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UNDERSTANDING THE APPLICATION OF MOBILE TECHNOLOGY IN LOCAL COMMUNITY CONTEXTS

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ABSTRACT

Understanding the impacts and consequences of information and communications technology in local communities through theoretical and practical approaches has long been studied. Among different types of technologies, mobile technology has suggested potential opportunities to community informatics, because a growing number of people across different age groups have adopted mobile phones, becoming an indispensable part of their daily lives, and because mobile technology transcends the limitations of time and place, expanding the ways of accessing and interacting with local community information and lowering the barrier to participation.

In this dissertation, I present my research studies in community informatics including local news and tweet aggregation, mobile timebanking, digital cultural heritage, and annual arts festivals. I argue that mobile technology has a significant influence on local communities by facilitating the creation, provision, and dissemination of hyperlocal community information as well as creating social interactions among local people. I articulate the utilization of mobile technology in local community contexts based on the findings and analyses from lab- and field-based user studies and discuss how mobile technology contributes to reinforcing community attachment, increasing community awareness and participation, and strengthening social support networks.
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Chapter 1

Introduction

Modern people live in a mobile, electronic, and individualistic age; however, a local community is still important for people, because it is the place where people are physically located, spend their everyday life, and interact with others. Although local communities vary in size, composition, and structure, the goals that most communities commonly share are to help local people and groups build and reinforce civic identity, enhance awareness, and increase participation and social capital (Carroll et al., 2014). To accomplish these goals, a growing number of local communities are trying to leverage benefits from the Internet and information and communication technologies. Research on community networks has attempted to assess the impacts and potential of computing resources from information and communications technology (ICT) as applied to those geographic community goals (Schuler, 1996).

Among the different types of ICTs, mobile technology, especially after the smartphone was introduced, has become a salient technology, gaining a lot of attention from researchers and practitioners, not only in community informatics but also in other disciplines. One obvious reason pertains to the growing number of its adoption by people. According to the recent report from the Pew Internet & American Life, 64% of American adults are now smartphone users and the number of smartphone adoptions has steadily increased across different age groups since 2011 (Smith & Page, 2015). A growing number of people also utilize their smartphones as portable computers, spending a lot of time using them (Karlson et al., 2009). The especially high percentage of mobile phone adoption and usage by young people is an indicator of future trends in people’s usage patterns, which also influence community networks. Second, mobile technology not only incorporates benefits and complements challenges from other technologies, but it also creates distinctive affordances and opportunities. It increases both mobility and accessibility,
allowing people to access a great amount of local information anytime and anywhere (Geser, 2004; Green, 2002), significantly increasing people’s expectations for such technologies to keep them up to date and in touch.

Web 2.0 technologies have been suggested as part of new community-oriented approaches to creating and disseminating local information within geographical communities (Carroll et al., 2013; Mason & Rennie, 2007). It provides additional channels for individuals to create and share their personal experiences with others in the form of user-generated content, shifting perspectives from top-down to bottom-up (Paulussen & Ugille, 2008; O’Connor, 2008). Rather than accessing or consuming information provided by officially designated institutions, people start to create a rich and a more diverse stream of community information (Gillmor, 2004).

More recently, we have observed the expansion of user generated content in microblogs through social media platforms. It lowers the barrier of participation by providing easy-to-use and straightforward applications, which support the creation, and sharing of various types of information including text-based messages, digital photographs and video clips (Bollen, Pepe, & Mao, 2009). This all leads to fulfilling the notion of hyperlocality (Farhi, 1991; Carroll et al., 2013; Hu, Farnham, & Hernandez, 2013), allowing information and interaction to be placed within a geographically local area and to be shared and accessed mostly by local people.

Obviously, individuals are the main entities in their community. They are the ones who create, access, consume, disseminate, share community information and also participate in community activities. For those who are already involved in the local community’s organizations and those already inclined to be civically engaged, any approach which makes more of the community’s activities more visible is expected to significantly increase their awareness and participation. But for community members with other kinds of motivations for digital participation, not necessarily being involved in a community’s groups or other activities, other
community networks directions which would support more social and individual contributions may be required to connect them with civic-themed content. Therefore, supporting additional channels that utilize suitable computing resources for increasing community awareness and participation is significant.

I argue that these aspects are well mediated or even enhanced by mobile technology when combined with the aforementioned benefits from Web 2.0, because mobile technology elevates the visibility of community information as well as lowers the barrier of individual participation. This is based on the fact that anyone who has a mobile device could be an active participant, contributing information and expressing their thoughts regarding the community or allowing those who are reluctant to be involved to still have access to community information through their personal mobile device anytime and anywhere, maintaining their civic awareness. In this sense, leveraging mobile technology will fit in well with community contexts, and this will lead to better affordances (Norman, 1990) for participation and motivation.

These standpoints motivate and even necessitate the investigation of the influences and outcomes of mobile technology utilized in a context of local communities. In this dissertation, I describe four research projects in community informatics that I have led and been involved in during my Ph.D. For each project, I have carefully designed and implemented a number of smartphone applications as well as conducted a number of both laboratory and field user studies in order to understand the following research question:

*RQ: How does mobile technology influence local geographical communities with respect to community identity, community awareness and participation, and social support networks?*

Based on the results from those user studies, I present the way local communities leverage mobile technology and discuss its application in the local community context in the
sense of community identity, community awareness and participation, and social support networks.

In the balance of the paper, in Chapter 2 and 3, I first present the previous theoretical and practical research efforts in community informatics and introduce a conceptual model of community. In Chapter 4, I will introduce four research projects along with the smartphone applications that I have designed and implemented. In Chapter 5, I describe the goals, procedures, and results of the user studies. In Chapter 6, I discuss how mobile technology facilitates community information creation, dissemination, and sharing as well as constructs or reinforces social interaction and connection among local people and with their community. In Chapter 7, I discuss theoretical and practical implications of the study results, limitations of my research, and finally future work that I would like to pursue next.
Chapter 2

Technology influence on local people and communities

When it comes to understanding the connections between technologies and local communities, it has been commonplace to study several local community aspects. Among them, civic awareness and participation have been considered to be important elements that motivate and lead to various forms of civic activities (Adler & Goggin, 2005), including voting, attending local community meetings, and helping other community members and groups to improve their community. Civic awareness and participation are interconnected concepts that influence each other and are developed together.

Prior research has reported that the use of local news media increases local knowledge and participation (Mcleod et al., 1996). As little as 10-15 years ago, these sources were rather limited, comprised primarily of newspapers, radio, or TV broadcasts. However, the diversity of local news sources has been greatly increased following the introduction and wide adoption of ICTs and Web 2.0, opening new opportunities for citizens in the same community to communicate. Such technologies have been considered to be a new or even an alternative way of increasing the creation and dissemination of information (Carroll et al., 2011; Foth, 2011). The use cases became even more diverse and distinctive after social media emerged as another important channel for local citizens to interact with their community (Kwak et al., 2010).

These new interaction opportunities have expanded the kinds of connections people may have in a local community. Hampton et al. (2011) found positive relationships between online activities by technologies and local participation, where people who showed high online activities (e.g., using social network sites, blogging, sharing videos, instant messaging, photo sharing, etc.) also tended to participation in traditional local settings such as neighborhoods, voluntary groups,
religious institutions, and public spaces. Similarly, Chung and Nah (2009) found that those online activities increase user awareness, satisfaction, and participation in local community news websites. Pasek et al. (2009) claimed that using online social networking websites leads to more engagement in civic activities and interaction with people, which could develop into building social capital. Based on a survey study with young adults, Farnham et al. (2013) reported that young citizens who showed high civic efficacy utilize more public networks (e.g., reading blogs or online journals, adding comments on them) or media sharing (e.g., sending emails and text messages to communicate with others about civic issues) and had higher levels of civic engagement.

**Research studies in community networks**

Community networks aim at facilitating information dissemination, promoting discussions, and coordinating joint activities in such settings as municipal government, public schools, and civic groups (Schuler, 1996). Investigating how technologies contribute to the strengthening of community identity, enhancement of residents’ awareness, and promotion of participation in activities in the community environment has become an essential element of the research of community networks.

As network infrastructure became more accessible to the general public, motivated individuals and groups in place-based communities began to explore the potential for information and communications technologies (ICTs) to be deployed for the purposes of supporting the goals of communities. Based on this perspective, connectivity among citizens was fostered and considered as the potential to enhance community life. The community has found new ways to reinvent itself to fit into the different technological, social or economic conditions over time.
(Wellman, 1999), and people in the community expect up-to-date information and value-added interactions through technology (Carroll et al., 2011). For example, Hampton et al. (2009) have found that Internet connectivity in public spaces contributes to the generation of social interaction and participation. Carroll and Rosson (2008) have investigated the benefits on infrastructure, service supports, education and culture, and recreation from ubiquitous computing in community context. Humpherys (2010) described how people create and maintain their social relationship with others through use of Dodgeball, a mobile application that enables users to meet up by distributing location-based information of user whereabouts. Dodgeball users found that the mobile social network facilitated social connection and also transformed the traditional notion of public space into a socially interpreted space. These various perspectives suggest the positive effects and outcomes from ICTs for the community in terms of increasing civic awareness, engagement and participation.

Along with these theoretical insights, much research has been done on the development of systems that harness the benefits of supplementing community activities with technologies. One of the main goals of community-oriented system development is to make community information more visible to community members, making them be more aware of their community and promote participation and engagement. Millen and Patterson (2002) describe the design idea of community software and discuss how to stimulate social engagement among members. Having a channeling mechanism and explicit notification message to make community activities more noticeable is necessary to facilitate discussion within community members. Such research efforts, which are aligned with that aspect, include What’s happening, a community awareness tool that is designed to easily convey community information and interact with other members with minimal efforts by integrating simple interfaces such as a communication bar and a screen saver (Zhao & Stasko, 2002). Apeer is a social visualization interface in order to support
building common grounds and creating social awareness among people by accessing the past and ongoing activities (Moraveji et al., 2004). AwareNews is the application which employs the notion of context awareness to present organizational community news information to people and to promote knowledge sharing among them (Decurtins et al., 2008).

More recent community projects include CiVicinity, a community portal that builds upon the tools provided by modern web technology (Carroll et al., 2012). Local news or calendar feeds are dynamically generated from various community sources, and the CiVicinity portal collects and displays the community information, bringing it into one easily accessible and central location. It also leverages the location information as a main context and visualizes both one’s physical and the news or events location on the map. Virtual Town Square (VTS) has a similar design rationale of what Civicinity takes into account with respect to aggregating local news and information to facilitate civic participation (Kavanaugh et al., 2013). Lastly, Whoo.ly is a web-based service that provides various types of community-relevant information, including recent tweets, active events, top topics, popular places, and active local people by discovering meaningful content from Twitter posts (Hu, Farnham, & Hernandez, 2013).

Another popular research direction in community informatics refers to the utilization of large screens to display community information and allow people to contribute their own inputs (Struppke, 2006). For example, Koch (2005) presents the idea of large displays to make community activities and members more visible and emphasizes the importance of facilitating community communications to enhance community awareness. Other studies include Twitterspace which presents tweets created on large screens in a physical community center of the university to deliver events and member activities to a broad audience (Ryan, Hazlewood, & Makice, 2008) and Discussion in Space (DIS) which is a feedback platform utilizing large screens and mobile devices to advertise community relevant questions and issues to the public as well as
encourage people’s responses via SMS and Twitter (Schroeter, 2012). Similarly, Viewpoint is a simple yet effective polling tool to increase the civic awareness of and participation in local issues of different stakeholders by allowing local citizens to vote by utilizing public displays and mobile phones (Taylor et al., 2012). Their two-month trial study results showed higher participation in voting for local issues as opposed to traditional methods (e.g., attending town hall meetings).

All of these projects contribute to understanding the application of technologies in the context of local community. However most of them tend to focus primarily on describing technological benefits of their system and relatively less on articulating social outcomes to and providing comprehensive analysis and insights on people and their community. Apparently, my research is consistent with the goals of those local community projects in terms of their motivations and expectations; however, the unique contribution is that I have taken a socio-technical approach. I have strived to not only design and implement mobile applications that create new or additional ways of accessing and interacting with local information and people, but also to articulate their impacts on people and their communities (i.e., how mobile technology makes community information more visible, positively affects community participation, and creates and reinforces social connection and interaction based on the conceptual model of community). Moreover, I attempt to present a more comprehensive analysis and framework based on the results obtained from four independent mobile-community projects with different objectives.
Chapter 3

Theoretical understanding of local community and mobile technology

Conceptual model of local community

Community is a widely used term that has been theorized extensively for a long time. It is commonplace to call a community if a group of people has similar interests in institutions, organizations, or groups (Wenger, 1998). It can be formed via offline or online. However the key point is that, to be a “community,” one should have unspecified social warmth to that group. This is aligned with the term “the sense of community” which refers to “a feeling members have of belonging, a feeling that members matter to one another and the group, and a shared faith that member’s needs will be met through their commitment to be together” (McMillan & Chavis, 1996).

Among a number of different definitions of community, my interest and focus lies in a geographical local community. It is true that nowadays people live in their mobile, electronic, individualistic age; however, a local community is still significant for them. I was interested in how technology (more specifically, mobile technology) transforms local communities with respect to interaction with local information and people. For example, people can access various types of community news or event information, express their personal opinions or thoughts to certain topics, and form or maintain social relationship with others in online and offline environments through technology. Since the late 1990s, the deployment of community networks has more rapidly increased and widely been investigated by many researchers, because of the development of the Internet as well as the growing number of its use and the installation of broadband wireless network in many communities. To better understand the relationship between technology and local community, I employ the conceptual model of community (Carroll, 2012).
comprised of three facets: community identity, local participation and awareness, and support networks, because its three constructs not only incorporate the notion of technological influences on people that we described in the previous section, but it also provides a lens through which potential innovations in community processes and infrastructures can be examined and evaluated.

Table 3-1: A conceptual model of community. (Carroll, 2012)

<table>
<thead>
<tr>
<th>Facet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Identity (attachment)</td>
<td>Members experience ideal of community by sharing values, episodes, traditions, and experiences of local and world events; feel belonging and shared emotional connection; regard for local places and past events; experience community membership as part of who they are; are committed to and believe in the community's capacity to thrive and develop.</td>
</tr>
<tr>
<td>Participation and Awareness (engagement)</td>
<td>At least some members enact shared identity through collective activity, including leadership and innovation in community practices. Through this activity, members become known; their conduct and contributions are visible; all members see that one can have an impact on community decisions and initiatives, and come to regard the community as sustainable and effective. A less active form of participation is maintaining awareness of community activity.</td>
</tr>
<tr>
<td>Social Support Networks</td>
<td>Community members typically play a variety of roles, and provide and reciprocate social and material support through a multitude of different tie types. The community is a relatively densely interconnected sub-network of the societal social network.</td>
</tr>
</tbody>
</table>

Table 3-1 shows the three facets of the conceptual model of community (Carroll, 2012).

*Community identity* refers to a sense of attachment and belonging to people, local places, and past events. When people think they are part of the community that they live and want to be more aware of and get involved in their community activity, they form and maintain community identity.
Participation and awareness (engagement) refers to more visible actions or activities developed from community identity. People become more aware of community news or events, and depending on personal preference and motivation, some people are actively involved in different types of community activities to voice their opinions to the public or to their community whereas some less active people maintain awareness of them. Its relation with community identity is mutual because increased participation and awareness also strengthens community identity.

Social support network refers to different types of actions and roles that each individual community member can take while participating in different activities. Individual citizens also have their own perception or knowledge of community information that affects the degree of their participation. As the community is an interconnected sub-network of the societal social network, a variety of information will be generated and shared by individual community members who have different motivations and expectations.

Affordances of mobile technology

Mobility

The principal advantage of mobile technology is increased mobility. It allows people to access services wherever they go and transcends limitations of geography and distance when digitally communicating with others. As such, there have been a number of research studies aiming at understanding its aspect and influence in different contexts ranging from mobile health (i.e., allowing individuals to receive needed medical attention and advice) (Istenpanian et al., 2004), mobile-payment system (i.e., flexibly managing their account or money transactions) (Kim
et al., 2010) to mobile workers (i.e., providing remote communication and collaboration among field workers) (Yuan et al., 2010).

When it is applied to a local community context, one could easily imagine that mobility will facilitate access and interaction with various types of community information (e.g., reading local news or events and adding comments) as well as create social communications and interactions with others (by exchanging text messages or using social media) at anytime and from anywhere. This could possibly lead to evaluating mobility primarily based on a technological perspective or merely as an alternative to a static or fixed activity. However, it is also important to understand mobility within a lens of social and cultural aspects, because it can be interpreted differently depending on how it is socially, culturally and contextually situated (Dourish et al., 2007). In this sense, I aim at articulating the applications and consequences of mobility in local community contexts by taking social standpoints.

**Immediacy**

*Immediacy* refers to the quality of bringing one into direct and instant involvement with something (e.g., entities, events, actions, *etc.*) in somewhat more time-critical situations or conditions (Anckar & D’Incau, 2002). When it is linked to mobile technology, immediacy usually pertains to how fast one could meet his/her expectations in terms of obtaining or accessing information in a particular situation or context. For example, Kynäslahti (2003) highlighted that immediacy of mobile technology allows the people to make memos and take photos while they are attending or observing lessons as well as share them with others instaneously. By conducting a study with high school students, Rau et al. (2006) found that increased immediacy from mobile communication technology contributes to social presence and motivates students to participate
more actively in classrooms, because it facilitates communications between students and instructors as well as make students feel more connected to the instructors and classroom activities.

Similar to these findings, when it comes to a local community context, we can imagine usage scenarios where a local member consumes information pertinent to a local community and interacts with any local content through their mobile device whenever he or she wants. More and more people are carrying their mobile devices at all time and wireless connectivity and capacity continue to increase with the expanded availability of WiFi access points or 3G/4G networks, various types of local community information (e.g., news, events, meetings, etc.) will be accessed through mobile applications or a web-browser when requested, and people can also create new content by themselves and share it with their friends or the public through emails or other social media channels.

Social Presence

*Social presence*, which refers to the “degree of salience of the other person in a mediated communication and the consequent salience of their interpersonal interactions” (p. 65; Short *et al.*, 1976), is considered to be a critical factor in creating and maintaining social interaction, as it stresses togetherness, psychological involvement, and behavior engagement among people (Biocca, Harms, & Burgoon, 2001). Social interaction often takes the form of digitally mediated communication; therefore, technology also shows a great impact on social presence. Social presence is not a direct benefit or opportunity from mobile technology but rather a consequence of mobile technology affordances. In other words, it can be broken down into more dimensions such as immediacy and intimacy (Short *et al.*, 1976), but my focus lies in immediacy. As
increased mobility is closely related to increased immediacy, the combined influence of mobility and immediacy broadens and increases social presence.

As such, there has been much research highlighting the positive correlation between mobile technology and social presence. As previously mentioned, Hampton et al. (2009) present that Internet connectivity in public spaces contributes to the generation of social interaction and participation, increasing social presence in public space, and Humpherys (2010) describes how people create and maintain their social relationship. In her book, Chayko (2008) describes the phenomena where groups of people connect via online and mobile technology with their friends, family members, and even people whom they have not met before, and develop a shared identity and culture as well as a sense of belonging and togetherness from making themselves more socially visible.

