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Research Report

# A scenario-based approach for projecting user requirements for wireless proximal community networks

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ABSTRACT

This study uses a scenario-based design approach to explore the implementation of software to be used on a proximal community Wi-Fi Network. A first step in any software engineering is a requirements analysis as way of identifying which stakeholders are likely to use the technology, how they will use it, and what their expectations for use might be. We implement a series of scenarios designed to test users' reactions to software that supports social, economic, and civic and cultural uses of a wireless community network in a downtown community setting. The findings suggest that economic activities have greater appeal to users in this context, than social and civic or cultural contexts. We also assess those characteristics of users that predict overall appeal of our software design. Among our findings we discover that individuals who use mobile technologies more often in interstitial spaces are more likely to find our scenarios appealing. We offer suggestions for future designs in this context.

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## 1. Introduction

Wireless communications continues to be among the fastest growing markets in the computing industry. The latest estimates project that global market penetration of cell phones has already exceeded 50%. In the U.S., mobile phones are continuing to replace landlines with 22.5% of American households now reporting that they own only cell phones, up from 17.5% in 2009 (Wireless & RFID., 2010).

Recent trends also show that Wi-Fi continues to see growth in cafés, hotels, airports (Mobile WiFI…, 2010). Part of this growth is being fostered by the introduction of Wi-Fi capable technologies in more and more devices. The introduction of portable devices with broad commercial appeal like the iPad and iPod Touch, gaming devices, and televisions have helped to foster growth in these markets.

These trends have opened up new opportunities for researchers to explore the ways that individuals will use wireless communications devices in the future. Some research has suggested that wireless communications technologies may be used for hyper-local advertising. JiWire, for example, found that 39% of those surveyed, expressed an interest in receiving location-based ads with coupons when they came from local advertisers. The research concluded, that "mobile users want[ed] to discover stores in close proximity to their location and review those ads on location-based apps" (Mobile WiFI…, 2010).

Not only does the introduction of location sensitive software on wireless technologies pique the interest of local advertisers, but it may have the potential to enhance social interactions as well. Location sensing features have already been used to leverage wireless devices to connect communities (Ganoe, Robinson, Horning, Xie, & Carroll, 2010). Location aware features of mobile devices have also been used to help users locate themselves in relation to events taking place in their town during a downtown festival. Other applications like Four Square use location to link friends and allow users to explore new places.

Still others have suggested that wireless technologies will play an important role in civic and political communications. Recent PEW research found that younger voters are among the largest group to gather political news and information online. The data also shows that 36% of the respondents who used text messaging reported using it during the 2008 Presidential campaign to send and receive political communications to friends, family and others (Smith, 2009). Among those who use social networking sites, 27% said that they have connected in some way to a political candidate to receive campaign updates (Pew Research Center, 2008).

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While early research looks promising, the day-to-day ways that individuals will eventually use wireless technologies are still relatively unknown. While there is some indication that wireless communications have the potential to serve the social, economic and political interests of end-users, what is still not known is whether the technologies will simply become another outlet for existing practices or if they will encourage new forms of interaction. Will wireless technologies encourage more participation in civic and political activities or will they simply provide another avenue for those who are already motivated towards such ends? Could wireless technologies be used to bring communities closer together and revive the growth of associations and other community groups that Putnam has documented have been on a decline (Putnam, 2001)? This study employs a scenario-based modeling approach (Carroll, 2000) as a means of assessing how user's existing attitudes and uses of technology could be influenced by the use of wireless scenarios described in the context of community activities. It explores our development of a community based app that could theoretically be built upon an Wi-Fi mesh network in a placed-based community for the purposes of increasing social, economic and political interactions among users.

The development of community-oriented applications for deployment in a Wi-Fi mesh network represents a unique area of design at the intersection of a potentially diverse set of stakeholders and system goals that are present in a geographic community. Just as cell phones have become ubiquitous, it seems that wireless web-enabled devices such as laptops, netbooks, smartphones and tablets are likely to define new kinds of mobile and social computing and new kinds of device interactions heavily dependent on high speed wireless network connections. The current work is part of an ongoing project to help shape development of web and mobile applications being developed in the context of geographic communities.

