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ACCESS ANYTIME, ANYPLACE: AN EMPIRICAL INVESTIGATION OF PATTERNS OF TECHNOLOGY USE WITHIN NOMADIC COMPUTING ENVIRONMENTS

BY
KARLENE CECELIA COUSINS

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of
Doctor of Philosophy
in the College of Business Administration
of
Georgia State University

GEORGIA STATE UNIVERSITY
J. MACK ROBINSON COLLEGE OF BUSINESS
2004

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2004

ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Business Administration in the College of Business Administration of Georgia State University.

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Pursuing a doctoral degree is an overwhelmingly, challenging but rewarding endeavor. It not only bestows knowledge upon the pursuer, but also builds and molds character. It is a feat that I could only accomplish by the grace of God, and the compassion of family, friends and those I met along the way.

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ABSTRACT

Access Anytime Anyplace: An Empirical Investigation of Patterns of Technology Use in Nomadic Computing Environments

By

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August 2004

Committee Chair: Dr. Daniel Robey

Major Department: Computer Information Systems

With the increasing pervasiveness of mobile technologies such as cellular phones, personal digital assistants and hand held computers, mobile technologies promise the next major technological and cultural shift. Like the Internet, it is predicted that the greatest impact will not come from hardware devices or software programs, but from emerging social practices, which were not possible before.

To capitalize on the benefits of mobile technologies, organizations have begun to implement nomadic computing environments. Nomadic computing environments make available the systems support needed to provide computing and communication capabilities and services to the mobile work force as they move from place to place in a manner that is transparent, integrated, convenient and adaptive. Already, anecdotes suggest that within organizations there are social implications occurring with both unintended and intended consequences being perpetuated.

The problems of nomadic computing users have widely been described in terms of the challenges presented by the interplay of time, space and context, yet a theory has yet to be developed which analyzes this interplay in a single effort. A temporal human

agency perspective proposes that stakeholders' actions are influenced by their ability to recall the past, respond to the present and imagine the future. By extending the temporal human agency perspective through the recognition of the combined influence of space and context on human action, I investigated how the individual practices of eleven nomadic computing users changed after implementation.

Under the umbrella of the interpretive paradigm, and using a cross case methodology this research develops a theoretical account of how several stakeholders engaged with different nomadic computing environments and explores the context of their effectiveness. Applying a literal and theoretical replication strategy to multiple longitudinal and retrospective cases, six months were spent in the field interviewing and observing participants. Data analysis included three types of coding: descriptive, interpretive and pattern coding.

The findings reveal that patterns of technology use in nomadic computing environments are influenced by stakeholders' temporal orientations; their ability to remember the past, imagine the future and respond to the present. As stakeholders all have different temporal orientations and experiences, they exhibit different practices even when engaging initially with the same organizational and technical environments. Opposing forces emerge as users attempt to be effective by resolving the benefits and disadvantages of the environment as they undergo different temporal, contextual and spatial experiences. Insights about the ability to predict future use suggest that because they are difficult to envisage in advance, social processes inhibit the predictability of what technologies users will adopt. The framework presented highlights the need to focus on understanding the diversity in nomadic computing use practices by examining how

they are influenced by individual circumstances as well as shared meanings across individuals.

CHAPTER 1

INTRODUCTION

> "It was the week before finals. My college professor boasted that he installed a wireless network at his house and was sharing drives between his desktop and his laptop. Knowing the professor we figured that he did not know how to secure his wireless network. So a few days before the final, we drove to his house with a laptop, got onto his wireless network and found a copy of the final. The professor presumably remains none the wiser."(Newsweek 2004)

1.1 Background

Mobile technologies permeate all levels of society. They provide utility in a wide cross section of industries and are being increasingly used in private sector organizations, government agencies, hospitals and schools. They transcend all areas of business and personal life.

