

# Wireless Business And The Impact On Firm Performance: The Strategic Move To Adopt A New Technology

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## ABSTRACT

*Information and Communications Technology (ICT) is receiving increased attention due to the vast potential it presents for rural and underserved settings. Successful adoption of new technology, in particular mobile commerce, can serve as a catalyst for improving quality of life and reducing the digital divide. Adoption of new technology is dependent upon variables such as: organizational culture, business strategy, as well as their surrounding environment. Hypotheses that investigate the relationships between the above variables and business performance in the context of the new technology adoption process are formulated. A sample of small and medium-sized businesses from the American Midwest that adopted, or are in the process of adopting, wireless technology is used to test these hypotheses. The methodology, results, and managerial implications are discussed.*

**Keywords:** Wireless Business; New Technology Adoption; Business Strategy

## INTRODUCTION

New technology adoption has received attention among researchers for some time. This includes early contributions of understanding the concept by Rogers (1962); computers (Stoneman, 1983); automatic teller machines (Murdock & Franz, 1983); the Internet (Kiiski & Pohjola, 2002); and Internet banking and shopping (Eastin, 2002). The adoption of new technology by businesses is a dynamic process, not well understood, with complexities that draw from the business environment, the organizational culture of the firm, its business strategy, and many other dimensions (Egan, Clancy, and O'Toole, 2003). The adoption process is fast and as new (information) technology becomes cheaper and more accessible, the competitive advantage early adopters have at the beginning, dissipates quickly (Beal 2000, Beinhocken, 1999, Chrisman and Leslie 1989).

In recent years, there has been discussion of whether ICT has changed the U.S. economy and society. Suggestions of an era of growth and productivity, low unemployment and inflation and economic expansion have been dubbed the "Information Revolution" or more often the "New Economy" (Taylor, 2001), however the diffusion of ICT remains inconsistent (Kanungo, 2001). With these challenges in mind, scholars and practitioners note that e-commerce and particularly m-commerce, has been embraced by businesses both small and large (Walzer, 2003; Taylor, 2001). Across a wide range of industries firms have adopted wireless business initiatives to better manage their internal processes as well as their interfaces with the environment. By understanding the determinants of business performance firms can better formulate their business models and comprehend how new technology can impact a firm and how companies can exploit this new technology (Afuah and Tucci, 2001).

There appears to be a gap in the literature with regard to mobile phone adoption and in particular m-commerce in rural communities in the Midwestern United States. This is surprising considering economic development initiatives developed by policy-makers at many different levels of government (Bartik, 2003). Calls for increasing wireless technology in rural regions of the United States have also been made by businesses, non-

government organizations and individuals interested in promoting the economic vitality of rural regions of the United States.

## **INTENSITY OF NEW TECHNOLOGY ADOPTION**

In the rural areas of the United States, labor-saving technology – coupled with globalization – are causing considerable disruption. Leading this new international economy, large corporations are squeezing labor resources and inefficiencies, causing many rural factories to close and relocate in order to deliver products at low cost to consumers. Conversely, these same forces are creating opportunities for small businesses and individual entrepreneurs. For example, the number of self-employed in rural areas has doubled since the 1980s (Goetz, 2008). The presence of self-employed workers and small businesses are important engines of economic growth (Bartik, 2002). The remarkable spread of self-employment has important implications for policy-makers, including decisions on wireless technology. Policymakers face critical decisions to raise the productivity of the self-employed, creating efficiencies and competitiveness for rural areas through the development of m-commerce.

Mobile Commerce applications are evolving with a wide variety of procedures in use. Applications have been developed for existing mobile platforms including laptop PCs, PDA's, probes (wireless sensors), telephone handsets, telephone headsets, mobile multimedia, wireless routers, gps, and specialty pagers. Mobile applications have focused on : (a) delivering existing Internet services to the mobile customer; (b) using location sensing to deliver location based information, (c) using location sensing for tracking (fleet services, automobiles, pets, etc.), (d) using broadband to deliver mobile entertainment content (music, games, etc.).

Application coverage is not universal and is constrained by the size, location and technology used by the mobile infrastructure provider. These issues are compounded in rural America by low population density and remoteness, with implications for access to markets, capital, labor, peers and infrastructure (Walzer, 2003). The sample for this research was obtained from the state of Kansas in the U.S. Midwest.