In summary, I considered all of the aforementioned concepts (*i.e.*, mobility, immediacy, social presence, innovations of a mobile application, and three facets of the local community) as a way to understand one’s connection to the local community through the use of and interaction with the mobile applications I designed and developed.
Chapter 4

Overview of four research projects and study goals

I have been involved in four research projects that investigate mobile-based community services and applications. The first project was designed to support the co-creation of digital cultural heritage. I designed and implemented the mobile application called Lost State College (LSC; Han et al., 2014a), which provides place-based local historical landmarks and integrates social features in which people can augment their personal reflections and stories to those landmarks. The second project is called Mobile Timebanking (MTB; Han et al., 2015). Timebanking is a community-based volunteering service exchange in which people provide and receive services in exchange for time credits, and MTB is an extension of traditional timebanking. The third project refers to the provision and sharing of local community news, and I designed and implemented the mobile application called Local News Chatter (LNC; Han, Shih, & Carroll, 2014, 2015) that aggregates local news articles from local news media and socially generated tweets from Twitter and displays those different types of community information in an integrated manner. The last project is an Arts Festival (ArtsFestApp; Shih, Han, & Carroll, 2015; Han et al., 2015), which is one of the largest annual local community events in State College. I have designed and developed the mobile app for the Arts Festival to allow festival visitors to access festival information as well as share their experiences through photos and comments, making their festival more fun and engaging.
Figure 4-1: The overview of mobile-supported community informatics. Increased mobility and immediacy of mobile technology as well as new opportunities that each mobile application provides would positively affect the three core components of the local community. The growing number of citizens’ smartphone adoption also suggests the importance of leveraging mobile technology in order to accomplish local community goals.

These research projects all account for the utilization and application of mobile technology in the context of local community. It is important to note that I employed a bottom-up approach where I strived to understand how mobile technology can be utilized in the context of four different local elements (i.e., local history, local volunteering, local news and social media content, and local festival) to provide positive influences on fundamental local community elements. In other words, as depicted in Figure 4-1, those projects were designed to leverage the three elements of mobile technology (i.e., mobility, immediacy, and new opportunities) in accessing, creating, and sharing community information, leading to increasing visibility of local
information and facilitating participation, creating and strengthening community identity, and supporting social support and interaction. In the following four sub-sections, I articulate the motivation and intention of each project and introduce the design of the corresponding smartphone application.

Lost State College (LSC)

Digital storytelling is synergetic with the continuous evolvement of mobile devices and the introduction of Web 2.0 applications, enabling people to easily add digital photos and leave personal experience narration (Jokela et al., 2008). When situated in local community contexts, digital storytelling encourages people’s interests in their community and is effective in engaging community members (Klaebe et al., 2007) and shared stories of community history strengthen the sense of community (Freidus & Hlubinka, 2002). Especially, for local residents, history of a community is part of feeling a sense of belonging or an emotional connection, which is regarded as community identity. The history of a community is a part of its identity and is the essence of the communal roots that local residents inherit or share by cohabiting or visiting a physical region (Carroll & Rosson, 2008).

There exist a number of mobile tour applications used in museums or historical landmarks, and much research has been made to understand how mobile technology transforms the traditional ways of social connection. For example, Aoki et al. (2002) developed a mobile tour application called Sotto Voce that incorporated an audio sharing mechanism. By using the application, participants were able to share audio clips through an “eavesdropping” mechanism, which created a strong interaction between companions. In addition, the notion of gamification has been widely used in order to increase social interactions. For example, Explore! (Ardito et al.,
2008) is a mobile game application used in archaeological parks. Groups of people performed a game to explore and enjoy heritage by interacting with each other and using mobile devices. 

*MuseumScrabble* is a mobile game for children who visit a historical museum (Sintoris *et al.*, 2010), where children should explore the museum and discover the relations between exhibits. However, I found that little research has been placed on detailing the relationship between user interactions with the application and the notion of storytelling, and how people perceive that aspect as linkage to their community.

One primary goal of local communities is to create and reinforce community identity by connecting residents to their local heritage. The history of a community is a part of its identity and is the essence of the communal roots that local residents inherit or share by cohabiting or visiting a physical region (Carroll & Rosson, 2007). Traditionally, the act of archiving and provisioning historical content was limited to cultural heritage institutions, and individuals simply accessed the resulting official history information as information consumers. However, the introduction of ICTs, Web 2.0, and social network platforms provides a new channel for individuals to create and share their personal experiences with others in the form of user-generated content. These opportunities leads to the realization of digital cultural heritage in which people become aware of different facets of history and augment their personal reflections or stories. They also encourage people’s interests in their community and may be effective in creating feelings of engagement and attachment among community members, which eventually contributes to feelings of a sense of belonging or emotional connection (Carroll & Rosson, 2008).
In this sense, the design goal of LSC (the meaning of LSC implies preservation efforts of local history, otherwise it will be “lost” in the future) is to make local heritage more visible and available to community members, aiming to capture and share the collective memories of a town’s history (Han et al., 2014a). As shown in Figure 4-2, LSC utilizes a geo-coded dataset of 14 historic downtown landmarks provided by a Borough of State College. For each location, LSC provides a name, address, a set of official historical and current photos, a text description, and a pre-recorded audio description for each landmark. Along with these official content, LSC also provides four additional interfaces called Social features in which people can add their personal reflections and stories to the landmarks through adding their Visits, Likes, Comments, or Photos on the mobile device. The design rationale of having Social features is to investigate how people
utilize them to reconstruct landmarks into more dynamic and socially meaningful places both to people and community.

**Mobile TimeBanking (MTB)**

Volunteering has long existed in local communities and been one of the critical elements that sustain local communities (Putnam, 2000). It is not difficult to see that many local people are willing to donate their time and money to help other people, schools, churches, hospitals, and local nonprofits in an effort to improve their communities.

Timebanks use time as a form of currency and aim to expand community-based volunteering through the exchange of time and skills among community members, creating an environment in which people receive and provide a service in exchange for time credits (Cahn & Rowe, 1992). For example, one neighbor who has a vehicle can give a senior citizen a ride to and pick them up from the hospital. Then, the earned time can be used to ask another member to fix their computer. At its core, time banking emphasizes its members using their own unique and valuable skills to help others. This helps timebank members develop a sense of self-efficacy and achievement regardless of their professional or income level (Cahn & Rowe, 1992; Cahn 2000; Collom, Lasker, & Kyriacou, 2012; Seyfang, 2004a, 2004b, Bellotti et al., 2014; Patrick et al., 2015). It also emphasizes the notion of co-production in which the provider and recipient create and enact a timebanking service together, which leads to positive social outcomes for people and the community (Cahn, 2010; Carroll, 2013).

The distinctive aspect of timebanking, compared to other types of community currencies, is a flexible management of time credits. People can spend time credits to meet their needs, donate them to other people, or even purchase some items, depending on the timebanks. This is
different from bartering or other types of traditional community currencies, which also indicates that timebanking emphasizes beneficial social outcomes derived from social interactions and connections with others not necessarily a value of time credits.

Figure 4-3: Screenshot of the hOurworld homepage.

As timebank is community-oriented movement and initiative, there are several timebank organizations in the US. Some of them have already leveraged technologies; for example, developing web-based software platforms to simplify what was traditionally paper-based work by coordinators, such as setting up timebank member accounts, recording time credit balances,
providing a list of requests from others, and so on. TimeBankUSA (http://timebanks.org/), is one of the largest timebank organizations in the US. TimeBankUSA now has about 250 local timebank branches with over 25,000 members in North America and 13 other countries, created a web-based platform called Community Weaver. hOurworld (http://www.hourworld.org/), another national non-profit timebank organization, which has around 500 timebanks with 33,000 members globally (as of August 2015), provides a web-based platform called Time and Talents.

Figure 4-4: Screenshots of the MTB application (Han et al., 2015). Add a task page (left); a list of tasks added by participants (right).

Mobile timebanking is an extension to traditional timebanking. It aims at not only supporting conventional timebanking activities but also addressing a finer-grain and more synchronous scheduling of neighborhood service exchange activities by taking advantage of
features of mobile computing such as high mobility and accessibility. This type of timebanking transactions is not well supported by traditional web-based timebanking, because people do not tend to continuously access a timebank website.

The smartphone timebanking application (our team named it MTB) incorporates synchronous interaction and location sensing as background services. Thus, MTB supports constantly checking for changes and updates both of incoming data streams and the device’s current location as a background service. MTB provides notification messages and filters information displays by location. Such features enable synchronous interactions that are also highly efficient. For example, the user can check a list of service requests from his or her neighbors, and the list presentation can be filtered and prioritized by where the user is current located; a request made minutes before for a quart of milk from the next-door neighbor would be prioritized very high if the user was standing in the grocery store.

The user volunteers for a request they wish to and are able to satisfy by selecting it. If the user is in the market, the user can choose the “buy milk” request from the current list. The application constantly polls responses to service requests through a background service; therefore, when the application confirms that a request has been selected, by communicating with the server through APIs, a notification message will be pushed the user who originally issued a request (e.g., I am bringing you milk and should arrive in ten minutes).

Figure 4-4 illustrates the design of MTB. There are various types of information that a user could add, such as a title, description, preferred date and time frame, estimated time to complete the task, and task location. After the task is posted, other users can access a list of tasks and see detailed information for each task. In addition, a built-in messaging function was also designed to support text-based communication between two users, allowing them to set a schedule, negotiate timebanking activities and so on. If available, users can also communicate via
email exchanges. Once the task is completed, the task requestors will be able to provide a satisfaction rating and additional comments for the job to support a reputational aspect of timebanking activities. MTB supports a push-notification feature that allows users to receive a notification for any incoming messages from others or status updates of their tasks in near-real time. Users can also access their task history and profile information.

**Local News Chatter (LNC)**

Traditionally, local news and newspapers have played a significant role in collecting everyday community information and disseminating it to local residents because they are primary sources of local news, activities, or events (Tezon, 2003). They have been regarded as an indicator of community awareness and engagement, and of the vitality of community because they define and reflect the perspectives of community members and activities (Putnam, 2002; Shah, McLeod, & Yoon, 2001). Local news and newspapers are still one of the main local community news providers; however, newspaper readership has been declined, because people have shifted to digital platforms to read news (Kohut et al., 2012; Putnam, 2000). Nowadays, it is common for people to find news online and increasingly on devices such as smartphones and tablets. Portable devices increase mobility and accessibility for people to access a great amount of online news and information anytime and anywhere, significantly increasing people’s expectations for such technologies to keep them stay up to date and in touch.

As previously described, Web 2.0 technologies create new affordances for people to create their own information and share it to others, and social media provides more opportunities to achieve those activities. Theoretically, such benefits from Web 2.0 allow local residents to
access or create diverse community information more easily and conveniently; however, when it comes to a practical level, there exist some challenges.

First, local community online interactions often failed to exceed the threshold of community perception (Carroll et al., 2012), because local information is primarily accessed by local residents, unlike to international news channels (e.g., cnn.com, nytimes.com) that are mostly accessed by people all over the countries. There are few posts and even fewer comments posted on the website. Another challenge is that most news websites are designed for providing headlines or popular news articles within the community on the front page. This could undermine the chance of discovering relatively less prominent news articles, unless the readers intentionally search for them. Especially in the context of a local community, less prominent news articles should not be overlooked because they may pertain to local news or events that are relevant to a smaller special interest groups in the community. Local community citizens may be also more interested in learning and discovering interesting local news rather than reading stories that are already widely covered by many other news media. Regarding the challenge from social media, although much research has demonstrated the effective communication method of microblogging (Ehrlich & Shami, 2010; Forte, Melissa, & Park, 2012), people tend to perceive microblog content as noise or junk unless it is controlled in a proper way (Andre, Bernstein, & Luther, 2012). This perspective calls for a necessity of having a critical measurement toward microblog content.
Figure 4-5 represents an overview of the Local News Chatter (LNC), a mobile application that aggregates local news articles and tweets and presents the integrated information in a tag cloud (Han, Shih, & Carroll, 2014). Regarding the local news sites, our assumption is twofold. First, local news sites are the most active community news providers when compared to those from other organizations and national news media. Second, if several local news media cover the same news topic, or if multiple news articles about the same topic are published, that topic can be considered to be a trendy local topic and is more visible across different local news sources. With this rationale, LNC collects RSS news article feeds from five local news sites and stores them in a database on our server on an hourly basis. Although it is possible that globally interesting news can appear on local news websites, the information processed and displayed in LNC is mostly related to the local community.

State College is a college town of about 45,000 students and 45,000 local residents living in neighborhoods that span approximately 10 square miles, embedded in a rural and agricultural region. In this community, there are five online local news sites, and I leverage the specific URL
(ending with “.../local”) that provides only locally relevant news content (no news articles at the national/international level). Thus, LNC is able to retrieve locally relevant news articles directly. I also verified that only local news were provided and displayed in the LNC application during the study. Each news item contains a set of metadata, including a title, description, source URL, and created date and time.

After a typical pre-processing step in NLP (Natural Language Process, such as stop word removal), word tags are extracted from news titles and descriptions, and their TF-IDF (Term Frequency-Inverse Document Frequency) scores are calculated. The TF-IDF score is a standard metric in Information Retrieval to measure the “importance” of a tag. The TF-IDF value of a tag \( w \) in an article \( a \) is positively correlated with the frequency of \( w \) within \( a \) but is negatively correlated with the frequency of \( w \) in the entire article collection (Salton & Buckley, 1988). I have designed the system to handle tags up to three words (tri-gram).

At the end, top-\( k \) tags with the highest TF-IDF scores are used as a parameter, along with a geo-coordinate and a radius (I used 3 miles because it is enough for covering this community), and submitted to a Twitter search API. Twitter returns a set of tweets that are pertinent to the provided tag and location, and the results are stored in the local server database. Since all reactions to the topics are retrieved from Twitter, users of LNC do not need to formally declare membership or interests before they can engage in a discussion on any given local topics.
Figure 4-6: Screenshots of Local News Chatter. (Top-left) main page shows a list of tags used in the news articles; (Top-right) detailed news page shows both news articles and tweets in an integrated manner. Users can open up the full news page and add tweets; (Bottom-left) detailed tweet page where users can interact with Twitter features including retweet, reply, favorite, and follow; (Bottom-right) users can go back and check their activities again (Han, Shih, & Carroll, 2014).
The role of the tags is to link the news articles and tweets and to present the local information together. The tags appear as a tag cloud (Figure 4-6; top-left), and the size of each font indicates tag popularity. Larger font means that more local news articles relate to the news topic related to the tag, whereas smaller fonts indicate more distinctive local news topics — note that these might actually be more informative, because it is less likely that any given citizen user will be aware of those news topics. In addition, users can access a different set of tags depending on three timeframes: daily, three days, and a week.

When a tag is clicked, LNC displays the linked local news articles and tweets together (Figure 4-6; top-right). If there are multiple news articles associated with the tag, users can swipe the screen horizontally and read them. There is also a list of associated tweets to the selected tag, and users can swipe the screen vertically to read them. Users can also utilize some of the Twitter features (Figure 4-6; bottom-left) and check their activities again later (Figure 4-6; bottom-right).

This design approach shows a unique way to represent and deliver community information. Unlike the project called Whoo.ly, which presents community information exclusively from tweets (Hu, Farnham, & Hernandez, 2013), LNC combined tweets and local news articles, presenting a unique way of community news provision. LNC also utilizes new content that is relevant to a local community and strives to combine local news articles and tweets based on the tags in order to present richer and more dynamic local community information to local residents.

**Arts Festival (ArtsFest)**

The Central Pennsylvania Festival of the Arts is one of the most popular summer events in State College. The festival takes place in mid-July, downtown and on the adjacent
Pennsylvania State University campus. It is a five-day event, celebrating the arts with a sidewalk sale and juried gallery exhibition involving around 1,000 artists, as well as music, dance, theatrical performances, and several workshops and events for children. More than 100,000 people visit the festival annually.

Since 2008, my research team has worked with the festival team, investigating challenges and opportunities to support the festival experience with technologies, including event information and basic social sharing features such as photo uploads, commenting, and liking (Ganoe et al., 2010). More recently, our focus has been placed primarily on understanding and articulating the impacts of mobile technology on people’s festival experience, and we have designed and implemented a festival mobile application. For the 2014 Arts Festival, we worked closely with festival administrators and staff during the three months prior to the festival to design content and functionality for the application, to refine information displays and user interactions, to plan dissemination and onsite support, and so on. The festival team provided us with official digital content such as event descriptions, images, descriptions and links to artists, and so on. We together organized this data in our database server and wrote APIs to enable communications between mobile clients and the server. The application (ArtsFestApp) was implemented for both native iOS and Android platforms, and it was available in the respective online application stores a few days before the festival started.
Figure 4-7: Screenshot of the festival application in 2014 (Shih, Han, & Carroll, 2015).
When users first launch the application they go through a terms of service interaction informing them that ArtsFest and its use is a research study, and inviting them to participate in the study. They can log into the application by either using a locally administered account or their Facebook account (Figure 4-7, top-left). After login, the performances page is displayed, including a navigational bar located at the bottom of the screen. The navigational bar includes links to the performance page, artist page, my list page, popular page, and other festival information (Figure 4-7, top-right).

Users can organize performance and artist information on the My-list page, indicating their attendance. Users can also interact with other users using the application. For example, they can capture and share their festival moments by posting photos as well as add Likes or comments to photos by others. The Popular page has tabs presenting lists of popular performances — based on the total number of attendances and photos, popular photos - based on the total number of Likes and comments, and popular users — based on the total number of event attendances, photos, comments, and likes contributed by the users (Figure 4-7, bottom-left, shows the number of Likes and comments for some popular photos). ArtsFestApp also provides a map view showing a set of photos shared by users as pushpins (Figure 4-7, bottom-right).
Figure 4-8: Screenshot of the festival application in 2015 (Han et al., 2015).
For the 2015 Arts Festival, our team has improved the previous version by fixing several bugs found in 2014 and by augmenting more features that are designed to leverage mobile technology features. Those new features include a notification of events, artists, user-generated content that a user is interested in, a personalized page that summarizes user’s all activities and notifications, and a recommendation feature that shows a list of recommended users (updated in every one hour) based on user’s interests in the arts festival and application usage as illustrated in Figure 4-8. The research goals in 2015 were to understand how the features that can be better supported by mobile technology (compared to desktop-based technology), which provides high mobility and immediacy, would enhance one’s festival experience and connection to their local community while attending a local event and using the mobile application. We measured user perception and experience in those features through the analysis on application usage logs and answers to the survey questions.
Chapter 5

User studies and results

To articulate the application of mobile technology into a local community, I have successfully conducted a number of user studies over three years. In this chapter, I describe the study goals, the design and the methodology of the user studies, and the study results.

Table 5-1: Summary of the user studies from four local community projects. (with the year of study completed)

<table>
<thead>
<tr>
<th>Project</th>
<th>User study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lost State College</td>
<td>Field study (2013)</td>
</tr>
<tr>
<td>Mobile TimeBanking</td>
<td>Field study (2014)</td>
</tr>
<tr>
<td>Local News Chatter</td>
<td>Lab study (2014), Field study (2015)</td>
</tr>
<tr>
<td>Arts Festival</td>
<td>Field study (2015), Field study (2015)</td>
</tr>
</tbody>
</table>

Table 5-1 summarizes the user studies that I have designed and conducted. For Lost State College, I completed a field study with 34 local residents where they had a walking tour in the downtown area. For Mobile TimeBanking, I completed a field study with 32 undergraduate students for five weeks. For Local News Chatter, I completed both lab and field studies with 30 local residents and 35 local residents, respectively. For Arts Festivals, I completed two field studies (in 2014 and 2015) during the festivals. In 2014, I had around 1,400 downloads and around 400 active users who interacted with the application more than once (e.g., posted user generated content, photos, Likes, comments; added Attends or Favorites to events or artists, etc.) and had around 1,200 downloads and 360 active users in 2015.
Overall, based on the user study results, I argue that each study result shows the different and salient insights of the impacts of mobile technology on a local community with respect to community identity, participation and awareness, and social support networks.