As people move among offices, homes, across cities and countries by airplanes, trains and automobiles to carry out work, they engage in activity similar to that of the Arabian nomads, who are a people with no fixed residence and who move from place to place within a well-defined territory (Merriam-Webster 2003). As such, organizations have directed their attention to providing their employees with computing environments to support this nomadic activity. Based on mobility and mobile technologies, nomadic computing environments make available the systems support needed to provide computing and communication capabilities and services to nomads as they move from place to place in a manner that is transparent, integrated, convenient and adaptive (Kleinrock 2001). Nomads use a diversity of devices such as personal digital assistants

(PDAs), laptops, tablet computers, mobile phones and handheld computers to access diverse human and technological organizational resources.

This thrust towards the deployment of nomadic environments is aimed at leveraging competitive advantage and increasing employee productivity and revenue, cutting costs, and increasing the customer base by providing access, anytime, anyplace to these organizational resources. The fact that productivity has improved is supported by market research (Gartner 2001) but these results also suggest that this increased productivity is achieved at the expense of precisely defined, dedicated, personal time. Since the use of the nomadic computing environment results in the blurring of boundaries between personal and work life, the location of human, technological and other organizational resources and the time of work have become irrelevant. Consequently more activities can be performed in shorter periods of time.

Earlier MIS research on nomadic computing environments was directed towards the improvement of mobile technology, but not much attention has been given to its social impacts till recently. Based primarily on anecdotal evidence, current views on the social impacts of mobile technologies suggest that mobile technologies and the environments they facilitate manifest a Janus faced quality (Arnold 2003). Mobile technologies can provide access and restrict access (Sherry and Salvador 2001). Personal activities can be carried out along with business activities (Gant and Kiesler 2002). Mobile technologies can be disruptive yet provide continuity (Davis 2002). They can facilitate synchronous or asynchronous communication (Kakihara and Sorensen 2001). Planned activities can be carried out alongside unplanned activities (Kakihara and Sorensen 2001). They can also control as well as empower (Sherry and Salvador 2001).

The literature also suggests that achieving true access, anytime, anyplace may be problematic. With regards to the notion of access anytime, organizational resources are not always accessible or available in a suitable form for use within the current context. In turn, nomads may deny access to themselves (Perry, O'Hara et al. 2001; Sherry and Salvador 2001). Anytime access may also cause unnecessary and unproductive interruptions to work (Davis 2002). The notion of access anyplace suffers from the same complexity. It is not always possible to derive the same level of utility of mobile devices and resources being accessed as not all spaces and places are functionally equivalent (Gant and Kiesler 2002). Anyplace access also blurs the boundaries between personal and work life. In summary, the nomadic computing environment is potentially demanding, complex and disruptive.

The projections for growth of the nomadic workforce are astounding. The International Data Corporation (IDC) estimates that between 2002 and 2006, the number of U.S. mobile workers will grow by almost 13 million, from 91.8 million to 104.5 million individuals. This significant increase is almost twice that of the projected growth of the U.S. worker population in general during the same time period (Drake, Glasson et al. 2002). Hence, usage is anticipated to increase but the social implications are not well understood. Consequently new forms of use, social actions, unanticipated responses and unintended consequences may have been overlooked (Davis 2002). Evidently our understanding of nomadic computing environments needs to be supported by more than anecdotal evidence. Our knowledge needs to be theoretically based.

1.2 Research Questions

In the search to become effective, nomadic computing users are challenged by three main issues:

(1) Temporal: There is the need to adapt to dynamic technological, individual and institutional environments over time.

(2) Spatial: They are required to use nomadic computing environments to work effectively across diverse spaces such as in airplanes, motor vehicles, clients' offices and hotel rooms.

(3) Contextual: The use of nomadic computing environments for the execution of business activities during personal time and vice versa results in the variability in the contexts of use based on the different personal and business roles that nomadic computing users play.

A variety of theories potentially provide explanations of these issues. Structurational models (Barley 1986; Orlikowski 1992; DeSanctis and Poole 1994; Orlikowski 2000) can give insight to the temporal and contextual issues while theories such as Gidden's time space analysis (Giddens 1979; Giddens 1984) can lend understanding to the temporal and spatial issues.

