

### 1 Introduction

Companies are continuously looking for ways to stay profitable and keep growing. Technology is no longer just an enabler of business processes but is increasingly becoming the core of a firm's growth strategy. According to Srinivasan, Lilien and Rangaswamy (2004), a firm's ability to sense and respond to new technology developments is critical for several reasons. Technological change is a principal driver of competition-destroying monopolies, creating new industries, and rendering products and markets obsolete. Secondly, in-house technology development is increasingly being complemented by additional sources both within and outside the company

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\*The authors gratefully acknowledge financial support from TBRC, Lappeenranta University of Technology and the College of Business at San Francisco State University for this study. The helpful comments of Dr. Richard Beer, Assistant Professor, Department of Information Systems at the University of San Francisco and former Executive Director, Fisher Center for Information Technology at the Haas School of Business, UC Berkeley are greatly appreciated.



and the industry (Chesbrough 2003). As it is difficult for firms to predict which technologies will succeed, companies need to experiment with several new technologies simultaneously. A firm may respond to a radical technology in several ways including ignoring the technology, monitoring it, forming alliances to exploit the technology, doing limited experimentation, and adopting the technology within the firm (Srinivasan, Lilien and Rangaswamy 2004), the last being the focus of this study. In e-commerce, organizations first exploit the Internet for information transfer and publishing, then for supporting transactions, and finally, for true commercial trading and collaboration among various actors (Ruyter, Wetzels and Kleijnen 2001). Mobile commerce or m-commerce is still in its infancy. However, borrowing from the e-commerce experience, organizations will probably adopt wireless e-business first to support their existing business and improve efficiency before they come up with new business models to transform the competitive landscape.

Wireless enterprise implementation issues frequently extend well beyond the technology domain and into areas of business practice and company culture. The vast majority of enterprises actively pursuing wireless enterprise strategies are hand-crafting solutions around their own corporate IT infrastructures, and their own home-grown business processes since there are few packaged mobile solutions (Figueras 2003). Figure 1 below illustrates the path of market development of various wireless-enabled business applications. At the moment the focus is on accessing information via wireless enterprise messaging. The future should hold more applications like wireless file access, telematics and alerts for facilitating better management decisions. Given the emerging state of the technology and its potential impact on the enterprise wireless e-business can be seen as truly radical.

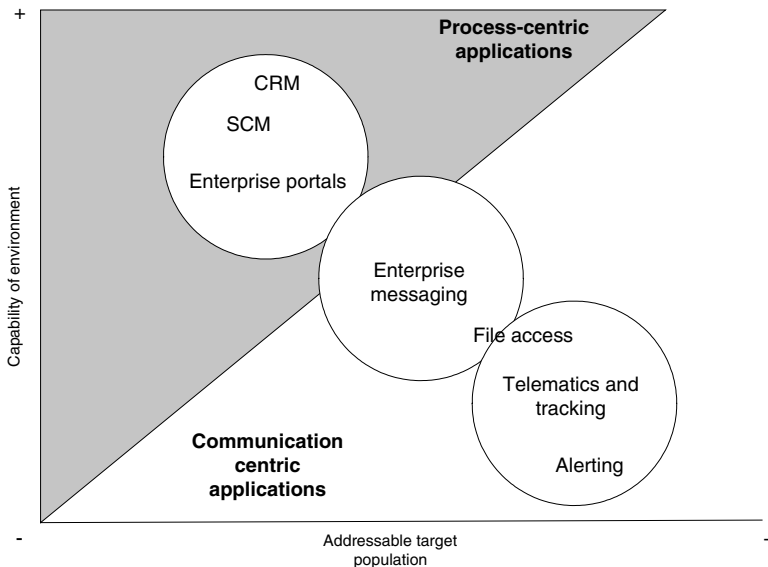


Fig. 1. Wireless business applications market development. Adapted from Figueras (2003)

Emerging technologies have the potential to remake entire industries and obsolete established strategies. Most firms feel they must participate in emerging technologies and markets in order to survive. The first reason is defensive, driven by the belief that newcomers are plotting to use new functionalities to attack the incumbents' core markets. The second reason is converse to the first: if the emerging technology realizes its potential, it will be too attractive to ignore (Day and Schoemaker 2000).

