1-1-2010

Using Technology Enabled Qualitative Research to Develop Products for the Social Good, An Overview

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ABSTRACT

This paper discusses the potential benefits of the convergence of three recent trends for the design of socially beneficial products and services: the increasing application of qualitative research techniques in a wide range of disciplines, the rapid mainstreaming of social media and mobile technologies, and the emergence of software as a service. Presented is a scenario facilitating the complex data collection, analysis, storage, and reporting required for the qualitative research recommended for the task of designing relevant solutions to address needs of the underserved. A pilot study is used as a basis for describing the infrastructure and services required to realize this scenario. Implications for innovation of enhanced forms of qualitative research are presented.

INTRODUCTION

In recent years, qualitative field study research techniques such as ethnography have gained greater cachet in a wide range of fields, most prominently the engineering, design, business and computer science fields. There is a growing recognition, fueled by the prominence of design consultancy firms such as IDEO (Kelly and Littman, 2001), that successful products are more likely to emerge when designers take into account the perspective of target users. At the same time, innovators from a wide range of fields seek to undertake socially and environmentally responsible work, as evidenced by the rapid expansion of membership in groups such as the Designers Accord (Walker, A., 2009), the increasing availability of socially responsible products (e.g. one laptop per child, emergence of giving-oriented business models (e.g. BOGO -- buy one, give one), and many articles in technology design publications such as the Association of Computing Machinery's (ACM) Interactions. An understanding of the cultures of groups

previously underserved, a task that is traditionally achieved with the application of qualitative research techniques, is generally believed to enhance work in this arena.

Numerous techniques from the social sciences are increasingly being employed by the design, engineering, and information systems communities in an effort to decipher oftentimes hidden, poorly understood, and unarticulated user requirements, and to enhance creativity (Denning and Dargan, 1996; Gassmann, et al., 2006; Kuhn, 1996; Schrage, 1996; Smith and Tabor, 1996, Shneiderman, et al. 2006). Yet the wider application of qualitative research is somewhat hampered by the difficulty of implementing complex, labor intensive, loosely structured procedures that are new to many in the design, business, computer science, and engineering communities (Tannen, 2008).

This paper discusses the potential for addressing at least some of the difficulties of qualitative research through the application of emerging technologies. In particular, this paper focuses on the integration of social media (also termed Web 2.0), the devices and networks of mobile technology, and the trend towards software as a service. We will start with a discussion of the use of qualitative research in product development, followed by a review of relevant emerging technologies and how they can facilitate the conduct of this research. We will then describe a pilot study of the use of these technologies for community research and use the findings of this pilot to identify the infrastructure that can enable and facilitate greater use of these technology enabled qualitative research techniques for the development of products and services to address social needs.

QUALITATIVE RESEARCH AND INNOVATION

Highly successful design firms (e.g. IDEO) and products (e.g. Intuit's Quicken, the Apple Macintosh user interface) provide much evidence of the effectiveness of qualitative, user focused design and innovation activities. SAS, a software company with a stated mission to be continually creative, underscores the effectiveness of environments that support collaboration by removing distinctions between cultural identities (e.g. "suits" and "creatives") and minimizing bureaucratic and life distractions (Florida and Goodnight, 2005). Lester and Piore (2004) discuss how innovations emerge from interpretive conversations among customers, designers, marketers, and others. Companies have joined industry consortia and set up company-owned stores (even an entire resort in one case) to encourage these conversations. Ramaswamy (2009) describes how top companies like P&G and Intuit are using Web 2.0 for these conversations, leading to the co-creation of value involving relevant stakeholders. Von Hippel's research shows the key role that users play in these conversations. User-led innovation can add value through involvement of lead users, who not only have deep understanding of a problem domain but also have devised solutions to address those very same problems (Baker, 2006; Franke, von Hippel, and Schreier, 2006; Von Krogh and von Hippel, 2006).

Two parameters that are the basis of the power of qualitative research to generate insights for user-led innovation are: the capturing of user perspectives, and geographic mapping of collected data. Capturing user perspectives is invaluable in building a strong understanding of a given problem from the user's point of view. Products that have successfully done this have achieved long-term success because users find that they are intuitive and easy to use. For example, Intuit's long-lived financial management software surely benefits from the research done by the company to understand how users actually do undertake their financial activities, in their

living rooms and dining tables (Lieber, 1997). The second parameter, geographic mapping, allows researchers to consider location as another source of user perspective, in addition to culture and background. Mapping collected data across a given geographical area, when done well, provides a compelling snapshot of the needs and perspectives relevant to a given geography. This snapshot can highlight stark differences among regions of a given geography – e.g. quality of schools in wealthy vs. poor neighborhoods, voting records of relevant lawmakers, numbers and types of crime incidents. It can also capture the different perspectives that come into play in a single point in that geography. For example, while a researcher visiting an economically depressed neighborhood may view a community park as dirty and unsafe, residents who live in the area may see it as a lively and inviting place that has hosted its cherished traditions over many years, a drug dealer may see it as a place of business, and a social worker may see it as a place where his/her clients may hang out to avoid a home visit.

Some of the most prominent methods of capturing user perspectives entail many hours of deep involvement of researchers in participant observation and ethnographic interviews to gain insight into the patterns and perspectives that form and influence behaviors and preferences of target users. Some techniques go beyond this by addressing the distance between researcher and respondent perspectives through the close involvement of target users or stakeholders in the research process. Community Based Participatory Research (CBPR) is an umbrella term used to encompass this latter set of research methods. CBPR includes techniques such as photovoice and photoelicitation where researchers use pictures taken by respondents as a way of eliciting stories of a user's life from the user's perspective (Strack, 2004; Khanlou and Peter, 2005). This technique has been successfully used in studying little understood communities such as the homeless and has great potential for building the knowledge that can result in better designed products and services for these communities (Le Dantec, 2008).

