The Future of Enterprise Is with the Mobile Workforce: An International Field Study

Lynn Rampoldi-Hnilo, Brent White, Michele Snyder, and Chad Sampanes

Oracle Mobile Applications User Experience, 4001 Discovery Drive Suite 340
Boulder, CO 80303
{lynn.rampoldi-hnilo,brent.white,
michele.snyder,chad.sampanes}@oracle.com

Abstract. To create the most effective mobile applications, Oracle must understand how and in what contexts the mobile workforce is using their mobile devices. Oracle mobile researchers went into the workforce population and conducted an international, ethnographic field study to fully understand the mobile worker's needs, behaviors, and contextually based activities.

Keywords: Ethnography, Field study, International research, Mobile, Enterprise applications.

1 Introduction

Technology experts predict that the next major computing platform will be the mobile device [1]. In the past, enterprise application companies have focused primarily on desktop and laptop software solutions. However, as the workforce becomes increasingly mobile, companies are responding with mobile solutions to complement their desktop applications. A complete enterprise solution that accounts for work context is a growing requirement for maintaining competitive and strategic advantages.

Since the launch of commercial wireless application protocol (WAP) services in 1999, there has been much hope that mobile devices would leverage some of the functionality found in desktop business applications. But the WAP approach failed because of major shortcomings in front-end design and mobile technology [2]. The devices and mobile network technologies of 1999 were too slow to process data, and the design approach of repurposing one design for all platforms resulted in unusable mobile interfaces. However, progressive advances in cellular networks and device capabilities, combined with a new design approach that understands the importance of creating a distinct mobile version, have now taken hold. Developers of consumer mobile applications have been quick to design specifically for mobile devices. A focus on a select set of consumer services and applications designed for specific mobile form factors contributed to the market dominance of Japan's NTT DoCoMo's i-Mode internet service [2]. As of January 2009 there were over 48 million Japanese subscribers comprising 53% of the market for browser-enabled phones [3]. i-Mode has succeeded in offering easy-to-deploy applications in categories such as gaming, multimedia and content creation that mobile subscribers want to use.

That consumer-based applications are driving innovation is not surprising for several reasons. First, although mobile devices were originally targeted for business purposes, it was primarily social usage (such as messaging friends and family) that turned mobile devices into a mass market [4]. Second, consumer mobile applications are widely available and in use by mobile workers. Many of these entertainment and news content services are used during the work day as employees pass time between tasks. Third, enterprise applications have typically been designed to address business processes that may involve multiple steps and high concentrations of data. Both of these characteristics do not fit a work style characterized by working in short spurts while viewing data on a relatively small screen [5].

When mobile, users must quickly access information and immediately take action or pass information on to others. The most successful business applications on the mobile platform match this frequently interrupted and fast-paced work style. The BlackBerry line of devices has dominated the corporate work place and hold more than 40 percent of the U.S. smart phone market [6]. The core service of the Blackberry is a corporate e-mail architecture that provides robust e-mail capabilities refined for mobile users. Other key mobile usage outside of voice calls revolves around messaging, music, games, and single-purpose utilities (such as calculators and alarm clocks). However, the concept of downloading applications onto mobile devices is becoming more common with new distribution models, such as Apple's iTunes Store, which has greatly improved the ease of finding and downloading mobile applications. As of February 2009, there were approximately 15,000 iPhone applications on iTunes. Only 7 percent of these applications are categorized under business [7].

Although mobile workers may not currently be running full-blown business applications, they still complete work tasks with applications that were delivered with or that were downloaded to their mobile devices (such as calendars and note taking). While we know that more sophisticated features (such as using integrated business intelligence when executing transactions) would be useful for mobile workers, we must better understand how users are currently working and meeting these needs through their existing mobile devices. A better understanding of existing usage will enable Oracle to create the most effective mobile applications.

