Managers and the Mobile Device: M-Learning and M-Business—Implications for the United States and China

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The use and abundance of mobile devices in the workforce, both company issued and personally owned has exploded worldwide. The propagation of the smartphone has led companies to consider how conducting mobile or m-business can improve their organization by increasing the productivity and efficiency of the workforce. This paper will explore and compare the current usage of smartphones in United States and Chinese businesses, the advantages and disadvantages of mobile learning and mobile business and the manager's part in overseeing their use by employees while understanding the security risks of the devices and protecting company data.

INTRODUCTION

United States and Chinese Economies

China's economic ascendency over the past 28 years has represented an economic miracle, and this tremendous growth has changed China from a poor economy to one of the world's leading economies. China's economic surge has also strengthened and increased the commercial ties between it and United States. Recently, it has been the third-largest US trading partner, its second-largest source of imports, its fourth-largest export market, and it has been the fastest growing US export market over the past five years (Elwell, Abonte, & Morrison, 2007). China is also the second-largest foreign holder of US Treasury securities, which has helped the US federal government fund its budget deficit (Elwell et al., 2007).

China has surpassed Japan in the second quarter of 2010 to become the world's second-largest economy just behind the United States (Barboza, 2010). It is the biggest exporter, auto buyer and steel producer, and its worldwide influence is growing. Moreover, China's spectacular growth is witnessed by its voracious appetite fueling demand for resources, machinery and products from the developing world (Hosaka, 2010). Some analysts predict that China will surpass the US by 2020 (Scherer, 2010).

The global significance of the US and Chinese economies is reason to consider how these economies are contributing to other factors and areas of innovation in business. The use and abundance of

mobile devices in the workforce, both company issued and personally owned has exploded. Recent statistics show that 55.7 million US consumers owned smartphones during the three months ending in August 2010 (Deatsch, 2010) and some researchers are predicting that smartphone usage will overtake other types of phones by the end of 2011 (Nielson, 2010). In China, where the population is 1.3 billion people, smartphone use has an even stronger market and substantial growth potential. Total domestic sales of smartphones have reached 13.48 million in the second quarter alone with a sequential growth rate of 27.5% (Analysys International, 2010a). Guo Haitao, vice-president of the Chinese research firm CCW Research, said smartphones in China are expected to account for 40 percent of the overall cell phone market by 2012 (Wang, 2009). Several reasons for the continued growth globally are the emergence of greater generation mobile technology networks, use of multiple mobile accounts from the same person and mobile penetration in later adopter countries (Boretos, 2007). According to Portio Research (2009) the number of mobile subscribers is expected to continue to grow rapidly to about 5.3 billion users in 2013. In China, where economic and social reform has led to a decline in the number of Chinese living in poverty and a rise in the average income per capita, a growth phase in mobile penetration is projected over the next few years (Boretos, 2007). This propagation of the smartphone has led companies to consider how conducting mobile or m-business and mobile learning or m-learning, can improve their organization by increasing the productivity and efficiency of the workforce.

While there is no standard definition of a smartphone across the smartphone industry, generally, the devices have more features than a regular cellular phone. The Australian Flexible Learning Framework (2010) describes the following differences between regular cellular phones and smartphones: smartphones allow users to access e-mails, contacts, and a calendar of appointments at anytime. A smartphone has more advanced features than a regular cell phone with more memory, faster processor and high-resolution screen, and smartphones allow users to run hundreds of thousands of applications or apps. Businesses need to consider these differences in company policies and employee training because smartphones and their use for accessing business related data need to be considered along the same lines as a laptop or company issued computer (Ogren, 2009). A recent example of employee misuse of company equipment in the workplace happened in Defiance, Ohio, USA where twelve employees were fired for circulating an off-color joke using computing devices in the workplace (FoxToledo, 2010). This type of inappropriate workplace behavior prohibited in employer technology policies should also include mobile devices.

LITERATURE REVIEW

Popular Mobile Devices
United States

Though there are many categories and models of smartphones, the top devices in the US are the Blackberry, Android, and iPhone. The Blackberry device has long been the smartphone chosen by US businesses for their employees since appearing on the market in 2002. A recent survey by Crowd Science found 66% of businesses planning to issue mobile devices for employees will purchase Blackberry's (Visage Mobile, 2010). However, of those employees who use an employer issued Blackberry, only 45% were satisfied with the device compared to 71% of iPhone users and 70% of Android users (Visage Mobile, 2010). This is important to consider when companies are faced with decisions on the type of mobile device to purchase for their employees, the current applications available for the device, and whether or not to allow employee-owned mobile devices onto the company network.