Geographical research techniques are used in a wide variety of fields including geography, urban planning, business, environmental sciences, and health sciences. They have been successful in influencing policy when they depict, in a single graphic, the resource discrepancies that exist within a given region or the differences in quality of life among different parts of the same city, county, state, or country. These location-based data and presentations can be powerful ways of identifying underserved populations in a given region and then understanding their perspectives on a given problem. These data can be used to enhance design and target deployment of services and products to areas that need them the most. Furthermore, these presentations can help identify the areas where current solutions are not working and more in-depth studies may be used to surface the real problems faced by residents in the area. For example, a map of local community assets may identify "food deserts" within a city, where residents do not have ready access to healthy foods. Solutions may range from bringing in farmers markets to the area, providing better transportation to sources of healthy foods in adjoining areas, or encouraging local merchants to provide healthy eating options. Photovoice studies with local residents may help identify the best solution among these alternatives or may surface hidden problems that need to be addressed. An area may be a food desert because it is unsafe and cannot attract farmers markets and other merchants at all. Hence the most important solution is one that addresses the safety of the locale. Or, it may be that there is a strong preference among residents for ethnic foods that are also healthy. Hence a farmers market that comes in should aim to include merchants that provide such ethnic foods and produce.

EMERGING TECHNOLOGIES

Social media, mobile technologies, and software as a service are among the current generation of technologies that comprise the nomadic information environment, defined by Lyytinen and Yoo (2002) as:

> A heterogeneous assemblage of interconnected technological and organizational elements, which enables the physical and social mobility of computing and communication services between organizational actors both within and across organizational borders (2002: 378)

Mobile technology includes a range of devices that are designed for portability, to enable users to access computing power anytime and anywhere. Aside from their small, lightweight form factors, these devices generally have radios that can connect to one or more pervasive networks (e.g. cellular, wifi), and provide alternative input modes (pen-based, voice recognition, video cameras).

Social media includes "any digital environment built on the contributions of and interactions among people" (Hirschorn, 2007). Aside from well known social networking portals like MySpace and Facebook, top social media offerings include wikis for collaborative writing and blogs that allow users to post musings, photos (photoblogs), and short messages (microblogging), from any location via a mobile device (moblogs) or standard desktop or laptop computer. Shneiderman deems wikis and blogs as tools for social creativity (2007). This paper contends that social creativity on these platforms are enhanced by the participation of users in the platform, not only by encouraging their inputs to collaborative conversations, but also because these platforms have the potential to capture users' thoughts and creations unfiltered by researchers' and editors' perspectives. Social scientists have started to tap into this rich body of data in emerging fields of e-social science for social network analysis (Mika, 2007) and digital ethnography, primarily of the YouTube culture (Wesch, 2008). Companies, particularly those that seek to involve users in innovation and value creation (e.g. P&G, Intuit), are doing the same (Ramaswamy, 2009).

Aside from the templates that structure the process and presentation of user contributions and interactions, social media also facilitate categorization of user posts. Every post can be assigned tags or descriptors that identify the key characteristics of the post – e.g. user name, location, and subject. These tags facilitate information searches and are also the basis for allowing the emergence of taxonomies that are aggregated from tagging activities of multitudes on online users. These user-generated taxonomies, termed folksonomies, (Vander Wal quoted in Smith, 2004, Quintarelli, 2005), are socially generated classification schemes. They are often captured in tag clouds or word aggregations (approximating the shape of a cloud) that depict the popularity of tags in relation to others via the use of font size (tags in larger font sizes are more popular than those in smaller font sizes) and font style (bolded tags are more popular than those that are not bolded). Some researchers in the semantic web community consider folksonomies as rudimentary examples of ontologies that are being developed to provide structured, machine-processable descriptions of documents and other online information (Mika, 2007; Brooks & Montanez, 2006). These ontologies are a key part of developing the semantic web where it is possible to search and integrate online data based on the meaning of posted material, as opposed to the currently available, less effective searches based on keywords. The emergence of the semantic web can

significantly impact the ease with which qualitative data generated via social media can be analyzed.

Social media services are examples of software distributed as a service. Often seen as a challenge to traditional models of software distribution, software as a service dispenses with per seat or per copy licenses of full software packages. Rather, users subscribe to an online service that provides the infrastructure for and maintains the software. With the rapid growth of dependable broadband network accessibility and relatively low cost of these services, this model of software distribution is growing in prominence, particularly in light of the 2008 economic downturn (IDC, 2009). They afford consumers, corporations, and non-profits access to pay-as-you-go, on-demand software that does not require major up-front capital outlays.

QUALITATIVE DATA FROM THE NOMADIC INFORMATION ENVIRONMENT

Current social media and mobile technologies can play a part in facilitating the collection of data that captures both user perspectives and geography. Social media, by lowering the barriers to self-publishing, facilitates the participation of target users in a research project. Instead of low-cost, film-based cameras to capture pictures of their lives, users can use a photoblogging site to publish the pictures and write reflections on them. These can later be revisited by a researcher with the user to further elaborate on the stories and reflections posted by the user. Text blogs in themselves are powerful ways for users to tell their stories and share their reflections on a given topic, with or without a structure imposed by the researcher, say in the form of questions. These blogs can then be mined for user perspectives on a given problem or even a solution. Many blogging sites include features that allow bloggers to publish from handheld mobile devices such as cell phones. Cell phones with cameras are virtually free these days and as smartphones reach greater levels of sophistication, the devices available through cellphone donation organizations like collectivegood.com will grow in sophistication as well. These technologies offer a cost-effective data collection method, even for resource strapped non-profit organizations and government agencies.

The greater availability of location aware devices – e.g. GPS-enabled cell phones, cameras, and handhelds – also facilitates the collection of geographic data. All data collected via such devices can be geocoded, that is, tagged with the position of the user in longitude and latitude (and sometimes compass heading and vertical position) when a given piece of data (e.g. a photo, a blog post) is collected. Thus, data can include geographic data automatically when the image is captured. The geocodes can then be cross-referenced with mapping software and address databases to place the data onto a map and tag it with a local address for the location. Many social media applications incorporate geography into their features. Mapping sites allow users to attach blogs, pictures, and multimedia material to locations on a map. While these are often used to capture tourist haunts and voyages across a given geography, they are also very useful for mapping out the same geography from the perspective of an underserved local resident or even an overwhelmed recent transplant.

