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CASE STUDY ANALYSIS OF CORPORATE DECISION-MAKING FOR CELL PHONE DEPLOYMENT

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Abstract

The wireless cell phone market has experienced phenomenal growth over the last decade. This paper studies the factors that five companies considered important in deciding to deploy wireless cell phone devices, the extent of current use of wireless cell phones, the extent of existing utilization and/or planning for web-enabled cell phone use, the constraining factors in their deployment decisions, how such decisions are made, and how regulation of the wireless industry has affected their decision-making process. The conceptual model combines the TAM and innovation diffusion models, adding the factors of security/privacy and web connectivity. Case study methodology is utilized for five manufacturing and technology firms. A key finding is that the most important decision factors are security/privacy, provision of quality service to customers, web connectivity, and, for one firm, productivity. Many other findings are presented, and the conceptual model is supported by the findings. The study's practical implications are examined.

Keywords: Case study, wireless, cell phones, PCs, mobile telephony, decision-making

Background And Literature Review

This study focuses on identifying factors that corporations consider important in their decision to deploy devices designed for mobile telephony and mobile data services. We also consider the approval steps in decision-making, the extent and importance of web-enabled cell phones, and the functional areas of use of cell phones.

There has been little research regarding corporate adoption of wireless (mobile) devices, but there is a solid foundation of theories and previous studies on technology adoption for this case study. The decision to adopt a wireless device, especially if the alternative is a wireline device, is in essence a technology adoption issue (Kleijnen and de Ruyter 2003, Van Akkeren and Harker 2003). A number of theories have been developed to help explain the concept of technology adoption (Mennecke and Strader 2003; Kleijnen and de Ruyter 2003). One widely accepted model is the Technology Acceptance Model (TAM) (Davis 1989, Davis 1993). Davis (1989) emphasized the theoretical constructs of perceived usefulness and perceived ease of use as a means of predicting user acceptance of information technology. Adams et al. (1992) replicated Davis' research for fixed voice and e-mail. They refined the measurement scales and utilized structured equation modeling to explain interactions. In later research using the TAM model, Davis' results in 1993 indicated that while ease of use is clearly important, usefulness is even more important in determining user acceptance. Lederer, Maupin, Sena, and Zhuang (2000) investigated TAM for work-related tasks involving the web. Their findings provided support for TAM and also showed that usefulness has a stronger effect than ease of use.

Rogers (1995) identifies six attributes of an innovation that help to explain the rate of technology adoption: (1) Relative Advantage (degree to which innovation is perceived as being better than the idea it supersedes), (2) Compatibility (degree to which innovation is perceived as consistent with existing values, past experiences, and needs of potential adopters), (3) Complexity (degree to which innovation is perceived as relatively difficult to understand and use), (4) Trialability (degree to which innovation may be experimented with on limited basis), (5) Observability (degree to which results of innovation are visible to others), and (6) Communication. In his discussion of the attributes of innovation, Rogers states "Cellular phones have an almost ideal set of perceived attributes, and this is undoubtedly one reason for the innovation's very rapid rate of adoption in the U.S." (Rogers, 1995, p. 245) Rogers then describes how cell phones meet all of his attributes.

The Davis and Rogers models are both widely supported and followed, and are also complementary. Davis’s two main constructs can fit quite nicely within the Rogers model. Specifically, usefulness is similar to Roger’s factor of relative advantage and ease of use is similar to Roger’s factor of complexity (Agarwal and Prasad 1997).

The Rogers factors were enlarged to include security and privacy as the perceived risk identified by Eastlick and Lotz (1999). We include this since cell phones are vulnerable to security and privacy violations. Another specific factor for cellular devices is payment and cost (see Kleijnen et al. 2003, for mobile gaming) and we likewise include it. Since studies of mobile adoption by Kleijnen et al. (2003) and Van Akkeren et al. (2003) point to present applications dominated by voice communications and simple internet, but a future of complex web, internet, and e-commerce enhanced uses, we have added web connectivity as a factor. Our pilot study emphasized strong concern in businesses for reliability and customer service of mobile devices, and we include them. It is possible that earlier studies focused on less mature technologies, so these factors were perceived as less important.