China

The smartphone market in China is expected to change due to the sales campaign of Apple's iPhone and the Android platform, as well as other providers' entry into the smartphone market (Analysys International, 2010a). Among different popular devices, the iPhone is considered one of the "hottest" smartphones in China. Since its launch on September 25, 2010, about 100,000 units of the phone were sold within four days, and another 100,000 consumers who placed orders for these units would receive their phones by the end of October. Even though Nokia still occupied the greatest share at 29.3% in the

smartphone market in the first quarter of 2010, the percentage has shrunk, and it is the first time Nokia dropped to less than 30% in terms of its sales volume. This also indicates Nokia's dominant position in the Chinese domestic smartphone market has been threatened, and its market share is no long remarkable. Further, due to the adjustment of sales policy towards the iPhone introduced by Unicom and other model smartphones such as the Android platform, Nokia's smartphone will continuously sustain enormous pressure from its formidable competitors (Analysys International, 2010b).

Despite Nokia's market share dropping under 30%, even under risk of being constantly eroded, its share is still huge compared with other types of smartphones. The Nokia 5230 V5.0 Symbian 9.4 S60 is the most popular among Chinese smartphones users, because of its superior price quality and outstanding performance. Currently, its unit price is around 1000RMB. Critical factors affecting the sales of the top ten smartphones in China are price, touchable screen and screen size. Even though Apple's iPhone4 has the most sophisticated technology, unparalleled functions and distinguished appearance compared with other types of smartphones, its price prohibits some buyers from purchasing it, thus only ranking six in popularity. With the advancement of the Internet, it is predicted that by the latter half of 2010, the direction of the Chinese smartphone market will be heading towards the larger touchable screen and affordable prices (Hu, 2010).

Telecom operators in China are exclusively Chinese and under State control with the State possessing majority ownership in all of them. After the 2008 reorganization of China's telecommunication industry, three cell phone service providers were left: China Mobile, China Unicom, and China Telecom (Powertech News, 2009; Uria-Recio & O'Connor, 2004). China Mobile, which is the largest telecom operator by subscribers, has experienced modest growth in profits as competition intensifies and a widening penetration of mobile services has occurred (Yue, 2010).

Mobile Learning

Since so many smartphones are being purchased by individuals and businesses, and the trend is expected to continue, there is a growing interest in how these devices could be used in the workplace for learning and training. In a recent survey of organizational practices on e-learning, which can be defined as broadly as lessons delivered in a face-to-face classroom using computers, to user-generated content, mobile devices, and collaborating with social networks, Rossett & Marshall (2010) found that the use of mobile devices for learning was rare, ranking last in reported current practice. However, using mobile devices for learning was named as one of the most favored forms of instructional design to consider in the future. What mattered most to organizations in the survey in their use of e-learning and possible barriers was money, resistance to change, technology shortcomings and a client preference for the classroom (Rossett & Marshall, 2010). Mobile phones are relatively inexpensive devices to purchase but can be costly over the long term when considering the cost of service contracts. The cost of the most popular smartphone devices in the US can average around $3800 over two years (Sullivan, 2009). Cost to businesses could easily be much larger if factors such as misuse of the device during work time lead to wasted time and inefficiency.

In China, a 16-gigabyte iPhone 4 with a two-year contract is priced at 5,880 Yuan or the equivalent of $878 US (Tuo & Shen, 2010). Two year contract costs for other popular advanced devices, for example, the Samsung S8500, could be prohibitively expensive, around 22520 Yuan ($3360 US). By contrast, less popular, mediocre smartphones, such as Motorola XT300, cost 1680 Yuan ($251 US) for a two-year contract (China Unicom, 2010).