One of the most important changes for society through the adoption of ICT appears to be the way that business is conducted. The Internet and related technologies are creating new communication systems for a variety of businesses in many varied industries (Barnes, 2002). The proliferation of wireless telephones offers a platform for unprecedented penetration on the Internet and services such as m-commerce. M-commerce is defined as any transaction with a monetary value, direct or indirect, that is conducted over a wireless telecommunication network (Barnes, 2002). Low-End Applications (LEA) include email, web browsing and information services. High-End Applications (HEA) include transactions, inventory management, supplier-buyer relationship, interactivity, etc. Firms can choose, and several have already chosen, between adopting LEA or HEA. In time those who adopted LEA will move to the more sophisticated and more profitable HEA. High intensity adoption is determined by HEA. Low intensity adoption will characterize firms that adopt only LEA.

Businesses adopt high and low-end applications to gain competitive advantages or capabilities (Feeser and Willard, 1990). The literature has defined specific characteristics and conditions that facilitate the adoption process. These include functional differentiation (Afuah and Tucci, 2001), administrative intensity (Wu, Mahajan, and Balasubramanian, 2003), external and internal communication, and vertical integration (Chrisman, Bauerschmidt, and Hofer 1998). Environmental factors that have been identified as antecedents of innovation adoption are: (a) competition, the fear of being left behind, the perceived need to keep-up (Covin and Covin 1990, Eastin 2002), (b) consumers and suppliers, that demand the adoption of a new technology that they perceive will reduce their costs, or increase their benefits.

This adoption has been enabled by m-commerce, which has the ability to change society through the advent of the mobile phone. Mobile phones were first introduced by AT&T's first network in 1977 (Oneupweb, 2005). Mobile phones since then have been adopted worldwide at a rapid rate and now outnumber landline phones and televisions, with more than 3 billion mobile subscribers worldwide and forecast to double that number by 2011 (Global Information Inc. 2006). By penetrating at a faster rate throughout the world than other communication technologies, mobile communication has become part of many peoples' lives throughout the world (Castells et al., 2007). Digital technologies have provided new applications and reductions in cost, thus increasing the diffusion of

mobile technology and m-commerce (Rouvinen, 2006). Technological change of this scale has the potential to not only change the way we conduct business, but other areas such as personal consumption, education, health care, entertainment, and recreation. Such a web-based economy enables people from around the world to work together, especially in remote areas, to create synergies not previously possible (Taylor, 2001).

Critical to the rapid diffusion of mobile technology is that a high degree of technical proficiency is not required on the part of the user, such as with personal computers (PCs) and the internet. This is considered an important point especially for the development of underserved areas as the technology can leapfrog the development of landline infrastructure (van Dijk, 2005). Therefore, m-commerce becomes increasingly appealing to businesses as potential customers can be contacted with different media options and more often which may not be possible with traditional media outlets (Balasubramanian, Peterson and Javenpaa, 2002).

Information search frequency is a variable represented by the number of times managers receive data about the environment (Botchway, Goodall, Noon and Lemon, 2002). Liao, Welsch and Stoica, (2000) observed that managers could obtain information along a continuum ranging from irregular to continuous gathering. The irregular approach is a reactive, spot behavior that involves external cues that force management into action. By contrast, continuous scanning is a perpetual, systematic and proactive approach to search relevant environmental information. Some researchers suggest that the level of environmental uncertainty and the availability of resources within an organization affect the extent of scanning activities undertaken by managers (Boyd and Fulk, 1996; Glazer and Weiss, 1993).

Managers routinely use information search to reduce uncertainty. When the environment has remained relatively stable or changed in slow cycle, managers will commit fewer resources to information search, which will lead to a longer cycle time. Higher environmental turbulence generally elicits more frequent scanning efforts (Chakravarthy, 1997). Under such conditions, decision makers need more information to define problems, generate and evaluate alternative solutions (Elenkov, 1997).

We hypothesized that for all SMEs (both LEA adopters and HEA adopters) that a firm's strategy affects its performance (Black and Boal 1994; Sansberg, 1986). Strategies are more desirable if they create or exploit asymmetries among firms and contexts (isolation from rivals, low cost provider). Strategy configuration (such as isolation from rivals, low pricing strategy, and brand loyalty) and links between strategy, structure, and performance have been studied by Kagan, Lau and Nusgart (1990), Karp (2004) and Castrogiovanni (1996). Strategy and organizational adaptation and their influence on performance were the topic of several other studies among such as Palmer, Wright, and Powers (2001), Rouvinen (2006).

Findings show that businesses with particular levels of adaptation (speed of response, brand loyalty) tend to have specific strategy-structure arrangements, which influence performance. Therefore, firms with an optimum strategy-structure match tend to have higher performance. Size is thought to have an effect and thus, the case of SMEs is of particular importance.

