



A holistic understanding of non-users' adoption of university campus wireless network: An empirical investigation



Qinyu Liao^a, Xin (Robert) Luo^{b,*}, Anil Gurung^c, Weihua Shi^d

^a Department of Accounting and MIS, University of Texas at Brownsville, One W. University Blvd., Brownsville, TX 78520, USA

^b Anderson School of Management, The University of New Mexico, Albuquerque, NM 87131, USA

^c College of Business, Marshall University, One John Marshall Drive, Huntington, WV 25755, USA

^d College of Business, The University of Southern Mississippi, 730 East Beach Boulevard, Long Beach, MS 39560, USA

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ABSTRACT

The last decade has witnessed the increasing implementation of wireless network in large number of university campuses. Although wireless network has promised such benefits as flexibility, low cost, and expandability, there is a lack of assessment on the student demand of wireless learning environment from the perspective of non-users. This study draws on the change management mechanism to empirically investigate salient factors determining the non-users' intention to adopt and use campus wireless network. Two hundred and eleven survey responses were collected at a US-based Hispanic serving university. The empirical results provide insightful suggestions to institutions and universities to better improve students' acceptance and enhance the usability and effectiveness of campus wireless networks.

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1. Introduction

With the rapid development and implementation of information technology becoming widely available, various information systems artifacts have been deployed for the pursuit of efficient and effective learning across a plethora of societal constituents. In essence, there is a paradigmatic switch from traditional in-class education to IT-enabled mobile learning. For university students, it seems that desktop computing has gradually become a matter of the past and mobile devices, such as laptops, iPads, tablets, and smart phones which represent enhanced computing flexibility and mobility, are the comparatively dominant personal computer of choice. As mobile technologies continue to advance and become increasingly ubiquitous in today's society, wireless computing is embarking as an inevitable and integral component of learning environments in higher education. In particular, we are witnessing a mounting number of "laptop universities" and distributed-learning communities which are based largely on high-speed wireless Internet technologies allowing users to go online at broadband speed in an anywhere and anytime fashion. With the increasing deployment of wireless networks on campus, university students are now able to leverage this emerging model of mobile Internet

access to electronically submit projects, conduct online library research, and actively participate in class discussions using platforms such as Blackboard or WebCT from anywhere without having to physically plug in their devices. Moreover, students taking handheld devices beyond the geographical constraints of the classroom could collect scientific data and share their findings in real-time with peers via the Internet.

Wireless technologies can provide encouraging learning opportunities for college students in rural areas (Venkataram, Rajavelamy, Chaudhari, Ramamohan, & Ramakrishna, 2003). Wireless networks can provide synchronized or asynchronous learning in both online and campus-based courses (Lou, Bernard, & Abrami, 2006). Becker and Haugen (2004) suggested that wireless networks can more effectively motivate students since the instructors can be more responsive and are available for quick turnaround on questions and discussions. As more instructors have moved away from authoritarian and non-interactive instruction, students are taking different learning approaches with the support of wireless technology. They can participate in web-based discussions and group activities with mobile devices at their own pace and at a time convenient for them. For schools and universities, the major benefits of deploying campus area wireless network are the cutting cost of cabling infrastructures, improved flexibility, cleanliness, and relatively easy expansion of networks. Furthermore, wireless technologies could alleviate or balance the

* Corresponding author.

E-mail addresses: qinyu.liao@utb.edu (Q. Liao), xinluo@unm.edu (Xin (Robert) Luo), gurung@marshall.edu (A. Gurung), weihua.shi@usm.edu (W. Shi).

demands on computer labs because students can remain connected at all times unrestrained by physical locations.

According to the 2010 Campus Computing Project annual national survey, US higher education institutions have witnessed continuing expansion of wireless technology use (*The 2010 Campus Computing Survey, 2010*). The use of mobile wireless technologies in higher education will continue to grow and become the learning environment of choice, as students are expecting resources and services for mobile apps in addition to wireless network access. Presently, there are several systems in use for mobile education, such as infrastructure-oriented Wireless Andrew at Carnegie Mellon University and content creation and dissemination oriented (i.e., pocket-WI) for lectures (*Lehner, Nosekabel, & Lehmann, 2003*). Given the benefits of mobile education, more universities are investing in wireless networking technologies (*Clarke & Flaherty, 2002*) and newly established schools are considering wireless networks as their primary channel for computer access (*Charp, 2002*). The “unwiring” of American classrooms is becoming so prominent that the U. S. Congress has begun to provide grants to support and increase the number of wireless classrooms (*Sharp, 2001*). In turn, students are attracted to these institutions demonstrating state-of-the-art technologies (*Calson, 2000a; Calson, 2000b; Young, 2000*). Yet, similar to the scenario in business settings, the successful implementation of mobile learning systems needs top management support such as a technical promoter, detailed requirements analysis, stability, and usability assessment (*Lehner et al., 2003*).