Once data are collected, they may be uploaded to standard qualitative research coding and analysis tools such as Atlas/ti or Nudist. However, there are two trends that may impact these procedures, particularly for relatively simple coding and analysis. First, software has been developed to more reliably handle non-digital text input such as ink. Researchers who have handwritten their observations can quickly search through such inked in material without first

using ink recognition to convert the handwriting to digital text. Second, it is possible to tag material as it is collected, providing a first level categorization of the data.

Software such as Microsoft OneNote, allows a user to attach tags and notes to video and audio as it is being recorded. The researcher can later return to his/her notes and playback the video and audio snippets that are attached to significant notes, perhaps for further analysis. As mentioned above, geotagging almost automatically (if the user turns it on), tags every piece of collected material with the location where it was collected. Social media also opens up the tagging process to relevant communities by allowing the data collector and other authorized users (e.g. other researchers, other members of the user community, designers and developers) to attach tags to collected material. While easing the process of communal tagging and the creation of folksonomies, it also enables a researcher to gain insights into the variety of perspectives that different groups bring to bear on a given piece of collected data.

A defining feature of social media is that it incorporates a platform that eases the process of self-publication both by providing user-friendly interfaces for building a multimedia site for posted material and by circumventing the editorial structure inherent in traditional publication formats. This opens up publication opportunities to a wide range of voices and perspectives, without the filtering that is inevitable in edited publications. This is a great opportunity for individuals and organizations that are interested in obtaining knowledge of a user's perspective. As the community plugged into social media and web 2.0 publication grows, there will become available a great resource of observations from a user's perspective, unstructured by a researcher's questions or presence and unfiltered by an editor's pen. As the semantic web grows to maturity it creates the possibility for documents to be tagged to ease integration of this material across many sites. Ultimately, this can facilitate not only the collection but also large-scale analysis of user-generated data currently proliferating on the web.

PILOT STUDY

In Spring 2004, students from three disciplines in a large, metropolitan university in the Western United States were involved in a community asset-mapping project (Ulrich, 2005). The goal of the project was to map out resources in the local community that helped or hindered healthy behaviors. These resources included parks, food markets, sidewalks for walking, and fast food outlets. Students in a Health Sciences class collaborated with a local Healthcare agency to develop an instrument to collect data on local resources. Computer Engineering and Management Information Systems students then developed an application that incorporated this instrument and installed it on Tablet PCs. This enabled Health Sciences students to walk local streets and collect information on local health resources. The application used Microsoft Active Server Pages (ASP) scripting to link a browser-readable form to a database used to store collected data. Both the browser-readable form and database were replicated on each user's local TabletPC. Hence, there was no centralization of data collected. Each TabletPC had a unique database containing data collected by the user of the machine. For comparison, users were also provided the option of using Microsoft's OneNote application to take notes and capture audio commentaries that were automatically linked to the notes.

TabletPCs were used in slate configuration. In slate configuration, a TabletPC does not have a hardware keyboard. Text data entry is achieved using a soft keyboard and a digital pen. It was also possible to enter data via the voice recording capability of each tablet. The slate

configuration made it easier for users to carry the device as they walked the streets. It was equivalent to walking around with a clipboard, albeit one that was about three pounds.

Health Science students tested the application and, after improvements were made, walked the local neighborhood of the university in teams of four. Each team had a member using the TabletPC application for text and audio entry, a member that took pictures with a digital camera, a member who had a handheld GPS device to note the longitude and latitude of each point of observation (then entered into the table pc application), and a fourth member who served as navigator, using a map to guide the team through the local streets it was assigned to survey.

As the teams came back to the university with the data they collected, a teaching assistant consolidated the data from the TabletPCs. This was done manually by inserting data from each team into a single master database. Pictures collected by the team were posted online using yahoo.com's photo sharing service. Notes and audio files collected using OneNote were consolidated into a single Notebook folder.

The most useful source of consolidated data turned out to be the online photo sharing service, a precursor to social media photoblogging services. Health science students downloaded relevant pictures from this service to use in their final posters and reports for their community health class. Most of the teams preferred to use the OneNote application instead of the browser-based survey. The longitude and latitude data was noted in each OneNote page for each point of observation, rather than being entered into the local database. The drawback to using the online photosharing service as the method of sharing pictures was that very little of the observational data collected by the students was easily accessible to them for their reports.

Based on this first pilot experience, a student developed an online system that integrated all the data collected into a single database. This second generation application assumed a centralized database that would be accessible via a pervasive network such as wifi or cellular. A user would access an ASP form that could be used to enter observations and location information as well as to upload picture files related to each observation. An additional feature was the automatic generation of a report that summarized all the observations collected so far. A user could subscribe to this report using the Really Simple Syndication (RSS) protocol. A researcher could potentially use the RSS feed to monitor the data being collected by students in real time. It could just as easily serve as an information source for members of agencies seeking to understand a local community more deeply or for individuals tasked with addressing problems (e.g. potholes identified, trees that need trimming). This is a similar application to the photoblogs and moblogs that are available today via standard blogging services.

QUALITATIVE RESEARCH ON THE NOMADIC PLATFORM

The pilot study highlighted the main functionalities that are key to enabling qualitative research on a nomadic platform. The following section will discuss the infrastructure required to provide these functionalities and then the next section will discuss services that leverage this infrastructure to facilitate participant privacy/security, portability, and data analysis.

Infrastructure is defined by Lyytinen and Yoo (2002) as: "the whole set of technological specifications, standards, and protocols and their technical implementations necessary to support mobility, large scale, and digital convergence, and the associated family of institutions and communities needed to develop and sustain such standards and technical implementations."

Services are: "any functional application of the infrastructure resources to provide a computational solution to a client's needs."