The regulatory environment of the wireless industry is distinctly different versus the wireline industry (Black 2002). The extent of firms’ perception of this regulation is examined in this study. The regulatory environment of the wireless industry is distinctly different versus the wireline industry. A review of that history reveals the Telecommunications Act of 1996 was passed with the purpose of reversing the concept of natural monopoly and to encourage competition (Black, 2002). Congress realized that evolution from monopoly to competition could take years if it depended upon wired systems. A much quicker approach was to acquire local infrastructure by encouraging competition through wireless (Black, 2002). As a result, Commercial Mobile Radio Services (CMRS), which includes cell phones, was exempted from certain provisions of the 1996 Act. However, other provisions such as frequency bands and certain charging items remain in effect and may affect the corporate uses of cell phones. Further, since intellectual property may be transferred over wireless, the rapid expansion in business cellular use may give rise to more violation of intellectual property laws and regulations. The regulatory aspect has not been included in prior studies of adoption, but the mass use of the devices and the increasing exposure of intellectual property and proprietary information justifies the inclusion of the regulation.

In sum, the two major models and recent studies seek to explain user adoption and acceptance of technology. This paper builds upon that body of research by seeking to identify the factors that corporations consider important in their decision to deploy mobile devices. The theoretical framework for the present study combines the Rogers and Davis models and adds the additional factors of cost, security/privacy, customer service, reliability, regulation, and future web-connectivity (see Figure 1). The model postulates that all of the factors may be influential on corporate decisions to deploy cell phones. Web connectivity is enclosed with a dashed line, since, unlike the other factors, it is not highly prevalent in use today (2003) in the U.S., but is anticipated to be very prevalent within a year or two. The model is rudimentary in the sense of not indicating paths or interactions between factors. This is necessary because the model is exploratory and does not yet have sufficient mobile, wireless based theory to postulate the interactions.

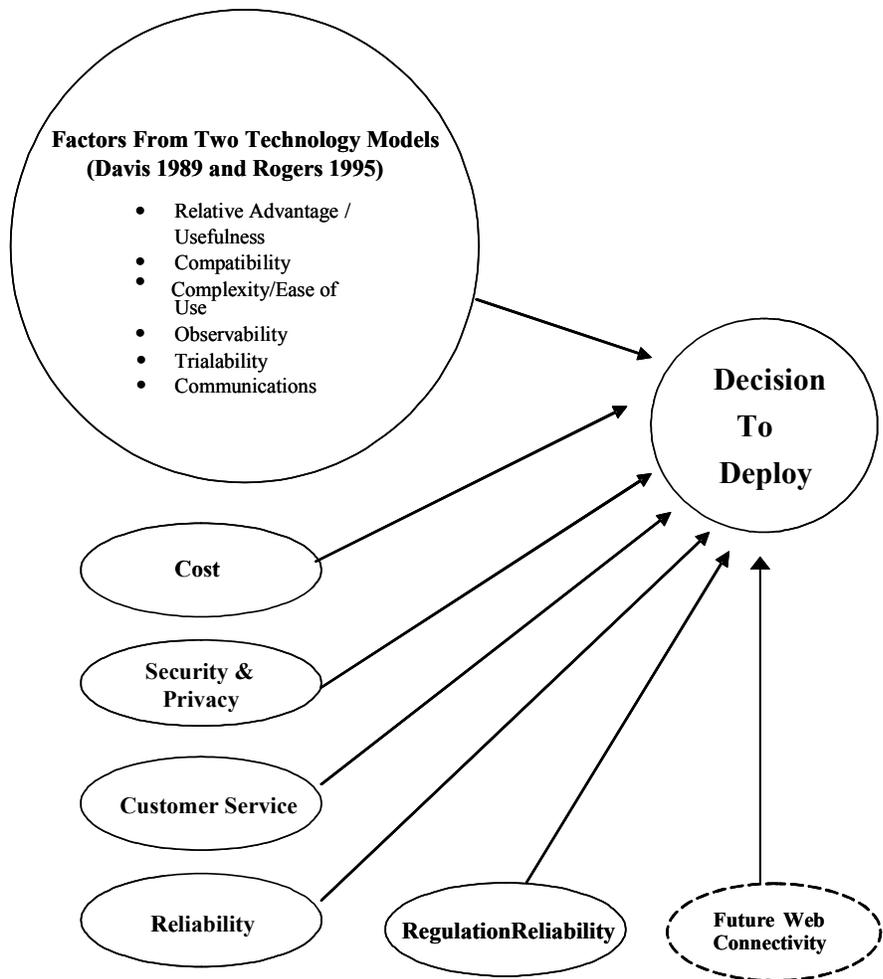


Figure 1. Research Model

Research Questions

The specific research questions are:

- What are the most important factors in making the decision to adopt cell phones?
- What is the decision-making process for cell phone adoption? Who in the organization makes the final decision about cell phone deployment?
- What are the business functional areas of cell phone use and how is the technology used in those areas?
- To what extent do companies use or plan to use web-enabled cell phone devices?
- What are the constraining factors in cell phone use?
- What effect have regulatory policies had on the corporate decision to deploy cell phones.