To gain this understanding, Oracle mobile researchers went out into the workforce population and conducted an international, ethnographic field study to fully understand mobile worker needs, behaviors, and their contextually based activities. The study tackled questions, such as "What types of applications do mobile users need to be more successful in their work?" and "Where is the future of mobile devices?"

2   Methodology

Mobile behaviors are not easily self reported because they are opportunistic in nature (that is, mobile tasks are completed when convenient) and are often unexpected or unplanned by the users (for example, users must often urgently respond to spontaneous e-mails or phone calls from managers). Therefore, the issues that we planned to explore in our study were contextual and rooted in behavior.

Ethnography was chosen for our study because it is a process of gaining an understanding of work or activity as it occurs in its natural environment [8]. Using this

method enabled us to observe mobile behaviors at the time of occurrence in their authentic work settings. Ethnographic research has been used for many years in fields such as sociology and anthropology, and it has recently become increasingly popular in the field of human computer interaction. Some of the goals of field studies in supporting technology design are to find opportunities, counter assumptions, or support preexisting assumptions [9].

Oracle conducted an international ethnographic research study in the U.S., Singapore, and India to understand users across technologically advanced cultures, diverse mobile workforces, and emerging markets. The goal was to thoroughly understand the mobile work environment by observing where, when, and how mobile workers use their mobile devices. In particular, we wanted to learn about the mobile culture of the participants, including personal versus work usage, percentage of time on their mobile devices, percentage of time spent on work away from their desks, and mobile etiquette. Furthermore, we also wanted to discover the types of content and applications that people expect, need, or want on their mobile devices for both work and personal use.

2.1 Participants

Our study involved interviews of 33 experienced mobile device users residing across the three countries (13 in Singapore, 10 in India, and 10 in the U.S.—a mixture of people from New York and San Francisco). The study was conducted in April and May of 2008.

We recruited three different groups of heavy mobile users for the study:

1. Mobile workers (N = 25): Mobile workers comprised the majority of the participants and were required to use their mobile devices for more than 2 hours a day for work-related tasks. These mobile users also needed to be out in the field at least several days a week. We specifically targeted the following worker roles: field sales representatives, field service technicians, portfolio managers, manufacturing or shipping agents, and retail merchandisers.
2. Everyday mobile users (N= 4): These participants were expected to use their mobile devices for at least 2 hours a day with 25 percent of their mobile usage for work-related tasks. They were not required to fit into any specific work role; however, they were expected to perform some of the following advanced functions on their mobile devices: e-mailing, browsing the Internet, playing games, text messaging, and shopping.
3. Young college age students in their early 20s (Gen Y) (N=4): Although these users do not use their devices for work-related tasks, they are the future mobile workers. In order to participate in the study, these Gen Ys were required to use their mobile devices for 2 hours a day and to perform advanced functions, such as e-mailing, Internet browsing, text messaging, and shopping.

2.2 Method

The field study consisted of us accompanying each of the participants during a day for a 5-hour period. In the 5-hour sessions, there was an introduction interview, a follow-along observation, and a post interview. We used four paired teams of researchers to

conduct the research. In Singapore and India, each pair consisted of a mobile researcher from Oracle and a local research counterpart from either Oracle or a research partner. In the U.S., two Oracle mobile researchers conducted the sessions.

The introduction interview lasted approximately 30 minutes and took place at the beginning of each session. The interview began with us introducing ourselves and explaining what would occur throughout the session. Next, the participants were given an opportunity to introduce themselves to us. Once we familiarized ourselves with each other, the participants were asked to describe their typical day and how it involved interacting with their mobile devices. In the final part of the introduction interview, the participants were asked to complete a short questionnaire that contained some demographic information about their mobile usage.

The observation portion of the session lasted for a 3- to 4-hour period, starting directly after the introduction interview. We went along with the participants as they went about their work and day-to-day activities. We remained as unobtrusive as possible during the follow-along period and talked occasionally and briefly only to clarify issues. We photographed, videotaped, and audiotaped participants completing their daily tasks, when appropriate.