The nomadic infrastructure that can best support qualitative research will be described in terms of networks, devices, hosted services, and institutions and communities. Since the pilot in 2004, there have been great strides in the efforts to create pervasive networks with sufficient bandwidth capabilities to support nomadic work by qualitative researchers. As of mid-2009, researchers have the option of accessing one of two wide-ranging networks to support their work on the field, WiFi and Cellular. WiFi networks are available in a great number of cities and even rural areas. Most of the time, a researcher may have to go to an Internet café or similar establishment to upload data collected on a device. WiFi is not quite available from every spot that the researcher may collect data from in the field. Still, WiFi provides relatively low cost, convenient, and fast broadband access. With the growing availability of 3G cellular networks across the world, cellular service has become a viable alternative to WiFi. Topping out at speeds over 7 Mbits per second, 3G cellular service has the potential to be a serious alternative to broadband access most people have at their homes. When fully deployed 3G cellular will be an excellent network to serve the needs of qualitative researchers. It will be virtually pervasive in its availability since cell towers are ubiquitous in many areas across the globe these days – definitely in greater numbers that WiFi access points. Fortunately, new devices coming into the market, such as smartphones, have built in radios that can access both WiFi and cellular networks. Additionally, these devices can switch automatically between the networks, depending on the strength of each. For devices with limited network connectivity, a USB or PCMCIA port will allow a researcher to add the capability of accessing WiFi, cellular and other networks via peripherals that add a radio to connect to a network (e.g. Sierra Wireless AirCard to connect to the cellular network) or a device that acts as WiFi hub connected to a dial-up service (e.g. Wiflyer) or a cellular network (e.g. MiFi router). To collect geocoded data, a researcher will also need to be able to connect to the GPS network. This connectivity is usually built into newer devices and if not, can be added via a USB or PCMCIA GPS card.

Ideal devices for qualitative research will integrate connectivity and multimedia input capability, in a portable package with an intuitive interface. As we found in the pilot, users prefer an interface that is most familiar to them and as close as possible to the clipboard that is typical hardware for field research. The slate configuration of the TabletPC was the ideal hardware form factor for this activity. As for the software, Microsoft OneNote was preferred over the survey format because OneNote looked and functioned most like the sheets of notepaper traditionally attached to the clipboard for user responses.

Device options are evolving from two directions – one is next generation TabletPCs and Laptops, and the other is next generation cellular smartphones. Additionally, high resolution cameras are incorporating GPS and limited data collection capabilities. Next generation TabletPCs and Laptops include TabletPCs (particularly those that offer the slate configuration like Apple's Ipad), Ultramobile PCs, and netbooks (inexpensive, small form factor laptops with limited processing power). Netbooks have just enough power to run the Windows operating system and Microsoft productivity tools and can connect to a variety of networks. Next generation cellular smartphones are epitomized by the Apple iPhone, but alternatives are emerging as well, such as Google Android devices. None of these yet lay claim to being the perfect machine for qualitative field research but many come close, albeit with a few minor adaptations. Most devices listed above

provide connectivity to both the WiFi and Cellular networks and incorporate GPS capabilities. Those that do not often include a port (e.g. SDIO, USB and/or PCMCIA) that makes it easy to add these network connectivity capabilities with inexpensive peripherals.

Many of the devices have integrated webcams or video cameras that facilitate the collection of video and pictures at the field site. The smartphones are generally better designed for video and picture collection because their cameras are positioned to take video or pictures of persons or other entities being interviewed or observed. Most of the next generation laptop/TabletPC devices have cameras positioned for video conferencing, hence facilitating collection of pictures and videos of the researcher or data collector not the subject. An exception to this would be TabletPCs with monitors that swivel so that the camera can be positioned to take the picture of the subject even as the researcher is able to type onto the keyboard of the TabletPC. Eventually, these devices may incorporate several cameras to collect data from multiple perspectives (e.g. user and researcher) simultaneously, much like the Nintendo DSi device currently affords.

Another key differentiator is input method. Researchers can choose among pen input, full-size or reduced size keyboards for traditional ten-finger typing, hardware keyboards for thumbtyping, or softkeyboards for thumbtyping. Pen input is the most flexible since it also allows drawing of diagrams and pictures by researchers and subjects. Although a few smartphones offer these, the best capabilities for pen input are available on the tablet PCs and ultramobile PCs. Traditional keyboards are available as an additional option in most tablet PCs, although in this case the researcher will have to contend with a larger, heavier and more expensive device. Netbooks have full keyboards, albeit of reduced size, making it difficult for users with large fingers to use. Smartphones generally provide either a hard or soft keyboard on which a user types with his/her thumbs. While one can gain enough proficiency in this input mode to enter quick notes and metatags to attach to multimedia material being collected, it is unwieldy for entering longer notes. Ways to counteract this is to save entry of longer notes until one gets back to a location where you have a machine with a full keyboard. The technology to record interviews using an audio recorder on the smartphone and convert the voice recording to text is also widely available and increasingly accurate. In summary, for data collection efforts that require copious

TABLE 1. Comparison of Mobile Device Capabilities for Data Collection

Device	Camera Input	Audio Input	Text Input	Best Use
Tablet PC/ Slate	Yes (generally facing data collector)	Yes	Pen or Soft Keyboard	Mobile collection of pictures, audio, mobile posting to blogging sites, Entry of long notes in stationary location
Netbooks/ Laptops	Yes (generally facing data collector)	Yes	Keyboard	Entry of long notes in stationary location
Smartphones	Yes (generally facing subject)	Yes	Soft Keyboard, thumbtyping input	Mobile collection of pictures and audio, mobile posting to blogging sites, limited note taking

notes, next generation laptops and tabletPCs are the best option as of this date. For data collection that involves collection and attachment of metatags to digital multimedia material (audio, video, pictures) a smartphone or a GPS enabled camera work best. Table 1 summarizes these comparisons.