Research Methodology

The methodology for this research is case study (Yin 1993, Yin 1994, Stake 1995). The case study strategy consists of defining the study focus, framework construction, interviews, data collection, and case analysis. The case study sample frame was determined by narrowing the industry focus to five manufacturing, distribution, entertainment, and technology companies having different size categories and ownership characteristics. As seen in Table 1, the first company employs 450 and is America's largest distributor of an industrial product. The second company is a world leader in information systems with more than 2,600 full-time staff and distributors located around the world. The third firm is a medical systems company that employs 2,600 worldwide. The fourth company is a global technology leader. The fifth one is a global leader in entertainment. Their corporate structures differ. The study is exploratory, and is not intended to be comprehensive or statistically representative.

For each firm, the study interviews the chief information officer or equivalent executive, and one or two managers in charge of telecommunications that includes cell phones. Two telecommunications managers were included, if the CIO designated that two people had overlapping responsibility.

To answer the research questions, the case study method is utilized to evaluate the factors in the research model (see Table 3). The study evaluates the relative importance of these factors in the companies' decisions.

Table 1. Sample of Five Companies

Case No:	Case 1	Case 2	Case 3	Case 4	Case 5
<i>Industry:</i>	Distributor of Industrial Products	Software Vendor and Services	Medical Products Manufacturing	Networking and Telecommunications Hardware	Entertainment
<i>Products:</i>	Industrial Plastics	GIS	Pumps/Disposables for Critical Care	Routers, etc.	Entertainment and Movies
<i>Employees:</i>	450	2,600	2,600	35,000	120,000
<i>Offices Outside U.S.</i>	No (First Overseas Office Opens in 2003)	Yes	Yes	Yes	Yes
<i>Ownership</i>	Subsidiary of Larger Int'l Public Firm	Private	Public	Public	Public

Interviews were conducted at both the IT decision-making and IT operational levels of each company. Interviews were conducted in person by the authors based on a standard set of interview questions, which are available from the authors by request (e-mail keith_roberts@redlands.edu). Each interview lasted 1-2 hours. The findings were taped as well as hand recorded by interviewers. The results were transcribed, and the interview transcripts were sent to each interviewee, who validated the information. At the time of the interview, additional supporting documents were gathered or requested. Examples include organization charts, annual reports, product reports, planning reports, and websites containing company and product information.

The case studies met the validity criteria for case studies, in particular, construct validity, internal validity, external validity, and reliability (Lin 1994). The construct validity came from multiple evidence sources, review of the case study transcripts by interviewees, and multiple sources of evidence (interviews and documents). Internal validity came from the construction of a detailed research framework, indicating analysis, ahead of time (Lin 1994). External validity is limited, since this is an exploratory study, and not replicating other studies. The presence of five cases from different types of firms constrains the external validity at the most to the manufacturing, distribution, entertainment, and technology sectors. Reliability is based on a detailed case study protocol that documents the scheduling, interview procedures, recording, follow-ups, questions, and summary data-base (Lin 1994).

The research framework consists of factors under the groupings of organization, cell phone decision-making, cell phone utilization, and the regulatory environment. Under organization, the factors were industry, primary product(s), firm size, firm organizational structure, and current cell phone dependency. The cell phone decision-making factors consisted of cost, convenience, success of units already deployed, bandwidth, e-connectivity, security/privacy, reliability, scalability/expandability, customer perception, project promoter, and level of decision-making. The cell phone utilization factors were number of cell phones deployed, extent of anticipated future deployment, uses of cell phones, and anticipated future uses. Regulatory environment factors consisted of the importance of regulation and the extent that regulatory agencies encourage competition. The research framework has proven to be robust, based on the interviews. Each question elicited values in the ranges expected by the research protocol, and the analyses were realizable.