Motivated by the foregoing, the first research question focuses on the development of a theoretical account which explains how the interplay of time, space and context affects the patterns of technology use within the nomadic computing environment. Stated more explicitly, the first research question is as follows:

1 *How can patterns of technology use within the nomadic computing environment be explained by the interplay of context, time and space?*

Secondly, though use in nomadic computing environments has been described as problematic and contradictory and unintended consequences abound, reports suggest that nomadic computing users enjoy increased productivity and are highly effective (Gartner 2001). This intriguing paradox is certainly worthy of further scrutiny. Consequently, the second research question is articulated as follows:

2 *How are patterns of technology use within nomadic computing environments associated with users' own interpretations of their effectiveness?*

Within the following pages a rigorous program of research is outlined which sought to answer these research questions.

Using an interpretive epistemology, I undertook a multiple case analysis of eleven, diverse, nomadic computing technology users. I extended the temporal aspect of Emirbayer and Mische's (1998) theory by including consideration of space and social context. This allowed an examination of the interplay of time, space and context in a single effort, unlike most other theoretical perspectives, which allow only a partial investigation.

Consistent with the temporal theory of human agency (Emirbayer and Mische 1998), viewing stakeholders' practices through the temporal dimension shows how the differences in stakeholders' past, present and future experiences and orientations, influenced their individual technology practices, resulting in diverse practices across users. Insights from the contextual dimension also illustrate the temporal theory of agency (Emirbayer and Mische 1998), by showing how the personal and business

contexts of action overlap and influence human agency. Insights from the spatial dimension extend the temporal theory of human agency by giving greater understanding as to how different spaces influenced stakeholders' agency. Consideration of the interplay of time, context and space contributed a better understanding of the diverse and contradictory practices that resulted in the effectiveness of nomadic computing users, also extending the temporal theory of human agency. An examination of the interplay between time, space and context uncovered the role of social forces in stimulating the adoption of nomadic computing technologies, a perspective which is consistent with the temporal theory of human agency (Emirbayer and Mische 1998)

The posited nomadic computing environment framework is multi-dimensional and as such, accommodates the scrutiny of practices through multiple perspectives. It is a powerful tool, which enables a rich, theoretical explanation for the multitude of practices, the contradictions in use and the resulting effectiveness of nomadic computing users.

CHAPTER 2

BACKGROUND

2.1 Defining Nomadic Computing

Nomadic computing is defined as the system support needed to provide computing and communication capabilities and services to nomads as they move from place to place in a manner that is transparent, integrated, convenient and adaptive (Kleinrock 2001). Nomads use a diversity of devices such as personal digital assistants (PDAs), laptops, mobile phones and handheld computers to access diverse human and technological organizational resources such as remote files, systems and services through Internet connectivity while on the move.

2.2 Enabling Technologies

Enabling technologies can be categorized as mobile devices, applications and networks.

2.2.1 Mobile Devices and Environments

Nomadic users have a wide and varied choice of mobile devices. These include mobile phones, pagers, smart phones, PDAs, laptops, tablet computers, handheld computers and vehicle mounted technologies (Muller-Veerse 2000; Tarasewich and Nickerson 2002; Varshney and Vetter 2002). The most common operating systems include the Palm OS and Microsoft's Windows Pocket PC. Disposable mobile phones are currently in existence and disposable laptops are currently under development (Tarasewich and Nickerson 2002).