- H1.** The more the firm is isolated from its rivals the higher its small business performance. The relationship will be stronger for LEA businesses than for HEA businesses.
- H2.** The extraction of temporary profits will negatively affect business performance. The relationship will be stronger for HEA businesses.
- H3.** Low pricing strategy is negatively related to business performance. The relationship will be weaker for the LEA businesses than for the HEA businesses.
- H4.** The higher the brand loyalty the higher the firm performance (stronger for HEA).
- H5.** Speed of response and performance are directly related (stronger for HEA).

**METHODOLOGY**

We surveyed over 900 businesses in part of rural Midwest (Kansas) to better understand the struggle local companies have with new technology adoption, especially mobile commerce. The questions asked relate to wireless technology devices used, applications implemented, or planned for the next two years, motivation to use wireless technology, and changes needed to expand their usage of wireless business. Other questions refer to the market and business environment (including government regulations and components of economic readiness as defined previously), its degree of turbulence, their business strategy, and their business performance.

The sampling frame was given by the list of businesses provided by the state Chamber of Commerce. We sent the survey to 987 small and medium-sized firms and received a 21.5 percent response rate. Results are shown in Tables 2, 3 and 4. Table 1 shows the wireless technology devices businesses use or plan to use in the near future (next year).

**Table 1: Wireless Technology Used for Business. Sampling Results**

<b>Technology</b>	<b>Already in Use (%)*</b>	<b>Plan to use in less than one year (%)*</b>	<b>Cumulative Percent (%)</b>	<b>Comments</b>
Cellular Phones	89.7	2.9	93.6	Close to achieving saturation
Wireless PCs	16.9	18.2	35.1	Rapid increase in adoption – the technology is moving towards mass adoption
Wireless Networks	13.3	16.0	29.3	Rapid increase in adoption (almost all early adopters use the technology)
Wireless PDAs	20.9	15.0	35.9	Increase (slower than the other technologies) in adoption
Other Wireless Devices	4.7	9.4	14.1	

\* percentage of businesses in the sample using or planning to use the technology (213 valid responses – see sample description)

**RESULTS**

Wireless networks are used only by early adopters. This research indicated that over 20 percent of all businesses have no application implemented. However only 8.5 percent will not implement any type of application for the next two years. While emailing/calendaring and web access are widely used (over one third of businesses), information services are used only by early adopters. Almost all firms polled use cellular phones (89.7 percent). Wireless operations management and interactive transactions are just emerging as options for business use.

Table 2 reports the means of the variables and their pairwise correlations. Tables 3 and 4 provide the results from hierarchical regression analysis with return on sales and growth rate as the dependent variable. Overall in both cases, incremental R-squares were all statistically significant, suggesting that after controlling for the effect of years in business and size, industrial business strategy variables contribute significant explanations of performance variance.

**Table 2: Descriptive Statistics and Pearson Correlation**

	Mean	Standard Deviation	Years in business	Size	Intensity of rivalry	Isolate from rivals	Extract temporary profits	Achieving a low cost position	Build brand loyalty	Speed of response
Years in business.	10.316	3.835	1.000							
Size	4.9243	1.217	.330***	1.000						
Intensity of rivalry	2.23	.64	-.039	.130*	1.000					
Isolate from rivals	4.25	2.65	-.003	-.004	.195***	1.000				
Extract temporary profits	2.82	2.41	-.142*	-.076	.085	.117	1.000			
Achieving a low cost position	5.24	2.28	.102	.204***	.066	-.115	.192***	1.000		
Build brand loyalty	6.18	2.29	.177**	-.031	-.020	.001	-.242***	.009	1.000	
Speed of response	6.57	2.13	-.053	-.137*	.115	-.034	-.081	-.078	.024	1.000

\*\*\* Correlation is significant at the 0.01 level (2-tailed).

\*\* Correlation is significant at the 0.05 level (2-tailed).