The US is a global leader in terms of total e-commerce sales, the number of e-commerce start-ups, and the number of established global e-commerce firms. This is in spite of a dramatic slowdown in the "dot.com" sector of new, Internet-based companies, and general weakness in the US economy (Fomin et al. 2003). Enterprise infrastructure is a vital factor influencing the development of e-commerce. In 2002, 82% of all US businesses, and more than 90% of medium and large businesses were connected to the Internet. About 25% to 49% of suppliers and/or customers in the electronics, information technology (IT) and telecommunications sectors are included in electronic supply chain activity. US electronics and IT businesses generate nearly one-third of their revenues from e-business, yet spend less than 5% on IT infrastructure (Fomin et al. 2003). Despite its leadership position there is a need for the US ICT sector to continue investing in e-business. US companies face a broad range of obstacles in adopting e-business, particularly their lack of ability to transcend significant technical, managerial, and cultural issues. The issues are even more complex in the area of wireless e-business where the technologies are newer and few published empirical studies exist to provide actionable guidelines to companies.

## 2 Conceptual framework

The current study addresses the gap in the existing literature with regard to the complex issues surrounding enterprise adoption of wireless e-business. We define wireless e-business as the use of all kinds of wireless devices (e.g. cell phones, personal digital assistants, mobile email devices, handheld computer etc.) to provide information and services to customers, employees or partners over private or public electronic networks.

This study aims to answer the following questions.

- 1) What is the current state of adoption of wireless e-business technologies in the US ICT sector?
- 2) What factors may affect the utilization of these technologies by this industry in the future?

Figure 2 posits the conceptual framework for the study showing the different stages of the technology adoption process for organizations as well as the main factors operating at each stage. In the pre-adoption stage companies take an internal perspective and analyze the fitness of the new technology for the contemplated task as well as the value of the new technology to the company (Tallon, Kraemer and Gurbaxani 1999). These are the drivers of the adoption decision. In the next phase companies analyze whether organizational and environmental factors are favorable for continuing with the novel technology. This may uncover inhibitors that can slow down the adoption process. However if the company decides to implement the

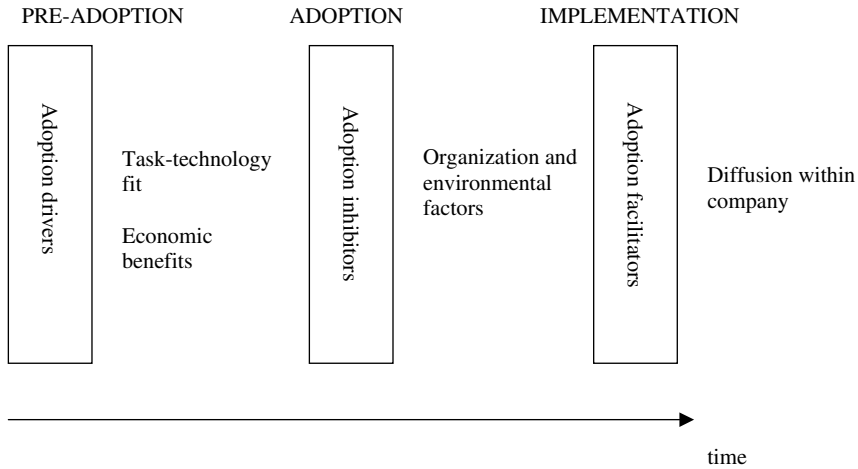


Fig. 2. Conceptual framework of technology adoption by organizations

technology, in the next stage it will find adoption facilitators that can help in the diffusion of the technology within the organization. In this study we take into account some variables in the pre-adoption, but mostly focus on the adoption stage of the framework. Implementation is beyond the scope of the current study.