This section will focus on social media hosted services rather than the full range of software and services available to the qualitative researcher. The reason for this is twofold. The social media hosted services are generally designed with novice users in mind. With this focus, the services have intuitive interfaces that a wide range of users can find easy to navigate. This is important when one considers methods like CBPR where a wide range of mostly novice users are involved in gathering data for the research project. The second benefit of hosted social media services is their relatively low cost, compared to traditional software and services that assume corporate clients with deep pockets and extensive staff. Social media takes more of a grassroots approach and hence has created a platform that is accessible to a wide range of users, enhancing self-publishing and accessibility of the technology even to novice users with few resources.

There are two main types of social media hosted services that can serve as infrastructure for qualitative research field studies – blogging and collaborative mapping. Blogging includes traditional blogs but perhaps more significantly micro-blogging sites like twitter and mobile blogging (moblogs). Blogs are web sites generally developed by individual users to serve as a repository of their writings, impressions, photos and other material to publish their thoughts, opinions, statements on a particular topic or their lives in general. Already, many non-profits have used blogs to provide compelling stories and images to the general public, raising awareness about the causes (and sometimes funding for the solutions to the causes) that they address. The Red Cross successfully generated support for relief efforts after the January 2010 Haiti Earthquake by sending out solicitations via microblogging site Twitter and posting videos and photos on the photoblogging site Flickr. Because Twitter made it easy to send donations via text message, the Red Cross raised twenty one million dollars in six days. Within two days of the earthquake, the Red Cross site on Flickr had received over one million views (Timo, 2010). This paper makes the case for extending the use of social media beyond these applications, enabling the collection of information about a given issue from the viewpoint of those most affected by the issue itself. This means providing access to social media sites, and devices that tap these sites, to the individuals who directly experience the effects of a given social, societal, or emergency problem (poverty, natural disasters, war), or to those who are directly working on solutions.

There are many social media hosting services that provide form-based input and templates that enable the novice user to get started with a blog with little effort or resources. Google provides a free blogging service, blogger, while the top blogging services – Typepad and Wordpress – are free or inexpensive. Each of these services provides templates for formatting blogs to include the common elements – a main section for writings, easy links to multimedia material (photos, video, etc.), facilities for comments from readers, and archiving of previous posts. Most interesting for the field researcher are mobile blogging features. Most blogging services – including google, wordpress, and typepad -- enable users to upload blog material from cell phones and mobile devices. Users can snap a picture with a cell phone and post it to their blogs using sms/mms or email. The posts can include text to add to the blog, tags to identify subjects and other categories pertinent to the posted material, and location geocodes from the device GPS or based on the position of the nearest cell tower. To facilitate mobile blogging, sites

like Wordpress and Typepad have even developed applications for mobile devices such as the iPhone.

Aside from mobile blogging sites, microblogging sites are another option for field researchers. Individuals use these sites, like industry leading Twitter, to share short tidbits (called "tweets") from their day with friends, family, and their extended online social network. Each tweet is limited to 140 characters and can be sent in from the twitter website or a cell phone. Interested parties can choose to follow the tweets of a user and to receive continuous updates. Twitter is positioned as a way of staying in touch with friends and family in between blog posts and emails, answering the questions "what are you doing?" for those who are interested. But users have co-opted the technology for a wide variety of communications (Pogue, 2009). Twitter has gained traction, providing an on-the-ground look at significant events such as the Hudson River plane crash, an earthquake in China, and the Fall 2008 attacks in Mumbai, India (Lamb, 2009). This underscores the power of this service for capturing knowledge from a user's perspective. While each tweet may be short on characters, a series of tweets can yield invaluable and substantial information about the daily lives of subjects in a qualitative study. Tweets are geo-coded with the home location of the Twitter user posting the tweet (not real time). When motivated correctly, blogs and tweets may serve as digital analogs of the diaries that qualitative researchers have asked their subjects to keep in the past. It may also be possible to find voluntarily shared blogs from individuals who may have been reluctant to keep such diaries in the past, particularly when aided by powerful search procedures and emerging tools of the semantic web.

Collaborative mapping services allow non-cartographers to annotate maps with information that is most important to them. Online sites like wikimapia.org, as its name implies, encourage users to participate in naming and describing points of interest across the globe. These collaborative maps can be a source of valuable local information for qualitative researchers. But perhaps more useful is a service that allows a researcher to collaborate with a limited set of users on annotating a map of a particular area of interest. This can be done with a free service from Google called Mymaps, accessible via the Google Maps home page. Low-cost solutions are also provided by organizations such as Berkeley's Geospatial Innovation Facility (http://gif.berkeley.edu). With these services, a researcher can invite participants to collaborate on building a description of a given locale. Participants can identify points or areas in the map and attach comments, pictures, video, and other multimedia material to them. Access to the completed map can be limited to only a select group of invitees. This feature is especially useful for maps built with the collaboration of protected or at risk groups.

As discussed above, emerging social media and mobile technologies can be used to build a powerful infrastructure for supporting qualitative research that aims to capture a user's perspective on a given issue and/or geography. However, despite the focus on non-expert users by many of these technologies, there is still great need for expertise in integrating across these technologies and in helping to influence the evolution of the technologies so that the requirements of qualitative research and human subject protection are considered. Often, qualitative research is done with limited resources by researchers in universities or community based organizations. These researchers have limited funds to allocate to making the technology work seamlessly and are often non-expert technology users working with limited information technology support. Institutions like the nonprofit technology clearinghouse, TechSoup, and Berkeley's Geospatial Innovation Facility, provide leadership in this arena as well as provide resources to help

researchers make wise and cost-effective decisions regarding the infrastructure for their research. Funding agencies, such as the Robert Wood Johnson foundation and the National Institutes of Health, that encourage the use of qualitative research methods like CBPR, can also provide much needed assistance by facilitating conversations among participants in their funded projects about technology applications. Organizations such as TechSoup and non-profit consortia can host conversations that highlight the experiences of early adopters of these technologies as well as bring together technology vendors and qualitative researchers to make the vendors aware of the pertinent features that can benefit researchers and innovators. The services discussed below are an initial set of foci for such conversations.