The final part of the session was a post interview that occurred after the observation period. During this time, we asked questions based on the observations that we recorded during the follow-along session. This time was also used to prompt discussions regarding other mobile tasks and trends that were not observed during the day. To gain a better understanding of future mobile device and application requirements, the participants were asked the following two questions:

1. What are the coolest new features that you have seen for cell phones or mobile devices?
2. If you could make your cell phone or mobile device do anything, what would it do?

This paper focuses on the results of these questions.

2.3 Analysis

We performed a qualitative analysis on the data to understand mobile trends and requirements for future design. To find trends across multiple users, we grouped data into categories (likes, dislikes, most innovative new features, and desires for future capabilities). We also assessed cultural differences across countries.

3 Results

Fresh designs often are inspired by what users need or want to see in the future. In order to capture forward-thinking ideas, we observed and talked to our participants about what they would like to see in either their current or future devices. What should an application or a device do in the future? This section is a synthesis of the common findings that we found across the U.S., Singapore, and India.

Participants in this study were heavy mobile users. They knew the strengths and weaknesses of their devices. Participants wanted to see improved form factors and

functionality, to have their phones better support their work needs, to enhance devices so that they had to carry around only one device instead of many, and to increase the multimedia functionality and services available on their devices.

3.1   Improve Form Factors and Functionality

A top request was for the existing functionality and devices to operate better than they currently do. In other words, don't add more, but make existing functionality better.

Participants wanted their mobile devices to have bigger screens, slimmer designs, increased memory, faster speeds, higher camera resolutions, shortcutting between applications, and better clarity of calls. They also wanted their devices to be water resistant and sturdier.

Participants wanted the features and functionality on their mobile devices to work better with faster speeds, better connectivity, and greater consistency. Participants wanted to receive e-mails consistently, browse the Internet as quickly as they do on their laptops, receive consistently correct GPS coordinates, and receive better Internet website updates of weather, stocks, and traffic.

Participants wanted data entry to be easier, with simplified text messaging programs, predictive text (T9), speech-to-text transformation, voice dialing, business card scanning input, handwriting recognition for contact names, and better data input methods.

Lastly, participants wanted enhanced voice capabilities on their mobile devices. Participants wanted their mobile devices to record what they say and correctly and consistently translate it into text. They also want to leverage "voice commands" to have the devices do what they say (for example, "open e-mail").

3.2   Enable Work

Participants in all three countries generally had their phones with them at all times, especially at work. They identified a number of ways they would like their phones to support them.

Programs and Documents. Participants straddle the mobile and desktop world and always need some way to bridge the two. The mobile workers in this study said that they need VPN to work remotely, to access enterprise programs, to provide real-time answers to their clients, and to retrieve documents from their home computers.

These on-the-move participants need smart phone functionality like MS office to remotely edit documents, e-mail, teleconference, take notes, and access shared document folders.

Immediate Information. Some participants said that they needed access to information that changes frequently or that is central to decisions that they must make while on the go. For example, they wanted access to bank internal deposit rates, exchange rates, stock market data (push and pull), and parts and inventory availability. Information related to current employee performance, budgets, and sales quotas was also identified as "must have" information.

Fig. 1. Participant in Singapore looks to mobile device while driving

Location-based Applications. Participants said that GPS navigation and mash-up applications that leverage GPS would help them identify client sites as they travel from one location to the next.

Sharing Information and Status. Mobile devices are perfectly suited to storing and sharing information with others. Participants want to be able to exchange updates and notes between team members, take pictures of important documents, send text messages to a distribution list of clients or colleagues easily, and bring client presentations with them via their mobiles (not their laptops). Participants also expressed the need to filter calls by time and have a status mode that alerts those trying to contact them when it's a holiday or when the participants do not want to be disturbed.

3.3   Create an All-in-One Device

A number of participants spoke of wanting only one device and making their current devices support a variety of tasks both personal and work related. This theme was most prevalent and articulated in Singapore, but was observed in both the U.S. and in Mumbai. Taking this to the next level, participants suggested the following:

Embedded Identification Chips. Participants want their devices to act as security badges, cash card devices, and credit cards.