The two stages of pre-adoption and adoption in Fig. 2, taken together, are similar to the technology-organization-environment framework put forward by Tornatzky and Fleischer (1990). This framework identifies three aspects of a firm’s context that influence the process by which it adopts and implements innovation: technological context, organizational context, and environmental context. We discuss technological and organizational context next. Since this is a single industry study in which the environment is held constant, we omit discussion of the environmental context.

**2.1 Technological context**

Rogers (1995) lists five innovation characteristics that are potential drivers of organizational adoption. Innovation Diffusion Theory (IDT) posits that innovation diffusion is achieved through users’ acceptance and use of new ideas. An innovation is an idea, practice, or material artifact perceived to be new by the relevant unit of adoption (Dewar and Dutton 1986). Rogers stated that an innovation’s relative advantage, compatibility, complexity, trialability and observability were found to explain 49–87% of the variance in the rate of its adoption.

Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes. Compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters. According to Tornatzky and Klein (1982) compatibility is a combination of what people feel or think about an innovation, and practical or operational compatibility with what people do. It is closely related to perceived usefulness, the degree to which a

person believes a certain system will help perform a certain task (Bruner and Anand 2004). Complexity is the degree to which an innovation is perceived as difficult to understand and use. Complexity in IDT is the opposite of perceived ease of use in the Technology Acceptance Model (TAM), shown in Fig. 3 (Davis 1989).

Studies have demonstrated that ease of use together with usefulness are two important drivers of innovation adoption (Bruner and Anand 2004). Trialability is the degree to which an innovation may be experimented with on a limited basis. Having the opportunity of experimenting with a new technology before deciding whether or not to adopt is an important benefit especially for early adopters, because they can only rely upon available information, while laggards can learn from others users' experiences. Finally, an innovation is evaluated according to its observability, which identifies the degree to which its performance and related benefits are visible to other users and not only to the companies that produce it. These five factors analyze the fit between the task and the technology.

A study by Tornatzky and Klein (1982) revealed that of all these attributes, relative advantage, compatibility, and complexity were consistently related to adoption decisions. Beatty, Shim and Jones (2001) developed a framework consisting of perceived benefits, compatibility, complexity, and management support to study the adoption of corporate web sites. As the various studies demonstrate there are plenty of theories to choose from when analyzing innovation adoption. Most theories use either IDT, TAM or the technology-organization-environment framework as a starting point. However each study needs to consider the different theories available and apply them to the specific innovation of interest.

The determinants of new technology adoption are the benefits received by the organization versus the cost of adoption. In many cases these benefits are simply the difference in profits when a firm shifts from an older technology to a newer one. Rosenberg (2002) argues that one of the reasons for the slow but eventually complete diffusion of new technology is their relatively poor performance in their initial incarnations. He identified several factors that are important on the supply side such as the improvements made to the technology after its introduction, the invention of new uses for the technology, and the development of complementary inputs.

## 2.2 Organizational context

The organizational context can facilitate or inhibit the process of technology adoption within an organization. Several studies have focused on reasons for

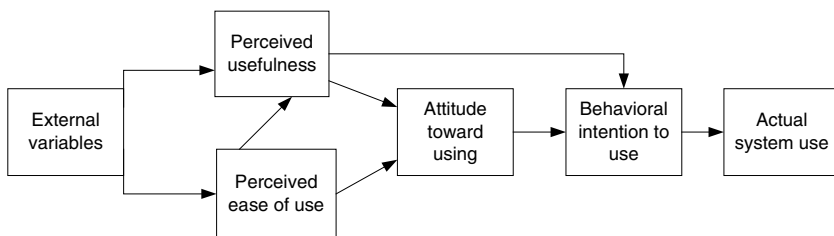


Fig. 3. Technology acceptance model (Davis 1989)