Lost State College (LSC)

The research goals of the LSC study were (1) to characterize the general usage of the mobile application and (2) to investigate how the participants utilized the mobile history application as a way of storytelling and placemaking mechanism, which refers to “the active process of connecting and relating to locations that become meaningful in our lives” (Ciolfi, 2012) and “a living and sustainable relationship with heritage” (Giaccardi and Palen, 2008) by allowing users to share personal and community memories through annotated photos and notes or capturing of sonic experiences of the natural heritage.

Study procedure

The study consisted of three steps. Prior to taking the tour, participants completed a brief online survey that asked for demographic information (e.g., age, gender, length of residency, technology use); they were introduced to LSC in the controlled conditions of a research lab. Then, they embarked on a tour using LSC. They were asked to follow a predefined walking route to ensure some comparability across users’ experiences. Participants who owned an Android smartphone downloaded LSC and used their own phones for the tour, while others used an Android smartphone that we provided (we first demonstrated its use). All walking tour took place when the weather was warm and sunny. Researchers walked behind the participants and took
notes on their behaviors; they also answered questions regarding use of the application throughout the tour. Afterwards, participants returned to the lab to participate in a semi-structured interview. The tour included 14 landmarks covering a total distance of about 2 miles. The average tour duration was approximately 56 minutes.

I also collected the interaction data that came in the form of touchscreen actions during the study. For example, participants touched the “Visit icon” to indicate that they had visited a landmark; they touched the “Visit text” to see a list of people who had visited previously. With this data, I was able to investigate the relationship between application usage and practices or patterns of digital cultural heritage.

**Sharing local historical information through Social features**

<table>
<thead>
<tr>
<th>Official photos</th>
<th>User-generated Photos</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Official Photos" /></td>
<td><img src="image2" alt="User-generated Photos" /></td>
</tr>
<tr>
<td><img src="image3" alt="Official Photos" /></td>
<td><img src="image4" alt="User-generated Photos" /></td>
</tr>
</tbody>
</table>

Figure 5-1: Examples of official photos and user-generated photos. Participants took various types of photos related to the landmarks (Han et al., 2014a).

The study results indicate that participants read official content as well as interact with all four Social features (*i.e.*, Visits, Likes, Comments, and Photos) during the tour, demonstrating the positive outcomes of adding a social interface. More specifically, participants added Visits to
mark their presence and Likes to express their personal preference to the landmarks in a simple manner (e.g., “It’s simple. I just clicked it when I liked the landmark”). Participants also took and shared a variety of photos for landmarks. Interesting finding here is that participants did not take photos that looked similar to existing ones that already had taken by other participants. Instead, they added ones that captured different angles, interesting architectural or decorative features, close-ups, insides, surroundings and so on (See Figure 5-1).

Table 5-2: Question types, counts and exemplary comments (a total of 102; ordered by counts) and a screenshot of the application that shows a list of commented added to the landmark (Han et al., 2014a).

<table>
<thead>
<tr>
<th>Types</th>
<th>#</th>
<th>Examples</th>
<th>Screenshot</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1. Personal appreciation</td>
<td>37</td>
<td>“nice hotel”, “quite a big pig”, “classic structure”</td>
<td></td>
</tr>
<tr>
<td>T2. Sharing a personal experience or story</td>
<td>21</td>
<td>“There’s an orthodontist office up there and it has an awesome fish tank in the waiting room”</td>
<td></td>
</tr>
<tr>
<td>T3. Landmark features</td>
<td>18</td>
<td>“Had no idea that it was originally a dump”, “Love the fallout shelter”</td>
<td></td>
</tr>
<tr>
<td>T4. Current state of the landmark</td>
<td>17</td>
<td>“The nittany quill is here and a closed store dragon chaser”</td>
<td></td>
</tr>
<tr>
<td>T5. Asking a question</td>
<td>5</td>
<td>“Why would they want to ruin the natural architecture with that front?”</td>
<td></td>
</tr>
<tr>
<td>T6. Adding information</td>
<td>4</td>
<td>“The delta program is housed here I think”</td>
<td></td>
</tr>
</tbody>
</table>

Similar to adding photos, participants augmented a total of 102 comments. I inductively coded the comments and grouped them into six types. Table 5-2 lists the types, counts, and some
examples. I noted that 36% of the comments (T1) simply expressed appreciation toward a landmark in a few words, 34% (T3 and T4) consisted of physical observations about the landmarks, and 25% (T2 and T6) provided additional information or stories to the landmarks. Overall, these activities demonstrate that the study participants showed great interests in the landmarks by adding photos and comments with different motivations.

Length of residence and level of interaction

Table 5-3: Application feature usages by three groups of the length of residence (Han et al., 2014a).

<table>
<thead>
<tr>
<th>Features (N)</th>
<th>High (11)</th>
<th>Mid (11)</th>
<th>Low (10)</th>
<th>F(2,31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Visit</td>
<td>9.8 (1.7)</td>
<td>5.2 (1.7)</td>
<td>10.2 (4.8)</td>
<td>2.4</td>
</tr>
<tr>
<td>Add Like</td>
<td>4.7 (3.9)</td>
<td>3.3 (3.0)</td>
<td>4.6 (3.8)</td>
<td>0.4</td>
</tr>
<tr>
<td>Add Comment</td>
<td>4.7(3.6)a</td>
<td>2.0(1.8)b</td>
<td>2.3(2.8)</td>
<td>2.9*</td>
</tr>
<tr>
<td>Add Photo</td>
<td>5.1(4.9)a</td>
<td>3.0 (2.9)</td>
<td>1.4(2.0)b</td>
<td>2.9*</td>
</tr>
<tr>
<td>View Visit</td>
<td>2.4 (3.3)</td>
<td>1.9 (2.3)</td>
<td>4.5 (4.3)</td>
<td>1.6</td>
</tr>
<tr>
<td>View Like</td>
<td>1.8 (1.8)</td>
<td>1.4 (1.8)</td>
<td>1.8 (1.7)</td>
<td>0.1</td>
</tr>
<tr>
<td>View Comment</td>
<td>4.0 (1.8)</td>
<td>4.0 (2.8)</td>
<td>3.9 (2.8)</td>
<td>0.1</td>
</tr>
<tr>
<td>View Photo</td>
<td>4.3 (3.8)</td>
<td>4.0 (4.2)</td>
<td>4.7 (3.8)</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Note: Reporting format: Mean (SD); a > b, p < 0.05; * p < 0.05

Based on the demographic and interaction data, I was able to show the relationship between a length of residence and social feature usage. The hypothesis was that people who have lived in a community for a long time might know more about its history than relative newcomers. To test this, I classified the length of residence into three categories (High – more than 4 years; Mid – between 1 and 4 years; Low – less than a year; this is because a majority of participants were undergraduate students who mostly live in the community for four years). The statistical results from ANOVA with Tukey-Kramer post-hoc analysis show that participants who have
lived in the community longer tended to add more comments \((t = 3.1, p < 0.05)\) and photos \((t = 3.4, p < 0.05)\) to the landmarks than those in the mid- and low-residence-time group (Table 5-3).

Table 5-4: Social feature usage at high-interaction and low-interaction landmarks (Han et al., 2014a).

<table>
<thead>
<tr>
<th>Features (N)</th>
<th>High (4)</th>
<th>Low (10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Visit</td>
<td>19.5 (1.0)</td>
<td>19.1 (1.4)</td>
</tr>
<tr>
<td>Add Like*</td>
<td>14.8 (1.5)</td>
<td>8.1 (0.9)</td>
</tr>
<tr>
<td>Add Comment*</td>
<td>9.3 (0.9)</td>
<td>6.0 (0.6)</td>
</tr>
<tr>
<td>Add User photo</td>
<td>9.3 (1.8)</td>
<td>7.2 (1.1)</td>
</tr>
<tr>
<td>View Visit</td>
<td>6.3 (0.7)</td>
<td>6.9 (0.4)</td>
</tr>
<tr>
<td>View Like</td>
<td>6.0 (2.0)</td>
<td>3.6 (2.1)</td>
</tr>
<tr>
<td>View Comment*</td>
<td>12.0 (1.1)</td>
<td>8.0 (0.7)</td>
</tr>
<tr>
<td>View User photo</td>
<td>11.3 (1.4)</td>
<td>9.4 (0.9)</td>
</tr>
</tbody>
</table>

Note: Reporting format: Mean (SD); * \(p < 0.05\)

In parallel with characterizing participants’ interactions, I investigated the relationship between individual landmarks and people’s heritage connection. In this analysis, I assume that landmarks that tend to evoke more use of social features are experienced as more meaningful.

To explore this possibility, I used k-means clustering to search for contrasting clusters of landmarks based on usage frequency of all social features. To decide a starting point of \(k\), I performed the centroid hierarchical clustering on the total interactions recorded for each landmark. This led me to cluster the landmarks into two groups; the k-means output showed that the clustering variables’ means differ significantly \((p < 0.001)\). Table 5-4 summarizes the feature usage across these two clusters of landmarks. It points to several differences among them; for example, more adding of Likes \((t(12) = 3.6, p < 0.05)\), as well as adding \((t(12) = 2.8, p < 0.05)\) and viewing Comments \((t(12) = 2.9, p < 0.05)\).
There were no patterns found related to who contributed the Likes. Many participants told me that they were aware of which landmarks were high in Likes; however, that did not necessarily warrant the extra step of viewing who liked the landmark, mainly because they did not expect to know most of other participants.

“I did not check other users, because I do not know them.” (P25)

However, as previously described, this aspect could possibly create another motivation to use Like because a few participants indicated they would be more engaging in using Like if they could see activities and content from their friends.

“I will use this feature more if my friends use this app.” (P29)

This also implies that participants wanted to create and maintain social interactions with others if the opportunity exists.

Regarding the Comment feature, both the adding and viewing of comments varied across the two clusters. I speculate that if a landmark is meaningful to participants, they will leave and check more comments. Perhaps they know more stories and information about those landmarks, or perhaps they want learn more about them because they seem particularly interesting. Lastly, I had expected to see more use of adding and viewing of Photos for landmarks clustering in the high-interaction group. Although the means of adding and viewing photos were tended to be higher for this group, the differences were not reliable enough to lead to a significant difference between the two groups.

In addition, I further investigated the relationship between the content of comments and a length of residence. In other words, I was interested if the local information from knowledgeable local citizens might be as insightful or interesting as the official history (i.e., participants with a longer residence history would share more informative content and story related to the landmark,
which refers to the comments in T3 and T6, accounting for a total of 25 comments from 102; 25%). To test this, I combined the comments of the mid and low residency groups and compared them to those from the high group using a Pearson’s chi-square method \( (2 \text{ (two groups of comments)} \times 2 \text{ (high vs mid/low residency)}) \). The result indicates that the high-residence-time group had more shared personal experiences and stories or provided additional information about the landmarks than the mid- and low-residence-time group \( (X^2 (1, N=102) = 3.4, p < 0.05) \). It shows that the comments from the high-residence-time group (68%) had more shared personal experiences and stories or provided additional information about the landmarks than the mid- and low-residence-time group (32%). This is in part because of the fact that those participants might be more aware of local history or more motivated to participate in this activity, which clearly shows different actions and motivations toward digital storytelling among local residents.

<table>
<thead>
<tr>
<th>Hotel and restaurant</th>
<th>Old photo</th>
<th>Recent photo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotel and restaurant</td>
<td><img src="image1.jpg" alt="Old photo" /></td>
<td><img src="image2.jpg" alt="Recent photo" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Public play-ground</th>
<th>Old photo</th>
<th>Recent photo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public play-ground</td>
<td><img src="image3.jpg" alt="Old photo" /></td>
<td><img src="image4.jpg" alt="Recent photo" /></td>
</tr>
</tbody>
</table>

Figure 5-2: Example landmarks in the high-interaction cluster. On the top is a historical building that has housed a hotel and restaurant for almost 100 years and is still a popular place; below is a public park that many local residents visit (Han et al., 2014a).
Landmarks with high interaction

The previous results raise the question of why participants used LSC more for the four landmarks in the high-interaction group and whether those landmarks should really be regarded as being more “meaningful”. By making a qualitative comparison of those four landmarks with the other ten, I noted characteristics that make these places uniquely interesting: These are all places that people know well but not well enough to know their history. More specifically, two of the landmarks are buildings that have housed a similar business for nearly 100 years. One has been operated as a hotel and restaurant since 1926 (Figure 5-2; top), and the other is a barbershop that is the oldest such establishment in this community; it has been in business since 1919 (Figure 5-2; bottom). Many residents visit these locations on a regular basis, going to eat or getting a haircut. A number of participants mentioned they were surprised to learn that these places have historic stories and value, and are still operating as the same business.

“*I love the long history and also food*” (hotel; P13)

“*wow this is cool that they keep it original!*” (barbershop; P9).
A third landmark is a statue of a pig family. It was built to commemorate the town’s agrarian roots; most of the town’s avenues were dirt roads in 1896 when the statue was installed, and farm animals freely roamed the village. Because it is the only statue in the downtown area, our participants paid considerable attention to it during the tour and showed interest when finding new information about its history. For example, as depicted in Figure 5-3 (right), participants mentioned,

“I didn’t know animals were prohibited from running around in State College so early in its history.” (P31)

“I always wondered what the story was behind here.” (P27)
The fourth landmark is a public playground or park. The interesting fact is that this location is a naturally occurring sinkhole, and for many years it served as the town dump. Some participants indeed were surprised of this fact.

“(I) never knew it was originally a dump, (it is) quite interesting to know about this.” (P16)

Similarly to the hotel and the barbershop, participants shared close connections to this landmark because a lot of local residents spend time together with family and friends there (“My daughter loves this park.” (P26)), and a number of annual local events, such as musical concerts and festivals, are held in this place attracting more people to come (“some good concerts at the parklet in the summer.” (P17)).

It might be true that the other ten landmarks did not have a similarly clear uniqueness, because most of them are now offices, residential buildings, or a school. In contrast to comments made about the four landmarks in the first group, some participants mentioned they did not know the other ten locations at all or failed to find a historical value from them. Although this cannot be generalized to perspectives from all participants — in fact some participants said they learned new information about these other landmarks — it seems that the four high-interaction locations were indeed experienced as more meaningful landmarks by most participants in our study.

Overall, these findings indicate that locations with unique back-stories may attract more interaction from participants, including user-generated historical commentary. Many participants seemed to be more interested to know others’ reactions toward those landmarks and wanted to explore them to find interesting stories or facts, increasing their awareness through different perspectives. They also shared their personal reflections on those landmarks, augmenting and co-creating the history information not only with respect to the landmarks themselves, but also to the community as a whole. This perspective well accounts for the notion of placemaking, because
socially generated content has reconstructed the spatial environment into more meaningful interactive historical landmarks. Evidently, they have become more aware of local community history.

These results of using and experiencing with the LSC show a few insights. By using LSC, participants became aware of local history through official and user-generated content. Being at the historical landmarks and accessing content through the application evoked some participants’ personal memories and stories. Motivated participants started to augment additional information that would be meaningful to the landmarks as well as other people and their community. A series of interactions and activities reconstructs, preserves, and develops local cultural heritage and connect local people and landmarks. Clearly LSC facilitates these flows because it placed participants at the landmarks and enabled them to access, create, and share content through a mobile device.

**Official and user-generated historical content**

While the contributions made through use of Social features can be interesting and reflect personal stories, these data are not official in their historical content and in fact may be inaccurate due to lack of knowledge or personal subjectivity (Dellarocas, 2003). Therefore, it is necessary to examine the impacts or validity of Social features with respect to learning experience or enjoyment.

A number of participants expressed positive reactions about the Social features. They found the use of these features to be fun and interactive, saying,

“*It’s easier and more interactive, more fun. I would definitely use the app for a tour with my friends, using features like visits, photos, etc.*” (P25)
They also found that Social features provided a unique and intriguing viewpoint that the official content could not. For example, participants said,

“I think comments are quite informative. There were some good photos that I liked a lot.” (P17) and “I think so. I made some observations from them since they are all related to landmarks.” (P26)

Although most participants were actively involved in using Social features or appreciated social content with respect to learning and being more aware of a history of their community, a small number of participants perceived Social features quite differently, preferring official content as a means of learning about history of this community. This seemed to be a pronounced personal preference with respect to learning. For example, some participants mentioned,

“Not really, I wanted to learn something more about the landmarks from official photos and description because those were from historians or someone in Borough, and I think social data is more for do I like it or this place is popular or not.” (P19)

“Like appreciating arts in museum, I read text descriptions more while looking at the buildings.” (P31)

Regardless of the method or preference when using LSC, most participants acknowledged that user-generated content was a valuable part of the historical information that could not be added or managed by the city officials. This came from active and voluntary participation as content created by participants became part of each landmark’s “story,” along with official content. LSC was utilized as creating a digital guestbook in a sense that (1) participants provided their different types of inputs to the landmarks with different motivations or purposes and (2) making their content more visible and accessible to other local community members.
LSC also enabled participants to realize that the place where they live has its own long and rich history as well as give them heartfelt appreciation for the people and families who built up the town over many generations. Some participants mentioned,

“I really didn’t know buildings have some stories and history. Giving more different perspectives to my community.” (P20)

“I have learned a lot about this community, like it used to be a bank, theatre, and it got burned, etc. I think it is a learning experience.” (P28)

They also mentioned that they felt more identity and belonging to a community after completing the tour.

“I love to know about the story of each building. Knowing a little bit more makes me feel even more like ‘townie’.” (P30)

Overall, this user study serves as an excellent example of how mobile technology can be used for placemaking and storytelling as a way to make community historical landmarks more meaningful, interactive, and visible to community members, as well as increase community awareness. The mobile application certainly offers new ways of learning about a community’s history, both through official content and socially generated content among local residents. As smartphones become more affordable and pervasive, we expect to see more interactive online social activities that lead to interesting and rich community historical stories. This expectation is also echoed by participants’ comments:

“It gives you online social interaction, and I can see how technology can be applied to learning about community history” (P22)

“It is easier and more interactive, more fun. I would definitely use the app with my friends, using features like visits, comments, photos, etc.” (P25)
Mobile Timebanking (MTB)

As there is neither existing mobile timebanking application nor study of it, the user study that I conducted was mainly exploratory. The goal of the study was (1) to present an analysis of mobile timebanking behaviors with respect to task types and (2) to discuss new affordances created and supported by mobile timebanking over traditional timebanking. I recruited 32 undergraduate students to participate in a five-week field study. Before using the application, participants accessed a list of timebanking service examples and scenarios extracted from a traditional timebank website to understand the basic concept of timebanking and the motivation of mobile timebanking and to set their expectations from the study. They were encouraged to post freely while using the application.

Table 5-5: Overall activities in mobile timebanking by university students (sorted by the number of posted tasks; Han et al., 2015).

<table>
<thead>
<tr>
<th>Category</th>
<th>Posted (count)</th>
<th>Completed (count)</th>
<th>Completion rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free Stuff</td>
<td>17</td>
<td>11</td>
<td>65%</td>
</tr>
<tr>
<td>For Sale</td>
<td>17</td>
<td>7</td>
<td>41%</td>
</tr>
<tr>
<td>Proofread</td>
<td>14</td>
<td>7</td>
<td>50%</td>
</tr>
<tr>
<td>Tutoring</td>
<td>14</td>
<td>2</td>
<td>14%</td>
</tr>
<tr>
<td>Buying</td>
<td>13</td>
<td>6</td>
<td>46%</td>
</tr>
<tr>
<td>Transportation</td>
<td>13</td>
<td>4</td>
<td>30%</td>
</tr>
<tr>
<td>Social Contact</td>
<td>11</td>
<td>6</td>
<td>54%</td>
</tr>
<tr>
<td>Info. Inquiry</td>
<td>9</td>
<td>6</td>
<td>67%</td>
</tr>
<tr>
<td>Others</td>
<td>8</td>
<td>2</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>116</strong></td>
<td><strong>51</strong></td>
<td><strong>44%</strong></td>
</tr>
</tbody>
</table>
Study procedure

During a five-week study, participants posted 116 tasks (66 requests and 50 offers) and completed 51 tasks (29 requests and 22 offers; 44% of the total tasks) as shown in Table 5-5. After the study was finished, all authors coded the tasks and classified them into nine groups (including “others”).

