

# Relationships between Wireless Technology Investment and Organizational Performance

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## INTRODUCTION

Information technology (IT) investments are justified based on average improvement in performance (Peacock & Tanniru, 2005). Firms rely on those investments (Demirhan, Jacob, & Raghunathan, 2002; Duh, Chow, & Chen, 2006; Tuten, 2003) because executives believe that investments in wireless technologies help boost company performance. In this regard, the benefits from wireless technology applications depend on the extent to which they are congruent with the firm's performance (Duh et al., 2006). But, some IS researchers argue that competitors may easily duplicate investments in IT resources by purchasing the same hardware, software, and network, and hence resources necessarily do not provide sustained performance (Santhanam & Hartono, 2003).

The use of wireless communications and computing is growing quickly (Kim & Steinfield, 2004; Leung & Cheung, 2004; Yang, Chatterjee, & Chan, 2004). The future of wireless technology may also bring more devices that can operate using the many different standards and it may be possible that a global standard is accepted, such as the expected plans for the 3G technology UMTS. The wireless beyond 3G (B3G) systems or the so called composite radio environments (CRE) (or even 4G systems) possess multiple features that allow employees to collaborate with each other and provide diverse access alternatives (Kouis, Domestichas, Koundourakis, & Theologou, 2007). But issues of risk and uncertainty due to technical, organizational, and environmental factors continue to hinder executive efforts to produce meaningful evaluation of

investment in wireless technology (Smith, Kulatilaka, & Venkatramen, 2002). Despite the use of investment appraisal techniques, executives are often forced to rely on instinct when finalizing wireless investment decisions. A key problem with evaluation techniques that emerges is their treatment of uncertainty and their failure to account for the fact that outside of a decision to reject an investment outright, firms may have an *option* to defer an investment until a later period (Tallon, Kauffman, Lucas, Whinston, & Zhu, 2002). In addition, many authors believe that if firms can combine the appropriate investment strategies to create a unique wireless technology capability, superior firm performance can be the result.

Utilization of wireless devices and being "connected" without wires is inevitable (Gebauer, Shaw, & Gribbins, 2004; Jarvenpaa, Lang, Reiner, Yoko, & Virpi, 2003). Market researchers predict that by the end of 2005, there will be almost 500 million users of wireless devices, generating more than \$200 billion in revenues (Chang & Kannan, 2002; Xin, 2004). And by 2006, the global mobile commerce (m-commerce) market will be worth \$230 billion (Chang & Kannan, 2002). Such predictions indicate the importance that is attached to wireless technologies as a way of supporting business activities. Evaluating investments in wireless technology and understanding which technology makes the "best fit" for a company or organization performance is difficult because of the numerous technologies and the costs, risks, and potential benefits associated with each technology.

The purpose of this study is twofold: first, to identify and discuss different investment options, and second,

to assist in formulating a wireless technology investment strategy for increasing organizational performance. This article is organized as follows. The next section outlines wireless technology investments and organizational performance. The third section contains major uncertainties and risks in the field of wireless technologies. In the fourth section, wireless technology and IT investment tools are examined. In the fifth section, formulating a wireless technology investment strategy is discussed. The conclusion of this article is presented in the sixth section.

## **WIRELESS TECHNOLOGY INVESTMENTS AND ORGANIZATIONAL PERFORMANCE**

Each year large and small businesses invest in wireless technologies to improve their business performance (Huang & Hu, 2004). The relationship between wireless technology investments and business performance is complex and multifaceted (Duh et al., 2006; Huang & Hu, 2004). In recent years, many authors have written about the resource-based view (RBV) theory to examine the IT-firm performance relationship (Ravichandran & Lertwongsatien, 2002). Many past studies in information systems (IS) have implicitly assumed that IS assets could have direct effects on firm performance (Ravichandran & Lertwongsatien, 2002; Santhanam & Hartono, 2003; Zhuang & Lederer, 2006). The main issue in this study is that wireless technology is necessary for business survival and that the appropriate investment in wireless technology resources and capabilities leads to enhanced firm performance (Lu & Ramamurthy, 2004). In fact, this theory based framework commonly referred to as the RBV has been adopted to address the productivity paradox, the controversy over the business value of IT, or wireless technology investments (Duh et al., 2006).

According to the RBV theory, the benefits of superior IT capability must be sustainable over time (Santhanam & Hartono, 2003; Zhuang & Lederer, 2006). So the wireless technology investment may not be immediately reflected in firm performance because it takes time for firms to assimilate new technology and realize related performance benefits. Researchers state that IT investments are made with long-term goals and there is a time lag in obtaining benefits (Santhanam & Hartono, 2003). Using cross-sectional archival data,

Lu and Ramamurthy (2004) found that under low environmental dynamism conditions, the performance advantages of increased IT capability are found to sustain over time, and that the declining cost of wireless technology and IT over time provides improved performance (Demirhan et al., 2002).

Although some important work has been undertaken, the relationships between wireless technology investment strategies and organizational performance are not adequately represented in current IS research. This study is among the first effort toward this end.

## **MAJOR UNCERTAINTIES AND RISKS IN THE FIELD OF WIRELESS TECHNOLOGIES**

Business transactions conducted through mobile devices such as palm-sized computers and vehicle-mounted interfaces, using wireless telecommunication networks, are termed mobile commerce (Benou & Bitos, 2007; Lin & Wang, 2006). These devices are transforming work practices and organizations (Scheepers, Scheepers, & Ngwenyama, 2006). Businesses today face several uncertainties in using wireless technology effectively (Shim, Varshney, Dekleva, & Knoerzer, 2003; Yang et al., 2004). One of the first uncertainties for managers investing in wireless technology is that standards may vary from country to country, making it difficult for devices to interface with networks in different locations (Shim et al., 2003; Tarasewich, Nickerson, & Warkentin, 2002).

Another uncertainty is that wireless networks lack the bandwidth of their wired counterparts (Tarasewich et al., 2002). Applications that run well on a wired network may encounter new problems with data availability, processing efficiency, concurrency control, and fault tolerance when ported to a mobile environment. Limited bandwidth inhibits the amount and types of data that can be transmitted to mobile devices. Significantly improved bandwidth is clearly needed before new types of mobile applications, such as Web access, video, document transfer, and database access can be implemented. Bandwidth is expected to increase rapidly over the next few years with the introduction of new generation of wireless technologies. It is therefore uncertain how fast firms will follow the increased bandwidth evolution.

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