corporations to adopt new technologies. Hartman and Sifonis (2000) call this the concept of net readiness for e-business adoption and identify four dimensions within an organization: leadership, governance, technology and operational competencies. Leadership deals with how the initiatives are managed and how the company stays motivated throughout the adoption process. Governance defines how the e-business should be organized in terms of structure and operating procedures. Technology is the organization's ability to rapidly develop and implement new e-business applications. Operational competencies are the way companies manage the coordination of the relationships between leadership, governance and technology and exploit the available resources. A study by Grandon and Pearson (2004) on the adoption of electronic commerce posits a similar framework with adoption related to organizational readiness, external pressure, perceived ease of use and perceived usefulness. Organizational readiness was assessed by analyzing financial and technological resources the company has available as well as factors dealing with the compatibility and consistency of e-commerce with firm's culture, values, and preferred work practices. External pressure was assessed by incorporating five items: competition, social factors, dependency on other firms already using e-commerce, the industry, and the government. Perceived ease of use and perceived usefulness were adopted from Davis' Technology Acceptance Model (Fig. 3).

### ***2.3 Other factors***

Several other factors have been found to explain e-business adoption by firms. One study indicates that firms are more cautious in adopting e-business in high electronic business intensive countries. Kraemer, Gibbs and Dedrick (2002) found evidence that firms in countries with more globally oriented economies have higher levels of Information and Communication Technologies (ICT) investment. Zhu, Kraemer and Xu (2002) conducted a survey on the adoption of electronic business in eight European countries. They developed a conceptual model incorporating six adoption facilitators and inhibitors based on the technology-organization-environment framework by Tornatzky and Fleischer (1990). They found that technology competence, firm scope and size, consumer readiness, and competitive pressure are significant adoption facilitators, while lack of trading partner readiness is a significant adoption inhibitor. They posited technology competence as consisting of 1) IT infrastructure- technologies that enable Internet-related businesses; 2) IT expertise – employees' knowledge of using these technologies; and 3) e-business know-how- executives' knowledge of managing e-business initiatives. Thus, technology competence constitutes not only physical assets, but also intangible resources such as expertise and know-how.

Firm size and industry concentration may affect e-business adoption. Larger firms in more concentrated industries may have an advantage due to economies of scale and scope. Studies suggest that their return on e-commerce investment may be significant due to larger production and distribution capacity. On the other hand, smaller firms may have an advantage due to their flexibility in entering new markets at relatively low cost. Nearly 90% of US firms are small with less than 20 employees, while

less than 1% are large firms employing more than 500 people (US Census Bureau 2003). Thus the relationship between size and e-business adoption is not clear.

### 3 Study

The purpose of this study is to analyse the readiness of the US ICT sector to adopt wireless e-business. We selected the ICT sector in the US because we believed this sector would be on the leading edge of wireless adoption. Company employees need to collaborate and communicate with globally dispersed members of work teams and also spend a fair amount of time travelling to different company or client sites, therefore they have needs for mobility (Sarker and Wells 2003). Since these companies make and sell products and services that enable wireless applications we felt companies would advocate the adoption of these technologies to employees. The focus on a single industry helped to keep the environment constant, which is a major factor in the adoption stage of our conceptual framework (Fig. 2).

#### 3.1 Data collection

We used the CorpTech database (<http://www.corptech.com>) as our sampling frame. CorpTech is a database of over 50 000 companies in various industries. The database can be searched using criteria ranging from industry to company size. CorpTech maintains detailed information on each public and private technology company, which is updated annually, including company name and address, ownership, annual sales and employees, multiple key executives, company description and product details in 3,000 hi tech categories. We selected three industries that corresponded to our description of the ICT sector in the US: computer hardware, computer software, and telecommunications and Internet.

The sample size was limited by focusing on companies with 500 employees or more because larger companies were expected to be early adopters of wireless technology. This is consistent with Chandy et al. (2003) who found that overall, dominant firms are more aggressive in their investments in a radical new product than other firms.