Findings

This section on findings first considers the prevalence of cell phones and anticipation of web-enabled devices. Next it examines the importance of factors in corporate decision-making on cell phone adoption. Then it turns to the process of decision-making, the uses of cell phones in the firms, and the extent of impact of regulation.

The current dependence of the five firms on cell phones is high. As seen in Table 2, the total prevalence of corporate cell phones (equipment provided or reimbursed) varies from 21 to 40 percent of the workforce. The dominant form of cell phone use in all the firms today is voice. No firm indicated that cell phone geo-referencing was activated. The software firm pointed out that some of its clients do have geo-referencing activated and in use. The proportion of web-enabled units in use is small, with a range of .025 to 12 percent of units. Many respondents emphasized that they feel that the web-enabled technology has not arrived yet on the market. At the same time, all firms indicated high or medium/high future dependence on web-enabled technology.

As seen in Table 3, firms rated the cell phone deployment factors rather consistently. The most important factors are security and privacy, ability to provide service to customers, and reliability. Security's prominence is consistent with the type of technology. This corresponds to perceived risk being most significant for mobile gaming (Kleijnen et al. 2003). Cell phones are known to be a less secure form of communication (Dodd 2002). Messaging from cell phones can contain vital corporate information on sales, marketing, strategies, and business areas that may be of crucial importance to competitors. Hence security would surely be a high concern for any competitive firm. Security and privacy were not present in the original TAM model (Davis 1989, Davis 1993), most likely because security and privacy exposure was less for the forms of technology examined.

The service to the customers is consistent with the TAM model (Davis 1989, Davis 1993) and subsequent TAM studies (Adams 1992, Lederer et al. 2000, and Gefen and Straub 1997). For two of our sample firms (Case 1 and Case 3), the importance of service to the customer is rated highest by respondents having the lowest reporting level. That may be because those interviewees are closer to the customers. A forward-looking factor is connectivity to the web. This was mostly rated as of high importance, although respondents in three different firms specified that it is of low/no importance now, but medium to high importance for the future. Since web enabled devices have a low level of prevalence today (in the range of 12 percent or less of equipment deployed), this response is inherently forward-looking. IT management recognizes that these devices, although imperfect today, are likely to improve in their functionality and user-friendliness to become reliable web devices in the future. Respondents had mentioned the need in sales and marketing for very rapid response times in the field, often 30 minutes or less. The e-mail and web capability would ease the ability to respond rapidly. It might also extend the use of these devices to field applications in more data-intensive sides of the business, e.g. inventory control, supply chain management, and operations.

The software provider company put a high emphasis on productivity, a new factor not in our theoretical model. It appears to be aligned with that firm's internal goal to stress productivity. It relates to the key usefulness factor in TAM (Davis 1989, Davis 1993; Lederer et al. 2000). Another firm, the medical manufacturer, added and stressed another new factor of supportability. This

Table 2. Firm's Dependence on Cell Phones: Present and Future

Case No:	Case 1 CIO	Case 1 Tel Mgr	Case 2 CIO	Case 2 Network/ Tel Mgr.	Case 2 Tel Indut Solut Mgr	Case 3 VP-IT	Case 3 Dir Tech & S'vices	Case 3 Tel Lead	Case 4 IT Supervisor	Case 4 Tel Mgr	Case 5 CIO	Case 5 Tel Mgr
<i>Units Deployed (Voice)</i>	40-50	40-50		450			350	300	12,000 to 16,000			7,200
<i>Employee Personal Units Reimbursed</i>	100-120	100-120			100s		200?		Some units		32,000	
<i>Estimated Percent of Workforce with Cell Phones</i>	34 percent	25 percent	21 percent	40 percent	33 percent						40 percent	
<i>Units Deployed (Voice and Web/Internet/E-mail)</i>	12	10		10?			30		In piloting today			1,000
<i>Primary Corporate Use:</i>	V	V	V	V	V	V	V	V	V		V	V
<i>Secondary Corporate Use(s):</i>	Minor W/E	Minor W/E		W/E slight			Minor W/E		Minor W/E			
<i>Future Strategic Dependency on wireless cell phones:</i>	M	H		H	H		H		H		H	H
<i>Geo-Referencing Present</i>	N			N	N	N					L	L
<i>Estimated Future Units to be Deployed:</i>	50	(NA)					175-200?					
<i>Primary Use of Future Units to be Deployed:</i>	V	(NA)		V and some W/A			V and W/A		V and W/A		S	P
<i>Current Mix of Voice With Web Interconnectivity:</i>	1.2	1.2		1.025			1.1					.025