Qualitative research on the nomadic platform will greatly benefit from dependable, broadband, pervasive networks. This will allow centralization of data collection from the first point of contact with the data source. Rather than storing the data on the mobile device and then synching the device at the main office or at a remote station, a pervasive network will allow instantaneous synching while the data is being collected. This will reduce problems with loss of data due to devices being mishandled and also reduce the effort to consolidate data from various devices. Servers can host databases that can be updated on-the-fly, in real time. Reports can also be generated and updated real time, as the data is being collected. Experts viewing these reports can even send out updated protocols to the data collectors based on the reports that have been generated on the data. Bandwidth will determine the richness of the data (text vs. images vs. audio vs. video) that can be sent back to the server in real time.

Services to ensure the privacy of the collected data from the point of origin will be indispensable not only to protect researchers from litigation but also to encourage candor among subjects. This paper uses a definition of privacy and security that juxtaposes the two concepts as elements addressing the same issue – that of the protection of user information and identity.

Privacy transgressions include identity theft, unauthorized secondary use of data, physical and virtual stalking, and attacks, and IP Theft. Security constitutes the protections that an individual and/or organizations puts in place to prevent and remedy such transgressions (Nath and King, 2009).When research subjects are in protected groups or engaged in activities that are outside the mainstream, privacy/security services will be especially pertinent. To encourage participation, it will often be necessary to ensure that the subject's responses, location, and other personal information are accessible only to the research team and other authorized parties. As the data collection effort becomes dispersed along a wide area, and the data collected takes on the digital form, it will become more and more difficult to assure subjects that only aggregate data will be published. Privacy/Security services are needed to facilitate that achievement of this standard.

To ensure participation of a large number of qualitative researchers – who often would prefer not to be involved, nor have the resources to be involved, with technical matters – these services have to be transparent and easy to set up. Strong encryption services will need to be seamlessly incorporated into applications much like the SSL standard is incorporated into browser technologies. The presence of pervasive networks will help here as well by reducing the need for user data to be stored on the data collection device, be it a cell phone, tablet pc, or laptop. Removing data storage from the mobile device, removes one of the weakest links in the system. Collected data cannot be accessed even if the device is misplaced or stolen since none of the data reside in the device. Privacy/Security services and policies will thus apply the most on the server

side and the communications between the server and the mobile device. These services also need to seamlessly integrate standards such as The Health Insurance Portability and Accountability Act (HIPAA) that protects health information, and Family Educational Rights and Privacy Act (FERPA) that protects student education records. The centralization of the data into a few locations brings up a related issue – while the data may be more secure and protected against catastrophic system failures, it is also easier for governments, terrorists, hackers and similar entities to access and aggregate these data, either by hacking into the servers or via subpoena. Privacy law experts (Solove, 2006), and consortia like the Global Network Initiative are convening conversations to build policies that enable server owners and managers (from a local nonprofit to large portal providers such as google, Microsoft, and Yahoo) to proactively address these latter concerns.

As underscored by the pilot study, one of the most difficult activities in qualitative research is analysis. The volume of unstructured data can make analysis overwhelming. Analysis also depends very much on the analytical ability and insights of a trained researcher. Analytical services can help this process through the distillation of data into key categories to facilitate subsequent human analysis of the raw and distilled data. Coding and flagging technologies can facilitate data distillation by attaching relevant tags to various types of data (digital text, inked text, pictures) based on a pre-determined coding scheme or ontology. This will be invaluable in juxtaposing data that throw light into concepts of interest to the researcher. This is also an area where the semantic web can be a great asset, particularly when researchers are trying to link up various unstructured data sources generated by the social media phenomenon. There is a wealth of information from the user's perspective that is being generated in the wikis, blogs, and tweets of social media participants. Often, these are also geo-coded automatically by authoring tools. Semantic web technologies can help greatly in identifying pertinent data sources, perhaps tagged based on a relevant ontology at the point of creation, and bringing them together for the researcher to analyze further.

INTEGRATION WITH ESTABLISHED QUALITATIVE RESEARCH

Beyond the qualitative methods discussed above, the combination of location-aware devices with social network media can be also find application in more established qualitative and mixed-method research orientations. As discussed earlier, two clear applications of the approach are the field study research methodologies of ethnography and case study, which have much in common and can be applied together or separately (Creswell, 2007). The focus of an ethnography is typically a culture-based group, while a case study often focuses on the case situation in which the group operates (Creswell, 2007), both are widely accepted types of the broader research class described as field work (Guba & Lincoln, 2005).

The combination of highly available technologies and group data contribution provide innovative opportunities for qualitative analysis. For example, the use of GIS tools with computer-based mobile devices provide rich data sources that are well suited to a post-positivist analysis model (Creswell, 2007) that still provides verifiable, empirical findings from a scientific orientation. On the other hand, the ready interpretation can be "constructed" by the distributed group of participants (Kukla, 2000). In addition, a variety of advocacy orientations that are focused on advancing the interests of a particular group (Torraco & Holton, 2002) can benefit

from the declining cost and availability thresholds for participation using mobile devices, as well as the inherently inclusive nature of social networks.

TABLE 2. Technology-enabled Fieldwork Approaches

Fieldwork Research Concept or Practice	Traditional use in Ethnography and Case Study	Applicability and Implications for Technology-enabled Qualitative Research
Social Construction	Meanings and understandings seen as socially constructed	Social media provides new opportunities to combine and construct meaning from diverse, distributed group member contributions
Pattern analysis	Systematic procedures: Comparison tables, taxonomies, cross-case analysis	Multi-location data from diverse, globally distributed participants can enable spatial analysis at alternative scales
Categorical aggregation, Naturalistic generalization	Combining data from individuals to create meaningful, interpretable groupings	Social media interaction of study participants offers possibility of participant-defined groupings, in addition to researcher-defined groupings
Snowball and Chain Referral Sampling	Subject recruitment of additional participants	Study participants using accessible, web-based technologies can easily locate and recruit additional participants that may otherwise remain hidden from study
Validation: Triangulation, Crystal Patterns	Multi-source and multidimensional data corroboration for validity analysis	Combination of multiple social media types, geocoded data, tags, and timestamps, provide new types of opportunities for multidimensional validation
System Bounded-ness	Defined delimitation of objects of case or ethnographic study	Emerging data from social media and crowd-sources may call for flexible expansion of predefined boundaries