Given this novel context, scenarios represent an important tool to guide software development as other approaches that are dependent on a current set of existing known uses- such as task analysis- are difficult to apply in a relatively unbounded context. Instead, we are attempting to elaborate new kinds of practices which address existing community goals such as civic participation, neighborhood interactions and local economic activity which leverage these mobile forms of computing and location awareness.

Our earliest explorations in our community context suggested that our potential users were more focused on the potential of municipal Wi-Fi to provide simple connectivity rather than on the potential for new kinds of interactions that such a network would make possible. In order to overcome this limitation of imagination, we have used a range of scenarios to engage with our community partners. Offering illustrative potential, uses such as location-based blogging, self-guided history tours, and on the fly volunteering have helped generate the support of local community leaders. With this scenario-based survey approach, we are attempting to now engage a much larger segment of the local population in order to understand both their current uses of the Internet and their preferences for our new types of applications.

Prior research has already provided some insights into how computer-mediated technologies are shaping social interactions and supporting existing attitudes in geographic communities. In a recent survey, Mersey (2009) examined how online newspaper readership might be linked to feelings about geographic space. The research showed that people who read local newspapers online also felt a greater sense of community. Of course the relationship here is not necessarily causal, but it indicates that technologies can at least enhance or support existing attitudes about a community. Other research has found that computer-mediated communication can open up new opportunities for people in the same geographic places to communicate and work together. Hampton (2007) found that providing neighborhoods with email lists to chat about community issues increased the number of weak neighborhood ties among experienced internet users and helped members of a community work through their problems. Beyond the effects of existing technologies, some design researchers have begun to ask how design affordances in mobile devices could encourage greater community interaction. In one experiment, designed to counteract the "cacooning" effect where individuals immerse themselves in their phones and other portable media in public spaces, Seeburger, Foth, and Tjondronegoro (2012) devised a mobile application that would allow users in co-located places to discover, share and recommend music interests anonymously with people nearby. The authors found that their design helped participants interact albeit anonymously with other people on the streets and city busses and that it was perhaps a first step in encouraging people to use their mobile devices to engage with one another in more social ways in public spaces. Their findings suggest that technologies like mobile phones, which are typically used for personal and private interactions, could also one day be used to help people feel a sense of social bonding with those around them.

In addition to these findings, some community research has focused on the ways in which virtual spaces can be used to meet the various social and informational needs of community members. Lev-on (2010), for example, observed that virtual communities can foster a continued sense of community among groups who are no longer connected by physical space. In his study of the Gush Katif, a Jewish settlement along the Gaza Strip, he observed that former residents used the internet to stay connected for years after the town no longer existed. Former residents used an online site called Katif.net to organize political protests, provide social support and foster feelings of group membership long after the community itself had been dissolved. Similarly, Shklovski, Burke, Kiesler, and Kraut (2010) found that musicians, who were displaced after Hurricane Katrina struck New Orleans, used mobile devices and the internet to provide support, to help individuals locate families and to stay connected.

Each of these illustrates the myriad ways in which computer-mediated technologies, online connectivity and mobile devices can be used to supporting a wide variety of geographic community needs. From providing mechanisms for social support during natural disasters to helping communities that are becoming increasingly insular in public spaces, technologies can connect, inform and engage publics in a wide variety of ways. However, designs to support community needs are often overlooked or an afterthought as needs arise in a community. Our current design is more intentional, and considers how networks themselves might support a wide variety of community goals.

### *1.1. Using scenario-based approaches for wireless community network design*

HCI design starts from a vision of what might be, but is not yet. A vision is a holistic glimpse of a better reality that is fleshed out with hopes and dreams. Visions are intended to reflect personal and collective values, to inspire action and commitment, to challenge assumptions, and to provide an optimistic prognosis. In this context, scenarios are narrative descriptions of situated human activity and experience. Casting a problem statement as a scenario implicitly motivates a more integrative problem analysis relative to a traditional requirements list (Rosson and Carroll, 2002). And conversely, casting a vision of possibilities as a scenario motivates more disciplined analysis of how a new technology might be used, by whom, and for what, relative to a sketch and a few tantalizing prognostications.

In the case of designing wireless and mobile applications to support civic and community goals, the main challenge is in trying