



Strategic implications of mobile technology: A case study using Value-Focused Thinking

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Abstract

Mobile technology extends computing and the Internet into the wireless medium, and provides greater flexibility in communication, collaboration, and information sharing. In this research, we used the ‘Value-Focused Thinking’ approach to examine the strategic implications of mobile technology in a leading publishing company. The result is a means-ends objective network that depicts the fundamental objectives of using mobile technology and how the fundamental objectives can be achieved through means objectives. The research findings suggest three main strategic implications of mobile technology: (1) improve working process; (2) increase internal communication and knowledge sharing; and (3) enhance sales and marketing effectiveness.

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1. Introduction

Information Technology (IT) is a critical resource for creating organizational value (Kohli and Devaraj, 2004). It also has the capability to transform the nature of products, processes, companies, industries, and even competition itself (Porter and Millar, 1985). Mobile technology, which can support computing on the move using portable devices through wireless networks (Varshney and Vetter, 2000; Malladi and Agrawal, 2002), has emerged as the next wave in IT revolution. Mobile technology includes technological infrastructure for connectivity such as Wireless Application Protocol (WAP), Bluetooth, 3G, and General Packet Radio Service (GPRS) as well as mobile information appliances

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such as mobile phones, PDA, and laptop computers (Varshney and Vetter, 2000; Perry et al., 2001; Nah et al., 2005). By extending computing and the Internet into the wireless medium, mobile technology allows users to have anytime, anywhere access to information and applications, which provides greater flexibility in communication, collaboration, and information sharing.

Mobile technology is gaining importance and popularity in organizations (Gayeski, 2002; Andersen et al., 2003; Siau and Shen, 2003; Siau et al., 2004a). Examples of applications of mobile technology in organizations include mobile access to company Intranet (Nah et al., 2005), mobile brokerage services (Looney et al., 2004), mobile payment and banking services (Herzberg, 2003; Mallat et al., 2004), and electronic procurement application systems based on WAP using mobile phones and laptops (Gebauer and Shaw, 2004).

The strategic importance of mobile technology cannot be underestimated. The rapid pace of adoption and advancement of mobile technology creates opportunities for new and innovative services provided through mobile devices. The emergence of mobile technology is expected to drastically affect a number of industries and to impact their strategic management (Barnes, 2002). Therefore, this new phenomenon needs to be better understood and warrants more research.

Research has shown that IT can have significant strategic impact on organizations. Studies have shown that IT can bring substantial cost savings (Mukhopadhyay et al., 1995; Buhalis, 2004) and can positively influence the financial performance of organizations (Brown et al., 1995; Hitt and Brynjolfsson, 1996; Bharadwaj, 2000; Santhanam and Hartono, 2003; Melville et al., 2004). Prior literature also suggests that IT can benefit organizations by enabling better customer services (Quinn and Baily, 1994), providing superior product quality (Bakos and Treacy, 1986; Ives and Learmonth, 1984), and creating competitive advantages (Griffiths and Finlay, 2004; Sethi and King, 1994).

However, the prior literature has focused mainly on the ‘what’ question—that is, what is the impact of IT on organizations. The ‘how’ question, that is, how IT impacts organizations, is still under-explored. Further, to assess the impact of a specific resource, the ‘how’ approach is more appropriate than the ‘what’ approach in assessing firm performance (Mooney et al., 1995; Ray et al., 2004). This is because a resource changes the processes in an organization, which in turn changes its competitive potential. Hence, the ‘how’ approach provides a deeper and more insightful understanding of how a resource helps an organization gain strategic advantages. On the other hand, the ‘what’ approach may assess firm performance which is the outcome of the aggregate effect of multiple business processes supported by various resources (Soh and Markus, 1995).

Since mobile technology is a fairly new phenomenon, its organizational and strategic implications have not been systematically studied. This study fills the void by examining the strategic implications of mobile technology in a leading publishing company that has realized the importance of mobile technology and equipped its sales personnel with wireless Tablet PCs. We adopted the ‘Value-Focused Thinking’ (Keeney, 1992) approach to identify values of mobile technology to this organization, as well as relationships among those values. As ‘Value-Focused Thinking’ is fundamentally about deciding what is important and how to achieve it, it helps to reveal the ‘black box’ of how the deployment of mobile technology strategically impacts the organization.

2. Impact of information technology on organizations

Information technologies can serve as powerful strategic tools for organizations (Buhalis, 2004). When IT is appropriately deployed in organizations, it can bring significant opportunities to organizations. The impact of IT on organizations can be grouped into two categories: *tangible* benefits of IT and *intangible* benefits enabled by IT.

The first category of research focuses on the financial performance of organizations resulting from investments of IT, which can be measured through *tangible* metrics, such as cost savings (Mukhopadhyay et al., 1995), productivity (Hitt and Brynjolfsson, 1996), market share (Banker and Kauffman, 1988; Barua et al., 1995), and profitability (Jarvenpaa and Ives, 1990; Brown et al., 1995). In general, IT resources create economic value for organizations (Melville et al., 2004). Further, many empirical studies have found support for a positive relationship between IT resources and organization's financial performance (Bharadwaj et al., 1999; Devaraj and Kohli, 2000; Bharadwaj, 2000; Santhanam and Hartono, 2003).

The second category of research is concerned with *intangible* benefits provided by IT. The intangible benefits of IT on business processes and relationships include better customer services (Quinn and Baily, 1994; Anderson et al., 2003), increased knowledge about customers (Cooper et al., 2000), improved coordination with partners (Buhalis, 2004; Mukhopadhyay et al., 1995), superior product quality (Ives and Learmonth, 1984; Ryan and Harrison, 2000), and competitive advantages (Griffiths and Finlay, 2004; Sethi and King, 1994; Melville et al., 2004). Competitive advantage usually takes the form of a company's cost position or product differentiation (Porter and Millar, 1985). IT can impact the competitive advantages of companies by affecting the way companies operate, by transforming the products offered, and by changing the nature of competition itself (Porter and Millar, 1985).

Table 1 provides a summary of prior literatures that have examined the impact of IT on organizations.

Although several studies in the prior literature has examined the tangible payoffs of IT, such assessments continue to be debated (Devaraj and Kohli, 2000; Martinsons and Martinsons, 2002; Ray et al., 2004). Empirical studies that examine relationships between IT capability and organization's financial performance have produced contradictory results and created the so-called 'productivity paradox' (Strassmann, 1990; Weill, 1992; Brynjolfsson, 1993; Mahmood and Mann, 1993; Soh and Markus, 1995; McKinsey and Co, 2002). The IT productivity paradox suggests that operational improvements gained from applying IT may not translate into financial measures of performance (Melville et al., 2004; Ray et al., 2004). Increasingly, IT is being used as a strategic tool to improve internal business process and to gain competitive advantage (Kohli and Devaraj, 2004). Therefore, intangible metrics, such as improvement in business process and better customer service, are more appropriate for assessing the impact of IT on organizations (Ray et al., 2004).