**Table 3: Regression Results High-End Applications Adopter Firms**

	Return on Sales				Growth Rate			
	Model 1		Model 2		Model 1		Model 2	
	$\beta$	<i>t</i>	$\beta$	<i>t</i>	$\beta$	<i>t</i>	$\beta$	<i>t</i>
Years in business	.111	1.353	.061	.800	.077	1.008	.191	-2.113*
Size	-.019	-.297	.049	.702	.073	.039	.011	.097
Isolate from rivals			.107	1.177			.078	.622
Extract temporary profits			-.213	-2.444**			-.161	-2.965***
Achieving a low cost position			-.114	-1.298			.179	1.099
Build brand loyalty			.034	.400			.187	2.333**
Speed of response			.048	.583			.155	2.711**
Adj. R <sup>2</sup>	.004		.170		0.02		.189	
F value	1.211		2.445***		.713		2.098**	

\*\*\* p < .01, \*\*p < .05, \* p < .1

**Table 4: Regression Results Low-End Application Adopters**

	Return on Sales				Growth Rate			
	$\beta$	<i>t</i>	$\beta$	<i>t</i>	$\beta$	<i>t</i>	$\beta$	<i>t</i>
	Years in business	.091	1.125	.059	.801	.079	.973	.210
Size	-.019	-.249	.042	.601	.092	.099	.021	.189
Isolate from rivals			.203	2.587**			.045	.556
Extract temporary profits			.303	2.983**			-.019	-.599
Achieving a low cost position			.098	1.157			-.087	-2.007*
Build brand loyalty			-.179	-2.503*			-.091	-1.111
Speed of response			-.233	-2.333*			-.079	-1.007
Adj. R <sup>2</sup>	.009		.177		0.01		.102	
F value	1.303		2.444**		.587		1.307	

\*\*\* p < .01, \*\*p < .05, \* p < .1

The hypotheses are partially confirmed. H1 stated a relationship between the firm's strategy and its performance. Again the results partially support the hypothesis. It seems that only successfully managing to isolate firm from rivals (H1) will increase its return on sales (Table 4). However, extracting temporary profits (H2) seems

to be a non-lucrative strategy for businesses. Achieving a low cost position (H3) and building brand loyalty (H4) will significantly increase the firm's growth rate but not the return on sales.

Strategic approaches could be clustered into two categories: Defending strategies and Proacting strategies. Isolating a firm from rivals, extraction of temporary profits and low cost achievements belong to the first category. Speed of response and brand loyalty belong to the second. High end application adopters (HEA) use a proactive strategic approach and have long term orientation. LEA adopters behave differently. They embrace a defending strategy and work on a short term perspective.

## CONCLUSIONS

Overall, the study found the effects of business strategy to be consistent across the two performance measures, growth rate and return on sales. Findings confirmed Chrisman's et. al (1998) theory that any model of SME performance should recognize the critical nature of strategy. Performance of businesses will largely depend on the competitive strategies within the chosen industry.

High-end adopters are not defenders. The proactive strategy is more market-oriented relying on brand loyalty and speed of response. These are two important components of marketing orientation as defined by Jaworski and Kohli (1993). The results show an implicit relationship between marketing orientation and high-end adoption of wireless applications. Anecdotal evidence suggests that corporate and government subsidies can have a substantial impact on the adoption process. As discussed, mobile technology has more potential than the Internet to help diminish societal inconsistencies and diminish the digital divide, thereby aiding in economic development and benefits. To accomplish this, governments and private business may need to create policies that favor development in these underserved regions to develop mobile access, use and commerce opportunities.

A common theme of ICT research is the need to demonstrate returns on investments in underserved regions (Keniston, 2002). Other initiatives could include public/private partnerships, incentives for non-profit organizations, training and education programs or the provision of subsidized access for disadvantaged people and communities. Our research provides evidence that such subsidies can have a considerable impact on the adoption process. Future research in this area will attempt to quantify this effect. Homeland Security issues will lead to a substantial deployment of wireless resources in the areas of healthcare and public safety. This deployment will be particularly significant in rural areas because of the threat of bio-terrorism. These efforts will provide a model for the private sector and possibly some infrastructure.

Similar to e-commerce that preceded it, m-commerce discussion is not about whether the technology will happen, but more about the speed and forms it will take, the political and competitive conditions under it which will flourish and the potential responses to various m-commerce formats. SME performance in our study concluded that wireless networks are used by early adopters, thus creating the need for wider diffusion of the technology for rural areas to be competitive. HEAs show greater success with growth rate and return on sales, underscoring the necessity of adopting wireless technology in rural areas.

Our findings have important implications for policy makers. As the digital revolution continues, it is increasingly important that rural regions are not left behind. While we should expect to see increasing returns for businesses as more people connect to digital networks, the technology alone does not create opportunities without human intervention (Fulton, 2000). We argue that these marketing activities through the advent of m-commerce, especially to underserved areas such as rural communities, will increase quality of life (for example Pan, Zinkhan & Sheng, 2007). The investment in mobile technologies and wireless networks has the potential to create utilities of time, place and information, thus expanding economic activity and creating wealth (Peterson and Malhotra, 1997).

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**NOTES**