For this analysis, I did not specifically consider whether the tasks were categorized into either requests or offers (where request means “I need some service” and offer means “I can provide some service”), because my intention here was to explore different types of tasks and to find if there were some tasks particularly pertinent to timebanking with a smartphone. I focus on describing each category with examples of the posted tasks and detailing more stories about each category.

Overall, participants requested or offered a variety of tasks. “Free Stuff” and “For Sale” were the most common posts; however, “Free Stuff” had a higher completion rate (65%) than “For Sale” (41%). There were several examples in “Free Stuff,” including giving away some textbooks (e.g., “Free security in computing textbook.”) or extra items (e.g., “I have an extra vacuum cleaner that I am willing to give away.”), or offering free food (e.g., “I will bake a cake for you. Message for details.”). As those tasks in “Free Stuff” seemed quite easy to take and complete, it might have a high completion rate. Examples in “For Sale” include, “I need a calculus book by James Stewart 7e. I will buy it.” In general, tasks or services which deal with items (e.g., exchange, sell, give away) are common in other existing timebanks (Collom et al., 2012) even though they are not strictly valuable in terms of time, and the study showed similar results.

A number of tasks were posted in “Transportation.” Several participants looked for and were willing to offer a ride (e.g., “Heading to Target in an hour, anyone needs a ride?”), but
only 30% of them were completed. For “Buying,” a few participants asked someone to purchase some goods or items for them (e.g., “I would like a 20 or 24 pack of Pepsi cans from the supermarket. I can pay back for the soda in full.”) or asked if anyone needed something because they would be there shortly (e.g., “I am going to Walmart this afternoon. Message me if you need something.”). Nearly half of the posted tasks were completed (46%).

Tasks in “Social Contact” are especially pertinent to a young adult population because most of them referred to playing video or computer games together online. While the tasks in this category are usually related to offline meetings or gatherings (e.g., potlucks, picnic, etc.) in traditional timebanking, the participants showed somewhat different but unique activities that reflect a characteristic of a young adult population. Examples include, “It would be nice to have someone to play games with on the internet tonight. Feel free to message me first.” More than half of the tasks in this group were completed (54%).

Among all timebanking tasks posted, in particular, those in “Free Stuff”, “For Sale”, “Transportation”, “Social Contact” are consistent with transactions documented in prior work (Collom et al., 2012), indicating timebanking in young adults on smartphones still fosters traditional timebanking transaction types.

It is also worth noting that the tasks in “Proofread,” “Tutoring,” and “Information Inquiry” are highly pertinent to university students, indicating that our participants appropriated the timebanking smartphone application to meet their academic goals. Tasks in “Proofread” (e.g., “I can proofread papers if anyone needs help with an assignment.”) and “Tutoring” (e.g., “I am good at Math until 140 course level and can help you if you need help.”) were examples of this. While the completion rate in “Proofread” was high (50%), I found that in “Tutoring” was quite low (14%), perhaps because tutoring requires offline interactions whereas proofreading can be done remotely. Some participants used the application for “Information Inquiry.” I found that
most tasks in this category were about students’ major or career; for example, “I would like an IST minor, please send me a detailed description of what exactly their degree is and answer any questions I might have since I am thinking about minoring in it.” Over half of them were completed (67%) again, perhaps because those tasks also can be easily done via online communications.

In summary, the results show that young adults used MTB in many different ways. All of the tasks were the ones observed in non-mobile timebanking contexts, yet some of them (e.g., “Proofread,” “Tutoring” and “Information Inquiry”) seem to be highly pertinent to participants’ school life, which are not found to be highly popular in conventional timebanks (Collom et al., 2012). It is also important to note that young participants engaged in timebanking quite actively, providing the fact that active timebank members (who regularly engage in timebanking) tend to complete 5-7 services per quarter (which is 1-2 service(s) per month; Collom, 2012). This also indicates a possibility of high engagement by young populations when mobile timebanking is introduced.

Potential opportunities of timebanking from the smartphone application

In this section, I present the study results within the lens of the three affordances of smartphone technology on timebanking, including reducing transaction time, supporting location and time-sensitive timebanking activities, and coordinating in real-time.
Table 5-6: Average time-to-task-completion calculated from the timestamp (unit is day; sorted by mean; “Others” excluded; Han et al., 2015).

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean (SD)</th>
<th>Min</th>
<th>Med</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buying</td>
<td>2.8 (2.6)</td>
<td>0.2</td>
<td>2.6</td>
<td>7.3</td>
</tr>
<tr>
<td>Proofread</td>
<td>2.9 (2.5)</td>
<td>0.9</td>
<td>1.9</td>
<td>7.9</td>
</tr>
<tr>
<td>Free Stuff</td>
<td>3.0 (2.7)</td>
<td>0.9</td>
<td>1.9</td>
<td>7.3</td>
</tr>
<tr>
<td>Social Contact</td>
<td>3.5 (2.1)</td>
<td>1.0</td>
<td>2.7</td>
<td>6.2</td>
</tr>
<tr>
<td>Transportation</td>
<td>4.0 (2.5)</td>
<td>1.0</td>
<td>3.9</td>
<td>7.3</td>
</tr>
<tr>
<td>For Sale</td>
<td>4.1 (3.9)</td>
<td>0.5</td>
<td>3.5</td>
<td>12.3</td>
</tr>
<tr>
<td>Tutoring</td>
<td>4.4 (2.0)</td>
<td>2.9</td>
<td>2.9</td>
<td>4.5</td>
</tr>
<tr>
<td>Info. Inquiry</td>
<td>7.1 (5.0)</td>
<td>1.1</td>
<td>6.6</td>
<td>13.5</td>
</tr>
</tbody>
</table>

**Ability to reduce transaction time**

All the timestamps for task transactions were logged in our database; thus, I was able to calculate the sensitivity of time in task completion. As shown in Table 5-6, if we assume that participants regularly updated task transactions during the study, most completed tasks took less than a week. Especially I found that those in “Buying,” “Proofread,” and “Free Stuff” were completed within three days on average. It is also worth noting that the minimum values for each category were mostly less than one day (for example, the minimum results of “Buying,” “Proofread,” “Free Stuff,” and “For Sale” are less than a day), indicating some participants utilized MTB to meet their needs or help others quickly. This seems to be due to greater accessibility as some participants checked the list of posted tasks regularly using their smartphone.

“I tried to browse the app regularly to see what sort of things people had posted.” (P12)

According to timebank coordinators, most traditional timebank members tend to report task completion several days later. From the discussions after the study, the coordinators and
system developers of timebanks agreed with the point in which completing a task within two days from the original posting date does rarely happen in practice of traditional timebanking. It was noted that this result might be influenced by the notion of mobility and immediacy of mobile technology, because participants received the notification about the updates from the application and were able to report the hour right from it.

It has been well known in timebanking communities that many timebank members do not report hours right after they complete the service or task because computers are not always available or accessible. Also in many cases, they forgot to report hours even if they completed the tasks. Reporting hours through the mobile application was designed to be easy, and it seems participants found in the same way too. In this sense, timebanking with a mobile application seemed to facilitate managing timebanking activities and transactions quickly and conveniently.

Figure 5-4: Examples of posted tasks during the study. Blue pushpins indicate “Requests” and red pushpins indicate “Offers.” Some of the task examples are more location and time sensitive (Han et al., 2015).
Ability to post and complete location and time sensitive tasks

To measure locational aspects of task transactions, I collected detailed stories of each completed task from participants during the post-study. I inductively coded and operationalized each story based on how and where the available task was accessed and taken by participants. Through this process, I was able to analyze if each task contained time- and location-sensitive components. I decided to consider a task as time- and location-sensitive if it was completed because (1) the task taker was in or near to the place that had been specified in the task description and (2) both the original task requestor and the taker reported the task as being completed in two days.

Statistically, I first found that the total number of fine-grained timebanking activities was 21 (18% out of a total of 116) for all tasks and 7 (14%) for the completed tasks. Those were from the three categories: “Free Stuff,” “Transportation,” and “Buying.” Some of these timebanking posts were shown in Figure 5-4. Although some items in those categories can be viewed as conventional timebanking tasks (Collom et al., 2012), their management and scheduling seemed to be influenced and facilitated by the smartphone application.

In the following, I present two detailed usage examples (which was completed in a day) from “Buying” and “Transportation.” First, in the “Buying” category, there was a task involving buying items named,

“Need a pack of A4 paper if someone is near a store. I can meet on campus or give directions to my apartment if needed.”

After few hours, one participant took this task, because he was at the location specified in the task description.
"I took this task because I saw it while I was at BestBuy looking for something else. I was able to pick up A4 paper and give them to him on campus later that day. He paid me back."  (P24)

The task taker (P24) did not go to the store just for the purpose of timebanking; therefore, it is worth noting that completing this type of task requires a number of pre-conditions including (1) the taker was at the right place to start it and getting to the right place to complete it was not inconvenient, (2) he found the task from the application, (3) he had enough money for this, and (4) he was willing to take the task. Consequently, I found that both participants felt great about this task completion because it was easy for the task taker, and valuable to the recipient.

"Very satisfied with this task. The task was convenient to complete because I was already at Best Buy."  (P24)

Another example is from the “Transportation” category, in which there was a case for offering a ride. One participant posted a task (on Thursday morning) for a ride to the place located around 8 miles away from the university.

"I need a ride to Bellefonte at 6pm on Thursday."  (P1)

After few hours of posting, this task was taken by someone who actually lives in that area.

"I live in Bellefonte and found that someone needed a lift, so I sent a message to him and we exchanged phone numbers to meet up."  (P12)

After they completed the task, both participants showed a high satisfaction, because one participant (P1) was able to have a free ride and the other participant was able to help and offer a ride easily (P12).

"We had to change times to meet, but I think it worked quite well."  (P12)
Another salient opportunity that I could see from these examples is the way that the timebanking application allows one to provide a service to another as a secondary task. Busyness has been identified as an obstacle to participation in timebanking (Lasker et al., 2011); therefore, this ‘altruistic multitasking’ may enable greater participation by busy people. Some participant comments supported this aspect.

“I found that factors such as how busy I was with other things and if I needed anything done at the time affected how willing I was to help other people.” (P11)

“I feel like it would contribute to the community by helping people with chores or things that they need, but do not have time to get or do it for themselves.” (P5)

**Ability to coordinate in real-time**

User study results also showed that timebanking with a smartphone application enabled near real-time coordination and communication among participants. I found that a total of 24 participants exchanged text messages during the study. As I closely looked at those messages, there are some overlapping cases where participants asked more details about the task posted, coordinated a time to meet, exchanged additional personal information (e.g., phone number, if both participants are willing to), and so on. According to participants, it seems that many of them found the messaging feature useful.

“The messaging function was useful to sort out specific details about the tasks that couldn’t be described in the task name.” (P17)

“I used this quite extensively to set up meeting times and solidify details otherwise unmentioned in the task.” (P29)
There was one usage case in which two participants exchanged messages for task management while they were at random places such as café or in transit. Figure 5-5 illustrates the flow of message exchanges between two participants. Here I would like to emphasize that how a timebanking smartphone application facilitates communications between two participants. It allowed them to set up the date/time and the location to complete the task as quickly as possible. A similar practice could occur within web-based transactions; however, mobile timebanking facilitates communications among participants by allowing them to get notified of and exchange messages in real time because a lot of people nowadays have their mobile device with or nearby them. These all make the whole timebanking process fast.
In summary, the usage results suggest opportunities in finding, accessing, managing, and completing timebanking activities and transactions leveraged by mobile and immediate aspects of mobile technology. From the results, I could argue that the timebanking smartphone application used by young adults creates new possibilities of increasing task diversity as well as facilitates task transactions and management.

**Activity and social interaction**

**Individual transaction and connections**

The number of posted tasks varied a lot by participant (Mean: 5.2, S.D.: 4.7), where the highest number of tasks was 18 and the lowest was 1 (7 participants posted only one task during the study), and the median was 4.0. This result is consistent with findings in the literature suggesting that there are always both active and non-active members participating in timebanking activities (Collom, 2011).
Figure 5-6: Social connections among 19 participants (who completed at least one task) based on the number of completed tasks and familiarity between two (Han et al., 2015).

I examined how each participant interacted with others because timebanking depends on individual interactions and communications. I chose to use the level of familiarity as a potential variable, because it is important especially for new potential timebanking members. To understand this, I collected the level of familiarity from participants during the post-survey, by asking them to indicate how familiar they were with other participants prior to completing a task, by choosing one of three options: Friend: I am very close to this user; Acquaintance: I know this user a little; Stranger: I did not know this user before. I then investigated how participants were connected with others based on the level of familiarity and the number of completed tasks between the two, to see how social relationships influence choice of whom to transact with.

I ran a social network analysis tool, Gephi (Bastian, Heymann, & Jacomy, 2009), to visualize all transactions (Figure 5-6). Among 32 participants, I found that all participants posted
at least one task and 19 participated in at least one task completion (represented as 19 nodes). Other 13 participants were still in the middle of the handshake processes at the termination of the five-week study period (e.g., waiting for the task requestor approve a task, waiting for the task taker to complete a task, or waiting for others to take task requestor’s tasks, etc.).

Each node represents an individual participant, and the size of nodes represents the number of transactions with others. Each edge represents one or more transactions between the two, and the width of edges represents both familiarity and number of transactions. The edge width is calculated as follows: width = (the number of transactions) X (familiarity score; from 1 to 3). The sizes of arrowheads on the edges indicate the number of times the one they point to was the recipient of a service. I then identified three small communities in the whole network. Each group is colored differently in the figure. The nodes in Group 1 (yellow) are strangers, those in Group 2 (orange) are either acquaintances or friends, and those in Group 3 (green) are acquaintances.

Figure 5-6 highlights two interesting observations. First, participants showed different preferences when interacting with others. On one hand, no participants in Group 1 had any pre-existing ties with each other before taking part in this study. However, many of them interacted and completed tasks with at least two other participants, and some of them completed multiple tasks with several other participants (e.g., P8 has 7 links and P23 has 5 links). People in timebanks that resemble P8, with several connections to others in an interconnected group as well as with those in a different group, would be able to bridge holes in the overall network. According to Burt (2010), such people see opportunities first and distribute innovative ideas to everyone else; therefore, it would be desirable if such people could be recognized and promoted in the timebanking network to increase and facilitate interactions. On the other hand, most of the participants in Group 2 tended to interact with others (sometimes multiple times) with whom they
had preexisting ties (either high or mid familiarity between the two), and two participants in Group 3 only interacted with each other.

Second, I found a number of reciprocated interactions (a participant helping another in return after previously being helped by them). Reciprocation is an important concept in timebanking because it is closely related to the formation of social bonds (Putman, 2000). It is more obviously shown in Group 2 and 3, but there are some connections in Group 1 as well. One particular finding is that, although most connections were not reciprocative, demonstrating the effectiveness of the “pay-it-forward” timebanking model, some participants seemed to gain more satisfaction when they had mutual contributions. In the previous section, I described one example of the completed tasks in “Buying” between the two participants (P8 and P15) who had not had pre-existing ties. I noticed that P15 reciprocated by helping P8 on proofreading a writing assignment a few days later.

“I am good at proofreading papers and I feel great that I could help him out this way for his help with Walmart.” (P15)

These reciprocated interactions imply two insights. One is the creation of a new social relationship. The previous case between P8 and P15 is such an example where both came to know each other while completing multiple tasks.

“I will say Hi to Rick if I see him again and spend some time talking with him.” (P15)

Another is about reinforcing existing relationships. This inference is especially supported by one completed task “I need a ride to Bellefonte at 6pm on Thursday.” between P1 and P12 in Group 3 (which was previously discussed). They already knew each other but were not well acquainted enough before taking part in the study. When P1 first took the task posted by P12, one of the initial actions was to exchange their phone numbers. While communicating and interacting
to complete the tasks, they became more familiar with each other. The following are each one’s comment about the other.

“He is a fun person to talk to.” (P1)

“I feel more connected to this person than before. We text and hang out now.” (P12)

Thus the reciprocal interactions that we can see in Group 2 and 3 are the reinforcement of ties that already exist. As evidenced by their greater thickness, pre-existing ties seem to make it easier to respond to others’ posts. And dyadic reciprocity also correlates highly with a pre-existing tie, even to the point of exclusiveness and isolation among people who interact a great deal as depicted in Group 3. This is an area of interest for further study and analysis.

**Sense of community attachment**

One particular aspect of sense of community attachment was the increased awareness of local community in regard to sharing various types of timebanking tasks, which complies with what timebanking studies have reported (Seyfang, 2004). For example, participants were surprised by the fact that there were a lot of tasks posted by others and mentioned that they were pleased to discover that there were many people willing to help each other in this community.

“It has definitely given me more confidence and trust in the community because now I feel like the community would be there to help me when I need any help.” (P8)

They also mentioned that timebanking helped them get a clearer idea of people’s general feelings toward one another in the area where they live.
“*I think this app could contribute to the community as a way to trade items locally, as well as a way to network with people inside the community you normally wouldn't have met.*” (P16)

Some participants also indicated that this study helped them gain self-esteem and now believed that helping others was not as complicated as they had expected. This perspective is also consistent with one of the positive outcomes of timebanking, which refers to the realization of one’s own unique skills that can be used to help others and for volunteerings in the community (Coleman, 1998).

“*I found my most valuable skills are writing related and I could help people with this more and more.*” (P32)

A number of participants also expressed that they wanted to give back to the timebank community after they received successfully completed services. As previously discussed, reciprocated interactions create and strengthen bonds among members in the same community, enriching social networks. Participants mentioned that mobile timebanking would allow local people to engage with each other and help each other even for the simplest tasks. This would lead to a growing sense of caring and respect for community members because local residents will be willing to help each other out and to inspire others to help people in the community without monetary compensation.

Overall, these comments suggest that the experience greatly exceeded participants’ initial lukewarm expectations of mobile timebanking as well as corresponding with positive outcomes of timebanking in general. Therefore, I can say that the idea of augmenting a smartphone platform into timebanking makes sense for this young student population.
Usability and challenges

I investigated some usability aspects of the mobile timebanking application in the post survey. Most participants said that they found the design of the application straightforward and easy to understand. Perhaps this is because of the fact that MTB has been designed and implemented through a series of investigations and discussions with an existing timebank. Some participants mentioned they liked the idea of extending the idea of timebanking into a mobile platform.

“Conceptual currencies have always been a really interesting concept to me, so wrapping my head around the time currency concept was entertaining. There was nothing particularly challenging about the experience from the application.” (P12)

“I personally didn’t find any challenges, I felt it pretty easy to use, and it didn’t take much time to figure out.” (P16)

Participants’ positive comments about the application show a potential to be an extension of an existing practice of timebanking for current timebank members.

At the same time, I also found some challenges (which are not necessarily related to usability issues) that participants encountered during the study. First, participants faced some difficulties when communicating with others. Some of them actually complained about the low response rates from others, leading to the situation in which the tasks could not be completed. Because all transactions and interactions were done voluntarily, it was relatively easy for anyone to simply ignore the calls or messages or to break up the connections without any notice. Participants reflected on this issue.

“I was frustrated, because one person didn’t end up completing my task, even though I messaged him multiple times.” (P8)
“Everything was good, but some people were not good at communication than others.” (P14)

Second, some participants mentioned that although they were able to see a number of available tasks; however, there were still not a lot of tasks that they could actually perform due to a lack of resources (e.g., car for transportation, computer programming skills for tutoring, etc.). Also, because all participants were students, the types of tasks might not be diverse enough.