A two-page questionnaire (Appendix 1) was mailed to the Information Systems (IS) manager at each qualifying company. We believed the IS Manager would be the right key informant to report on the company's experience with wireless technologies. If the name of the IS manager was not available from the database, the questionnaire was sent to the R&D manager or the CEO. The survey questionnaire was mailed to 1162 companies and the respondents were given the option to either return the survey by mail or respond online at a designated web site. As an incentive to participate, respondents were promised a summary of the survey results. In order to increase the return rate a persistent follow-up was done by phone. Data was collected between January and March 2003. All together 140 surveys were undeliverable. We received 50 completed surveys that could be used in our analysis. Thus, the response rate was a mere 4.9%. The average age of companies was 25 years and the companies studied had an average number

of 5453 employees. They spent, on average, 6.1% of their sales income on IT, higher than the 5% reported by Fomin et al. (2003). Fifty-six percent of our respondents were from the IS function with titles like CIO, CTO, network manager etc., 12% were from R&D, 8% were CEO's and the rest represented assorted functions and titles.

### 3.2 Measurement

The items on the questionnaire were designed to tap into the innovation characteristics (Rogers 1995) and net readiness dimensions (Hartman and Sifonis 2000) discussed before. Table 1 provides means and standard

**Table 1.** Item means and standard deviations

Please indicate the extent to which you agree or disagree with the following statements by clicking the appropriate button, where 1 = <b>completely disagree</b> and 5 = <b>completely agree</b> .	Item Mean	Std Dev
3 Our organization has a culture of enterprise-wide information sharing.	3.86	1.05
4 We have identified all our technology needs required to support our business processes.	3.22	0.79
5 Adopting wireless e-business is compatible with our business objectives.	3.66	1.08
6 Senior management is aware of the business opportunities presented by wireless e-business technology.	3.48	1.07
7 Our company is aware of the range of wireless e-business technologies available in the market.	3.45	0.89
8 Our technology infrastructure can easily accommodate integration of wireless e-business technology.	3.56	1.09
9 Our company has in place a well-accepted road map for implementation of wireless e-business applications.	2.66	1.14
10 We have clearly defined roles, responsibilities and accountability for wireless e-business initiatives.	2.6	1.23
11 We have defined all the metrics to properly measure the results of our wireless e-business initiatives.	2.32	1.24
12 We possess the technological competence required to implement wireless e-business solutions.	3.84	0.98
13 The company has the resources to support an effective wireless e-business strategy.	3.28	1.03
14 Wireless e-business will help our company reduce costs over the long run.	3.38	1.18
15 Wireless e-business will help our company serve our customers more effectively.	3.74	1.09
16 Wireless e-business applications will help us better manage relationships with our business partners.	3.36	1.29
17 Wireless e-business applications will make our employees more efficient.	3.92	0.99
18 The results of our wireless e-business initiatives, to date, have been promising.	3.19	1.25
19 The implementation of wireless e-business solutions will be critical to our company's success.	2.92	1.25
20 We expect our investment in wireless e-business technology to increase significantly in the future.	3.08	1.15



**Table 2.** Popularity of various wireless devices (n = 50)

Device	Percentage of sample using device
Cell phone	70.0%
Personal Digital Assistant (PDA)	68.0%
RIM Blackberry	54.0%
WLAN, WiFi networking	28.0%
Laptop, notebook computer	12.0%
Pagers (one way, two way)	12.0%
Smart phones	10.0%
Others	2.5%

deviations for each of the 18 Likert items in the questionnaire (5 point response scale, 1 = completely disagree, 3 = neutral, 5 = completely agree). Item means range from 2.32 to 3.92. Since none of the means exceeded 4, it appears that respondents did not have strong feelings about wireless and did not regard it as being critical to their success.

### 3.3 Results and analysis

Table 2 shows that cell phones are the most used wireless devices, followed by PDAs and RIM Blackberry. However, most of the cell phones are not Internet enabled. Only 10% of the sample reported using Smart phones that have web access.

Table 3 shows that the most popular application being used on wireless devices is email followed by voice calls and personal information management (address book, calendar, notes, to do list).