(NA) = Doesn't know answer

(Missing) = this response is missing from interview

Nomenclature: (V) Voice

(W) Web/Internet

(E) E-mail/Messaging

(MC) M-Commerce

(P) Point of Sale

(S) Supply Chain/Logistics

(H) High

(M) Medium

(L) Low

Mix: Voice with Some Web

Voice and Web

1 2 3 4 5

Table 3. Importance of Cell Phone Deployment Factors

Case No:	Case 1 CIO	Case 1 Tel Mgr	Case 2 CIO	Case 2 Networ TelMgr	Case 2 Tel Solut Mgr	Case 3 VP-IT	Case 3 Dir. Tech & S'vices	Case 3 Tel. Lead	Case 4 IT Supervisor	Case 4 Tel Mgr	Case 5 CIO	Case 5 Tel Mgr
<i>Cost:</i>	M	M/H	M	M	H	M	H	M	H	M	M/H	M
<i>Reliability:</i>	M+	H	M	H	M/H	H	M/H	H	M	H	H	L
<i>Bandwidth:</i>	L/M	(NA)	L Now	M	None	M	None; H future	None	L/M	H	L	L
<i>Security/Privacy:</i>	H	H -	H	H	(NA)	H	M	(NA)	H	H	H	H
<i>Convenience to Employees; Employees' Ease of Use</i>	M	L+	M	L/M	L	M	H	M	M	M	M	L
<i>Expandability/Scalability</i>	L/M	MI	M	M	(NA)	M	M	L	H	H	M	M
<i>Ability to Provide Service to Customer</i>	M	H	H	H	(NA)	(NA)	M	H	(NA)	(NA)	H	H
<i>Outside Perception</i>	M	H	M	M	(NA)	M	None	H	H	H	M	M
<i>Connectivity to Web:</i>	H	H	M	H	None; M future	L/M	None; H future	None	H	H	L Now; H Future	L Now H Future
<i>State/Fed. Reg.:</i>	L	None	H	L	None	L	None		L/M	M/H	M	L
<i>Other: Productivity</i>			H		H			M	M		H	L
<i>Other: Support ability</i>			H	L		H	H	H			H	M
<i>Other: Reg. in For. Countries</i>				H								
<i>Other: Coverage</i>								H				
<i>Other: Opportunity Cost</i>										M		
<i>Most Important:</i>	Connectivity to Web/ Security, privacy	Ability to Provide Service to Customer	Productivity	(NA)	Productivity	Reliability	Reliability Supportability	Coverage/ Service Quality	Security, privacy	Security, privacy	Security, privacy	Security, privacy

(H) High

(M) Moderate

(L) Low

(NA) = respondent does not know answer

(MI) = this response is missing from interview

Other: Refers to factors identified by respondents and not in the theoretical model.

seems tailored to that firm and sector. Medical devices are becoming more sophisticated all the time, which requires increased supportability. From its experience with medical devices, the firm is sensitive to the costs associated with supportability. It is a forward-looking factor, since support of a cell phone for simple voice is not burdensome, but will multiply with web-enabled cell phones, which that firm is actively piloting. The factors of reliability and cost were rated at medium to high. It is important that cost is not the primary driver for these cases. We heard from several respondents that companies may not choose the cheapest alternative, if the key factors of security/privacy and convenience are not met. Reliability also is a leading factor and relates to the strategic importance of cell phones, verified by all respondents. Reliability and convenience are components of usefulness that is the most prominent factor in the TAM models (Davis 1989, Davis 1993).

The least important decision-making factor is state and federal regulation. For instance, one CIO stated in regards to FCC regulation “It doesn’t create satisfaction, I’m either going to be in a neutral state or dissatisfied.” Regulation was consistently rated as of no or low importance, except for the CIOs of the software firm and entertainment company. The other respondents pointed to several reasons including that cell phone regulation is the concern of the cell phone equipment makers and of service providers, not of the customer firms using the equipment and services. In other words, “let AT&T worry about it.” Another reason for the low rating is that U.S. federal and state regulations of use and content are very limited; hence, why be concerned about it. One network manager rated this factor low in the U.S., but rated it as high for other countries. The reason is that most other nations have cell phone cost structures that are prohibitive, and often the costs are affected by their federal regulation. Another area of impact relates to equipment standards, which may be restrictive overseas. The software firm CIO who rated U.S. federal and state regulation as high was concerned with the realms of privacy and security, which are influenced by regulation. He felt strongly that these realms could not be ignored, but rather that corporate citizens must consider them. The entertainment company CIO rated regulation as medium because of concerns for future outlets for broadband services. There was also concern about the exposure of intellectual property, including its legal protection.