In this study, we focus on examining intangible benefits of mobile technology. We collected data from a leading publishing company. As part of the data analysis, we developed a means-ends objective network that illustrates the relationships between

Table 1
Summary of prior literature on impact of information technology

Categories	Benefits	Examples from prior literatures
Tangible benefits	Reduced cost	Santhanam and Hartono (2003), Buhalis (2004), Mukhopadhyay et al. (1995), Bakos and Treacy (1986), Pfeiffer (1992), Barua et al. (1995), Baharadwaj (2000)
	Improved productivity (i.e. amount of output produced per unit of input)	Ryan and Harrison (2000), Brown et al. (1995), Hitt and Brynjolfsson (1996)
	Increased profitability	Santhanam and Hartono (2003), Devaraj and Kohli (2000), Bharadwaj (2000), Cooper et al. (2000), Brown et al. (1995), Jarvenpaa and Ives (1990)
	Increased market share	Banker and Kauffman (1988), Barua et al. (1995)
	Savings in labor	Ryan and Harrison (2000)
Intangible benefits	Increased consumer surplus (i.e. the accumulated difference between consumer demand and market price)	Hitt and Brynjolfsson (1996)
	Improved customer service quality	Ryan and Harrison (2000), Cooper et al. (2000), Quinn and Baily (1994), Pfeiffer (1992)
	Improved organizational efficiency	Pfeiffer (1992), Bakos and Treacy (1986)
	Quicker response to customers	Anderson et al. (2003)
	Deeper knowledge and understanding of customers	Anderson et al. (2003), Cooper et al. (2000)
	Improved decision-making ability	Ryan and Harrison (2000)
	Superior product quality	Ryan and Harrison (2000), Mukhopadhyay et al. (1995), Bakos and Treacy (1986), Ives and Learmonth (1984)
	Knowledge/information management and sharing	Kraemer and Dedrick (2002), Quinn and Baily (1994), Mukhopadhyay et al. (1995)
	Improved coordination/relationships with partners	Buhalis (2004), Mukhopadhyay et al. (1995), Pfeiffer (1992)
	Other forms of competitive advantages	Melville et al. (2004), Griffiths and Finlay (2004), Sethi and King (1994), Bakos and Treacy (1986), Pfeiffer (1992), Porter and Millar (1985)

the features and applications of mobile technology and their strategic impact on the organization.

3. Characteristics and implications of mobile technology

Mobile technology has extended computing and the Internet to the wireless medium, thus providing more freedom to individuals in their personal life and at work (Jarvenpaa et al., 2003). The most touted advantage of mobile technology is mobility (Sarker and Wells, 2003), which enables anytime, anywhere computing (Varshney and Vetter, 2000;

Davis, 2002). Anytime/anyplace computing can remove time and space constraints in accessing critical information and enhance capabilities for communication, coordination, collaboration, and knowledge exchange (Davis, 2002). Users of mobile technology can have access to the Internet and mobile applications whenever the need arises, such as when ‘traveling, wandering, and visiting’ (Sarker and Wells, 2003). Therefore, mobile technology can result in efficiency and productivity as users can make better use of their time and attend to business and social obligations in real-time (Sarker and Wells, 2003; Jarvenpaa et al., 2003). Varshney and Vetter (2000) also argued that mobile technology can provide the flexibility required by the mobile work force.

Mobile technology can support an organization’s activities throughout its value chain (Barnes, 2003) and impact the organization’s competitive advantage (Porter and Millar, 1985). Mobile technology can provide a number of benefits to organizations, such as connectivity, flexibility, interactivity, and location awareness. These benefits can help to increase the efficiency and effectiveness of an organization’s value activities, and to transform business processes (Barnes, 2003).

There is a paucity of research to assess the strategic impact of mobile technology on organizations. This paper is a step toward this direction to fill the gap. It presents the results of a case study that identifies the values of mobile technology in a leading publishing company and how mobile technology can have strategic impact and implications on the organization.

4. Research methodology

4.1. Case study research

As the aim of this research is to study the strategic and organizational impact of mobile technology where few studies exist, case study approach is well-suited for this research. A case study is an ‘empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident’ (Yin, 1994, p. 13). Case study allows the researchers to understand the nature and complexity of the process that is taking place and answer the ‘how’ and ‘why’ questions. Hence, it is an appropriate methodology for this research.

4.2. Value-Focused Thinking

Interviews are an essential source of case study information (Yin, 1994). Keeney’s (1992) Value-Focused Thinking (VFT) approach was used to conduct the interviews, and to articulate and organize the data from the interviews. The VFT approach, which is fundamentally about deciding *what* is important and *how* to achieve it, defines essentially what the decision maker cares about (Keeney, 1992). Values are principles used for the evaluation (Keeney, 1992). Values that are of concern are made explicit by the identification of objectives. An objective is a statement of something that one *desires* to achieve (Keeney, 1992). An objective is characterized by three features: a decision context, an object, and a direction of preference.

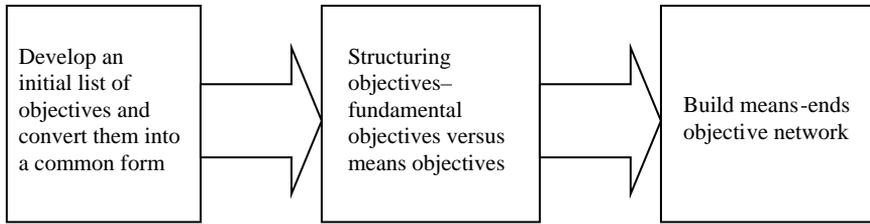


Fig. 1. Steps involved in Value-Focused Thinking approach.

The steps of VFT are as follows (as shown in Fig. 1):

- (1) *Develop an initial list of objectives and convert them into a common form.* Several popular techniques that can help stimulate the identification of possible objectives include ‘wish list’, problems and shortcomings, alternatives, and consequences (Keeney, 1992). We applied these techniques by asking the subjects questions about the values of mobile technology in relation to their job and company strategy, and later converting the values into a common form (i.e. expressing them in the form of ‘objectives’). Such questions include:
 - ‘What are the benefits of using mobile technology in your job?’
 - ‘How does mobile technology help to achieve your company strategy?’
- (2) *Structuring objectives—fundamental objectives versus means objectives.* After collecting the list of objectives, this step distinguishes between fundamental objectives and means objectives. Fundamental objectives concern ‘the ends that decision makers value in a specific context’ whereas means objectives are ‘methods to achieve ends’ (Keeney, 1992). To separate means objectives from fundamental objectives and to establish their relationships, we used a test called ‘Why Is That Important?’ For each objective identified, asking ‘Why Is That Important?’ yields two types of possible responses. One is that this objective is one of the essential reasons for interest in the situation and is fundamental for decision-making. This is called a fundamental objective. The other response is that an objective is important because of its implication for some other objectives. This is called a means objective.
- (3) *Building the means-ends objective network.* The final step in the VFT approach is to build the means-ends objectives network. This network provides a model of the specific interrelationships among the means objectives and their relationships to fundamental objectives.

4.3. Company background

The company that we studied is a leading international publisher of introductory through advanced-level textbooks, professional reference publications, and monographs. The company is a market leader in publishing and an innovator in online learning.