“It seems like a lot of participants are looking for a certain text book or a certain set of skills that I don’t have such as graphic design, programming, etc.” (P17)

It is worth noting that those two challenges seem to be consistent with what has been reported in other timebank studies that could limit participation. For example, in the national survey of timebank coordinators, “contact difficulties” and “unavailable desirable service” are identified as one of the top challenges (Collom et al., 2012). Perhaps they are fundamental issues in timebank communities. However, the first challenge could potentially be mitigated by adding additional awareness features to make the transaction process more transparent. The second challenge might in part be addressed by having more timebanking members with different talents and specialties. Most participants also believed that more interesting and various types of tasks would need to be posted, if timebanking is to become more widely adopted.

Local News Chatter (LNC)

For LNC studies, I completed one lab study and one deployment study. For the laboratory study, the primary research goal was to understand the feasibility and usability aspects of LNC. I recruited a total of 30 local residents via mailing list, university research website, and word of mouth. Each participant was asked to schedule a one-hour appointment to complete the survey
study in our research lab. Before using LNC, participants answered 5-point Likert scale questions (where 1 = *Never* and 5 = *Everyday*), about their current practices of online local news consumption. The participants were then provided with a mobile device installed with LNC. A researcher provided a short tutorial of the functions and the interface of LNC and answered any questions that the participants had. As the last step of the tutorial, the participants were asked to click on two different pre-set tags and read corresponding local news content so that they could get a sense of the type of information that LNC provides before the actual study.

**Study procedure**

For the purpose of control, all participants accessed the same tag cloud during the study. The tag cloud contained 50 different tags with 25 smaller and 25 larger tags. After completing the tutorial, participants were asked to follow study instructions displayed on a lab computer screen and answered survey questions at the three stages throughout the study.

![Figure 5-7](image)

Figure 5-7: The procedure of the user study with three stages. I aimed at investigating different perspectives in each stage. Note that the 1st and the 2nd stages were repeated five times (Han, Shih, & Carroll, 2014).
Figure 5-7 shows the procedure of the user study, which consists of three stages. First stage was to investigate how participants utilized the tag cloud to consume local news. After the participants had chosen the tag, but prior to clicking on it (so that they did not know what would be shown), they were asked to answer the following set of questions: (1) why they picked that tag (motivation), (2) what they expected to see from the news articles and tweets (expectation). Then they were asked to click the tag and read the associated local news articles and the tweets.

Second stage was to evaluate the microblog content from the participants’ experiences. After they read all the associated local news articles and the tweets, the participants answered the following set of questions: (3) whether the contents of the tweets were relevant to the associated local news topics (relevance), (4) whether they learned something useful from news articles or tweets (learning experience), (5) whether they had shared interests or opinions from tweets (shared interests or opinions), and (6) whether they were willing to provide own inputs to LNC (tweeting or retweeting). The first and the second stages were repeated five times for a total of five tags.

Last stage was pertinent to understanding the overall outcomes of LNC use. After having read the associated local news articles and tweets and answering the survey questions for all five tags, we asked the participant to answer general questions about their experiences, including (7) whether LNC would contribute to their awareness of a local community news, events, or activities (community awareness) and (8) whether they would be interested in having more interactions with others who have similar interests if they use LNC on a daily basis (social interaction).

All survey responses were inductively coded by the first author, and then discussed in groups including all authors to iteratively generate and refine the codes until a sense of closure was reached. No data was discarded or refined.
Results

All 30 participants mentioned that they were generally interested in local community news information. Sixteen of them were in their 20s, 11 of them were in their 30s, and 3 of them were in 40s or 50s. Some participants also indicated that their current practices involve using both online local news sites as well as social media, such as Twitter or Facebook, to receive local community news information.

I describe the study results in three sub-sections with respect to the usability and feasibility of LNC as well as potential opportunities and benefits of LNC when used by local citizens: (1) understanding participants’ motivations and expectations of choosing a tag with different popularity and accessing local community news content using a tag cloud; (2) articulating their interpretations and evaluations of the tweets that were associated with the corresponding local news articles; and (3) exploring their motivations of creating and sharing local community information with others. These new opportunities were also reported by participants in the deployment study; thus, here I only describe the one found in the lab study.

Making less popular local issues more visible

One of the challenges in accessing local community online information is that most digital news websites are not well designed for providing diverse types of local community information. Similar to what is shown in other national media websites (e.g., cnn.com, nytimes.com), most local community websites provide headlines or popular news articles within the community on the front page. This could undermine the chance of discovering relatively less popular news articles, unless the readers intentionally search for them. Especially in the context
of a local community, less popular news articles should not be overlooked because they may pertain to news or events that are relevant to some local citizens or smaller special interest groups in the community. Local community citizens may also be more interested in learning and discovering interesting local news rather than reading stories that are already widely covered by many other mass news media.

One of the initial goals in designing LNC was to provide diverse community information. By providing different sizes of locally relevant tags in a tag cloud, LNC provides the opportunity for readers to determine how best to access the local news articles. Participants liked the idea of presenting community news in that interface because it grabbed their attention quickly; for example,

“*It helped me become more aware by graphically showing me what is happening, even if I just open the app and glance at the homepage of it*” (P6)

“*I think it helped keep me much better informed about local news, particularly about current "hot topics" in the area*” (P19).

They also indicated that they felt presenting local community information in a tag cloud helped them stay in-the-know about what is going on, and reported that LNC increased their local community awareness of local news, events, or activities by making it easy to get all the recent local information in one place. Some participants mentioned that

“*It allowed me to easily stay up to date on a lot of information about the local community*” (P15)

“*Pointed me to news stories or insights about the local area which I might not know (and therefore be interested in) otherwise*” (P22).

Furthermore, I explored possible motivations and expectations for picking a tag and how that would pertain to consuming local community news information. I first coded the participants’ responses to the questions about their motivations and expectations and identified one core
element, awareness, which refers to the fact that being aware of a tag involves having heard of or been previously exposed to the local topic referred to by the tag on a general level. I then investigated the relationship between one’s awareness of the topics and tag size.

Table 5-7: The relationship between awareness and tag size (Han, Shih, & Carroll, 2014).

<table>
<thead>
<tr>
<th>Awareness</th>
<th>Tag size (count)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Smaller (25)</td>
<td>Larger (25)</td>
</tr>
<tr>
<td>I was aware of any local topic referred to by the tag</td>
<td>18</td>
<td>39</td>
</tr>
<tr>
<td>I was NOT aware of any local topic referred to by the tag</td>
<td>67</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>85</td>
<td>65</td>
</tr>
</tbody>
</table>

Table 5-7 summarizes participants’ responses regarding awareness and the number of selections by tag size. Chi-squared test shows a significant difference between awareness of local topics and tag size ($X^2(1,N=150) = 23.9, p < 0.001$), indicating that participants tended to pick the smaller tags if they were not aware of the local topics (72.0%), whereas they were more likely to pick the larger tags if they already knew about the local topic from the tag (68.4%). Some of their responses gave me more detailed explanation of their motivations and expectations in using the tag cloud. On the one hand, because larger tags represent popular local news information, by picking them, participants wanted to obtain updated news or read tweets from other people, or local groups or organizations in order to broaden their knowledge toward the corresponding local topics.

“I knew this tag would show continuing sanctions and lawsuits and wanted to see people’s reactions and local perspectives about this topic from tweets” (P22).
On the other hand, participants tended to pick smaller tags because they were less aware of a tag itself or the local news associated with the tag. They wanted to know what the tag meant and what kind of the locally relevant news articles and tweets would be shown.

“It was a small tag that I was not aware of, so I wanted to see how it would look” (P2)

“It is a small tag. I have a daughter in college and I thought this would probably tell me tuition rates and what increases were happening all over” (P25).

These results seemed to verify one of our design motivations of LNC. While the existing news aggregators only display the most mentioned news topics across news sources by design, by providing both popular local news topics (larger tags) less visible news topics (smaller tags) together in a tag cloud, LNC can present more diverse local community news information and supports users’ different motivations and expectations of local news consumption.

**Making hyperlocal microblog content more meaningful**

The content from the tweets tends to have some degree of variations, which has been already identified by prior research. As mentioned previously, Andre, Bernstein, and Luther (2012) found that users believed only 36% of tweets were worth reading and did not want to read others’ conversations, mood, activities, and presence maintenance mainly because most of them were boring. Rather, users seem to like the tweets that are informative and have fun or happy sentiments. Thus, I sought to empirically understand and evaluate how participants perceived the tweets from LNC, leading us to articulating system design that could enhance their experiences.

Overall, participants answered that the tweets from 79% (118 out of 150) tags are well associated with the local news topics, showing the high relevance of the tweets. Below, I
analyzed participants’ evaluation on tweets in terms of learning experience and shared interests or opinions.

**Learning experience**

![Bar chart showing the relationship between relevance of tweets to local news topics and learning experience from tweets (Han, Shih, & Carroll, 2014).](https://via.placeholder.com/150)

Figure 5-8: The relationship between relevance of tweets to local news topics and learning experience from tweets (Han, Shih, & Carroll, 2014).

Participants mentioned that they learned something useful about their local community from the tweets in 74% (112 out of 150) of the tags that they had selected. As illustrated in Figure 5-8, participants learned more useful information when the tweets were relevant to local news topics ($X^2(1, N=150) = 34.25, p < 0.001$). Based on the participants comments, I identified the two main reasons for that finding, including the cases in which the content of the tweets (1) had additional information that news articles did not contain or (2) referred to people’s opinions or
thoughts (both positive or negative) toward the news articles or the tag. The followings are the participants’ comments for each reason.

(1) “I learned about recent safety and crime events in this area as well as some from the surrounding communities. None of these events I was previously aware of, so I appreciated being educated on this platform” (P22; Figure 5-9, left)

(2) “I could see people's interests and eager for support the apartment residents. People retweeted the way how to donate, the motivation of fire, and so forth” (P29; Figure 5-9, right)

Both reasons point to extending and enhancing participants’ knowledge or perspectives of local news information or local sentiment. These results are consistent with some of the motivations of consuming online news comments presented in Andre, Bernstein, & Luther (2012), indicating that participants found the tweets presented in LNC meaningful and relevant. Such examples with the corresponding reason are illustrated in Figure 5-8. The left screenshot shows the news about police investigation and the right screenshot depicts the fire incident both from formal news articles and user tweets.
It is worth noting that sometimes the news articles and tweets did not match up quite well, mainly because those two sources are connected through the tag, not necessarily by content. This might raise a question about the inconsistency of local news articles and tweets, which could lead to undermining user experience or expectation. However, we found that, even if the tweets did not match the local news articles very well, some participants still seemed to consider them to be useful and informative as additional local community information, because those tweets were obtained based on the locally relevant tags. Figure 5-8 also supports this perspective, as we found that some participants still considered some tweets to be informative even if they were not well relevant to the associated local news topics (i.e., they answered they learned something useful...
from 41.6% of tweets that were not relevant to local news topics), which resonates well with some of their comments.

“These tweets were more helpful to me than the news articles were. If the tag were not cars but rather wrecks, they would still have been about as informative on the subject, but I am still relatively pleased to see that the twitter aspect of the program could cast a light on the subjects that I was hoping to see” (P7)

“A lot of interesting studies at Penn State were highlighted not from the articles but from the tweets” (P30).

Similarly, according to some participants, another positive reaction toward the tweets is that the tweets sometimes contained more meaningful or informative content than the news articles. This aspect in part supports one of our design motivations of utilizing tweets into local community news context with respect to providing additional locally relevant information that may not be easily accessed (or not available at all) through online local news sites. For example, some participants indicated,

“These [tweets] were what I had hoped to learn on the entering the thread. I feel that sometimes Twitter was a better medium than the local news” (P12)

“I found the tweets to have a lot more useful information than I thought, more interesting to read them than the news articles” (P25).

An additional interesting finding here is that the design rationale of LNC seemed to positively influence some participants’ perception toward Twitter itself or its content, indicating tweets could be utilized as a great resource if managed appropriately.

“I have tried to avoid Twitter like the plague, but I think I would start appreciating it more, particularly truly "news-worthy" tweets. The tweets are good ways to learn key words and ideas circulating in local news” (P19).

However, we found that not all tweets were perceived as informative local content. Some participants complained that some of the tweets (1) contained similar or just the same information
that the news articles provided and (2) lacked people’s expressions or opinions, which both did not seem to impact participants’ sense of learning from the tweets. For example,

(1) “They pretty much just summed up what was in the news article. I didn’t learn anything from this” (P24)

(2) “Most of the tweets were just providing links to news articles about the issue. Very little opinion on the issue. I already learned from the articles everything that I wanted. Nothing new from the tweets” (P8)

**Shared interests or opinions**

Participants answered that they found shared interests or opinions from the tweets from almost half of the tags (51%; 76 out of 150). Considering the example of the recent fire incident depicted in Figure 5-9 (right), one reason of having shared interests or opinions seem to be extended from learning experience if the content of the tweets is reasonably aligned with one’s personal interests or opinions.

“Definitely, I was very interested in how to help and what I can do to help them” (P29).

The other reason is the sharing of personal experiences with some local events that they attended or participated. It seems that participants felt great about reading the similar excitement, effort, or motivation from the tweets.

“Yes, I enjoyed the festival tremendously. It’s good to realize that almost everyone feels the same way” (P18).

Conversely, we found that the reasons for not identifying with the tweets including (1) misalignment with one’s own interests or opinions, (2) a lack of interests or personal indifference to the topic, and (3) unrelated or less informative content. This result implies that learning experience does not seem to necessarily affect one’s shared interests or opinions (and statistically,
there was no significant difference) because the former refers to extending one’s knowledge or perspective whereas the latter is more pertinent to individual preferences or situations. Below are participants’ comments that support each reason.

(1) “I did not have shared opinions because they were all bashing our school on twitter” (P3)

(2) “I do not care one bit about football, so I did not have shared interests with those who tweeted” (P19)

(3) “I did not share opinions because these tweets were mostly unbiased and objective reports of news stories” (P22)

Overall, the analysis based on these two perspectives (i.e., learning experience and shared interests or opinions) shows that participants perceived the tweets presented in LNC were quite informative and useful with respect to accessing and consuming local community information. Simply presenting the tweets themselves without connecting them to local topics could possibly make tweets noisy streams or spam. Our method, which is to anchor tweets to the tag extracted from local community news articles, leads not only to complementing formal local news sources, but also making tweets more meaningful and informative content to local people.

We argue that another salient benefit of LNC is that it utilizes users’ existing Twitter practices instead of requiring them to adopt a new technology platform completely. LNC users are able to access community discourse for current local news, events, or activities without much effort, because it utilizes the content that already exists in local news media and Twitter.

**Leveraging local knowledge for community discourse**

Much research has reported that the motivations for tweeting or retweeting on traditional social media are highly individual-oriented such as broadcasting personal updates or some
random thoughts, maintaining informal communications or conversations, or sharing information to their followers or one-time visitors (boyd, Golder, & Lotan, 2009; Zhao & Rosson, 2009). One outstanding difference between LNC and Twitter (and other third party Twitter-based applications) is that LNC connects local people through hyperlocal news topics that are relevant to the local community.

![Chart showing the relationship between having shared interests from tweets and tweeting/retweeting.](image)

Figure 5-10: The relationship between having shared interests from tweets and tweeting/retweeting (Han, Shih, & Carroll, 2014).

Increasing social interactions and connections among local residents is one of our main design rationales; thus, our intention here is to understand the motivations of creating or sharing community information as well as explore the reasons why participants were reluctant to engage in those activities. Although we did not ask participants to provide their own tweets or retweets during the study we asked them whether they would be willing to retweet existing posts or tweet new posts if they use LNC on a daily basis. Participants answered that the tweet content from
38% of the tags (57 out of 150) would impact their willingness to take actions on tweeting or retweeting.

As shown in Figure 5-10, the Chi-squared test showed that LNC users tended to tweet or retweet more when they were interested in the local news associated with the tag \( \chi^2(1, N=150) = 35.01, p < 0.001 \). While unsurprising, participants shared more details on their motivation to add to the already abundant tweets on the topics of interest. In terms of the creation of new tweets, there were two reasons. On the one hand, some participants wanted to add additional and non-repetitive meaningful information or personal opinions that had not been provided by the existing tweets. For example,

“I felt I needed to tweet something to share a different side on the basketball program and how it will take hard work and smart calls next year and how even once and a while the top dog can be beaten by a rising team” (P6)

“I am interested in how people are still feeling. I was surprised that people aren’t stating too much about Penn State paying all the money and how it may affect the university financially. So I would add a tweet” (P18).

Apparantly, those participants did not have any shared interests from the tweets but mentioned they would like to add a new one to express their personal thoughts or opinions expecting that other users might see it.

On the other hand, some participants indicated that they wanted to join existing discussions or conversations that matched their interests or were willing to start a discussion as well. Examples include

“I would be more willing to participate if someone that attended the event initiated some discussion” (P15),

“I think that if I would have tweeted about the money, it would have opened up a lot more chatter” (P18).
Similarly, regarding retweeting activities, in most cases, we identified the combined motivation of one’s agreement and intention to spread the opinions to other people as follows.

“[I] would retweet because I saw that others on tweeter were talking about it” (P11)

“I would certainly retweet a message about an interesting noon event in this community or somewhere else I know” (P21).

It seemed that those participants who were generally positive about tweeting new or retweeting existing community information wanted to take advantage of utilizing LNC as a way of reaching a larger audience and potentially creating a constructive online discussion and conversation space for local topics.

“I would hope that my opinions were not taken out of context. I assume that most of my tweets only reach my followers and do not expect many people to look at aggregated tweets. This is a practical application of aggregated tweets and might anticipate my tweets to be seen more often here” (P18).

Along with these positive reactions, however, some participants were reluctant to create or share content. We identified four reasons for this: (1) they did not want to provide redundant content, (2) they did not have specific thoughts or opinions about the topic, (3) they did not want to reveal their identity, and (4) general preference toward Twitter. For example,

(1) “I felt no motivation to share or retweet something many people have already tweeted multiple times” (P3)

(2) “I wouldn't retweet since this is a controversial topic that I don't know enough about to share an opinion, or someone else's opinion, for that matter” (P26)

(3) “I would be hesitant that my opinion about a single event would be connected to my identity. This is particularly worrisome for people who do not know me in real life and what kind of opinion they might form about me” (P23)

(4) “I do not like twitter. Once again I am utilizing it as a means to an end. I am glad to see the rest of the people using it for its intended purpose and it is benefiting me a lot, but I would not tweet unless I absolutely had to” (P14)
In particular, regarding (3), previous research has reported that people tend to create or retweet content based on their perceived audience (Marwick & boyd, 2011). It is possible that some of the study participants did not perceive their audience on social media as local, but LNC has influenced their perception of using Twitter at a local level to some extent. Perhaps this lack of individual anonymity in a hyperlocal environment might affect some participants’ willingness to tweet or retweet content because that can be accessed and re-evaluated by other local residents, and their identity could be revealed.

Interestingly, this perspective seems to affect the way of posting and sharing local community information more carefully and thoughtfully. Some participants mentioned,

“I would make a conscious decision to make my Twitter public; no problem with my tweets showing up here” (P13)

“I would adjust the content shared accordingly to protect my own safety and privacy” (P22).

These results in general indicate that having shared interests or opinions is a prerequisite to be engaged in tweeting and retweeting activities. While it would be difficult to generalize the application of shared interests or opinions because it varies a lot by users, one salient aspect of tweeting and retweeting activities is that they contribute not only to the diversity of content, but also to the increase of awareness to the corresponding topics.