Although wireless technologies could trigger fundamental changes in the ways universities create and disseminate ideas and knowledge, they are still considered as a complement to the wired network operation. Extant studies mostly are limited to wireless standards, cost, technical problems, security concerns, faculty acceptance, and occupant health (*Arabasz and Pirani, 2002; Demb, Erickson, & Hawkins-Wilding, 2004; Green, 2003; Lu & Korukonda, 2008; Lu, Quan, & Cao, 2009*). These studies involved faculty or students with high percentage of mobile device ownership or using free wireless devices provided for research purpose. Although prior studies have explained why and how people adopt different information technologies, little empirical research has been conducted on students' adoption of campus wireless networks, especially from a perspective of non-users. *Dwivedi and Irani's study (2009)* on broadband adoption found that users and non-users differ in terms of factors associated with adoption decision. In particular, non-users are usually not fully aware of the benefits of new technologies and do not recognize enough perceived resources that are available to support the adoption process. *Steele (2001)* also pointed out that the benefit of campus wireless access might exist for some students in some contexts and depends on the availability of other computing resources on campus. In this study, non-users refer to *students who do not use the campus wireless network due to limited time on campus, unavailability of mobile devices, insufficient network access, or lack of wireless technology know-how*. From the students' perspective, the introduction of wireless network migrates some of the traditional learning and instructional process. The conversion of non-user to users is a change process that may require support, encouragement, and possibly incentives from the administrators, IT staff, and instructors. In an effort to fill the void in this research paradigm, we draw on technology adoption theories and change management mechanisms and propose a holistic model to help IS researchers and higher education administrators understand the important factors contributing to the adoption of campus wireless networks from the perspective of non-users. In essence, this study addresses the following questions:

1. What are the key factors influencing non-user students' intention of adopting campus wireless network?

2. How can universities and faculty address non-user students' concerns and improve their acceptance of campus wireless network?

The rest of this article is organized as follows: we first revisit the relevant studies in literature. Then we investigate the theoretical underpinnings and elucidate the development of research model, which is followed by our research methodology as well as the data analysis. In addition to discussions, implications for IS researchers and administrators in higher education are also presented. Finally we discuss the research limitations and future research opportunities in this intriguing context.

2. Literature review

The literature on technology adoption suggests that Technology Acceptance Model (TAM), which was originally proposed by *Davis (1989)* and derived from the Theory of Reasoned Action (*Fishbein & Ajzen, 1975*), is a well acknowledged model to understand acceptance of new information technologies. A variety of factors contributing to end user adoption, such as perceived risk, trust (*Gefen, Karahanna, & Straub, 2003*), perceived reliability, self-efficacy (*Taylor & Todd, 1995; Venkatesh & Davis, 1996*), training (*Al-Gahtani & King, 1999*), trustworthiness (*Carter & Bélanger, 2005*), and perceived security, have been identified to extend the TAM to study adoption of different information systems. While in TAM the perceived usefulness and perceived ease of use do not have a direct impact on adoption intention, the Unified Theory of Acceptance and Use of Technology (UTAUT), an extension of TAM, implies that the antecedents can directly affect adoption intention (*Rana et al., 2012*).

Extant literature on wireless technology has been extensively focused on the use of mobile phones and its applications in m-commerce including interface design, social context, and usability (*Chan et al., 2002; Ling, 2001; Osborn, 2003; Palen, Salzman, & Youngs, 2001; Sadeh, 2002; Venkatesh & Ramesh, 2006*). Other factors such as perceived usefulness, perceived ease of use, perceived playfulness (*Moon & Kim, 2001*), perceived credibility (*Wang, 2003*), perceived financial cost (*Luarn & Lin, 2005*), perceived security, and task type are more pertinent to end user perceptions (*Fang, Chan, Brzezinski, & Xu, 2005*) while portability, flexibility (*Rajala, 2003*), and expandability (*Walery, 2004*) are the top concerns for companies and higher education institutions. According to *Pedersen (2001)*, the traditional models for technology adoption may be modified and extended to include a specific end-user analysis to study mobile Internet services.

Most prior studies on mobile technologies in the education context shed light on wireless technology capabilities rather than student demand analysis. *Gay, Stefanone, Grace-Martin, and Hembrooke (2001)* investigated the impact of wireless computing on learning environments, and *Swan, Hooft, Kratcoski, and Unger (2005)* noticed that the use of mobile devices can increase student learning motivation. Furthermore, *Corlett, Sharples, Bull, and Chan (2005)*, *Rogers, Price, Randell, Weal, and Fitzpatrick (2005)* found that institutional support, such as course content and timetabling information, wireless connectivity and usability, is important for students using mobile learning organizers. Quality of information (*Roschelle, Penuel, Yarnall, Shechtman, & Tatar, 2005*), diversity and incompatibility between mobile technologies for education (*Pinkwart, Hoppe, Milrad, & Perez, 2003*), and availability of mobile learning devices (*Soloway, Norris, Blumenfeld, Krajcik, & Marx, 2001*) are the factors that have discouraged wireless network adoption in enhancing student learning environment. These are the external facilitators or barriers of mobile learning systems adoption by students.

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