The company has four main divisions: editorial team, publisher, marketing, and sales. Unlike the other three divisions, which are based in the head office, the sales division

comprises over 300 sales personnel (including regional managers, district managers, and sales representatives) who are distributed geographically and are always on the move. Sales representatives work closely and interact regularly with university instructors who are their main customers. They present new products (books and supporting materials) to instructors, persuade instructors to adopt new textbooks or reference materials, collect feedback from instructors regarding their products, and monitor sales in the bookstores. Their job typically involves visiting with instructors on campuses (to promote their products and to provide customer service) and checking sales in the bookstores. District managers are supervisors of sales representatives; their main responsibilities are to coordinate and oversee the job of the sales representatives, monitor the performance of the sales representatives, and support sales activities of the sales representatives.

4.4. Data collection

Using the VFT approach, we interviewed 12 sales representatives and district managers from the publishing company regarding their use of mobile technology to support both their jobs and company strategies. Nine of them are sales representatives and three of them are district managers. The sample size was determined by the ‘point of saturation’, which is a standard stopping rule for qualitative research. Each interview lasted about 30–45 min. The interviews were audio-recorded and notes were taken by the researchers during each interview.

Since August 2003, these subjects have all been using Tablet PCs to perform their daily working activities such as accessing the company Intranet, checking and searching electronic catalogues, demonstrating products to customers, and taking notes using the handwriting feature of the Tablet PCs.

We also observed some sales representatives at work to examine how they interacted with instructors (such as demonstrating new products, checking/searching electronic catalogues, and answering questions) and how they utilized mobile technology (in this case, Tablet PCs) to better serve customers and carry out their job-related tasks. The observational data provides another means to validate the results of the interviews with sales personnel.

In addition, we used archival records such as annual reports and the company website, which provide descriptions of the history of the company, the mission of the company, the structure of the company, and press release archival regarding the company’s use of technology.

Table 2 shows the data collection checklist that summarizes the data resources used in this study.

4.5. Company strategies

As the world’s leading publisher of academic and reference textbooks, the publishing company under study is committed to providing the most innovative, flexible, and powerful educational materials available today. The company is typically one of the first to introduce new educational materials, as one of the company’s strategic focuses is *product innovation*.

Table 2
Data collection checklist

Data type	Resources	Number
Interviews with sales personnel	Sales representatives	9
	District managers	3
Observation	Sales representatives interacting with instructors	2
Archival records	Company website	Yes
	Company annual reports	Yes

The company is also very ‘customer-oriented’ (as is also reflected in its mission statement—to be a leading company in publishing that extends value to its customers). The sales personnel we have interviewed also indicated that providing excellent services to customers is an important component of the company’s strategy. As one sales representative indicated during the interview,

‘Our company always wants to provide the best and most efficient services to our customers... We constantly listen to our customers... trying to understand what they want, [so that] we can meet their needs.’

Before the company introduced Tablet PCs and deployed them among the sales force, the sales personnel had to carry heavy paper documents with them during their visits to campuses to meet with instructors. The company used to print sales manuals and product catalogs on a periodic basis, provide hardcopies of product updates whenever there was a change or new edition, and distribute them to sales representatives all over the nation. Also, in the past, sales representatives did not have access to computers or the Internet while on campus. As such, they had to wait until they were back at their offices or homes before sending follow-up emails to customers, updating customers’ records, and sending out customers’ product requests.

To *enhance the efficiency* of sales representatives and to provide *better services to customers*, the company adopted mobile technology in the Sales division in August, 2003. Every sales representative is now equipped with a Tablet PC to support their daily activities. The sales representatives now carry Tablet PCs with them to the customers’ sites (campuses) instead of bulky paper documents as in the past.

The sales representatives in this company are mobile—meaning that they spend most of their working hours traveling (between their homes and the campuses), on campuses (moving between buildings and instructors’ offices), and at instructors’ offices. The main reason for the company to adopt Tablet PCs is to gain strategic advantages over its competitors. This company is, therefore, an excellent site for studying the strategic impact of mobile technology in an organizational setting.

5. Research results

The means and ends objectives were derived from the transcripts of the interviews. The initial list of objectives contains 163 means objectives and 27 candidate fundamental objectives. Two researchers carefully reviewed the objectives list: redundant objectives were

Table 3
Fundamental objectives

Fundamental objectives	Evidence from interviews
Maximize customer service	<ul style="list-style-type: none"> • Using Tablet PC, I can provide better services to our customers • Customer service has been improved after we used Tablet PC
Maximize company image	<ul style="list-style-type: none"> • Instructors are very impressed with [our use of] this new device... • [By using Tablet PC] it shows that our company is really leading and cutting edge...
Maximize employee satisfaction	<ul style="list-style-type: none"> • I am very happy with my job now after • I used Tablet PC... I feel our company really cares about us and is willing to make our job easier
Maximize efficiency	<ul style="list-style-type: none"> • Now, I am able to visit more instructors every day... • I can get most of my daily job done in campus...
Maximize effectiveness	<ul style="list-style-type: none"> • [Tablet PC] enables me to do my job better • It has definitely improved effectiveness of my job
Minimize cost	<ul style="list-style-type: none"> • Our company can save some money by using Tablet PC... • Company can reduce cost of printing [paper documents]

removed and similar objectives were grouped together. The final set of objectives includes 31 means objectives and six fundamental objectives; examples are given in Tables 3 and 4 to serve as support and evidence for each objective. The means-ends objective network was constructed based on the list of objectives derived as well as the relationships between the objectives. For example, if a subject stated that ‘It would be nice that wireless connection is available everywhere so that I can get access to the Internet using my Tablet PC no matter where I am...’, it suggests a causal relationship between the objective ‘maximize coverage area’ and the objective ‘maximize accessibility of Internet’. The relationships between objectives can also be derived from the ‘Why Is That Important?’ test. For example, when a subject indicated that, *stable connection is important*, the researchers then asked ‘Why is that important?’ The subject responded as follows: ‘Because I want to get constant signals while I am accessing Internet using my Tablet PC...’ In this case, it suggests that ‘maximize connectivity’ is a means to ‘maximize accessibility of Internet’.

The means-ends objective network, which depicts relationships between objectives, is presented in Fig. 2.

6. Discussions and implications

6.1. Fundamental objectives and means objectives

The overall objective for mobile applications is to maximize the overall benefits to the company. We identified six fundamental objectives in this study—maximize customer service, maximize company image, maximize employee satisfaction, maximize efficiency, maximize effectiveness, and minimize cost. According to our subjects, these objectives are the fundamental reasons and main drivers for rolling out Tablet PCs to the sales personnel in the organization.