The last investigation was to broadly understand potential communications and social interactions through LNC use, because the aforementioned results were constrained to the tweets presented during the study. I found that 21 out of 30 participants (70%) stated that they would be interested in having more interactions with others who have similar interests as revealed through tweet content using LNC. This shows a possible utilization of LNC as an information sharing and social tool among motivated and engaged local residents. One participant indicated,
“I would find it easier to tweet back and forth with locals who share similar opinions. The Twitter Universe is so vast that I never feel connected with anyone because they feel too far away from me. I think knowing that I was communicating with local folks would increase my interests” (P24).

In summary, participants showed different motivations or intentions to be involved in social communications and interactions compared to what regular Twitter users generally possess. They wanted to share content that will be meaningful to their local community and people, such as added knowledge or personal opinions about the local issues. This perspective is different from what was reported in (Naaman, Boase, & Lai, 2010), where people mostly use Twitter for personal updates. The hyperlocal content provided by LNC provides similar usage as reported in (Forte, Melissa, & Park, 2012), where teachers use Twitter in more meaningful ways such as maintaining professional ties with different educational communities, sharing resources, and making connections with students. By leveraging scattered local knowledge and opinions, LNC shows the potential for creating a space to discuss and share information about local topics and providing a social channel to interact with other local members and their community.

**Using LNC everyday**

Participants from the field study also experienced similar opportunities while using the application – diversifying local news content and creating local interaction space. To see how participants engaged in using LNC, I measured their usage logs collected from Google Analytics.
Figure 5-11 shows the summary of LNC usage. First, on average, 27 participants used LNC per week (Figure 5-11, left). The number decreased over time; however, we did not see a huge drop during six weeks. The average usage time of LNC was around four and a half minutes per session (Figure 5-11, right). Although there were some fluctuations between weeks, no significant changes were found.

Table 5-8. Summary of tweets, retweets, watchlists by participants.

<table>
<thead>
<tr>
<th>Type</th>
<th>Total</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tweets</td>
<td>104</td>
<td>2.9</td>
<td>4.1</td>
</tr>
<tr>
<td>Retweets</td>
<td>214</td>
<td>6.1</td>
<td>5.1</td>
</tr>
<tr>
<td>Tweets+Retweets</td>
<td>318</td>
<td>9.1</td>
<td>7.2</td>
</tr>
<tr>
<td>Watchlists</td>
<td>51</td>
<td>1.5</td>
<td>1.8</td>
</tr>
</tbody>
</table>

I collected a number of tweets and retweets posted by participants through LNC. They consisted of different types, which includes annual or small local events, weather, accidents, and so on. Table 5-8 shows the total number, mean, and standard deviation of tweets, retweets, and watchlists posted during six weeks.
As we can see, participants added around twice as many retweets as new tweets. Each had different number of tweets, retweets, or watchlists, but did not show any extreme cases where few participants dominated the whole results. Twelve participants only posted retweets during the study.

It might be possible that the reports from Analytics are limited to the average usage by all participants, and reports from individual users could not be obtained. There might be some participants who used LNC more than others (i.e., super users), which would affect overall usage reports. However, given the fact I see a reasonable distribution from the number of tweets and retweets posted by, and watchlists added by participants, I could assume there was no extreme case. Overall, it seemed that participants used LNC regularly through the study.

**Arts Festival (ArtsFest)**

**Study procedure**

We had the same study procedure for 2014 and 2015 Arts Festivals. In advance of the event, we utilized local news coverage, and mailing lists to advertise and make people aware of the app. At the festivals, we had a booth to assist with download, installation and use (Figure 5-12).
Figure 5-12: Festival Booth (Shih, Han, & Carroll, 2015).

After people installed the ArtsFest application, they used it however they wished to: our team was interested in their spontaneous and natural use of ArtsFest. After the festival, we invited all users to participate in an online survey through emails. The post survey asked the participants about basic demographics, whether the social media content presented in ArtsFest seemed relevant to the festival experience, and how the social media content affected and influenced their festival experiences using Likert scale and open-ended survey items. The primary goal was to explore and understand how people perceived the application and measure the extent to which the application provided a space for social interactions and connected people to the festival as well as the local community.
Figure 5-13: Past and current festival photos. Users can access the photos on a map (left), in a thumbnail view (middle), and in the detailed photo view (right). Users can also add likes or comments to the photo detail page (Shih, Han, & Carroll, 2015).
Arts Festival 2014

During the 2014 Arts Festival, we identified a total of over 300 photos from past instances of the festival on Flickr and Instagram, each annotated with a username, timestamp, and description. As depicted in Figure 5-12 (left), the application displays photo locations with pushpins on a heatmap (also in a list; center) organized into three time ranges, 2014, 2013-2010, and before 2010. Users are always able to see their own locations on the map, thus they could browse through photos from locations nearby. When users click on one of the pushpins, they can see the associated photo, and can add likes and comments. We also collected 815 tweets from past festivals, which described ones’ excitement (e.g., “I [heart] Arts Fest Weekend!”), appreciation (e.g., “Thank you for keeping everything safe and under control this Arts Fest Weekend”),
information about festival events (e.g., “Saturday Night featuring DJ Gigi from 9 pm”), and so on. Application users could read them in a list view (Figure 5-13).

Arts Festival application users

ArtsFest received around 1,400 downloads in 2014. Out of all the application users, we received 271 survey responses. The survey respondents were 63% females. Their age group ranged from young adults (18-29, 31%), adults (30-49, 23%), and senior adults (older than 50, 46%). About 42% of them were from the local region, 40% from other areas in Pennsylvania, and the rest were visitors from out of the state. About 61% of them had attended the festival before. In terms of the time they spent at the festival, 62% of them indicated that they spent more than a total of 5 hours and visited 2.3 days on average at this year’s festival. Saturday is the most popular day, with 90% of the respondents having attended the festival.

Results

Impacts on Festival experiences

Overall, users directly contributed 125 photos and 119 comments through the ArtsFest application, and the application also extracted 85 festival-related photos, and 363 tweets from social media platforms during the festival. Users added a total of 195 Likes to photos and comments. The total of user-contributed photos in 2014 (210 photos) was relatively lower than the number that we were able to extract from social media for the years 2005-2013 (300 photos), but when we considered the number of photos created and generated per year, we could see more
photo-activities this year. This in part indicates that many users showed their interests in creating and sharing their festival experiences with others and seeing aggregated social media content at the festival has the potential to encourage people to further engage and interact with others through sharing more user-generated content. The relatively high amount of interactions with social media content is especially positive because over two-thirds of the festival attendees are adults and senior adults who tend not to engage with social media sites as much as teens and young adults. Overall, 431 of the users (30%) used the attendance feature in the application to plan their day at the festival. Usage logs indicate that users accessed 7.65 screens per session (where one session means a user opened and closed the application) and used the application for about 5 minutes per session.

We analyzed the survey responses to understand how users perceived the application with respect to festival experiences and engagement. Overall, it is not surprising to see that people’s main motivation of using ArtsFest was to check any relevant information about the festival and plan their schedule. For example, the survey respondents indicated that they used the application to find performance (M:4.31, SD: 0.94) or artists (M:3.87, SD:1.10) information.

Table 5-9: Experiences evoked by social media content (1 = Strongly Disagree; 5 = Strongly Agree) (Shih, Han, & Carroll, 2015).

<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance of the photos and comments to the festival</td>
<td>3.99 (0.78)</td>
</tr>
<tr>
<td>More aware of what is going on during the festival</td>
<td>4.03 (0.91)</td>
</tr>
<tr>
<td>More dynamic and richer festival experience</td>
<td>3.55 (1.06)</td>
</tr>
<tr>
<td>More engaged in the festival</td>
<td>3.32 (1.01)</td>
</tr>
<tr>
<td>Enjoy looking at photos and comments</td>
<td>4.01 (0.82)</td>
</tr>
<tr>
<td>Bring back one’s vivid memories at previous festivals</td>
<td>3.72 (0.95)</td>
</tr>
</tbody>
</table>

Table 5-9 summarizes users’ experiences interacting with the social media content. According to the results, many of them indicated that past photos posted by others are highly
relevant to the festival, which empirically validates our method used in extracting and aggregating festival relevant photos and comments. They also answered that they became more aware and engaged, and enjoyed looking at social media content contributed by themselves and others. Seeing social media content enriched their experiences and brought back vivid memories that they experienced at the previous arts festival. Overall, we can see that people were generally positive about the social media content presented in ArtsFest.

Table 5-10: Category and its count of user comments.

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expressing one’s excitement in the festival and appreciation to others’ photos</td>
<td>56 (47.0%)</td>
</tr>
<tr>
<td>Describing people, events, activities, and atmospheres of the festival</td>
<td>36 (30.2%)</td>
</tr>
<tr>
<td>Reflecting on past festival experiences</td>
<td>21 (17.7%)</td>
</tr>
<tr>
<td>Others</td>
<td>6 (5.1%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>119 (100.0%)</strong></td>
</tr>
</tbody>
</table>

We also conducted a content analysis for the comments shared by participants. Two authors independently categorized all comments and jointly derived four categories as shown in Table 5-10. Not surprisingly, the highest category was expressing one’s excitement and appreciation (e.g., “arts fest is amazing,” “really nice shot,” etc.), followed by describing people, events, activities, and atmospheres of the festival (e.g., “beautiful quilt,” “love the sand sculpture,” etc.). Interestingly, there are a number of comments that describe one’s reflection on past festival experiences (e.g., “in twenty plus years we have experienced every extreme of weather. one year we bought sweatshirts!,” “This photo made me think of a friend”, etc.).
Arts Festival 2015

As previously described, ArtsFest for 2015 was designed to provide interactive features such as notification, personalize page, and user recommendation features that are more tailored to the mobile environment. The focus applied in 2015 ArtsFest was to explore the relationship between the new interactive features from the mobile application and three elements of the local community (i.e., community identity, engagement, and social support network). In other words, our team wanted to understand how users perceived those three community values through the usage of and experience in the new features of the application. In this section, I will describe some of the usage reports, and in the next section, I will describe the relationship with application experiences and community connection.

Figure 5-15: User generated photos during 2015 ArtsFest.

In 2015, there were around 1,200 downloads and 348 active users who used several different features in ArtsFest more than once. Application users used attendance and favorite features showing their interests in musical performances and artists as well as shared their festival moments through photos, comments, and Likes (Figure 5-14 shows the photos — exciting moment and interesting sand sculpture — shared in 2015).
In addition, extending the finding in 2014, users thought they were reasonably well aware of festival information and people’s activities during the festival through ArtsFest. According to users’ survey responses, they believed that the application allowed them to keep up with the festival events and news (M: 5.67, SD: 1.27) and to know how people enjoyed the festival through their photos, Likes, and comments (M: 4.95, SD: 1.39).

Figure 5-16: Users’ actions after they received user recommendations.

I was particularly interested in how users perceived and used a recommendation feature. We asked about the actions that users took after they received a list of recommended users (Figure 5-15). As a result, 32% of users mentioned that they took a look at the events that some of the recommended users attended or Liked, 22% mentioned that they took a look at the profile of some of those users, and 20% mentioned that they took a look at social activities (e.g., photos, Likes, and comments). Interestingly, 16% said that they sent a “Wave” message to the recommended users, which simply means saying hello or getting receiver’s attention and is similar to the “poke” feature on Facebook. Based on the usage logs, I found that 60 unique users (17.2% out of the 348 active users) sent “Wave” messages during the festival. Although I did not
measure how many Wave messages were entailed after receiving recommendations, this survey result indicates some actions from recommendations to messages. Lastly, 7.5% answered that they looked around to see some of the matched users in the real world. One of the design rationales of ArtsFestApp was to create some level of social interactions (which could further lead to interactions in the real world). From these results, we can see that users took a look at others’ profile and their festival activities, which means that the recommendation feature showed potential for enhancing festival engagement, especially in an online context. Based on the open-ended responses, four respondents mentioned that they found this feature useful, as they were able to find out interesting events or photos that they were not aware of. For example, one user mentioned,

_I liked being able to reference the events, their locations, and other details from those users._ (U15)

Conversely, even if they liked the idea of creating and sharing user-generated content, two users mentioned that they did not use the app for a social purpose but for a guide to the festival, and this might affect the low results in sending messages or looking around others in Figure 5-15 (I will discuss this more later). For example, one user mentioned,

_I was not interested in the social purposes of this app, only festival information._ (U45)
Chapter 6

Community connections from the use of local community mobile applications

As previously described, much research on local communities seemed to focus mostly either on (1) studying local activities or perceptions enhanced by existing technology, or on (2) introducing new civic technologies and detailing the affordances of those technologies through user studies. Here I found a limitation where those studies tended to lack the evaluation through a more theoretically grounded community framework, which I attempted to achieve to some extent through the design of the local community applications and user studies.

This section describes my attempt to understand the relationship between the affordances and opportunities offered by four mobile applications and three elements of the local community. I have attempted to both quantitatively and qualitatively measure and understand the relationship based on the user study results to initiate a local community framework mediated by mobile technology. In particular, I employed a qualitative approach to the Lost State College and the Mobile TimeBanking projects and a quantitative approach to the Local News Chatter and the 2015 Arts Festival projects.

Qualitative understanding of community connection through mobile technology

In Chapter 3, I presented three affordances (i.e., mobility, immediacy, and social presence) that mobile technology supports. I combine those three with the conceptual model of the local community (Carroll, 2012) based on the user studies of Lost State College and Mobile TimeBanking.

For the relationships among mobility, immediacy, and social presence, although each has unique characteristics and implies different impacts and consequences, they are not mutually
exclusive but rather influence each other and develop together. The literature review in Chapter 3 highlights that mobility is a more location-oriented and immediacy is a more time-oriented element of mobile technology. Social presence is the one that is greatly influenced by the combination of mobility and immediacy. In other words, mobile technology significantly increases mobility and immediacy in terms of information access, share, and dissemination, and these two factors increase social presence.

![Proposed model of mobile-mediated local community](image)

Figure 6-1: Proposed model of mobile-mediated local community. Mobility and immediacy create and facilitate social presence of people co-located in the same area, which also leads to the positive influence on community identity, participation and awareness, and social support networks. I investigated this relationship based on our two mobile community projects (Han et al., 2014b).

From the Lost State College and the Mobile TimeBanking projects, as illustrated in Figure 6-1, I tried to qualitatively understand the relationship between affordances of mobile technology and the three facets of a conceptual model of community.
Figure 6-2: Evaluation of Lost State College through a qualitative approach (Han et al., 2014b).

Mobility, Immediacy, and Social Presence

Lost State College and Mobile TimeBanking studies leverage mobility to a considerable extent in a way that each project not only has the designated smartphone application but it was also used by participants in the wild. In the Lost State College study, participants appreciated the landmarks and created and accessed official and social content while they were physically located at the landmarks, having more vivid and interactive cultural experiences. In the Mobile TimeBanking study, participants checked and posted timebanking tasks or services and communicated with others by utilizing the messaging feature while they were outside (or at a third place), facilitating management and transactions of timebanking activities easily and conveniently.

Immediacy is achieved when the participants are able to access information that they seek and share it with whom they want when they want to. In the Lost State College study, participants were able to check or visit the nearest landmark by utilizing the map interface that displays the locations of both landmarks and participants. They were able to read and access historical
information as well as create and share content right from their mobile device. In the Mobile TimeBanking study, a list of timebanking tasks can be filtered and sorted based on one’s time and location, allowing some participants to find a specific task that they could take, if the task satisfied their situational conditions. Participants also used the messaging feature to exchange task-related information, and the application notified them of incoming messages in real time to maintain conversations. This facilitates the management of timebanking exchanges quickly and easily. Immediacy will become more salient, not only because the increase of wireless network connectivity and capacity and its cost becomes more affordable, but also due to the fact that more people use mobile phone every day and place their device in close proximity. Because immediacy is closely related to mobility, leveraging them together will create more time- and location-oriented opportunities such as proactively delivering community news, event, or activity information to local people.

Lastly, both projects showed increased social presence during the study. In the Mobile TimeBanking study, participants posted diverse timebanking tasks and services, increasing the visibility of not only themselves but also their needs and willingness to share. Many times, mobile timebanking requires face-to-face interactions between two people to complete the task even if the interaction is initiated online. From the study, we observed that some participants exchanged their phone numbers to facilitate timebanking task transactions or extended a possibility of maintaining social connection in the future. In this sense, mobile timebanking bridges social and physical presence and interaction. Although there was no physical or face-to-face interactions from the Lost State College study, accessing Social features, for example, checking who visited or liked the landmarks, reading comments and checking photos posted by others, was an essential part of their experiences as well as increasing the visibility of social presence. Participants indicated potential social outcomes if more local people including their
friends or family members as well as visitors use the application. They expected to see more diverse and interesting historical content shared by more people and wanted to make local landmarks more meaningful and interactive places.

![Diagram](image)

**Figure 6-3**: Evaluation of Mobile TimeBanking through a qualitative approach (Han et al., 2014b).

**Community Identity, Participation and Awareness, and Social Support Networks**

Increased social presence mediated by mobility and immediacy clearly shows a positive influence on the local community. On the one hand, Lost State College leverages mobile technology to emphasize and increase the visibility of the communal roots that local residents or shared by digital cultural heritage. It combines official historical landmark information and user-generated content through social features, allowing local residents to augment their different or sometimes distinctive personal and community memories and additional stories to the landmarks. This is a good example of how the participants utilized the mobile history application as a way of transforming static community historical locations into more dynamic and interactive places.
On the other hand, Mobile TimeBanking presents trust-oriented social interactions and connections through volunteer efforts and activities. It combines volunteering and new opportunities of mobile technology, allowing people to check if there is any community member who is in need or request a service if they want to get some help by others whenever and wherever they need directly from their mobile device. In this sense, timebanking with mobile technology not only satisfies existing practices of traditional timebanking activities but it also shows a potential of increasing the visibility of local people’s needs as well as providing a channel to build and strengthen social interactions and connections among community members. Because different community members would have different needs and motivations, Mobile TimeBanking presents opportunities to build the implicit social network existing in neighborhoods or other community structures.

These studies also showed that participants had different levels of digital participation in augmenting and providing community information. In the Lost State College study, participants who have lived in this community longer tended to add more and informative historical content to the landmarks. Relatively newcomers added less photos and comments and were more likely to express personal appreciation toward the landmarks. In the Mobile TimeBanking study, different participants posted a different number of timebanking tasks or services and interacted with people at different levels of familiarity to complete the tasks. Also in both projects, we found that some participants preferred accessing and consuming information (maintaining awareness of community activities) to adding new content and interacting with others.

Regardless of the level of engagement, the studies demonstrated that mobile technology provides opportunities to some specific local community contexts (i.e., cultural heritage and volunteering). Given the fact that more people are adopting smartphones, delivering various types
of local information through designated applications to their device would make them more aware of what is happening in their local community and encourage them to be involved in different types of community activities and interactions with others and their own community.

These findings of mobile technology applied in a local community could be further developed into the notion of the Internet of Things (Atzori et al., 2010; Jara et al., 2014), which refers to the integration of identifiable objects of the physical world by making them accessible through the Internet. User generated content in Lost State College is all connected to the location of historical landmarks and timebanking tasks created and shared also contain location information. In this sense, both applications consider activities occurred in those locations to be the Internet of Places, which again would be greatly utilized by mobile technology. Our projects show the potential of reshaping the access of community information as well as the conservational methods of dealing with it in more interactive ways. They also give us an insight to better understand mobile technology application and management in contemporary geographical communities.

Quantitative understanding of community connection through mobile technology

Along with previous qualitative analyses on the relationship between mobile technology affordances and three facets of the local community, I also attempted to employ a quantitative methodology in order to understand how the affordances of the mobile application impact one’s relationship with and connection to the local community as illustrated in Figure 6-4.
Figure 6-4: Understanding the relationship between new affordances from the application and community facets.