The decision-making process varied and appears linked to corporate culture and organizational structure. The decision process originated with promoters and progressed through approval stages, with different routes to the final approval.

As seen in Table 4, for the industrial products distributor (Case 1), both project promotion and final decision-making rested with the CIO. Only in the case of large projects did the final approval go above the CIO, to the CEO. This organization tends to be hierarchical, emphasizing consistent executive decision-making. Another reason for this pattern is the excellent managerial ability of the CIO, which allows him to act as promoter and approver, without disengaging or putting off subordinates. At the software firm (Case 2), a key promoter is the network/telecommunications manager. This manager usually partners with a person on the business side who is requesting the project, and they participate together in moving it forward. The process is that the project proposal receives the approval of the CIO and next that of the chief operating officer (COO). In all cases for this firm, the final approval rests with the corporate vice president, who is the second person in charge of the firm. This matches the corporate culture for this firm, in which all financial decision-making goes through the top executive office for final approval. For the medical device company (Case 3), the Director of Technology and Shared Services is the key promoter. Sales, R&D, and other relevant users also participate in promoting the project. Final approval stays with the Director for lower cost projects and the VP of IT for higher cost projects. This process resembles that for the software firm, except that final approval stops at the VP-IT level. The large technology leader (Case 4) has a shared and participative decision-making process. The promotion equation is turned around, so the user, i.e. project owner, is the principal promoter and works with a variety of IT consultants to develop the project proposal. Next, it goes as a finished package to a Client Services Review Board for final approval. The IT manager who heads the Board is the final decision-maker. For the entertainment company (Case 5), the Telecom Manager is the promoter, while the CIO typically makes the final decision except in cases where the project connects to the company network. In the latter case, the final decision is made by a corporate board, which includes the CIO.

The findings identify the leading functional areas of corporate cell phone use. In all cases, sales had a high level of cell phone use. This makes sense since verbal communications are all important in competing for sales in the field. Respondents pointed consistently to the need for quick verbal field response times by salespeople to customers, their support team, and other key parties, often in less than an hour. If sales people did not respond quickly, competitor sales forces would gain. Marketing was somewhat more moderate particularly for the industrial products distributor and the medical equipment manufacturer. For those firms, the marketing people are more centralized at headquarters, where they are more likely to depend on fixed telephony and Internet. Overall, marketing was moderate to high in use. All of these uses, except IT, relate to the communication factor in adoption theory (Rogers, 1995).

Executives were intensive users. One CIO stated “They (executives) are very dependent upon cell technology for communication among themselves and to anybody in the organization.” The entertainment company made an interesting observation in regards to executives gravitating to cell phones in lieu of e-mail because of judicial discovery concerns in the event of litigation.

Table 4. Wireless Cell Phone Promoter and Final Decision-Maker

Case No.	Case 1	Case 2	Case 3	Case 4	Case 5
Project Promoter	CIO	Dual promotion from Tel. on technical side (key promoter) and a person on business side. Tel., CIO, and COO add approvals	Dir. Tech. and Shared Services is primary promoter. Sales, R&D group, and others participate in promoting	Project owner - is an internal client. The project owner works with IT consultants to develop the proposal	Tel.
Final decision maker for small projects	CIO	Corporate Vice President	Dir. Tech. and Shared Services (<\$50,000)	Client Services Review Board approves. IT manager in charge of Board is final dec. maker	CIO
Final decision maker for larger projects	CEO	Corporate Vice President	VP-IT (>=\$50,000)	Client Services Review Board. IT manager in charge of board is final dec. maker	Corporate Board if project connects to company network

Nomenclature: (CEO) Chief Executive Officer (CIO) Chief Information Officer
 (T) Top Level Manager, other than CEO (Tel) Telecommunications Manager
 (M) Middle Level Manager (N/A) Not Applicable