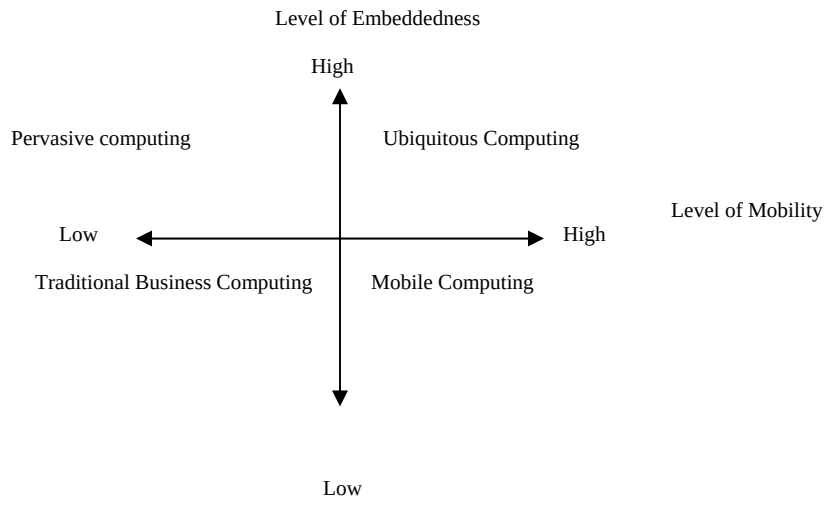
Initially, mobile devices were geared towards specific functions and as a result, it was not uncommon for nomadic users to possess and use more than one device. Increasingly, there is a trend towards digital convergence as the functionality of several devices is combined into one. For instance, many smart phones such as the Pocket PC and the Blackberry combine the functionality of mobile phones, PDAs and laptops. Smart phones come with the capability to permit voice communication, browse the Internet, access email and run personal productivity applications such as scheduling, and office applications such as word processors and spreadsheets. Digital convergence also requires that various devices share information and interoperate seamlessly while providing services across heterogeneous computing networks (Lyytinen and Yoo 2002a). There is also a trend towards appliance-like devices that are embedded in everyday artifacts within the environment, creating intelligent appliances with specific purposes and functionalities. This property is known as embeddedness.

Mobile devices can be configured to form various types of environments based on the degree of mobility and the level of embeddedness of the devices. Lyytinen and Yoo (2002a), describe these environments as mobile, ubiquitous or pervasive. These environments are illustrated in Figure 1.

Mobile environments combine low levels of embeddedness with high levels of mobility (Lyytinen and Yoo 2002a) as users carry devices with them as they move.

Pervasive environments assume that devices are embedded in the environment but are immobile, as they do not travel with the user (Lyytinen and Yoo 2002a). Examples of pervasive computing include a single device such as the intelligent medicine cabinet (Han 1999)

Figure 1. Dimensions of Ubiquitous Computing – Adapted from Lyytinen and Yoo (2002a)



Within pervasive computing environments, the devices have the capability to obtain the information from the environment in which it is embedded and utilize it to dynamically build models of computing. Conversely, the environment is intelligent and has the capability to detect other devices entering it.

In contrast, ubiquitous computing environments combine high degrees of mobility of devices with high levels of embeddedness of devices (Lyytinen and Yoo 2002a). Traveling devices interact with embedded devices through wireless networks (Tarasewich and Nickerson 2002). Thus any computing device moving with the user can build dynamic models of its various environments and configure its services accordingly. Furthermore the devices will be able to remember past environments they operated in, thus helping users to work when they reenter those environments. Devices may also proactively build services in new environments when users enter them. Examples of

ubiquitous environments include environmental interfaces such as the home lab[1] (Burkey 2000) or the intelligent city known as Cooltown[2] created by Hewlett Packard laboratories (Kindberg, Barton et al. 2003). Nomadic computing environments cover the spectrum of mobile, pervasive or ubiquitous computing with ubiquitous computing being the ultimate form of nomadic computing.

2.2.2 Mobile Networks

Mobile networking technologies are categorized as personal area networks (PANs), wireless local area networks (WLANs) and wireless wide area networks (WWANs). PANs are short range links (up to 10 meters) that connect an individual user's computing devices and communication tools. Mobile PANs commonly utilize Bluetooth technology, which is a global open specification for low cost radio based links between personal computing devices and productivity tools. Bluetooth client devices can connect with each other directly at distances of up to 10 meters achieving data transfer rates of up to 1Mbps. Business users can use a Bluetooth compliant wireless phone as a modem to connect to the mobile Internet. They can perform wireless printing from a Bluetooth enabled notebook, PC and printer and perform cable free file transfer and data synchronization between individuals and workgroups using Bluetooth enabled PDAs,

[1] In the home lab, appliances, screens, chairs, etc. all act as input and output devices and the house itself is a distributed system of agents which also learns user patterns. For instance, if a person were to sit down in a chair every evening and turn on the light above that chair, over time HomeLab would recognize this as a pattern and start activating the light as soon as the person sat down in that chair. Both the chair and the light become part of the interface. The user only has to behave normally while the environment learns about them and adapts to them.