Ethnographic researchers have recently developed parallel research patterns that integrate with the methods described here. Examples include multi-site ethnography (Marcus, 1995) and multi-local field work (Hannerz, 2003). These can be applied in exploratory manner, serving as an evolving explanation that builds a "cluster of ideas surrounding the notion of (a) model." (Torraco & Holton, 2002). Ethnographic analysis using multi-site participants can be applied in a wide variety of behavior and attitude analysis (e.g., Schouten & McAlexander, 1995), and have already combined with GIS tools to address or support social advocacy positions (e.g., Skinner, Matthews,

& Burton, 2005). Fortunately, multi-site and GIS-coded data merge easily with qualitative coding tools (e.g., Fielding & Cisneros-Puebla, 2009; Kwan & Ding, 2008).

Table 2 compares the traditional use of key fieldwork research elements as applied in traditional ethnography and case study (Creswell, 2007; Guba & Lincoln, 2005; Schwandt, 2007; Seale, 1999; Yin, 2003) with their potential contribution to the technology-enabled approaches discussed here.

CONCLUSION

A nomadic information platform built on mobile technology, social media, and software services has great potential for facilitating the application of qualitative research in the design of products and services, particularly for poorly understood, underserved groups. As discussed in this paper, many services need to be in place before this platform becomes a fully viable alternative for researchers and innovators hoping to use the platform for their design and development activities. Furthermore, these benefits may not be realized until the generation of researchers who grew up on social media join the academy and design professions. Already we see early signs of these with recent Ph.D.s like Danah Boyd (http://www.danah.org/) and Michael Wesch (http://ksuanth.weebly.com/wesch.html) who publish on multiple platforms, both traditional (journals) and emerging (blogs). As their numbers grow and they apply their experience to developing and adopting traditional research tools, we can expect to fully realize the potential of these huge stores of user-generated content to enhance our knowledge of user perspectives and preferences. There is great promise that this will lead to the design of innovative and relevant products and services for the underserved.

APPENDIX: GLOSSARY OF TERMS

CBPR – Community-based participatory research – a "collaborative approach to research that equitably involves all partners in the research process and recognizes the unique strengths that each brings. CBPR begins with a research topic of importance to the community, has the aim of combining knowledge with action and achieving social change to improve health outcomes and eliminate health disparities." (WK Kellogg Foundation)

GPS – Global Positioning System – A network of satellites that allows users on the ground to determine their exact position

Geocoding – Identifying the exact latitude and longitude of a location, based on an address, GPS data, or other location information

ASP, ASP.net – Microsoft Active Server Pages system – Allows dynamic updating of web pages to show new information

RSS – Really Simple Syndication – Web page data standard that allows dynamic updating of new information in web pages

USB – Universal Serial Bus – A standard for connecting computer equipment; Describes connectors and receptacles used to plug computers and devices together

PCMCIA – Personal Computer Memory Card International Association – A group that created standards for connecting computers; A type of connector found on computers and devices

SDIO – Secure Digital Input/Output Card – Small card that allows wireless transmission to computers and devices; Bluetooth is a leading example

SSL – Secure Sockets Layer – A data security and encryption standard for validating and protecting information sent over the web

Tag Cloud – Word Cloud; A visual, clustered representation of words (tags) used in social media, often with larger sizes for frequently-used words

Crowdsourcing – Using large numbers of persons with web access to add information and generate content

REFERENCES

Baker, E. (2006, Winter). "Ideas on the Edge, Interview: Eric von Hippel." *CIO Insight*. 12-18.

Brooks, C.H. and Montanez, N. (2006). "Improved annotation of the blogosphere via autotagging and hierarchical clustering." *Proceedings of the 15th International conference on World Wide Web*, 625-632.

Creswell, J. (2007). *Qualitative Inquiry and Research Design* (Second ed.). Thousand Oaks, CA: Sage Publications.

Denning, P. and Dargan, P. (1996). "Action-Centered Design." in *Bringing Design to Software*, Winograd, T. (ed.). ACM Press: New York, NY. 105-120.

Fielding, N., & Cisneros-Puebla, C. (2009). CAQDAS-GIS Convergence: Toward a New Integrated Mixed Method Research Practice. *Journal of Mixed Methods Research, 3*(4), 349-370.

Florida, R. and Goodnight, J. (2005, July-August). "Managing for Creativity." *Harvard Business Review*.

Franke, N., von Hippel, E., and Schreier, M. (2006). "Finding Commercially Attractive User Innovations: A Test of Lead-User Theory." *Journal of Product Innovation Management*, 23, 301-315.

Gassmann, O., Sandmeier, P., and Wecht, C.H. (2006). Extreme customer innovation in the front-end: learning from a new software paradigm. *International Journal of Technology Management*, 33 (1).

Guba, E., & Lincoln, Y. (2005). Paradigmatic Controversies, Contradictions, and Emerging Confluences. In N. Dezin (Ed.), *The Sage Handbook for Qualitative Research*. Thousand Oaks, CA: Sage

Hannerz, U. (2003). Being there... and there... and there! *Ethnography, 4*(2), 201-216.

Hirschorn, M. (2007, April). The web 2.0 bubble. *Atlantic*. Available at: http://www.theatlantic.com/doc/ 200704/social-networking

Kelly, T., and Littman, J. (2001). *The art of innovation: Lessons in creativity from IDEO, America's leading design firm*. New York: Currency.

Khanlou, N. and Peter, E. (2005) Participatory action research: considerations for ethical review. *Social Science and Medicine*, 60, 2333-2340.

Kukla, A. (2000). *Social Constructivism and the Philosophy of Science*. New York: Routledge.