Table 5 Business Activity Use

Case:	Case 1 CIO	Case 1 Tel Mgr	Case 2 CIO	Case 2 Network/ Tel Mgr	Case 2 Tel Indut Solut Mgr	Case 3 VP-IT	Case 3 Dir Tech & Shared S'vices	Case 3 Tel Lead	Case 4 IT Supervisor	Case 4 Tel Mgr	Case 5 CIO	Case 5 Tel Mgr
Sales	H	H	M/H	H	H	H	H	H	H	H	H	H
Mktg	M	M	M/H	H	H	H	L	M/H	H	M	H	M
Oper	L	L	L/M	M		L	L	M/H	M	H	M	M
Logis	L	L	L/M	L	(NA)	L	L	M	M	M	H	H
Exec			H	H		H	H	L	H	H	H	H
Mgt	H	H	M	H	L/M	M	H	L	H	M/H	M/H	M/H
Other	L	L										
Other: Purch			L									
Other: Facil							H					
Other: IT							H			H		
Other: Legal							H					
Other: Clinic Cons								H				
Other: Movies on Location											H	H

Nomenclature: Logis. Logistics
 (H): High Exec. Executives
 (M): Medium Mgt. Management
 (N/A): Not Applicable Other: Other
 Sales: Sales Facil.: Facilities
 Mktg: Marketing Clinic Cons: Clinical Consultant
 Oper: Operations Purch: Purchasing

Middle managers had moderate to high cell phone use. Respondents pointed out that middle managers in the regions utilized cell phones a lot. For instance, regional head managers for the industrial products firm and software company had cell phones as a standard daily device.

All four firms revealed high cell phone use in IT. However, the use emphasis in IT departments was on researching, piloting, and evaluating wireless technology, rather than for verbal communications and leadership. Uses in operations and logistics were low, except for the large technology leader and entertainment company, which were moderate to high. It should be kept in mind that the technology leader had a generally higher level of adoption (40 percent). The medical manufacturer also cited high functional area uses in facilities and legal.

In sum, for the functional areas, higher use today depends on the needs for rapid verbal responses, which is characteristic of executives and workers and managers in the field. Employees who are located in one location, including many in operations and logistics, had low utilization. IT was high due to its R&D role.

Discussion

The most important adoption factors are security/privacy, reliability, customer service, and web connectivity. The security/privacy and reliability factors were not in the traditional adoption models, but may have become more important in the decade or more since those models were introduced. They correspond to the finding of the most important individual mobile gaming adoption factor of perceived risk, reported by Kleijnen et al. (2003). The importance of customer service is related to, but not the same as the ease of use factor in the two traditional models. It is different in that it is the corporate step that can lead to ease of use. It points to practical steps that management can take to assure good adoption success with cell phones, i.e. to build up internally or arrange for external customer service for the cell phone users in the firm. This factor is likely to become more important in the future as web and Internet applications become more prevalent and also more complex requiring greater user support. Web connectivity is a forward looking factor, since voice communications dominates in today's uses for the sample firms. Since the technology is moving so rapidly (Dodd 2002), it is essential that corporate decision makers look ahead in their adoptions. At the same time, respondents reported that they were also intensively prototyping and testing current 3G cell phone devices, since they were skeptical of their current technical functionality and robustness.

The moderate adoption factors reported were cost, convenience/ease of use, expandability/scalability, and outside perception (i.e. Roger's communication). These were mostly traditional factors, which were supported but not leading. Ease of use and cost are in concert with the Kleijnen et al. (2003) findings on mobile entertainment devices, showing high ratings for complexity and payment options. However, communications was very low in that study but moderate in ours. Mobile gaming by individuals may not depend on how visible it is to others, but rather on the individual's motivation and enthusiasm for the application, whereas corporate adoption with our confirmed functional emphases on sales, marketing and executives implies a higher interest in the outside perception of the technology.

The low ratings for regulation are due in large part to firms' perceptions that cell phone vendors are responsible to consider this, rather than corporate users. The one firm with a CIO rating of high is a firm with a stated social consciousness and sensitivity. That may have encouraged gaining more knowledge of regulation beyond just authorization to operate the devices, but delving into privacy, intellectual property, and international sides of regulation. As the uses of this technology become more complex and web-driven in the future, regulation may become more prominent.

The study also shows that decision-making for cell phone adoption is quite varied and is linked to the corporate culture and organizational structure. This finding is practically important for vendors of mobile devices, who need to be adaptable to the variety of ways such decisions are made. Future research, with larger samples, could attempt to link the adoption decision-making approaches to organizational and cultural types.