Model to Consider for M-learning

Online or web-based learning has become a popular way for businesses to offer teaching and learning for employees (Davidson-Shivers & Rasmussen, 2006). Therefore, it is no surprise that converting courses to mobile learning or m-learning is being considered for the future. The term m-learning refers to the use of mobile and handheld devices (Mahmoud, 2008). Online learning has been defined as a situation where "learners are at a distance from the instructor but all are connected via the Internet and Web" (Center for Technology in Education at John Hopkins University [CTE], 2003, n.p. as cited in Davidson-

Shivers & Rasmussen, 2006). The Internet and the Web have become major forms of delivery for online learning because of the rise in the connections to networks, affordability of technology and ease of use of software applications (Davidson & Rasmussen, 2006). M-learning offers advantages for employees because they can access training information anytime and anywhere, and the devices are smaller than laptops so they are more portable.

In the business setting, when offering material in an online learning environment, choices must be made in terms of hardware, software, administration, management, and infrastructure. The choices can be explored using a web-based evaluation tool developed by Khan (2001)—the framework for e-learning. E-learning refers to "the use of any electronic applications and processes for instruction" (Davidson-Shivers & Rasmussen, 2006, p.10). The term e-learning is sometimes used synonymously with online learning and will be considered for adaption to m-learning. Khan's framework (2001) considers eight areas for evaluating the online learning of material; pedagogical, technological, interface design, evaluation, management, resource support, ethical, and institutional. These eight areas can be used to consider the advantages and/or disadvantages of offering material electronically and used to make a decision as to whether or not a business should offer specific material through mobile devices.

Pedagogical

The pedagogical choices for offering m-learning in a business environment involve analyzing the content, conducting a learner analysis, deciding on the goals for the instruction, and the information delivery such as text, audio, and video. A method for answering questions, clarifying direction and promoting collaboration with other learners should be analyzed.

Technological

The technological choices that should be made include thinking about if the m-learning content will have personnel to assist employees, determining the hardware and software requirements to run the course and for the learners to install on the devices used to access the content. A business also needs to determine if the course will provide links to resources to either purchase or download the necessary software and the cost of any necessary software purchase or downloads.

Interface Design

Many decisions will need to be made in the interface design of the content which refers to the overall look of the m-learning program and includes the design of the Web pages and the browser(s) used to access the content. This category also includes the content design, navigation with the site, and the testing of usability.

Evaluation

M-learning courses should also have a method for evaluation. This includes both the assessment of employees and the evaluation of the instruction and learning environment.

Management and Resource Support

The management of m-learning, using Khan's framework, refers to the maintenance of the learning environment and the distribution of information. Businesses need to determine the level of staff support for the m-learning. A business also will need to consider how the employees will receive notification of the availability of the training and the accessibility of the learning. Choices exist for when the m-learning will take place— during the employee's workday or in addition to the workday. Closely related to the management of the m-learning is the resource support. This area considers what is required to foster a meaningful learning environment. This means exploring whether troubleshooting help will be available and how much and how often.

Ethical

A business will need to consider how the m-learning relates to social and political influence, the cultural diversity within the organization, employee diversity, geographical differences, information accessibility, etiquette and any legal issues that may arise because of using a m-learning course.

Institutional

Finally, the business should consider any issues that are related to the human resources department and other administrative functions. This involves considering the documentation required for employees participating in the m-learning. In addition, consideration should be given to how the documentation will be maintained and whether or not the online training will be required for salary increases or as part of an ongoing learning and training requirement.

Advantages of m-Learning

The benefits of offering content mobilily can be broken down into two categories, benefits for the business and benefits for employees. Businesses can benefit by using m-learning in several ways. Perhaps the most important is the cost efficiency that m-learning could provide. In a recent report by the American Society for Training and Development (ASTD), 70 percent of learning organizations looked for ways to become more efficient at delivering learning, such as e-learning, which could also include m-learning. This has lead to an increase in informal learning, reduction of travel to training events and more use of webinars and podcasts for just-in-time learning ("Learning in Tough Economic Times," 2009). Other benefits for businesses using m-learning include the potential to reach a large number of employees easier and more effectively.

Offering employees training through mobile devices can provide benefits for employees by giving them the flexibility of pursuing training anywhere and anytime, convenience and the continued development of knowledge, skills, and abilities (Davidson-Shivers & Rasmussen, 2006; Miner, 2009).