Table 4
Means objectives

Means objectives	Evidence from interviews
Able to beam information	<ul style="list-style-type: none"> • [Using infrared beam] I can directly send files to my customers... • I can beam information back and forth to my colleagues...
Maximize interoperability of systems	<ul style="list-style-type: none"> • The systems must be able to talk to each other... • [The company] makes sure that [all the employees] are accessing the same information
Maximize coverage area	<ul style="list-style-type: none"> • It would be nice that wireless connection is available everywhere... • Currently I can only get wireless [connection] in a few places in your campus...
Maximize connectivity	<ul style="list-style-type: none"> • I would like to have better connection, which means constant signals... • Stable connection is important, otherwise, you get cut off...
Maximize battery life	<ul style="list-style-type: none"> • I always bring extra batteries with me when I have campus visits just in case the battery is down... • Our current battery can only last for 2 h; I have to watch for it...
Minimize damage/loss of mobile devices	<ul style="list-style-type: none"> • This device [Tablet PC] is fragile, I am always worried that I might break it • I can't imagine what if my Tablet PC is lost...that will be really bad... [because] I have all the information inside...
Improve accuracy of voice or handwriting recognition	<ul style="list-style-type: none"> • The good thing about Tablet PC is that I can take notes on it and save my own notes... • I hope in the future the voice recognition feature will be improved...
Enable multi-media presentation at customer site	<ul style="list-style-type: none"> • I can show PowerPoint slides, audio, and video using my Tablet PC to market a book to potential adopters... • Now I can do multi-media presentations to instructors [using Tablet PC]...
Maximize information transfer/sharing	<ul style="list-style-type: none"> • Easier to transfer files to colleagues... • [Since we are accessing the same information], I guess it is easier to share information among colleagues...
Maximize accessibility of Internet	<ul style="list-style-type: none"> • I can get access to Internet using my Tablet PC... • Now I can check email or do searching any time...
Maximize real-time availability of information anytime, anywhere	<ul style="list-style-type: none"> • We have our sales manual and product catalogs electronically... so I can always have the information with me when I carry my Tablet PC... • Product information, marketing information... everything is available... I can get this information whenever I need it...
Maximize update of information at source	<ul style="list-style-type: none"> • Updating information is so easy now... you can get it done while talking with instructors [i.e. customers]... • Whenever there is something that needs to be updated, I can do it right away... [instead of] doing it at night when I got back home...
Able to input information to mobile devices on the spot	<ul style="list-style-type: none"> • Microsoft Journal [provided in Tablet PC] allows me to take notes during conversation with instructors and save it as a file • I can type the notes or reminder into the Tablet PC while in instructors' offices...
Maximize quality of product demonstration	<ul style="list-style-type: none"> • [With the multimedia features of Tablet PC], I can demonstrate to the instructors our new products better... • I can show [the instructors] the video [that accompanies the product]...

(continued on next page)

Table 4 (continued)

Means objectives	Evidence from interviews
Maximize communication within organization	<ul style="list-style-type: none"> • Communication within the company is improved after using Tablet PC... • I communicate with my colleagues a lot through e-mail... now it is more convenient to send emails...
Maximize collaboration with colleagues	<ul style="list-style-type: none"> • We can do brainstorming using Tablet PC... • My colleagues can help me solve some problems or answer some questions through e-mail or video-conferencing...
Minimize the need to carry bulky paper documents to customer site	<ul style="list-style-type: none"> • This is the best thing of using Tablet PC, it is paperless • We used to carry sales manuals and catalogs to instructors' offices... Each of them is about 500 pages!
Maximize instantaneous notification of product updates	<ul style="list-style-type: none"> • When there is update about the products, company can notify us immediately... • [The company] used to mail us the updates about products every year... it takes time...
Facilitate planning of daily tasks	<ul style="list-style-type: none"> • I store all the instructors' information in the Tablet PC, so I can sort by name, by office building, or by office hour... it really helps when I am planning for the day...
Enable e-mail follow-up with customers anytime, anywhere	<ul style="list-style-type: none"> • I can send emails to instructors while on campus now... often during the waiting time for another appointment... • Now I can do follow-up with instructors whenever I have some time while on campus...
Minimize ease of searching information	<ul style="list-style-type: none"> • It is easier to search for product information when it is available electronically... • I can search using Internet, our electronic catalog, or company Intranet...
Maximize real-time response to customers' queries	<ul style="list-style-type: none"> • When instructors have questions about our products, I can answer these questions quickly [by looking them up on the Tablet PC] • [Because information is readily available and easy to search], I can respond to customers' queries almost real-time...
Able to submit customer's product request on the spot	<ul style="list-style-type: none"> • I can fill out the product request form on the spot and submit it electronically [using the Tablet PC]... • [When customers ask for review copies], I can submit the requests right away in front of the customer...
Maximize electronic recording of customer feedback on the spot	<ul style="list-style-type: none"> • I can record instructors' feedback about our products or services during our conversations using my Tablet PC... • I can take notes, or even audio-record the instructors' opinions and feedbacks...
Maximize sense of belonging/community	<ul style="list-style-type: none"> • I feel I am connected with my colleagues [through my Tablet PC]... • [Being able to communicate and collaborate with colleagues] gives me the sense of belonging... that I am not alone... I can talk to others and get help from them...
Minimize printing/distribution cost	<ul style="list-style-type: none"> • Company used to print out sales manuals and catalogs and distribute them to sales reps... By making everything electronic, company can save on the printing cost and distribution cost... • Company can inform us about product changes without sending paper documents... it saves money...
Maximize knowledge of up-to-date product information	<ul style="list-style-type: none"> • I have found [after using Tablet PC] that I know our product better... I am more knowledgeable about our products...

(continued on next page)

Table 4 (continued)

Means objectives	Evidence from interviews
Maximize professionalism	<ul style="list-style-type: none"> • I am able to know the most up-to-date information about our products... • It makes me feel confident that I am able to do my job better with the help of Tablet PC... • [By using Tablet PC] I am perceived by customers to be more capable and knowledgeable...
Maximize use of employee time	<ul style="list-style-type: none"> • [Tablet PC] really helps me use my time better on campus... • I can send follow-up emails to instructors while waiting on campus... [which] turns idle time into working time...
Improve responsiveness to customers	<ul style="list-style-type: none"> • [After using Tablet PC], I am able to respond to our customers more quickly... at anytime and anywhere in the buildings... • I have been more responsive to customers with the help of Tablet PC...
Minimize wait time of product delivery	<ul style="list-style-type: none"> • [By submitting customers' product requests on the spot], they can get the products quicker... • There is less wait time for customers to get the product delivered to them... because the request is submitted immediately

The first fundamental objective identified is *maximize customer service*, which is one of the main strategic focuses of the company. Equipped with Tablet PCs, sales representatives are able to have access to product information (sales manuals and product catalogs) and the Internet whenever the need arises. They can check or search for information easily at the customers' sites and answer queries on the spot. When customers request for review or desk copies of products (books or instructional materials), they can fill out the product requests on the spot and submit the requests immediately, which helps to reduce the time taken for customers to receive the products. The sales representatives can also send follow-up emails to customers using their Tablet PCs during the slack time between appointments or visits. Therefore, the sales representatives can be more responsive to customers in answering their questions, processing their requests, and following up with customers. These enable them to provide better customer service. This finding is in line with the prior literature (Ryan and Harrison, 2000; Quinn and Baily, 1994; Pfeiffer, 1992; Cooper et al., 2000) where improved customer service quality is found to be one of the main intangible benefits brought about by IT. This benefit is also echoed by Jarvenpaa et al. (2003) who argued that mobile technology, being mobile and wireless, has provided users with more 'freedom' and new means to interact with customers; thereby, enabling them to serve customers better. This increased customer service quality can help to increase bargaining power and create switching costs of customers.

Another fundamental objective is *maximize company image*. The sales representatives feel that using Tablet PCs help them appear more confident and knowledgeable. As the subjects indicated:

'Our company has always been [at the] leading and cutting edge in using new technology...Our company is one of the first companies in the industry to adopt Tablet PC...'

'Our customers are very impressed with [our using] cutting edge technology...'