[2] Cooltown adapts web infrastructure to support nomadic users. Web technology is pushed into digital "appliances" like printers, radios, and automobiles. People, places and things have a web presence and a URL. These physically related appliances have been organized into web "places," which are accessed through mobile devices and wireless networks. A museum, conference room and mobile bus have been configured.

laptops and desktops. Users can also perform a wireless backup between Bluetooth enabled devices.

WLANs are medium range links with a range of up to 100 meters and data transmission speeds of up to 54Mbps. WLANs connect groups of users and their shared resources within an organization's building or campus. They are typically used to extend the reach of a conventional wired LAN. The major standard for WLAN networks is 802.11.[3] WLANs, often in the form of wireless hot spots, are used to connect mobile workers, provide information access in common work and meeting areas such as libraries, airports and conference rooms, and extend the corporate network into areas where wired connections are impractical or uneconomical. Smaller organizations may dispense with wired LANs completely and deploy WLANs as their only networking infrastructure.

Cellular solutions are typically used for wide area wireless connectivity, or WWANs. Cellular voice networks offer a growing range of data services for remote access to corporate networks, email and other resources. Until recently these services were limited to the relatively slow transfer rates of 1G (first generation) analog and 2G (second generation) digital networks. Currently, mobile network standards include 2G, two and a half generation (2.5G), and the third generation (3G) (Tarasewich and Nickerson 2002). Research on fourth generation (4G) networks is being aggressively pursued. 2G technologies include Time Division Multiple Access (TDMA), Code

[3] 802.11a standard enables data rates of up to 54 Mbps in the 5Ghz spectrum.
802.11b standard enables data rates of up to 11Mbps and ranges of up to 100meters and operates in the 2.4 Ghz spectrum.
802.11g is an extension to the 802.11b standard and broadens existing 802.11b rates to 54Mbps but operate at shorter ranges than 802.11b
.

Division Multiple Access (CDMA) and Global System for Mobile Communications (GSM). TDMA and CDMA are primarily used in the US while Europe has standardized on GSM. On a worldwide scale, GSM is the most widely used of the technologies but only achieves speeds of 9.6 kbps. The inability of the US to implement a nationally agreed upon, single standard has limited the ability of nomadic users to obtain access as they roam nationally and globally. In Europe, because of universal standardization on GSM, providing access to nomadic users nationally is less problematic. Finally, 2G technologies are circuit switched services, requiring a user to dial in and maintain communications to obtain services.

2.5G standards include High Speed Circuit Switched Data (HSCD) with rates of 38.4 kbps and Enhanced Data GSM Environment (EDGE), which is based on GSM and has speeds of 384 kbps making it capable of delivering multimedia and other bandwidth intensive applications. Another 2.5G standard is General Packet Radio Service (GPRS) which promises data rates up to 114kbps and is always on, thus allowing mobile users to access the Internet without dialing in.

3G is the future of mobile phone networks standards and will be implemented in the form of Universal Mobile Telecommunications Systems (UMTS). With UMTS, text, voice, and multimedia can be transmitted at 2Mbps or greater. UMTS is based on GSM and is the planned global standard for mobile users. Using GSM, mobile users can be continuously connected to the Internet and have access to a consistent set of services worldwide.

4G networks support roaming across diverse wireless and cellular networks, for instance from a satellite based network to a high speed wireless LAN (Varshney and Jain

2001). Users will have access to different sets of services, the convenience of one device, increased coverage, one bill, reduced cost and increased reliability of service. 4G will support IP and facilitate transmission rates of 50Mbps or more. 4G networks have the potential to deliver true ubiquitous computing environments. It is predicted that 4G networks will be available in 2006. Although 4G will support higher levels of interoperability and higher data transmission speeds, there are several issues to be resolved. It is also not clear whether 1G and 2G vendors will first move to 3G or will migrate directly to 4G networks.