However, a business considering m-learning should first determine the purpose of the learning initiative within that particular business. The purpose of m-learning should be to drive business results and not simply reduce the costs of training. Companies may choose m-learning over traditional learning for the same reasons they choose e-learning; increased mobility of the workforce, greater acceptance of web-based training, potential for cost savings, and better system operations of networks (Britt, 2004).

Costs of undertaking any learning initiative in an organization are always at the forefront and the return on investment (ROI) should be evaluated. The ROI is defined in accounting as earning per dollar of investment (SkillSoft, 2005). A ROI evaluation of converting traditional training to mobile learning would compare the costs of m-learning to the monetary benefits that resulted from the conversion. Measuring the actual impact of learning in performance can be accomplished by increasing the benefit derived from the learning solution and reducing the learning solution costs (SkillSoft, 2005).

Mobile Business

Even though electronic commerce bears continuous phenomenal growth, mobile commerce is still in its infancy (Hsieh, 2007), and research on a business model-based mobile business classification is limited (Leem, Suh, & Kim, 2004). Nevertheless, it is still expected that wireless and mobile networks will supply new revenues for growth in mobile commerce and offer new applications to business and consumers (Coursaris & Hassanein, 2002; Kumar & Zahn, 2003). Mobile business or m-business represents the convergence of two technologies – the Web and wireless devices (Lu, Liu, Yu, & Yao, 2003). Any business with an Internet presence, even a basic Web site, is participating, perhaps unknowingly in m-business because customers can access company information, such as a Web site, using a mobile device. Hence, businesses need to consider m-business in their strategic and marketing plans.

According to the GartnerGroup, consumer to business e-commerce will come from smartphones using mobile commerce technology (Hsieh, 2007). Many researchers suggest the next phase of electronic business growth will be in wireless and M-commerce (Ngai & Gunasekaran, 2007; Smith, 2006;

O'Connell, 2005; Matthew, Sarker, & Varshney, 2004; & Urbaczewskj, Valacich, & Jessup, 2003). The mobile service market is projected to have a substantial impact on the daily activities and social lives of people in the future, profoundly changing the economies and social interaction behavior of people (Chen & Cheng, 2010).

Companies considering a planned m-business strategy should take into account m-business for new and existing customers and increasing efficiency for employees. Mobile services can be categorized into mobile communications, mobile transactions and mobile information (Chen & Cheng, 2010). Mobile users can access services and applications for a particular business and engage in transactions based on the services available on a company's Web site. Research on mobile service concepts is limited, but as more users adopt smartphone technology, new applications and services are being developed to meet the demand (Chen & Cheng, 2010).

Chen and Cheng (2010) described different strategies for a mobile business model approach. Two of the categories identified were: (1) the mobile service provider provides content and a platform to deliver and facilitate services in the form of business and service management and customer relationship management, and (2) the mobile service provider creates content and directly provides the content to the mobile user. These categories consider the relationship a business has with the mobile service provider, something to consider when deciding on a type of smartphone to purchase for employees.

Leem, Suh, and Kim (2004) suggest a mobile business model from the approach of B2C (business to customer), and B2B/B2E (business to business; business to employee). Using the recommended approach by Leem et al., (2004) allows for differences in perspectives, and purpose. Companies can strategically consider each approach for defining the marketing, sales, and transaction functions using mobile technology.

Disadvantages of Mobile Devices in the Workplace

While the potential for attracting and retaining customers using mobile devices is advantageous to a business, there are potential disadvantages. Customers and employees may be uneasy or frustrated using mobile technology for business transactions if the speed of the connection is slow, the screen size is too small or accessing the data is generally inconvenient (Leem et. al., 2004).

In addition, personal calls and e-mails could detract from the time for which the employer is paying. Unauthorized use of the Internet not only wastes employees' time but also reduces a company's bandwidth that rightfully should be spent on work (Ariss, 2002). Lee (2006) summarized disadvantages of mobile business in four areas: security, management, information access, and effects on employees and distributed workforces. In terms of the security, user identification and privacy, could easily be hacked through the wireless transmission. Besides, since m-business allows for mobilization, the workforce becomes more distributed; the further the workforce is distributed, the harder it is for the company to manage. Even though m-business increases efficiency, effectiveness, and convenience, paradoxically, it also slows everything down simultaneously when speeding things up. For example, workers are distracted due to the bombardment of e-mails, messages, phone calls, and etc. Additionally, workers feel pressure to be more productive due to technology making things easier, which means with the time they save, more is expected to be done. With the increasingly distributed workforce led by m-business, the collaborations among project teams will be threatened. This is because when people are linked to each other through the web, phone calls, instant messaging, and even teleconferencing, it will be tough to gather everyone in one place and at one time to work together. Quite often, wireless mobility steals employees' time with family because this makes it possible for them to take their work to home, thus potentially weakening the family relationships and losing social interaction.