I especially used this methodology to the deployment study of ArtsFest, which is the investigation of a conceptual framework for a local community based on empirical outcomes. In this project, I study the basic affordances of mobile technology — mobility and immediacy — as well as the special opportunities from our app — notifications, personal update page, and user recommendations — and the relationships between these aspects and one’s local community connection. By combining this conceptual model with user study results, I strived to understand how and to what extent users’ perceived opportunities supported by the app affect their perception of the three elements of Carroll’s model. I also investigated the interrelation of three community facets through a deployment study. In the following section, I present a model that integrates mobile technology benefits and local community connection, which we hope to be used or further developed by other local community studies.
Table 6-1: Summary of effects of ArtsFest on five constructs. (1 = Strongly Disagree, 7 = Strongly Agree)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Perceived Mobility &amp; Immediacy (MI)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI1: The app allows me to access festival schedules, photos, or shared content anytime anywhere</td>
<td>5.86</td>
<td>1.17</td>
</tr>
<tr>
<td>MI2: The app allows me to share my festival experiences anytime anywhere</td>
<td>5.22</td>
<td>1.18</td>
</tr>
<tr>
<td><strong>Perceived Opportunities (OP)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OP1: Having my update page in the app allowed me to keep up with the festival events and news</td>
<td>4.95</td>
<td>1.18</td>
</tr>
<tr>
<td>OP2: Having my update page in the app made the festival more engaging</td>
<td>4.79</td>
<td>1.19</td>
</tr>
<tr>
<td>OP3: Receiving notifications from the app about festival activities was useful</td>
<td>4.74</td>
<td>1.37</td>
</tr>
<tr>
<td>OP4: Receiving recommended users was useful</td>
<td>4.28</td>
<td>1.14</td>
</tr>
<tr>
<td><strong>Attachment (AT)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AT1: The app makes me think I belong in the local community</td>
<td>4.83</td>
<td>1.23</td>
</tr>
<tr>
<td>AT2: The app makes me think being a local community member is good</td>
<td>5.11</td>
<td>1.15</td>
</tr>
<tr>
<td>AT3: The app makes me feel connected to the local community</td>
<td>4.92</td>
<td>1.18</td>
</tr>
<tr>
<td><strong>Engagement (EN)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EN1: The app encourages me to say what goes on in local community</td>
<td>4.73</td>
<td>1.19</td>
</tr>
<tr>
<td>EN2: The app encourage me to interact with local activities</td>
<td>5.21</td>
<td>1.13</td>
</tr>
<tr>
<td>EN3: The app makes me think people are engaging in local activities</td>
<td>5.22</td>
<td>1.01</td>
</tr>
<tr>
<td>EN4: The app allows me to reflect on experiences of local activities</td>
<td>4.61</td>
<td>1.11</td>
</tr>
<tr>
<td><strong>Social Support Networks (SN)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SN1: The app makes me think people share important local information together</td>
<td>4.82</td>
<td>1.15</td>
</tr>
<tr>
<td>SN2: The app makes me think people create diverse local activities</td>
<td>4.92</td>
<td>1.08</td>
</tr>
<tr>
<td>SN3: The app makes me think people share different local experiences</td>
<td>4.79</td>
<td>1.10</td>
</tr>
</tbody>
</table>

Technology affordances and local community facets: Arts Festival 2015

From the 2015 Arts Festival, I collected survey responses from 102 users. For the analysis, I used the responses from 82 users who answered all survey questions. Questions included user’s perception on new interactive features provided by the mobile application including, personalized update page and recommendation. Questions also included three facets of the local community.
Survey responses

Table 6-1 (above) summarizes users’ perceived mobility and immediacy, perceived opportunities of the Arts Festival application, and the three constructs of the local community with corresponding questions and results.

The principal advantage of mobile technology is increased mobility, which allows people to access services wherever they go and transcend limitations of geography and distance when digitally communicating with others. Another advantage of mobile technology is immediacy, which refers to the quality of bringing one into direct and instant involvement with entities, events, or actions in more time-critical situations or conditions (Anckar & D’Incau, 2002). When immediacy is specifically linked to mobile technology, it usually pertains to how fast one could meet his or her expectations in terms of obtaining or accessing information in a particular situation or context. In a local community context, both mobility and immediacy will facilitate access to and interaction with local information and support social interactions with other local members anytime and anywhere.

In this regard, we asked users to answer their perceived mobility and immediacy when using ArtsFestApp. As a result, users were quite positive about the basic affordances that mobile technology provides through the experience of the app.

Regarding how users experienced and perceived the interactive features — real-time updates through notifications, my update page, and user recommendations — of the app, users somewhat agreed with the positive impacts of using those features on their festival awareness and engagement. They did not find the recommendation feature to be as useful as other aspects but still above borderline, indicating a somewhat positive impact.
With all survey responses, we used Structural Equation Modeling (SEM), because SEM allows a set of relationships between independent variables and dependent variables to be examined (Fornell & Larcker, 1981). Through this, we can formalize the relationships among the perceived affordances of the app and local community elements. Regarding a sample size, SEM requires minimally five times the number of variables for significance testing of model effect (Kling, 1998), which is satisfied in our study.

Table 6-2. Summary of variables’ reliability, and convergent validity.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Loading</th>
<th>α</th>
<th>CR</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI1</td>
<td>0.66</td>
<td>0.76</td>
<td>0.77</td>
<td>0.75</td>
</tr>
<tr>
<td>MI2</td>
<td>0.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OP1</td>
<td>0.75</td>
<td>0.87</td>
<td>0.85</td>
<td>0.75</td>
</tr>
<tr>
<td>OP2</td>
<td>0.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OP3</td>
<td>0.68</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OP4</td>
<td>0.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AT1</td>
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<td>0.73</td>
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<td>0.71</td>
</tr>
<tr>
<td>AT2</td>
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<td></td>
<td></td>
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<tr>
<td>AT3</td>
<td>0.66</td>
<td></td>
<td></td>
<td></td>
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<tr>
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<tr>
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<tr>
<td>EN3</td>
<td>0.64</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SN1</td>
<td>0.74</td>
<td>0.80</td>
<td>0.78</td>
<td>0.76</td>
</tr>
<tr>
<td>SN2</td>
<td>0.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SN3</td>
<td>0.74</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: CR: composite reliability; AVE: average variance extracted.

Table 6-3: Correlation of latent variable and AVE for discriminant validity.

<table>
<thead>
<tr>
<th>Construct</th>
<th>MI</th>
<th>OP</th>
<th>AT</th>
<th>EN</th>
<th>SN</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI</td>
<td>0.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OP</td>
<td>0.37</td>
<td>0.86</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AT</td>
<td>0.28</td>
<td>0.62</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EN</td>
<td>0.41</td>
<td>0.71</td>
<td>0.66</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>SN</td>
<td>0.29</td>
<td>0.69</td>
<td>0.60</td>
<td>0.82</td>
<td>0.88</td>
</tr>
</tbody>
</table>

Note: Diagonal elements represent the square root of the AVE.
In order to validate the model, we measured reliability, and convergent and discriminant validity for each factor. For internal consistency reliability, we measured Cronbach’s $\alpha$ and composite reliability (CR). The interpretation of the coefficient of CR is similar to that of Cronbach’s $\alpha$, except that it also takes into account the actual factor loadings, rather than assuming that each item is equally weighted in the composite load determination. The results show that both parameters have high values (the requirement is above 0.70), indicating acceptable internal consistency among factors for each construct.

To measure convergent validity (testing whether constructs are expected to be related are in reality related) and discriminant validity (testing whether the constructs that should have no relationship actually do not have any relationship), several indexes were assessed. For convergent validity, all factor loadings should exceed 0.60 (Hair et al., 2009) and Average Variance Extracted (AVE) should exceed 0.50 (Fornell & Larcker, 1981). The result showed acceptable convergent validity. Lastly, for discriminant validity, we compared the inter-construct correlations between constructs with the square root of AVE. In general, the shared variances should be lower than the square root of AVE (Fornell & Larcker, 1981), and the result again showed acceptable discriminant validity. Overall, our data met all criteria (Table 6-2, 6-3).

**Structural model results**

After having gained confidence about the appropriateness of the measurement, we examined the model’s goodness-of-fit. We used the ratio of $\chi^2$ to Degrees-of-Freedom ($df$), Comparative Fit Index (CFI), and Root Mean Error of Approximation (RMSEA), which are the most commonly used measures in SEM. The model showed $\chi^2/df = 1.24$, RMSEA = 0.05, and
CFI = 0.98, confirming that our model exhibits a good fit with the data. Figure 6-5 illustrates the full model.

Figure 6-5: Structural equation model of two affordances of ArtsFestApp and on community attachment, engagement, and social support networks. $X^2(2) = 2.492, p = 0.287$. Note: lines with arrows represent standardized path coefficients or correlations statistically significant at $p < 0.05$. $R^2$ indicates the amount of variance in an endogenous variable that is explained by its predictor(s) in the model (note: *$p < 0.05$, **$p < 0.01$).

The results of the model show a number of insights. First of all, perceived mobility and immediacy of ArtsFestApp showed a significant influence on perceived opportunities of the app ($\beta = 0.32, p < 0.01$) and a strong direct influence on engagement ($\beta = 0.13, p < 0.05$). Mobility and immediacy have been acknowledged as the basic affordances of mobile technology. Users who experienced these affordances when accessing festival information and when sharing festival experiences and reflections were more positive about the interactive features of ArtsFestApp. It is also worth noting that users’ community engagement was strengthened by their positive perception on mobility and immediacy, showing a strong relationship between the basic
opportunities of mobile technology and community engagement. This substantiates previous findings about mobile technology and civic engagement (Foth, 2011).

In addition, perceived opportunities of ArtsFestApp showed a strong and positive influence on all community facets ($\beta = 0.60, 0.68, 0.69, p < 0.01$). This indicates the role of the app in evoking and facilitating one’s community connection in a positive manner. Accessing and interacting with festival information through an official (e.g., events, artists, etc.) and social channels (e.g., photos, comments, recommendations, etc.) seemed to give users positive impressions, making them feel attached to other users and local community as well as encouraging them to share more interesting festival information.

The model also verifies the theoretically studied relationships among three community elements. Attachment was positively related to engagement ($\beta = 0.31, p < 0.01$), indicating that feeling more connected to the local community leads to having more engagement and vice versa. Attachment was also positively related to social support networks ($\beta = 0.24, p < 0.05$) but weaker than their relationships with engagement were stronger ($\beta = 0.31, 0.67, p < 0.01$). It is also important to see that engagement is a key mediator of mobile experiences and facets of community, since it is strongly related to mobile affordances and strongly connected to two other local community elements. Overall, the model demonstrates that the basic affordances of mobile technology lead to positive perceptions on new opportunities by ArtsFestApp, and that also amplifies one’s community connection.
Chapter 7

Discussion

The evolution of public participation has explored ways to increase citizen awareness and deliberation by creating new processes, and a tool integrated with technology is one way for supporting that. People tend to be more engaged in their community provided that they have an awareness, which makes them feel they are part of the community. Although people are clear about the affordances and functionalities of participation they want them from an emerging tool, having a corresponding and right tool which reflects their needs, awareness, and other aspects is necessary in this current digital world (Kavanaugh et al., 2005)

Community networks take advantage of technologies to create and maintain the social network of interaction, trust, and reciprocity among different entities (e.g., people, groups, institutions, etc.) in community, and its infrastructures have attempted to support and enhance community information generation and interaction. As technology evolves and changes over time, having different lenses to understand and apply design rationales in new technology is vital to fully harness the advantages of it. Although mobile technology has been introduced more than 10-15 years, applying this into local community context has become popular more recently. This is in part because of the fact that more people have adopted mobile technology, and mobile technology itself creates potential opportunities that local communities can leverage with respect to increasing community awareness and participation. With these perspectives, mobile technology should evolve together with pre-existing infrastructure of wireless community and desktop interactions by incrementing additional yet unique affordances to local community.
I have described the applications of mobile technology in a local community context based on the four projects that I have led and been involved in. Each project was carefully planned, designed, and implemented to accomplish the goals of mobile-supported community informatics by allowing local residents to easily access different types of community information, promoting their participation in different community activities and creating and enhancing their social connections and interactions with others and their community all through their personal mobile device. In this section, I will summarize the user study results of the local community projects and discuss theoretical and practical implications. I will also discuss limitations of the studies and future work that I want to pursue more in the future.

**Mobile-mediated community model impacts**

I have described my attempt to understand the relationship between people and their community mediated by mobile technology intervention by applying the theoretical baseline. Most of the previous community studies that introduced new community tools tended to place much emphasis on their unique features or potential technological benefits. However, in many cases, those studies tended to lack a comprehensive analysis on the relationships among a user, a tool, and a community; for example, how people create or strengthen the connection to their local community through the use of and interaction with the mobile application.

The literature review shows that little has been done in applying fundamental components of local communities as a means to evaluating local community tools. Therefore, the contributions of my dissertation are not only the introduction of using and interacting with different local resources (e.g., history, volunteering, news, social media, and arts festival), but also the application of Human-Computer Interaction standpoints to understanding how people use
and engage with the tools and the presentation of a mobile-mediated local community model based on people’s experiences of the tool in the wild.

Lost State College & Mobile TimeBanking

In the Lost State College study, I have investigated how application usage and user experience (grouped both by participant activity level and landmark interest) could turn landmarks into more active and interactive places and connect to community history storytelling and feelings of community heritage. In the Mobile TimeBanking study, I have investigated how timebanking on a smartphone platform would support existing timebanking transactions as well as create more opportunities for users to provide or receive community-based volunteer tasks or services through greater accessibility to the application and through being able to take advantage of mobility and immediacy.

The design rationale for each project was as follows. Lost State College combines official historical landmark information and user-generated content through social features, allowing local residents to augment their personal reflections and additional stories to the landmarks. Mobile TimeBanking leverages the notion of volunteering and mobile technology, where it increases the visibility of local people’s needs as well as provides a channel to build and strengthen social connections among community members.

From the user studies, I found that participants showed different levels of their involvements and motivations in augmenting and providing richer and more dynamic community information to other people as well as their community; for example, in the LSC study, participants who have lived in this community longer tended to add more and informative historical content to the landmarks. The study analysis showed how a digital tool makes local
community history information more visible and supports social interactions, creating and sharing additional content to local history. LSC leverages the effort to identify the history of places in communities and shows how storytelling can be used to create and reinforce community identity. In the MTB study, participants completed a number of different types of tasks with people at different levels of familiarity. There were participants who engaged in posting their requests and looking for help as well as spending their own time and resources to help others. There were also participants who rather wanted to access and consume information, maintaining awareness of community activities.

Overall, increased participation and awareness reinforces a sense of belonging and attachment to other people and their community. By leveraging affordances of mobile technology such as high mobility and immediacy, both LSC and MTB successfully show the potential of reshaping the conservational methods of dealing with the community information in more interactive ways, which also show increased social presence of users and their activities in the local community. Those projects also give us an insight in order to better understand how the affordances of mobile technology would positively evoke and facilitate one’s connection to their local community.

**Local News Chatter and Arts Festival**

Motivated by the role of local news in connecting people and their local community and by the high level of adoption of mobile devices for accessing local news, I presented the Local News Chatter application and report the findings from the lab and field user studies. From participants, LNC shows the two perceived opportunities — *diversifying local news* and *creating local interaction space* — that help to connect people and local community.
Regarding ArtsFest, I successfully conducted two user studies on the ArtsFest applications. In 2014, the main goal was to understand how the contributions and interactions with social media content through mobile devices could heighten one’s sense of awareness, engagement, and participation. The study analysis revealed rich interactions with social media content that not only captured and enriched users’ personal festival experiences, but also evoked points of reflections that influenced their festival experiences with their friends, family members, and online community members.

Especially from the Arts Festival, I tried to understand empirical outcomes through theory-based standpoints. I wanted to claim the importance of considering fundamental community aspects for the assessment of community tools and to bring attention to this topic, as I have found they were not well articulated in most prior studies. As such, I have presented a model as an example and starting point. I attempted to connect the perceived affordances of local community technology to users’ perceived connection to the local community.

In 2015, the primary study and design objective was to understand how the affordances of mobile technology would connect users to the local community by using the mobile-mediated local community framework. ArtsFest was designed to provide the features (i.e., real-time push notifications, personal update page, and recommendation) that are more tailored and better supported by mobile technology. The study analysis showed that basic mobile affordances, perceived mobility and immediacy, positively influence the specific and more advanced opportunities provided by ArtsFest, which in turn lead to strengthening one’s community connection. The analysis also re-verifies the relationship among three local community elements, showing positive correlations.

Overall, all of these user studies demonstrate the utilization of the existing model of the community to technology intervention. This conceptual mobile-mediated local community model
could benefit from operationalizing other new measures or re-appropriating, depending on the context, technology and theoretical conceptualizations. For example, civic efficacy can be added and measured, as the previous study showed that identification with local community (civic awareness and engagement) leads to having high civic efficacy (Farnham et al., 2013). In addition, some additional aspects of mobile technology (e.g., information accessibility, exchange, and social interaction, etc.) could also be studied because mobile devices facilitate communications among local people and are found to be well associated with online and offline civic engagement (Campbell & Kwak, 2010; Cheng, Liang, & Leung, 2014).

It is important to note that the model is not the one that can be employed in any settings on technology and local communities. Rather, I wanted to argue that it is important to think about fundamental community aspects that for the assessment of community tools and to bring discussions about this. As such, I have presented a model as an example and starting point. I hope that this way of understanding a community tool can provide a guideline to some of the local community researchers and practitioners who study and design the application of technologies in the context of local communities.

**Limitations and future work**

**Lost State College**

There were several limitations identified in the study. First, I only studied individual user’s interactions and experiences to the local landmarks and community. As a result, participants only had the option to pass on ideas or knowledge to future tourists. As described in Brown and Chalmers (2013), participating in a group setting can be a very sociable activity.
There is an opportunity to design a mobile application that allows members who belong to the same group (i.e., by proximity to the landmark or by closeness of members’ social ties) to share and reflect on their experiences.

Second, 32 participants do not necessarily represent the general population, and the findings might not generalize to other broader contexts. Scalability is also another issue as I realized that properly managing the increased number of social data would be additional challenges if more people use the application. Some participants have also suggested that having an interface for sorting user-generated content and displaying them based on popularity might be helpful.

Third, although it was found the length of residency to be a factor that affected application use, there might be other factors such as the degree of a sense of community, personal interests to history in general, and more. While it is hard for me to present a broad understanding of local heritage connection given that this study focuses on the individual use of LSC, I believe that my approach reflects experiences and connection to community heritage from an individual’s perspective and presents novel contribution to the literature.

The findings also hinge on analysis of interaction data and user-generated content from a single usage scenario. We might have different patterns of application use or different experiences or perceptions to local heritage from local residents or potential visitors who will take a tour or visit a landmark multiple times. The idea of utilizing LSC as a guestbook and storytelling mechanism to local history could be generate additional insights. Future work that explores different usage scenarios and local heritage connections in different contexts and conditions could unveil more interesting results of local heritage.

As part of its technological implications, LSC supports a notion of agency in construction, in that people can create and in a sense “authorize” their own content regarding
local evidence of social construction of local heritage as participants wanted to be connected with other local residents and interact with them with respect to preserving and developing cultural heritage. If we were to enable even more persistent communications among local residents, the system might take the socially constructed co-creation experience to another level, which may or may not be desirable and could have interesting additional implications for community engagement (i.e., might residents use such a system to debate current plans for renovation or removal of sites). Such broader implications are not visible in the one-time usage scenario we studied, again pointing to the importance of investigating naturalistic heritage and community identity creation and formation in a long-term deployment study.