The most popular applications have to do with communicating and organizing information. In the "Others" category were companies that mentioned applications such as file sharing, application testing, groupware synchronization, navigation, surveys, accounting, contacting field support/sales personnel and bar code scanning. These are the few companies that have invested in wireless applications for critical business processes such as product development and testing, and customer service. Sixteen items from the

**Table 3.** Uses of various wireless applications (n = 50)

Application	Percentage of sample using device
Email	68.0%
Voice	34.0%
Personal Information Management	28.0%
Web browsing	20.0%
Documents, presentations	12.0%
Notification/alerts	10.0%
Others	28.0%

**Table 4.** Factor analysis

	Factor 1 Relative Advantage	Factor 2 Governance, leadership, operational competencies	Factor 3 compatibility
Our organization has a culture of enterprise-wide information sharing.			0.830
We have identified all our technology needs required to support our business processes.			0.604
Our company is aware of the range of wireless e-business technologies available in the market.			0.580
Our technology infrastructure can easily accommodate integration of wireless e-business technology.			0.599
Senior management is aware of the business opportunities presented by wireless e-business technology.		0.501	
Our company has in place a well-accepted road map for implementation of wireless e-business applications.		0.828	
We have clearly defined roles, responsibilities and accountability for wireless e-business initiatives.		0.864	
We have defined all the metrics to properly measure the results of our wireless e-business initiatives.		0.901	
We possess the technological competence required to implement wireless e-business solutions.		0.683	
The company has the resources to support an effective wireless e-business strategy.		0.675	
Adopting wireless e-business is compatible with our business objectives.	0.622		
Wireless e-business will help our company reduce costs over the long run.	0.834		
Wireless e-business will help our company serve our customers more effectively.	0.867		
Wireless e-business applications will help us better manage relationships with our business partners.	0.853		
Wireless e-business applications will make our employees more efficient.	0.877		
The results of our wireless e-business initiatives, to date, have been promising.	0.753		

questionnaire (items 3 – 18) were factor analyzed and yielded three factors that explained 70% variance. The results are presented in Table 4. The first factor may be interpreted as relative advantage (Rogers 1995) The second factor encompasses three dimensions of net readiness – governance, leadership and operational competencies (Hartman and Sifonis 2000). The third factor is conceptually similar to compatibility described by Rogers (1995).

**Table 5.** Regression analysis. *Dependent variable:* Future importance and utilization of wireless e-business

	Standardized Betas	t-statistic
Relative advantage	0.52	3.0*
Governance, leadership, operational Competencies	0.4	2.2*
Compatibility	-0.12	-0.79
Sales revenue	0.2	1.3
Age	0.13	0.8
%Sales on IT expenditure	-0.14	-0.9
Adjusted R-square	0.54	

\*significant at  $p < 0.05$

Next we wanted to investigate what impact these three factors may have on the future importance and utilization of wireless e-business by US ICT companies. Two items in the questionnaire measured this aspect: (1) The implementation of wireless e-business solutions will be critical to our company's success (item 19), and (2) We expect our investment in wireless e-business to increase in the future (item 20). Cronbach's alpha for the two-item scale was 0.88. We constructed our dependent variable, future importance and utilization of wireless e-business, by averaging the response on two questions. Cronbach's alpha for the scale items measuring each factor were 0.92 (relative advantage), 0.87 (governance, leadership, operational competencies), 0.70 (compatibility) The independent variables were created by averaging the scores across the questions that loaded high on each factor. Then we did a regression analysis, results presented in Table 5. The questionnaire also collected data from each company on sales revenue, age and what percent of sales revenue was spent on information technology. These three were used as control variables in the regression analysis.

The regression results above show that relative advantage and governance, leadership, competencies are both positively related to future importance and utilization.

#### 4 Discussion

From this study, it looks like the US ICT sector is not very far along in its use and application of wireless e-business technologies, as of the first quarter of 2003. Rudimentary applications like email and voice telephony, rather than critical business processes, seem to be the most prevalent uses of wireless technology. Part of the reason may be the economic downturn of the early 2000s, when US companies were very hesitant to invest in new IT infrastructure or devices. Companies planning major mobility projects face issues that must be addressed such as poor security and a constrained user interface. Other inhibitors may be related to the lack of standardization of corporate IT infrastructure, typically LAN technologies, server operating systems, databases and ERP (enterprise resource planning). Faced with large amounts of systems integration, many US ICT firms may not be ready for

this. It may be that US ICT companies see wireless e-business as a technology in search of a problem.<sup>1</sup> Ubiquitous connectivity to the Internet may be fun but IS managers are more concerned with tangible payoffs from technology investments.