Businesses participating in mobile commerce to sell goods or provide services could expand their market, increase sales and retain their customers. However, they are also limited by some distinct disadvantages – speed of delivery, small screen size and security. Larmore (2010) indicated that mobile phones are less capable than computers in terms of speed; therefore, it is suggested to remove all images that are not vital in mobile websites, plus eliminating flash, scripts, and plug-ins in order to optimize the devices to ensure customer satisfaction. When it comes to the average screen size of a mobile phone, it is

only two by three inches. The small screen size implies that the business should cut down the amount of information presented, number of steps for checking out, and guarantee a maximum amount of background and text contrast. Finally, Larmore (2010) emphasized the security issues associated with mobile phones. As mobile phones are more commonly lost or stolen than laptops, companies have to ensure that the security and privacy of its customers are not compromised in case the mobile phones for business use are lost. It is recommended to avoid storing sensitive information on mobile devices, strengthen the data encryption, and protect the wireless connection from unauthorized access, hackers and viruses.

M-business may also be unsuccessful in some specific markets. For example, consumers are hesitant to shop furniture-related goods online because they want to test the comfort of an expensive item such as a sofa before they purchase it (Blackman, 2009). Additionally, people prefer to shop for perishable items like food in a conventional way instead of shopping through the Internet. One of the factors discouraging consumers from shopping for perishable items online is the time required for delivering such goods (Giles, 2010). Giles (2010) further pointed out there are still many people who cannot utilize m-business due to poor conditions, lack of knowledge, or mistrust of conducting financial transactions through the Internet. John (2008) revealed that even though e-commerce could be an effective conduit for visual and auditory information–seeing pictures, hearing sounds, and reading text, it does not allow for the full scope for our senses. Thus, e-commerce does not convey the richness of the world. For the company using e-commerce, they have to employ trained, well-skilled workers to maintain and create the e-commerce facility of the company, thus increasing the labor cost. The factors effecting e-commerce are the same for m-business.

Current Mobile Applications for Businesses
United States

Useful basic applications or "apps" for small businesses can cost as little as $10 and moderate apps as little as $2,000 (Yates, 2010). The use of smartphone apps is predicted to explode with downloads of mobile apps increasing from around seven billion in 2009 to nearly $50 billion by 2012 (Yates, 2010). Smartphone apps are changing the way businesses operate from documenting expenses and processing credit cards to enhancing the way customers interact with their products and services (Ransom, 2009). Some business tasks are allowing companies to free up sales staff and cut down on paperwork (Raice, 2010). Insurance Company, Aflac Inc. for example offers its 70,000 sales employees the option of uploading various mobile apps to their personal smartphones for accessing the customer database, claims or policy information (Raice, 2010).

China

The smartphone business application industry in China is still in its infancy. There are many hardware platforms in the market, thus many companies producing business application software are caught in a dilemma (Zi, 2009). However, this has not hindered the rapid development and increased popularity of smartphones. China is entering a phase of dramatic growth in the smartphone ownership and the market for apps since new young wealthy consumers are becoming comfortable with the technology (Longden, 2010). According to the Ministry of Commerce of The People Republic of China, the scale of the Chinese e-commerce market has exceeded 3.5 trillion Yuan ($0.52 trillion) for 2009, an increase of 48.5% over 2008. It is predicted that transactions will exceed 7.5 trillion Yuan ($1.12 trillion) in 2012. With expanding technology purchased by businesses, the smartphone will gradually supersede the personal computer (Liu, 2010). Recently, China Telecom and RIM Co. began collaborating to promote the BlackBerry Storm 9530, which is targeted at Government & Enterprise customers. As far as its business applications is concerned, it supports installation of an application system, and allows its users to seamlessly, and securely send e-mails to their enterprise account. In addition, this smartphone provides "simultaneous functions", which means it could allow users to send e-mails, surf websites, synchronize the data, and maintain phone calls, etc. at the same time. This certainly increases the working efficiency of business people (SoHu IT, 2010). Nevertheless, smartphone business usage in China still is not