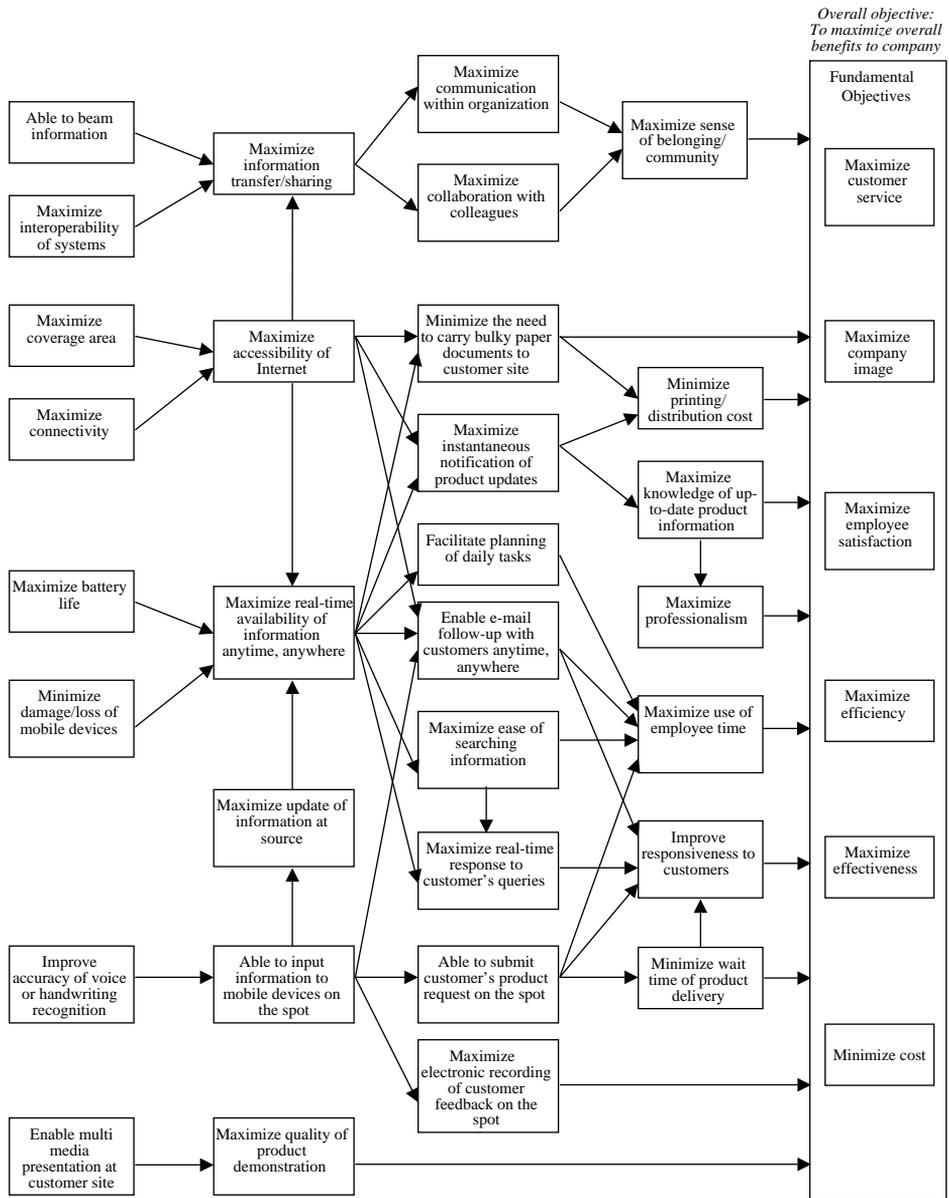


Fig. 2. Means-ends objective network.

‘It shows that our company is willing to invest in new technology to serve customers better...’

Being a leader in the industry, the company is committed to providing the most innovative, flexible, and powerful educational materials available today. The use of new

and innovative IT is important as IT can play a role in ‘producing new knowledge dissemination platforms’ (Jarvenpaa and Ives, 1990). The use of this new, cutting edge technology by sales representatives showcases the company’s ability and willingness to be ‘innovative’ and at the ‘cutting edge’ in sharing and disseminating knowledge among salespersons, and in supporting better communication with customers. Also, the use of Tablet PCs has enabled the sales representatives to be more knowledgeable about the products and enhances their professional (‘confident’ and ‘capable’) image, which in turn improves the image of the company. This objective has not been reported in the prior literature and is a new finding in this area of research on organizational implications of mobile applications. Though new, this objective is not surprising as it is in line with the strategic focus of the company under study.

According to the subjects, the fundamental objective, *maximize employee satisfaction*, is one of the main drivers of the company’s decision to deploy this new technology. The use of mobile technology not only eliminates the need to carry heavy paper documents as part of their job, but also helps to streamline the process involved in sales and marketing, and enables the sales representatives to reduce their overall workload while getting the same amount of work done (e.g. having most of the work done while interacting with customers rather than at the end of the work day). The sales representatives are more satisfied with their job as they are less likely to bring work home with them, thus increasing their overall quality of life. In addition, the mobile technology enables them to utilize their time better (e.g. reduce ‘slack’ or ‘dead’ time), and helps to create a sense of belonging to a community by enabling them to communicate and collaborate with their colleagues more easily and readily. Hence, employee satisfaction has significantly increased. Interestingly and surprisingly, such benefits of mobile technology have not been cited in the prior literature. Since employee satisfaction has been shown to have positive impact on organizational performance (Bartel, 2004), more companies are realizing the importance of employee satisfaction and its impact on performance. Increased employee satisfaction can also help to reduce employee turnover, which can help to reduce recruiting and training costs in organizations. Our study demonstrates and provides an example of how employee satisfaction can be increased by streamlining the work process of employees who are always on the move.

Maximize efficiency and *Maximize effectiveness* are the other two main reasons for deploying mobile technology to the sales representatives. With the help of Tablet PCs, the sales representatives are more knowledgeable about the company’s products, which enable them to do their job better. Utilizing the multi-media features provided by Tablet PCs, the sales representatives are also able to improve the quality and effectiveness of product demonstrations. Meanwhile, efficiency can be achieved by carrying out their job-related tasks in a timelier manner; for example, sales representatives can now provide quicker responses to customers’ queries and submit customers’ product requests on the spot. As suggested by Sarker and Wells (2003), ‘mobility means efficiency’. Equipped with Tablet PCs, sales representatives are able to ‘fill’ time, meaning that they can carry out their daily tasks (such as sending e-mails to instructors) between appointments and scheduled activities, and during any slack or dead time, e.g. while on the move. In this way, their work efficiency is significantly improved, as highlighted by several subjects during the interviews; one of which is quoted below:

‘[Before using Tablet PC], I was only able to visit 10–12 instructors a day... now I can use my time more efficiently [by using Tablet PC]... I am able to visit 18–20 instructors every day.’

This finding shows that mobile technology can be a great tool to help employees carry out their job quicker and better, which is in line with the findings reported by Bakos and Treacy (1986), and Pfeiffer (1992).

Minimize cost has been identified as another fundamental objective in using mobile technology. This fundamental objective can be achieved through cost saving in printing and distributing paper documents such as sales manuals and product catalogs. All the subjects felt that the cost incurred by their company for supporting sales activities had been significantly reduced, particularly with regard to printing and distribution.