However, we have learned that the future importance and utilization of these technologies by US companies will depend on their relative advantage, in their ability to boost revenues or reduce costs as a result of better serving customers, partners and employees. While we confirm this aspect of Rogers' Innovation Diffusion theory, we also find empirical support that organizational readiness in terms of the adopter organization's governance, leadership and operational competencies, will also be positively related to future importance and utilization of wireless e-business technologies. Not only does the supplier industry have to demonstrate the relative advantage of their products and services, but ICT companies themselves have to get ready for these new technologies by providing internal leadership, supporting organization structure and processes and developing operational competencies to manage these new wireless e-business technologies. Thus, both supply and demand conditions have to improve before wireless e-business technologies can take off in the US. Taken together, our empirical results provide support for the conceptual framework of the adoption process (Fig. 2).

## 5 Limitations and future research

This study has all the limitations of a cross-sectional survey research design. We have a small sample of companies based on a low response rate of 4.9%. Our choice of the US ICT sector for our survey may have been misplaced. In hindsight, the healthcare sector and the transportation sector may be further along in the adoption of wireless e-business. Maybe the timing of the survey during the economic downturn made it a lower priority for IS managers busy with more important tasks. Our incentive offer of sharing a summary of survey results may have been inadequate to motivate participation by senior executives. Finally we may have had a better response from small and medium businesses rather than the large companies we focused on. Future researchers should do a better job of addressing these issues.

Nevertheless we have some interesting results that the US ICT sector, expected to be on the leading edge of adopting wireless e-business technologies, is in the very early introduction stage of the technology life cycle. It may take several years for these technologies and devices to be used widely for critical business processes by mainstream companies in corporate America. Both the supplier industry and their potential customer organizations have their work cut out for them to gain traction and reap the benefits from these new wireless e-business technologies.

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<sup>1</sup> We are grateful to an anonymous reviewer for pointing this out.

Similar research is also called for in other countries to investigate the current status and future potential of wireless e-business in enterprise markets. In consumer markets it is well-known that Finland, Sweden, Japan and South Korea had an early lead over the U.S in wireless mobility. Is the same pattern going to be repeated in enterprise markets? That remains an interesting question for the wireless supplier industry.