**Mobile TimeBanking**

The study results described and discussed in this paper were based on the usage and experience of young university students. I acknowledge that the user study results cannot immediately be generalized to other populations or existing timebanks, because of the limited number and particular demographics of our participants and relatively short-term application usage. Existing timebanking members might show different usage of the timebanking application and user experiences (Patrick et al., 2015). More extensive usage of the application as well as the time dollar usage patterns would be far better articulated in a larger study. I am also interested in investigating additional affordances of mobile technology and their impacts on timebanking as well as evaluating their relationships.

Also in the social interaction analysis, our team only considered the initial familiarity level between two participants prior to completing any tasks. But, clearly, there might be some changes of familiarity between two participants after they complete some tasks or interact with
each other. This study may not be enough to allow a relationship to grow significantly. Because I am interested in exploring the influence of relationship changes on people’s task and social management, I plan to investigate this through long-term and extensive user studies in the future with one or more real timebanks.

I am in the process of revising the application, based on participants’ feedback and lessons about further design opportunities. Because our timebanking smartphone application is now being augmented to integrate with existing timebank infrastructures to be managed by real timebank communities, I have deployed the application to their affiliated timebanks. As existing members of timebanks have shown great interest in having a mobile version of timebanking, I believe this will allow us to investigate the effects of timebanking with a smartphone platform in broader ways.

**Local News Chatter**

Regarding LNC, especially from the field study, the generalizability of our findings is limited by the relatively small number of participants studies. A long-term deployment study with more users in multiple local communities is necessary to better understand the application of mobile technology to local communities. I am currently in the process of redesigning our systems based on the findings and conducting a long-term deployment. From future user studies, I would like to apply and re-evaluate the model presented in the Arts Festival study for theoretically and empirically understanding the role of LNC in bringing local citizens to their community more closely.

There is also a question about the scalability of LNC. I tested LNC in the small local community with around 45,000 people. Geographically, this community is quite separated from
bigger metropolitan cities. It might be reasonable that the idea of LNC might work well and be welcomed by participants due to the size and geographical boundaries of this community. However, given the fact that slightly more than one-half of the nation’s population still live in jurisdictions with fewer than 50,000 people (2010 US Census), and most communities, regardless of their size, try to have and maintain community information, facilitate community interactions, and are interested in leveraging technologies to accomplish them, I hope LNC will be utilized as an easy-to-use application that not only increases local information diversity but also facilitates interactions. I am hoping to expand the study to other local communities that have different demographical and geographical characteristics and study the impacts of LNC on them.

**Arts Festival**

For the study in 2014, ArtsFest identifies relevant social media content and relies on the festival participants to curate past and real-time festival information by annotating, commenting, and sharing their experiences with others. However, scalability could again become an issue as social media usage becomes even more widely adopted in the future. Future systems could leverage automatic image tagging and recognition, and topic modeling algorithms to seed the curation process. Advanced algorithms could then be applied to infer real-time classification based on historical data, especially given the consistent nature of recurring and cyclical events. A context-aware mechanism based on users’ interests, location, and time expressed both explicitly and implied implicitly in context can be used to filter and proactively suggest relevant social media content as well as improve user experience.
Other points: privacy, technology affinity

From the user studies, I mostly presented the positive influences of mobile applications on local communities. For example, from the LSC study, I have shown that interactions through Social features increase one’s local history awareness and participation. From the MTB study, I have shown that many participants looked for activities that they could do for others or shared what they needed through the application. From the LNC and the ArtsFest studies, I have shown that social media content can be used to increase local news awareness, and reconstruct and diversify people’s festival experiences.

Although this may be beneficial for community members to engage in personal reflections, digital storytelling, and contributing to diverse local community aspects, privacy remains a concern (Palen & Dourish, 2003). In the ArtsFestival study, for example, there is a privacy concern especially from the recommendation feature, because user’s interests and application usage logs will be considered and calculated. Providing an interface that allows users to control the visibility of their information to the public would mitigate this concern to some extent.

In her studies, Silva (2010, 2013) argues that a number of salient factors, such as privacy, security, power, and sociability should be taken into account when designing mobile technologies. She emphasizes that understanding how social norms and influences could affect how people perceive knowing other people’s locations and the subsequent privacy implications is particularly important. Wilken (2013) discusses social opportunities of leveraging mobile phones and technologies for not only strengthening existing social networks but also for opening up new social and interactive possibilities. For example, they propose that technologies could be designed to lower privacy concerns by allowing people to maintain a manageable and playful distance. In terms of how social inequality impacts ICT use and adoption in the community
context, Crang et al. (2006) argue that many studies that introduce technology artifacts often fail to investigate social impacts and consequences of ICT-mediated social inequalities and urban digital divides of individuals and groups in place-based communities. In their case study of ICT practices of two groups (i.e., affluent and professional groups and marginalized groups), they found that professional group tend to utilize new media technologies as a individualized background infrastructure, whereas marginalized groups are more collective and collaborative and are affected by their existing social and neighborhood networks.

In this sense, an in-depth analysis of the privacy implications and risk assessment of future mobile systems, which leverage some of one’s contextual information (e.g., activities, locations, time, etc.) used by many people, is warranted to maximize collective benefits at the local community level and to minimize the risks of unintended consequences. I hope to investigate how negative implications such as privacy concerns and social inequalities could be integrated into our proposed community model, and how researchers and designers could be more mindful of the negative implications ICTs on community identity, awareness, participation, and social support networks.

If the privacy concern is somewhat managed by the application or users, there is also a research opportunity to provide more accurate and relevant information based on one’s context. For example, I am planning to leverage Beacon devices for accurately detecting user’s location and providing various types of relevant information (e.g., user-generated photos, festival events, artists, promotions around user’s location, etc.), directly to user’s mobile device (Kouhne & Sieck, 2014). This will show a potential for receiving context-aware local news, history, events, or festival information (and more) and engaging in new interactions with local community information and other members.
Besides the privacy concern, although I tried to recruit a broad range of participants with diverse demographics, many of the study results were based on the usage and experience from local participants who tend to be familiar with using smartphones and social media. Although the smartphone adoption rate is growing fast and technologies have become indispensable part of daily life, there are still a lot of people who have maintained their own ways of maintaining their local awareness and participating in local activities through technologies or other means. For example, in a local news context, even if one is a tech-savvy, she might access local news information from a newspapers simply because she prefers to read something from a paper. Therefore, evaluating the tools and the mobile-mediated local community model through diverse demographics is needed to better understand the impacts of those tools and the design of technologies for local communities.

**Closing remarks**

Overall, I believe the work and research during my Ph.D. successfully has brought empirical and comprehensive understandings of the impacts and consequences of mobile technology to local communities through the design of the mobile tools and user studies. From LSC, I was able to articulate awareness, reflection, and co-creation of digital cultural heritage in different cases. From MTB, I was able to demonstrate the possibility of employing mobile technology in a local timebank context and articulate the opportunities and challenges of the application of the mobile application. From LNC, I was able to obtain more promising use-cases and insights the way the system supports interesting real-life cases and propose the mobile-mediated local community model. From ArtsFest, I was able to not only demonstrate the design idea of leveraging social media content for enhancing users’ festival experiences but also again
re-verify the local community model. Figure 7-1 illustrates a trajectory of my research goal that I proposed two years ago, and I believe I have accomplished them during the last two years.

Figure 7-1: The proposed timeline of my study. I have successfully accomplished my goal during the last two years.
References


Burt, R.S. (2010). *Neighbor Networks*. Oxford University Press, USA.


Han, K., Chen, J., Lee, S., & Carroll, J.M. (2015). Being connected to the local community through the local Festival mobile application. (working paper)


Appendix

Arts Festival 2015 Pre Survey

Thank you in advance for taking the time to fill out our survey! The mission of the Central Pennsylvania Festival of the Arts is to celebrate the arts with presentations of diverse, high-quality visual and performing arts through the cooperative volunteer support of the community and The Pennsylvania State University. The essence of this organization is the enrichment and education of the audience, grounded in personal interaction between artist and audience. Our app is designed to add value to your experience of the Festival. The responses you give to this survey are strictly confidential and will be used for evaluation purposes only. This survey should only take 3-5 minutes of your time.

Q1. What is your email address? Please enter the same one that you used for the official arts festival app (or your email address for Facebook).

Q2. What is your motivation for downloading the Festival app?

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
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<td>Find performance information</td>
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<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Find art/artists</td>
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<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Find locations/map</td>
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</tr>
<tr>
<td>Share social contents (e.g., photos, likes, comments, etc.) and interact with others</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</tr>
</tbody>
</table>
Q3. Please rate the following statements about your sense of local community.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>My community members and I value the same things.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Being a member of my community makes me feel good.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I can trust people in my community.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Being a member of my community is a part of my identity.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Fitting into my community is important to me.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I care about what other community members think of me.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>It is very important to me to be a part of my community.</td>
<td>○</td>
<td>○</td>
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</tr>
<tr>
<td>I feel hopeful about the future of my community.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Q4. What is your sex?
○ Male
○ Female
Q5. What is your age?
- < 20
- 20-29
- 30-39
- 40-49
- > 50

Q6. Thank you for taking the survey! Hope you find the app useful and enjoy the festival!
Arts Festival 2015 Post Survey

Thank you in advance for taking the time to fill out this survey. Your thoughtful response benefits:

- State College
- Arts Festival
- Ongoing research in the College of IST

The mission of the Central Pennsylvania Festival of the Arts is to celebrate the arts with presentations of diverse, high-quality visual and performing arts through the cooperative volunteer support of the community and The Pennsylvania State University. The essence of this organization is the enrichment and education of the audience, grounded in personal interactions between artist and audience. Our app is designed to add value to your experience of the Festival. The responses you give to this survey are strictly confidential and will be used for evaluation purposes only.

This survey has 21 questions. It will take around 20 minutes to complete the survey. Please select the most appropriate response for each question. Thank you!
Q1. Please rate the following statements about the festival app.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The app allows me to keep up with the festival events or news</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The app allows me to know how people enjoyed the festival through their photos, likes, and comments</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The app provides a channel to be connected and interact with other festival attendees</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The app makes me engaged in the festival</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Q2. Please rate the following statements about the outcome of using the festival app.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makes me think I belong to the local community</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Makes me think being a local community member is good</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Makes me feel connected to the local community</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Encourages me to say what goes on in local activities</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Encourages me to interact with local activities</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Makes me think people are engaging in local activities</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Allows me to reflect on experiences of past local activities</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Makes me think people share important local information together</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Makes me think people create diverse local activities</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Makes me think people present shared different local experiences</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Q3. Please rate the following statements.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The app allows me to access festival schedules, photos, or shared content anytime and anywhere</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>The app allows me to share my festival experiences anytime and anywhere</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Q4. Please rate the following statements.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having my update page in the app allowed me to keep up with the festival events or news</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Having my update page in the app made the festival engaging</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Receiving matched users gave me a chance to interact with others</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Receiving messages from the app about upcoming events was useful</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Receiving messages from the app about festival activities (e.g., likes, comments, waves) was useful</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Receiving recommendations about matched users was useful</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Q5. Did you have any concerns about keeping track of your interests, activity history, and locations through the app? If so, please describe.

Q6. To what extent did you add photos for the following reasons? (if applicable; if not, please skip)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>To capture/bookmark my festival moments</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>To share my festival interests and moments with others</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>To make the festival interactive and engaging</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>To become popular or more recognizable by others</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I am a person who always posts photos</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Q7. To what extent did you add Likes or Comments for the following reasons? (if applicable; if not, please skip)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>To capture/bookmark my festival activities</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>To share my interests in people’s photos</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>To share my appreciation to people who posted photos</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>To make the festival interactive and engaging</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I am a person who always adds Likes or comments</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Q8. Do you like to meet and talk to new people during the festival who - (choose all that apply)
- share similar festival interest with you (1)
- attend or like the same musical performances (2)
- visit or like the same artists (3)
- comment or like the same photos shared in the app (4)
- I do not want to meet or talk to new people in the festival (5)

Q9. What did you do when you received a list of recommended users from the app? (choose all that apply)
- Took a look at the profile of some of those users (19)
- Took a look at social activities (e.g., photos, likes, comments) of some of those users (24)
- Took at a look at events that some of those users attended or liked (30)
- Sent a "Wave" message to some users (32)
- Looked around to see some of matched users (33)
- I did not get any recommendations (34)

Q10. How did you feel (or what did you do) when you received "Wave" messages from someone you don't know?
- It was fun to receive a simple message from others (1)
- I took a look at their profiles and sometimes sent "Wave" back to them (2)
- I wanted to meet them in person (3)
- I actually met some of them in person and had brief conversations or took selfies together (5)
- I did not get any waves (6)

Q11. Do you have something more to share about interactions through "Waves"? If so, please describe.
Q12. Please rate the following statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The app is a useful medium for social interactions</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>I felt comfortable sharing my activities through the app</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>I felt comfortable interacting with other users through the app</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>I was able to form some distinctive festival impressions of individual users</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>The app makes me believe that users are active in creating festival contents</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>I believe the app allows me to be socially connected with others</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>I believe the app allows me to influence each other in making the festival more interactive and engaging</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>I believe the app amplifies my festival experience</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>
Q13. Please answer the following statements about your sense of Local Community after using the app.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community members and I value the same things.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Being a member of this community makes me feel good.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I can trust people in this community.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Being a member of this community is a part of my identity.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Fitting into this community is important to me.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I care about what other community members think of me.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>It is very important to me to be a part of this community.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I feel hopeful about the future of this community.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Q14. Have you previously attended Arts Festival?
☐ Yes (1)
☐ No (2)

Q15. How many days did you attend this year's Festival?
☐ 1 day (1)
☐ 2 days (2)
☐ 3 days (3)
☐ 4 days (4)
☐ 5 days (5)

Q16. What is your sex?
☐ Male (1)
☐ Female (2)

Q17. What is your age?
☐ < 20 (1)
☐ 20-29 (2)
☐ 30-39 (3)
☐ 40-49 (4)
☐ > 50 (5)

Q18. What is your email address? (please enter the same email address that you have used for the app)

Q19. What was the most useful and interesting feature of the app that influences your festival experience?

Q20. If you have any additional comments about the app or Festival, please provide them here.

Q21. Thank you again for your time! We hope to see you at the festival again next year.
Local News Chatter Pre-survey

Researchers in the Center for Human Computer Interaction at Penn State have developed the mobile application that aggregates traditional local news sources and local social media content. Our research goal is to present community information according to its content and to make it more visible to local residents, thereby increasing community awareness and participation. We are interested in investigating how participants perceive aggregated community information while using the application and if the application helps them be more aware of local community news/events/activities.

This pre-survey will take around 5 minutes to complete. By clicking on the ">>" button, you agree to participate in this study.

Q1. How frequently do you access local news information from the following sources?

<table>
<thead>
<tr>
<th>Source</th>
<th>Less than once a Month</th>
<th>At least once a Month</th>
<th>Several times a Month</th>
<th>At least once a Week</th>
<th>Several times a Week</th>
<th>At least once a Day</th>
<th>Several times a Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local newspaper(s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local news TV or radio broadcast(s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local news website(s) (i.e., statecollege.com, collegian.com, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet search engine or search portal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile news &quot;app&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social networking site (i.e., Facebook, MySpace, Twitter, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word of mouth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q2. Are there other sources that you use to access LOCAL news information? If so, please describe.
Q3. How often do you use Twitter?
- Never use (1)
- At least once a Month (2)
- Several times a Month (3)
- At least once a Week (4)
- Several times a Week (5)
- At least once a Day (6)
- Several times a Day (7)

If Never use is Selected, Then Skip To End of Block

Q4. Please rate the following statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I use Twitter to get information/ideas</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I use Twitter to contribute to a pool of information</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I use Twitter to learn how to do things</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I use Twitter to stay in touch with others</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I use Twitter to interact with others</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Q5. What is your age?
- Less than 20 (1)
- 20-29 (2)
- 30-39 (3)
- 40-49 (4)
- More than 50 (5)

Q6. What is your sex?
- Male (1)
- Female (2)

Q7. How long have you lived in State College?
- Less than 1 year (1)
- 1-2 years (2)
- 2-3 years (3)
- 3-4 years (4)
- More than 5 years (5)

That's it! Thanks for your time. Please download and install the Local News Chatter app and start using it for three weeks.
Local News Chatter Post-survey

Thank you for using Local News Chatter (LNC). This post-survey (takes 20-25 minutes) is to share your experiences of LNC. Please answer openly and truthfully.

Q1. Please rate the following statements.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNC allows me to access more dynamic local news information</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>LNC provides more information of the local topic that I was already aware of</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>LNC allows me to access hidden local news information</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>LNC brings out locally relevant tweets otherwise mostly not being accessed</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>LNC makes me believe how active local users are in creating or broadcasting local information</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>LNC makes me more interested in local news and activities</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>LNC allows me to reflect on my experience of past local news stories</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>LNC provides a new channel to be connected and interact with other local residents</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>LNC creates a space of online conversations for local news/events/activities</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>
Q2. Please rate the following statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNC makes me feel I am a member of State College</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>LNC makes me think I belong in State College</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>LNC encourages me to say about what goes on in State College</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>LNC makes me think people are good at influencing one another</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>LNC makes me feel connected to State College</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>LNC makes me think people have shared important news and events together</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>LNC makes me think people and I value the same things</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>LNC makes me think being a member of State College is good</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>LNC makes me think people have similar needs, priorities, and goals.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Q3. Please rate the extent to which LNC makes you believe each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree or Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can have more of an impact on spreading out local news to more people, even though I am only one member of this community.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I can have more of an impact on creating and facilitating online discussions on local news, even though I am only one member of this community.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Local members can get more of a chance to voice their thoughts/opinions, even though not all users are comfortable with speaking up.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Local members can get more of a chance to create and facilitate online discussions on local news, even if one idea does not seem to fit.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Our community can have more of a chance to build on ideas suggested by a wide variety of local members, even if there are many different ideas.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Q4. How did LNC change your awareness of the local community? Please describe.

Q5. How did LNC change your interest in participating in the local community? Please describe.

Q6. Think of the time (if any) you added a tag onto your "Watchlist", why did you use the "Watchlist" feature?

Q7. Think of the time (if any) you posted a "Tweet", why did you post it?

Q8. Think of the time (if any) you posted a "Retweet", why did you post it?
Q9. Think of the time (if any) you added a "Favorite" to the tweet, why did you add it?

Q10. Think of the time (if any) you "Followed" someone, why did you do that?

Q11. How often did you use LNC in the following locations?

<table>
<thead>
<tr>
<th></th>
<th>Several times a Day</th>
<th>At least once a Day</th>
<th>Several times a Week</th>
<th>At least once a Week</th>
<th>At least once during the study</th>
</tr>
</thead>
<tbody>
<tr>
<td>At home</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>At work or school</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>While riding as passenger in the car or on a bus</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>At a random place (e.g., coffeeshop, grocery store, bus stop)</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>While walking</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
</tbody>
</table>

Q12. Did you use LNC at other locations? If yes, please describe.

Q13. Have you established any personal (online or offline) connections with others who have shared interests or opinions while using LNC (e.g., I followed him/her)? If yes, please describe.

Q14. How did you feel about having your own Tweets showing up in LNC?

Q15. Do you recall any negative experiences using LNC that you would like to share?

Q16. I will continue to use LNC after the study.
   ☒ Yes
   ☒ No

Q17. What other features would you like to see from LNC? Please describe.

Q18. What is your email address? (NOTE! should be the same as what you specified in the presurvey)

Q19. Thank you- Is there anything else you would like to share?

That's it! This study has been completed. We really appreciate your participation!
Vita

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Human-Computer Interaction (HCI), Data Management & Analysis, Computer-Supported Cooperative Work (CSCW), Mobile & Ubiquitous Computing, Social Computing, Community Informatics

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May 2002 – Nov 2004

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  2009 – 2011

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  2001 – 2009