The fundamental objectives identified in this study indicate that mobile technology can be used as a means to better achieve company strategies. This assertion can also be supported by examples from companies in other industries. For example, in a case study by Nah et al. (2005), the fundamental objectives identified for mobile applications in a public utility company include: maximize efficiency, maximize effectiveness, maximize customer satisfaction, maximize security, minimize cost, and maximize employee acceptance. These fundamental objectives highlight the overall benefits of mobile applications in the company, and help the utility company ‘provide energy and services of superior value’.

The means objectives derived from this study as well as the relationships between them illustrate how the fundamental objectives can be achieved. The means objectives not only include features or functions of mobile technology, but they also suggest possible applications enabled by mobile technology.

Among all the means objectives, *accessibility of Internet* and *real-time availability of information anytime, anywhere* are two important ones. Without ‘Internet access’ and ‘real-time availability of information’, mobile technology would not be able to offer many of the benefits to the sales personnel or be able to facilitate their daily tasks as best as they are right now. These two objectives are the means to achieve a number of other objectives. For example, they minimize the need to carry bulky paper documents to customer sites, maximize instantaneous notifications of product updates, facilitate the planning of daily tasks, enable almost instantaneous e-mail follow-up with customers, and maximize the ease of information search.

The subjects we interviewed also highlighted the unique features or functions provided by mobile technology that have made mobile applications valuable. These features/functions include ability to beam information, wireless coverage area, connectivity, voice/handwriting recognition, and multi-media capability. These are the means that lead to the rest of the objectives in the means-ends objective network.

6.2. Strategic implications of mobile technology

Fundamental objectives are the ‘fundamental values’ (Keeney, 1992) of mobile technology for this organization, and the key sources of competitive advantages provided by mobile technology. In this case study, six fundamental objectives are found to

contribute to the overall objective of maximizing the company's benefits of using mobile technology. The main drives for the company to adopt mobile technology are to 'increase efficiency' and 'provide better customer service', which are two key dimensions of competitive advantages (Sethi and King, 1994). In this company, mobile technology has been adopted and applied in the organization as a strategic tool to achieve competitive advantages (Buhalis, 2004; Kohli and Devaraj, 2004).

The means-ends objective network also depicts how fundamental objectives can be achieved through means objectives, that is, how company strategies can be achieved via the use of mobile technology. The relationships between means objectives and fundamental objectives demonstrate how mobile technology strategically impacts the organization. Based on the means-ends objective network we have derived, we identified three main strategic implications of mobile technology: (1) improve working process; (2) increase internal communication and knowledge sharing; and (3) enhance sales and marketing effectiveness. These implications can help to strengthen and achieve company strategies.

- (1) Improve working process. IT is commonly deployed to help improve and streamline business processes (Kohli and Devaraj, 2004). Mobile technology is not an exception. Moreover, with features such as wireless connection and mobility of devices, mobile technology provides 'real-time availability of information' and 'Internet access at anytime, anywhere'. This is particularly important when 'information is transforming the nature of competition' (Porter and Millar, 1985), as information is a main source of competitive advantage. Our means-ends objective network suggests that mobile technology can help to: (i) improve the working process by enabling activities to be carried out in real-time (such as real time response to customers' queries, and ability to submit customers' product requests on the spot), and (ii) streamline the process by removing redundant procedures (such as by inputting and updating data/information at source, and enabling electronic recording of customer feedback while interacting with customers).
- (2) Increase internal communication and knowledge sharing. Facilitating communication is one of the goals of using mobile strategy (CIO insight, 2003). Mobile technology can help to enhance interpersonal relationships and increase flexibility in coordination (Jarvenpaa et al., 2003). It provides a new medium and channel for communication and knowledge sharing. In our case, the use of Tablet PCs has made it easier for sales personnel to transfer or share information with one another and enabled them to communicate and collaborate better, which in turn, create a sense of belonging to a community. These objectives are the means of the fundamental objective—maximize employee satisfaction. Satisfying employee demand has been a main driver for the adoption of mobile technology (CIO insight, 2003).
- (3) Enhance sales and marketing effectiveness. In a study by Schlosser (2002), it was found that innovative ways of using technology were shaped by individual needs as users adapted their message contexts, social etiquette, self-impressions, and ways of doing business. The use of mobile technology can help to shape the user's image with 'prestige' and to be 'leading edge' (Schlosser, 2002). The same idea was verbalized by the subjects. As one of the subjects stated during the interview,

‘[By using Tablet PC] it shows that our company is really leading and cutting edge...’

Hence, mobile technology can be used as a sales and marketing tool to enhance company image and to give customers the impression that the company is at the ‘cutting edge’. This finding is also reported by Kraemer and Dedrick (2002) who suggested that the use of the Internet and e-commerce in Cisco could support its strategies by ‘showcasing its own use of Internet as a marketing tool’ (Kraemer and Dedrick, 2002).

7. Reliability and validity of research

To enhance the rigor of the study, we followed the three principles of data collection proposed by Yin (1994).

- (1) *Using multiple sources of evidence.* Multiple data sources can contribute to a high degree of construct validity (Sarker and Lee, 2003). In our case study, we interviewed both sales representatives and district sales managers, who are provided with Tablet PCs to support their sales activities and to enhance customer service. We also observed sales representatives’ use of Tablet PCs when they were interacting with customers. In addition, we used archival records such as annual reports and the company website to provide us with a more in-depth understanding of the company, and to substantiate and complement the results of the study.

We also interviewed seven customers (university professors who have an average of 7 years of teaching experience) to collect data regarding customers’ responses to the use of mobile technology by the company’s sales force. Interviews with customers serve as anecdotal evidence to validate the values of mobile technology as indicated by the sales personnel.

All the customers interviewed have noticed that the sales representatives have started to use Tablet PCs to support their sales activities during campus visits. They also observed that the sales representatives were using their Tablet PCs for taking notes, for keeping records on meetings and discussions, and for searching catalogues and information. Most of the customers have also noticed that the sales representatives can enter orders or input customer requests electronically during the conversations. One customer stated:

‘When we were talking, he (sale representative) took notes on the Tablet PC. If he needed to check something, he was able to pull out the record of our last conversation from the Tablet PC. When I requested for a desk copy, he could submit the request online right in my office during our conversation using the Tablet PC.’

After the adoption of Tablet PCs, the customers have found the sales representatives to be more responsive to their needs and the sales representatives were able to provide answers to questions more quickly and effectively. One customer provided an example:

‘Before [the sales representative used the Tablet PC], if I asked him something about the textbook, he usually gave me the answer at the end of the day; last time [after the sales representative used Tablet PC], when I asked him something, he went out and came back within five minutes and told me the answer! I guess he was checking the information down the hallway.’

From the customers’ perspectives, the use of Tablet PCs by the sales representatives helps to create a positive *impression* and improve the company’s image. As one customer indicated,

‘When the sales representatives are using Tablet PCs, it shows that they are able to keep up with new technology. This is especially so when they are dealing with professors who are teaching technical courses. It is quite impressive to see them use state-of-the-art technology like Tablet PCs. It shows that the sales representative is technically competent. It also indicates that the company is willing to invest in their employees to serve customers better and the company is doing well.’