Kuhn, S. (1996). "Design for People at Work." in *Bringing Design to Software*, Winograd, T. (ed.). ACM Press: New York, NY. 273-289.

Kwan, M., & Ding, G. (2008). Geo-Narrative: Extending Geographic Information Systems for Narrative Analysis in Qualitative and Mixed-Method Research *The Professional Geographer, 60*(4), 443-465.

Lamb, G. M. (2009, February 12). Twitter's secret: the law of unintended consequences. *Christian Science Monitor*. Available at: http://features.csmonitor.com/innovation/2009/02/12/twitter's-secret-the-law-of-unintended-consequences/

Le Dantec, C.A. (2008). Life at the Margins: Assessing the role of technology for the urban homeless. *Interactions*, 15 (5), 25- 27.

Lester, R.K. and Piore, M.J. (2004) *Innovation: The Missing Dimension*. Cambridge, MA: Harvard University Press.

Lieber, R.B. (1997, February 3). Storytelling: a new way to get close to your customer. *Fortune*, 3, 102.

Lyytinen, K. and Yoo, Y. (2002). Research Commentary: The Next Wave of Nomadic Computing. *Information Systems Research*, 13 (4), 377-388.

Marcus, G. (1995). Ethnography In/Of the World System: The Emergence ot Multi-Sited Ethnography. *Annual Review of Anthropology, 24*, 95-118.

Mika, P. (2007). *Social Networks and the Semantic Web*. Springer: New York.

Nath, A.K. & King, R. C. (2009). Customers' perceived security: relative effectiveness of trust transference mechanisms. *AMCIS 2009 Proceedings*. Retrieved from: http://aisel.aisnet.org/amcis2009/766/

Pogue, D. (2009, February 11). Twitter? It's what you make it. *The New York Times*. Available at: http://www.nytimes.com/2009/02/12/technology/personaltech/12pogue.html?_r=1&scp=5&sq=twitter&st=cse

Quintarelli, E. (2005). Folksonomies: power to the people. Paper presented at the ISKO Italy-UniMIB meeting. Available at: http://www.iskoi.org/doc/folksonomies.htm.

Ramaswamy, V. (2009). Leading the transformation to co-creation of value. *Strategy & Leadership*. 37 (2), 32-37.

Schouten, J., & McAlexander. (1995). Subcultures of Consumption: An Ethnography of the New Bikers. *Journal of Consumer Research, 22*(1).

Schrage, T. (1996). "Cultures of Prototyping." in *Bringing Design to Software*, Winograd, T. (ed.). ACM Press: New York, NY. 191-205.

Schwandt, T. (2007). *The SAGE Dictionary of Qualitative Inquiry, 3rd Edition*. Thousand Oaks, CA: SAGE.

Seale, C. (1999). Quality in Qualitative Research. *Qualitative Inquiry, 5*(4), 465-478.

Shneiderman, B., Fischer, G., Czerwinski, M., Resnick, M., Myers, B. Candy, L., Edmonds, E., Eisenberg, M., Giaccardi, E., Hewett, T., Jennings, P., Kules, B., Nakakoji, K., Nunamaker, J., Pausch, R., Selker, T., Sylvan, E., Terry, M. (2006). "Creativity Support Tools: Report from a U.S. National Science Foundation Sponsored Workshop. Journal of Human-Computer Interaction, 20 (2), 61-77.

Shneiderman, B. (2007). Creativity support tools: accelerating discovery and innovation. *Communications of the ACM*. 50 (12), 20-32.

Skinner, D., Matthews, S., & Burton, L. (2005). Combining Ethnography and GIS Technology to Examine Constructions of Developmental Opportunities in Contexts of Poverty and Disability. In T. Weisner (Ed.), *Discovering Successful Pathways in Children's*

Development: Mixed Methods in the Study of Childhood and Family Life. Chicago: University of Chicago Press.

Smith, G.C. and Tabor, P. (1996). "The Role of the Artist-Desiger." in *Bringing Design to Software*, Winograd, T. (ed.). ACM Press: New York, NY. 191-205.

Smith, G. (2004). Folksonomy: Social Classification. Blog post available at: http://atomiq.org/archives /2004/08/folksonomy_social_classification.html

Solove, D. J. (2006). A taxonomy of privacy. *University of Pennsylvania Law Review*. 154 (3), 477-559. Retrieved from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=667622#

Strack, R.W., Magill, C., and McDonagh, K. (2004). "Engaging Youth Through Photovoice." *Health Promotion Practice*, 5 (1), 59-58.

Tannen, R. (2008) The Researcher-Tool Mismatch: improving the fit between user researchers and technology. *Interactions*, 15 (5), 74-78.

Timo (2010). Haiti earthquake: the red cross red crescent social media response. Available at: http://sm4good.com/2010/01/24/haiti-earthquake-social-media-response/

Torraco, R., & Holton, F. (2002). A Theorist's Toolbox. *Human Resource Development Review, 1*(1), 129-140.

Ulrich, T. (2005, October 12). "How Computer Maps will Help The Poor." *Christian Science Monitor*. Available at: http://www.csmonitor.com/2005/1012/p13s02-legn.html

Von Krogh, G. and von Hippel, E. (2006). "The Promise of Research on Open Source Software." *Management Science*, 52 (7), 975-983.

Walker, A. (2009, January 5). Creatively Engaged. *Good Magazine*. Available at: http://www.good.is/?p=13987

Wang, C. and Burris, M. (1997). Photovoice: Concept, Methodology, and use for participatory needs assessment. *Health Education and Behavior*, 24, 369-387.

Wesch, M. (2008, June 23). *An Anthropological Introduction to YouTube*. Presentation at the Library of Congress. Available at: http://www.youtube.com/watch?v=TPAO-lZ4_hU

Winograd, T. (1996). "Introduction." in *Bringing Design to Software*, Winograd, T. (ed.). ACM Press: New York, NY. xiii-xxv.

Yin, R. (2003). *Case Study Research: Design and Method* (Third ed.). Thousand Oaks, CA: Sage Publications.