## References

- Beatty RC, Shim JP, Jones MC (2001) Factors influencing corporate web site adoption: a time-based assessment, *Information and Management* 38: 337–354
- Bruner II GC, Kumar A (2004) Explaining consumer acceptance of handheld Internet devices, *Journal of Business Research*, In press
- Chandy RK, Prabhu JC, Antia KD (2003) What will the Future Bring? Dominance, Technology Expectations, and Radical Innovation, *Journal of Marketing* 67 (3): 1–18
- Chesbrough HW (2003) *Open innovation: the new imperative for creating and profiting from technology*, Harvard Business School Press, Boston
- Davis FD (1989) Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly* 13 (3): 319–340
- Day GS, Schoemaker PJH (2000) Avoiding the Pitfalls of Emerging Technologies, *California Management Review* 42 (2): 8–33
- Dewar RD, Dutton JE (1986) The adoption of radical and incremental innovations: an empirical analysis, *Management Science* 32 (11): 1422–1433
- Figueras J (2003) The wireless enterprise: Two years on, *Computing & Control Engineering* 2: 10–13
- Fomin VV, King JL, McGann ST, Lyttinen KJ (2003) *Globalization of Electronic Commerce: Environment and Policy in the U.S.*, Center for Research on Information Technology and Organizations, University of California, Irvine
- Grandon EE, Pearson JM (2004) Electronic commerce adoption: an empirical study of small and medium US businesses, *Information and Management*, In press.
- Hartman A, Sifonis J (2000) *NetReady- Strategies for the success in the E-economy*, McGraw-Hill, New York.
- Kraemer KL, Gibbs J, Dedrick J (2002) *Impacts of Globalization on E-commerce and Firm Performance: A Cross-Country Investigation*, University of California, Irvine
- Rogers EM (1995) *Diffusion of Innovations*, 4th edition, The Free Press, New York.
- Rosenberg N (2002) Factors Affecting the Diffusion of Technology, *Explorations in Economic History* 10 (1): 3–33
- Ruyter KD, Wetzels M, Kleijnen M (2001) Customer Adoption of E-Service: An Experimental Study, *International Journal of Service Industry Management* 12 (2): 184–206
- Suprateek S, Wells JD (2003) Understanding Mobile Handheld Device Use and Adoption, *Communications of the ACM* 46 (12): 35–40
- Srinivasan R, Lilien GL, Rangaswamy A (2004) Technological Opportunism and Radical Technology Adoption: An Application to E-Business, *Journal of Marketing*, 66 (3): 47–60
- Tallon P, Kraemer KL, Gurbaxani V (1999) *A value based assessment of the contribution of information technology to firm performance*, Center for Research on Information Technology and Organizations, University of California, Irvine
- Tornatzky LG, Fleischer M (1990) *The Process of Technology Innovation*, Lexington Books, Lexington
- Tornatzky LG, Klein RJ (1982) Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings, *IEEE Transactions on Engineering Management* EM-29: 28–45
- US Census Bureau (2003) *Statistics about business size from the U.S.* Census Bureau, Available at: [www.census.gov/epcd/www/smallbus.html](http://www.census.gov/epcd/www/smallbus.html)
- Zhu K, Kraemer KL, Xu S (2002) *A cross-country study of electronic business adoption using the technology-organization-environment framework*, University of California, Irvine.



## Appendix 1. Questionnaire

In this questionnaire, “wireless e-business” means the use of wireless devices, (e.g. cell phones, personal digital assistants, mobile email devices, handheld computers etc.) to provide information and services to customers, employees, or partners over private or public electronic networks.

- 1 What, if any, wireless devices, are currently used widely by employees in your company? (describe in words)
- 2 What information applications, if any, are the above devices used for? (describe in words)

Please indicate the extent to which you agree or disagree with the following statements by clicking the appropriate button, where **1 = completely disagree** and **5 = completely agree**.

- 3 Our organization has a culture of enterprise-wide information sharing.
- 4 We have identified all our technology needs required to support our business processes.
- 5 Adopting wireless e-business is compatible with our business objectives.
- 6 Senior management is aware of the business opportunities presented by wireless e-business technology.
- 7 Our company is aware of the range of wireless e-business technologies available in the market.
- 8 Our technology infrastructure can easily accommodate integration of wireless e-business technology.
- 9 Our company has in place a well-accepted road map for implementation of wireless e-business applications.
- 10 We have clearly defined roles, responsibilities and accountability for wireless e-business initiatives.
- 11 We have defined all the metrics to properly measure the results of our wireless e-business initiatives.
- 12 We possess the technological competence required to implement wireless e-business solutions.
- 13 The company has the resources to support an effective wireless e-business strategy.
- 14 Wireless e-business will help our company reduce costs over the long run.
- 15 Wireless e-business will help our company serve our customers more effectively.
- 16 Wireless e-business applications will help us better manage relationships with our business partners.
- 17 Wireless e-business applications will make our employees more efficient.
- 18 The results of our wireless e-business initiatives, to date, have been promising.
- 19 The implementation of wireless e-business solutions will be critical to our company's success.
- 20 We expect our investment in wireless e-business technology to increase significantly in the future.
- 21 Which year was your company established? \_\_\_\_\_
- 22 How many employees in your company? \_\_\_\_\_
- 23 What is your company's primary business? \_\_\_\_\_



24 What was your company's sales revenue during the last fiscal year? \$ \_\_\_\_\_ million

25 What percentage of your company's sales revenue is allocated to information technology expenditure annually?

Your Name:

Title:

Company Name:



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