Overall, the customers believe that the quality of customer service provided by the sales representatives has improved. The sales representatives are not only able to respond to their requests and needs more quickly, but they also appear more professional and prepared. The use of Tablet PCs by sales representatives is considered a good indicator of the company’s capability and well-being, which helps to improve the company’s image. The points that were highlighted by the customers correspond closely to the objectives we have derived from the interviews with the sales personnel, including ‘maximize customer service’, ‘maximize company image’, ‘maximize efficiency’, ‘improve responsiveness to customers’, and ‘maximize professionalism’; therefore, the interviews from the customers provide additional support for the means-ends objective network and give us confidence in the validity of our research results.

- (2) Creating a case study database. A case study database helps to increase the reliability of the case study (Yin, 1994). In our study, we maintain case study notes by taking notes during the interviews. We also audio recorded the interviews for documentation purposes. Our case study documents also include company background information and company annual reports.
- (3) Maintaining a chain of evidence. This principle allows an external observer, for example, the reader of this paper, to trace the chain of events occurring in this case study (Yin, 1994). In our research, we provide anecdotal evidence from the case study database to explain and illustrate the impact of mobile technology to the organization under study. We also followed the steps of the VFT approach for articulating the interviews and organizing the results. This provides the chain of evidence leading up to the means-ends objective network.

The use of a systematic methodology—the VFT approach—also enhances the reliability and validity of the results. The VFT approach is a proven methodology that has been used in various disciplines. Table 5 summarizes previous literatures that applied the Value-Focused Thinking approach. These applications have shown that the VFT

Table 5
Summary of research using the value-focused thinking approach

Literature	Applications of VFT
Keeney and McDaniel (1992)	Strategic decisions at British Columbia Hydro and Power Authority
Keeney (1999a)	Foundation for Seagate to identify its vision and mission statement
Keeney (1999b)	Values of Internet commerce to customers
Torkzadeh and Dhillon (2002)	Develop instruments that measure factors that influence the success of Internet commerce
Dhillon et al. (2002)	Value focused assessment of individual privacy concerns for Internet commerce
Dhillon and Torkzadeh (2001)	Value focused assessment of information system security in organizations
Siau et al. (2003) and Siau et al. (2004b)	Trust in m-commerce
Siau et al. (2004a)	Values of m-commerce
Nah et al. (2005)	Values of mobile applications in a public utility company

approach not only can uncover hidden objectives, but it can also provide a systematic, proven, and reliable way of identifying the relationships among objectives.

8. Conclusion

Mobile technology has advanced rapidly and significantly, and has shown great promise and potential for organizational use. As demonstrated in this study, mobile technology can be used as a strategic tool in organizations.

This study examines the strategic impact of mobile technology on organizations by studying a leading international publishing company using the VFT approach. The use of the qualitative approach provides us with deep insights on the strategic implications of using mobile technology to support sales and marketing in this organization.

One of the major contributions of this study is the development of a means-ends objective network that depicts the means and fundamental objectives, as well as relationships between the objectives. Based on the means-ends objective network we derived from the study, we found six fundamental objectives that not only correspond closely to the company's strategies but they are also the main sources of competitive advantage for the company.

We identified three ways in which mobile technology can bring strategic implications to organizations. They are: (1) improve working process; (2) increase internal communication and knowledge sharing; and (3) enhance sales and marketing effectiveness.

As one of the first empirical studies to examine strategic and organizational implications of mobile technology, this study provides a means-ends objective network that can serve as a conceptual foundation for future research in the area. For researchers, this network presents a framework and model for understanding and explaining the strategic implications of mobile technology in organizations. Although this research is based on a leading publishing company, we believe the findings are also applicable to other organizations. For practitioners, the means-ends objective network presents

a ‘roadmap’ that can help them achieve company strategies and gain competitive advantage when adopting and implementing mobile technology.

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References

- Andersen, K.V., Fogeigren-Pedersen, A., Varshney, U., 2003. Mobile organizing using information technology (MOBIT). *Information Communication and Society* 6 (2), 211–228.
- Anderson, M.C., Banker, R.D., Ravindran, S., 2003. The new productivity paradox. *Communications of the ACM* 46 (3), 91–94.
- Bakos, Y., Treacy, M.E., 1986. Information technology and corporate strategy: a research perspective. *MIS Quarterly* 10 (2), 107–119.
- Banker, R.D., Kauffman, R.J., 1988. Strategic Contributions Of Information Technology: An Empirical Study of ATM Networks Proceedings of the 9th International Conference on Information Systems, Minneapolis, MN, 9 1988 pp. 141–150.
- Barnes, S., 2002. The mobile commerce value chain: analysis and future developments. *International Journal of Information Management* 22, 91–108.
- Barnes, S., 2003. Wireless applications in the firm’s value chain. In: Barnes, S. (Ed.), *M-Business: The Strategic Implications of Wireless Communications*, Butterworth-Heinemann, MA, pp. 38–59.
- Bartel, A., 2004. Human resource management and organizational performance: evidence from retail banking. *Industrial and Labor Relations Review* 57 (2), 181–203.
- Barua, A., Kriebel, C.H., Mukhopadhyay, T., 1995. Information technologies and business value: an analytic and empirical investigation. *Information Systems Research* 6 (1), 3–23.
- Bharadwaj, A.S., 2000. A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS Quarterly* 24 (1), 169–196.
- Bharadwaj, A.S., Bharadwaj, S.G., Konsynski, B.R., 1999. Information technology effects on firm performance as measured by Tobin’s *q*. *Management Science* 45 (6), 1008–1024.
- Brown, R.T., Gatian, A.W., Hicks Jr., J.O., 1995. Strategic information system and financial performance. *Journal of Information Systems* 11 (4), 215–248.
- Brynjolfsson, E., 1993. The productivity paradox of information technology. *Communications of the ACM* 36 (12), 67–77.
- Buhalis, D., 2004. eAirlines: strategic and tactical use of ICTs in the airline industry. *Information and Management* 41, 805–825.
- Cooper, B., Watson, H.J., Wixom, B.H., Goodhue, D.L., 2000. Data warehouse supports corporate strategy at first American corporation. *MIS Quarterly* 24 (4), 547–567.
- Davis, G.B., 2002. Anytime/anyplace computing and the future of the knowledge work. *Communications of the ACM* 45 (12), 67–73.
- Devaraj, S., Kohli, R., 2000. Information technology payoff in the health-care industry: a longitudinal study. *Journal of Management Information Systems* 16 (4), 41–67.
- Dhillon, G., Torkzadeh, G., 2001. Value-Focused Assessment of Information System Security in Organizations, in Proceedings of The Twenty-Second International Conference on Information Systems, pp. 561–565.