aggressively prospering, and one of the major concerns that business users have is the security problem. For example, since the manipulation of the smartphone is out of range of IT control, the infected smartphone could spread the virus by simply connecting the Wi-Fi of its user's company, and then, automatically force the infected smartphone to send the enterprise confidential data in/out, thus potentially crippling the working mechanism of the entire company (SonicWALL, 2010).

Security of Devices

Some of the attractiveness of using the smartphone, such as its portability and size, are also features that have led to headaches for businesses as employees lose the devices or they are stolen. The costs associated with lost or stolen data could be much more expensive, and more important to consider than the actual cost of the hardware itself (Richardson, 2003). Companies must be prepared and aware of potential security risks. While security risks never stop evolving, acknowledging the human computer interface (HCI) element in any security awareness training is imperative for effectively minimizing the risks and potential losses to businesses adopting mobile devices for m-learning or m-business functions (Shaw, Chen, Harris, & Huang, 2009).

Milligan & Hutcheson (2007) studied the possible risks of using smart phones and found the most typical forms of risk are:

(1) Viruses, worms, or other PDA-specific malware.
(2) Theft of sensitive data.
(3) Exposure of critical information through wireless sniffers. Wireless intruders could capture e-mails, e-mail addresses and attached data if security is insufficient.
(4) Loss, theft, or damage of device.
(5) Use of the device as a proxy to establish virtual connection from an attacker to an internal network.
(6) Data loss/leakage due to the small size and portability.
(7) Fraud enabled by remote access or copying mass amounts of sensitive data.
(8) Spam causing disruption and driving up service costs if targeted toward mobile devices.

In order to minimize the risks, several policies and procedures should be put in place.

Ariss (2002) examined the arguments for and against computerized monitoring in the workplace, particularly with respect to employees' e-mails, since the advanced technologies could be employed either to increase the working efficiency or misused to harm the organization by utilizing company resources for personal use, breaching company security, or triggering liability related issues. Ariss (2002) concluded that it is advised to identify the business purpose for the monitoring and confine it to what is necessary to accomplish that purpose. In addition, each employee should be required to sign a statement authorizing the organization with the right to monitor e-mails and computer usage. A company should develop a written policy defining the proper use of communication systems, inform employees of the timeframe to monitor them, inform employees about the company system which not always ensures privacy, and consider the possible costs (i.e. low morale, potential law suits, etc.) of excessive monitoring.

Nykodym & Ariss (2006) proposed several ways to fight the cybercrime, and indicated the control of cybercrime needs to be attacked from three levels: (1) management needs to be held accountable for handling concerns including hiring screenings, firing practices and Internet use contracts, (2) education and learning on the prevalence of cybercrime for companies and their managers, and (3) the issue should be dealt with on a very grand scale. This means for example, setting up an agency to develop international standards and punishments for cybercriminals, standardization for Internet security, and investigation into criminal activity on the Internet.

CONCLUSION

The growing trend and expectation to access information anytime and anywhere and connect to each other using mobile devices is anticipated to continue. With the worlds' two largest economies, the US and China, driving much of the innovation and adoption of technologies in the workplace and society, it is important to consider the emerging preferences of consumers and employees for mobile devices and the growing number of users in these two countries.

While smartphones offer convenience for m-learning, business transactions, personal use and recreational purpose, etc., they also bring about potential risks and dangers that could cause huge losses in terms of lost company and customer data. In order to minimize the potential loss caused by smartphones, companies need to have strong policies in place for their managers and employees on smartphones and the data the phones contain. It is also shown that data encryption, personal online operational behavior, anti-virus software installation, and application software installation are all critical to prevent smartphones from attacks. In addition, future research could be conducted on the following aspects of mobile devices; evaluating the ROI on m-learning and m-business, and company security issues with lost and stolen mobile devices. All of these issues are important to consider in the adoption and acceptance of mobile devices in the workplace and society—a trend that is expected to continue.

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