The functional areas of heavy use were not surprising – they were voice-communicative environments, particularly sales, marketing, and executives. IT is also high due to its role in testing, i.e. Roger's trialability (Rogers, 1995). The benefits of cell phone use differ by area. For executives and managers, cell phones provide instant verbal communications worldwide within and outside the company. For sales people, cell phones give the benefit of increasingly rapid verbal exchanges with customers. Several respondents commented that today, customers may be influenced in sales decisions by 15 minutes of sales call lag. Frequent daily calling is becoming the norm. Another important benefit is for communications with sales support. In one firm each sales agent in the field was paired up with a sales support person in headquarters, and much of the daily communication flow

to and from the field was verbally through cell phones. Marketing benefits from cell phones through verbal communications to and from site meetings, conferences, conventions, and field visits. IT mostly benefited by performing testing and prototyping of cell phone models and features, rather than personal communications, which tended to be based on employees' personal units. For the future, if 3G cell phones become widespread, other functional parts of the firm that are more oriented towards Internet uses, will be likely to move up in importance. How much so depends not only on the technical success of 3G devices, but also on the future power of mobile web and Internet applications.

There are several implications of this research for corporate decision making. The first is that decision makers should focus on the principal expected uses and users, not what is being used today. In particular, this sample of firms today is primarily focused on voice and voice-related users. However, all the companies plan to be web-activated in the future. The uses and users emphasized in this study will shift and the managers need to plan for this. For instance, the decision makers need to determine how their present and future e-business will be connected to web-enabled m-business. Today the cell phone users are principally employees who need to verbally communicate a great deal in their jobs. Web-enabling will add other types of users who are more data-driven, rather than verbal. Management needs to do process and work activity studies to determine how the users will change in a web-driven m-environment. The study also informs decision makers to have heightened awareness of security and privacy concerns, including the potential loss of proprietary information and intellectual property. The future web-enabled environment will heighten the need for scrutiny here, since much more information will be potentially exposed. Regarding the corporate process for cell phone adoption and deployment decisions, the main advice from the study is to select a process that includes some prototyping of uses. All of these firms had benefited by having IT employees conduct prototyping on alternative devices loaned by vendors. Rapid prototyping by IT should be stressed even more for the web-enabled uses. At the same time, management should be careful on extrapolating IT employee satisfaction to others, say legal or marketing employees. Managers should consider letting IT drive prototyping but including some users from target functional areas.

Conclusion

This study has examined corporate cell phone adoption and uses. The research questions are answered as follows:

- RQ1. The most important factors are security/privacy, reliability, customer service, and web connectivity.
- RQ2. The decision-making process for cell phone adoption was unique to each company and depended on that firm's organizational structure and corporate culture. The final decision-maker varied considerably by firm and by size of project; decision-makers included a middle level board, technical director, CIOs and CEO.
- RQ3. The business functional areas of highest cell phone use were sales, marketing, executives, and IT. The first three were primarily for voice communications to customers and employees, while IT used cell phones for testing and prototyping.
- RQ4. Only one large entertainment firm has significant web-enabled cell phone uses today. The other four companies plan to add significant web-enabled uses in the future, emphasizing Internet communications initially.
- RQ5. The constraining factors on cell phone use were cost (moderate), security/privacy, regulation (only for the entertainment firm), and business activities, in that certain functional areas were presently not emphasized.
- RQ6. The regulatory policies had low impact for three respondent firms. The software company had moderate influence, related to its concern about the regulation and ethics of content. On the other hand, the large entertainment firm was very impacted by the FCC, in particular regarding regulation and legalities of intellectual property in the web-enabled cell phone environment.

The theoretical framework of the paper for cell phone adoption and deployment is validated as appropriate. Both new factors and traditional ones are shown to be important. The new factors emphasize having a robust and secure use of the devices, with necessary user support.

The study is limited by only examining cases for five firms in four industries. Future research needs to encompass larger samples of firms, which would be more robust and enable more sophisticated methodology, such as multivariate statistics. A weakness of the present study is not including the measurement or analysis of the extent of success or failure of corporate cell phone implementation. Including success measures for a large sample would provide more extensive and robust advice for corporate decision making. A large sample would also allow industry sector comparisons. The present multi-layered interview methodology could be supplemented with surveys of a larger sample of firms.

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