- Dhillon, G., Bardacino, J., Hackney, R. 2002. Value Focused Assessment Of Individual Privacy Concerns For Internet Commerce, in Proceedings of The Twenty-Third International Conference on Information Systems, pp. 705–709.
- Gayeski, D.M., 2002. Learning Unplugged. American Management Association, New York, New York.
- Gebauer, J., Shaw, M.J., 2004. Success factors and impacts of mobile business applications: results from a mobile e-procurement study. *International Journal of Electronic Commerce* 8 (3), 19–41.
- Griffiths, G.H., Finlay, P.N., 2004. IS-enabled sustainable competitive advantage in financial services, retailing and manufacturing. *Journal of Strategic Information Systems* 13, 24–59.
- Herzberg, A., 2003. Payments and banking with mobile personal devices. *Communications of the ACM* 46 (5), 53–58.
- Hitt, L.M., Brynjolfsson, E., 1996. Productivity, business profitability, and consumer surplus: three different measures of information technology value. *MIS Quarterly* 20 (2), 121–141.
- CIO insight (2003) When Will Mobility Add Strategic Value? Available at: <http://www.cioinsight.com/article/0,3959,1033114,00.asp>.
- Ives, B., Learmonth, G.P., 1984. The information system as a competitive weapon. *Communications of the ACM* 12 (3), 1193–1201.
- Jarvenpaa, S.L., Ives, B., 1990. Information technology and corporate strategy: a view from the top. *Information Systems Research* 1 (4), 351–376.
- Jarvenpaa, S.L., Lang, K.R., Takeda, Y., Tuunainen, V.K., 2003. Mobile commerce at crossroads. *Communications of the ACM* 46 (12), 41–44.
- Keeney, R.L., 1992. *Value-Focused Thinking*. Harvard University Press, Cambridge p. 1992.
- Keeney, R.L., 1999a. Developing a foundation for strategy at Seagate software. *Interfaces* 29 (6), 4–15.
- Keeney, R.L., 1999b. The value of Internet commerce to the customer. *Management Science* 15 (4), 533–542.
- Keeney, R.L., McDaniels, T., 1992. Value-focused thinking about strategic decisions at BC Hydro. *Interfaces* 22 (6), 94–109.
- Kohli, R., Devaraj, S., 2004. Realizing the business value of information technology investment: an organizational process. *MIS Quarterly Executive* 3 (1), 53–68.
- Kraemer, K.L., Dedrick, J., 2002. Strategic use of the Internet and e-commerce: Cisco systems. *Journal of Strategic Information Systems* 11, 5–29.
- Looney, C.A., Jessup, L.M., Valacich, J.S., 2004. Emerging business models for mobile brokerage services. *Communications of the ACM* 47 (6), 71–77.
- Mahmood, M.A., Mann, G.J., 1993. Measuring the organizational impact of information technology investment: an exploratory study. *Journal of Management Information Systems* 10 (1), 88–122.
- Malladi, R., Agrawal, D.P., 2002. Current and future applications of mobile and wireless networks. *Communications of the ACM* 45 (10), 144–146.
- Mallat, N., Rossi, M., Tuunainen, V.K., 2004. Mobile banking services. *Communicates of the ACM* 47 (5), 42–46.
- Martinsons, M.G., Martinsons, V., 2002. Rethinking the value of IT, again. *Communications of the ACM* 45 (7), 25–26.
- McKinsey and Co. 2002. US Productivity Report 1995-2000, available at www.mckinsey.com/knowledge.
- Melville, M.N., Kraemer, K., Gurbaxani, V., 2004. Review: information technology and organizational performance: an integrative model of IT business value. *MIS Quarterly* 28 (2), 283–322.
- Mooney, J.G., Gurbaxani, V., Kraemer, K.L., 1995. A Process Oriented Framework for Accessing the Business Value of Information Technology Proceedings of the Sixteenth International Conference on Information Systems, Amsterdam, The Netherlands 1995 pp. 17–28.
- Mukhopadhyay, T., Kekre, S., Kalathur, S., 1995. Business value of information technology: a study of electronic data interchange. *MIS Quarterly* 19 (2), 137–156.
- Nah, F., Siau, K., Sheng, H., 2005. The value of mobile applications: a study on a public utility company. *Communications of the ACM* 48 (2), 85–90.
- Perry, M., O'hara, K., Sellen, A., Brown, B., Harper, R., 2001. Dealing with mobility: understanding access anytime, anywhere. *ACM Transaction on Computer-Human Interaction* 8 (4), 323–347.
- Pfeiffer, H.K.C., 1992. *The Diffusion of Electronic Data Interchange*. Springer-Verlag, New York, NY.

- Porter, M.E., Millar, V.E., 1985. How information gives you competitive advantage. *Harvard Business Review* July–August, 149–160.
- Quinn, J.B., Baily, M.N., 1994. Information technology: increasing productivity in services. *Academy of Management Executives* 8 (3), 28–51.
- Ray, G., Barney, J.B., Muhanna, W.A., 2004. Capabilities, business processes, and competitive advantage: choosing the dependent variable in empirical tests of the resource-based view. *Strategic Management Journal* 25 (1), 23–37.
- Ryan, S.D., Harrison, D.A., 2000. Considering social subsystem costs and benefits in information technology investment decisions: a view from the field on anticipated payoffs. *Journal of Management Information Systems* 16 (4), 11–40.
- Santhanam, R., Hartono, E., 2003. Issues in linking information technology capability to firm performance. *MIS Quarterly* 27 (1), 125–153.
- Sarker, S., Lee, A.S., 2003. Using a case study to test the role of three key social enablers in ERP implementation. *Information and Management* 40, 813–829.
- Sarker, S., Wells, J.D., 2003. Understanding mobile handheld device use and adoption. *Communications of the ACM* 46 (12), 35–40.
- Schlosser, F.K., 2002. So, how do people really use their handheld devices? An interactive study of wireless technology use. *Journal of Organizational Behavior* 23, 401–423.
- Sethi, V., King, W.R., 1994. Development of measures to access the extent to which an information technology application provides competitive advantage. *Management Science* 40 (12), 1601–1627.
- Siau, K., Shen, Z., 2003. Building customer trust in mobile commerce. *Communications of the ACM* 46 (4), 91–94.
- Siau, K., Sheng, H., Nah, F., 2003. Developing a Framework for Trust in Mobile Commerce Proceedings of the Second Annual Workshop on HCI Research in MIS, Seattle, WA 2003 pp. 85–89.
- Siau, K., Sheng, H., Nah, F., 2004a. The Value of Mobile Commerce to Customers Proceedings of the Third Annual Workshop on HCI Research in MIS, Washington, DC 2004.
- Siau, K., Sheng, H., Nah, F., Davis, S., 2004b. A qualitative investigation on consumer trust in mobile commerce. *International Journal of Electronic Business* 2 (3), 283–300.
- Soh, C., Markus, M.L., 1995. How IT Creates Business Value: A Process Theory Synthesis Proceedings of the Sixteenth International Conference on Information Systems, Amsterdam 1995 pp. 29–41.
- Strassmann, P., 1990. *The business value of computers: an executive's guide*. The Information Economic Press, New Canaan, CT.
- Torkzadeh, G., Dhillon, G., 2002. Measuring factors that influence the success of internet commerce. *Information Systems Research* 13 (2), 187–204.
- Varshney, U., Vetter, R., 2000. Emerging mobile and wireless networks. *Communications of the ACM* 43 (6), 73–81.
- Weill, P., 1992. The relationship between investment in information technology and firm performance: a study of the value manufacturing sector. *Information Systems Research* 3 (4), 307–333.
- Yin, R.K., 1994. *Case Study Research: Design and Methods*. Sage Publications, Thousand Oaks, CA.