Household Management Tools. A hot area of interest was making mobile devices more powerful so that these devices can help participants manage their household appliances. Participants wanted their devices to be able to turn on the air conditioning when they were are 20 minutes from the house, to operate garage doors, to control the television, and so on.

Personal Information Storage. Participants would like their devices to act like an organizer and to take over the functionality of a personal journal, for example to track all policy and insurance numbers.

Record Auto Location. Most Singaporeans need to park in underground parking structures if they drive. These participants said that they wanted their devices to record where they parked so that they did not have to search for their cars in these dark basements.

3.4 Enhance Multimedia

Participants love the notion of using their mobile devices to watch TV, to receive streaming video, to read really simple syndication (RSS) blogs, to teleconference, and to have MP3 capabilities. Participants in all three countries noted that multimedia enhancements such as these are expected in the future for their devices.
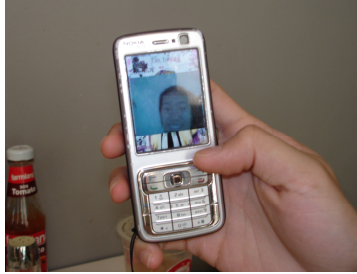

Fig. 2. Participant in Singapore teleconferences with a friend

4   Conclusion

Mobile devices and applications provide functionality that support both personal and work tasks. There is no widespread delineation between work and personal use. Mobile users want devices that are robust and help them accomplish a vast array of tasks. It is imperative that mobile devices and functionality continue to improve in form and functionality to make it easier for users to complete their personal and work tasks using their mobile devices. Many of the tasks on mobile devices (for example, sending and receiving e-mails and texts, viewing documents, and getting directions) can serve both personal and professional needs; the only aspects that differ are the content and recipients of the information.

In the past, mobile application development has been focused on creating consumer applications. For this reason, mobile users and mobile subscribers are often using consumer-oriented applications and devices to accomplish business tasks (sometimes creatively so). Therefore, it's imperative that we examine how mobile workers use these consumer applications.

Even though the intent of our study was not to be consumer-focused, requirements that apply both to the consumer and business spaces emerged, making our findings applicable to consumer- and enterprise-oriented mobile application development. Mobile workers want their phones to enable work, such as supporting documents, sharing information, and providing immediate access to data. They also expect applications to account for their location because they are on the go when using their mobile devices. Not only do mobile users want their mobile devices and applications to look good, but also they want these devices to be capable of accomplishing a vast array of tasks for them. Most users are trying not to carry their laptops around. For the same reasons, they most definitely do not want to have to carry two or three mobile devices around to get their jobs done. When mobile workers aren't working, or when

they have free time during the work day, they also want their mobile devices to have high media capabilities, such as MP3 or streaming TV.

Following are several key lessons for those designing and developing mobile devices and applications:

1. Consider creating mobile devices and applications that are flexible enough to support work and personal tasks. Many successful products have integrated *both* types of functions into *one* solution or make it easy to integrate and switch between related applications.
2. Consumer needs and applications continue to drive innovation in the mobile domain. To be fresh and creative, enterprise mobile designers and developers should assess the consumer space.
3. Enterprise mobile designers and developers should identify consumer applications that accomplish enterprise-like tasks and should leverage these existing applications as part of the full enterprise mobile solution, rather than trying to recreate these applications.
4. Enterprise mobile designers and developers should leverage the inherent abilities of phone devices, such as the phone's ability to make calls; take photos; navigate (GPS); and list contacts, calendar items, and tasks (personal information management), to enhance mobile solutions and limit the need for additional devices.

Mobile users know the ins and outs of their mobile devices. It is up to designers and developers to know these users and their mobile device habits. This understanding will enable us to enhance the mobile users' experience—to provide smart solutions that improve and expand mobile device capabilities and that blend consumer and enterprise functionality into one innovative device.

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