Notwithstanding the promise of 4G technologies, mobile networks do not provide the bandwidth of their wired counterparts, which can achieve connection speeds of up to 10 gigabits per second.

2.2.3 Mobile Applications and Services

Nomads have both personal and business applications available to them. Business applications include inventory management, claims processing, order processing. Mobile office applications include scheduling, contact management, email and internet connectivity, word processing, spreadsheets and presentation tools (Varshney and Vetter 2002). Nomadic applications range from miniature desktop applications to novel and inventive use of the environment to enhance productivity and create new ways of doing business. Several organizations go further and integrate wireless applications across the supply chain and enterprise resource systems are being wireless enabled.

Personal applications include entertainment services, gaming, investing, banking, distance education and product location.

In order to ensure integrity of data across multiple devices and data sources, mobile clients are synchronized with other devices and databases through a variety of technologies.

2.3 Deploying Nomadic Computing Environments: State of the Practice

2.3.1 Challenges Facing the Nomadic Worker

The growth in the use of wireless technology is closely aligned with social change. Society is moving rapidly towards increased mobility, shortened lead times to make decisions, and an increasing population of nomadic workers like consultants, independent contractors and freelancers (Faigen, Fridman et al. 2002). With advances in information technology such as networks, applications and Internet-enabled tools, people have the electronic resources to accomplish much more than a single individual could have possibly achieved a decade ago.

According to industry studies, (Cisco 2003) professionals are at their desks just 30 percent of the time and spend nearly 50 hours a month in meetings. These users have access to their valuable wired desktop network connections for less than a third of the business day. Based on these demands and limitations, users are trying to make full use of small pockets of free time as well as to be more productive in carrying out work activities. To help employees address these challenges, organizations have deployed nomadic computing environments so as to extend access to critical applications, content, and communications channels to workers away from their desks. Ideally, these environments are deployed to extend productivity zones in three main ways: within the confines of the local office, at home, and on the road (Cisco 2003).

2.3.2 Extending Productivity Zones at Work

The main business location is typically an area where employees have a designated work space, but move from place to place as they participate in planned and unplanned meetings, collaborate face to face with other people and pursue work related activities. Using WLANs, access points are provided in places where they were previously unavailable or impractical, such as meeting rooms, lunch areas, lobbies, libraries and other common areas. Thus the nomadic worker is provided with access to the resources available at their traditional wired location, facilitating greater responsiveness and faster decision making. This can result in workers gaining additional time each day during which they can make productivity gains. In addition, making the network accessible to more employees more of the time improves the return on investment of the company's wired network investment. WLANs are also being leveraged in manufacturing and production environments to carry out activities such as maintenance and inventory tracking.

2.3.3 Extending Productivity Zones at Home

Organizations also deploy nomadic computing environments to provide telecommuting facilities for employees working at home. Employees may be forced to leave the office early for personal reasons such as a doctor's appointment or to be with a sick child. In cities with grueling rush-hour traffic, some employees opt to leave early to beat the rush, and then continue to work from their home workstations. Instead of being cut off from work, employees can remain productive for additional hours once they are home. Organizations may also encourage employees to work from home as a strategy to reduce office space requirements and real estate costs. Such "teleworking" represents a

way to extend employee workdays, reduce real-estate costs for employers, and improve employee satisfaction and responsiveness. The primary components of a teleworking setup are a broadband Internet access service and virtual private network (VPN) technology for enforcing data security across the Internet. In addition to providing access to company data and e-mail from home, a full-service teleworking setup can include an extension to the company voice system through a converged voice and data network based on IP communications. Using an IP communications solution, teleworkers can be available to customers at their company telephone extension even while working from home. IP communications also improves the company's profit line by allowing teleworkers to call customers and partners from their homes while still taking advantage of the corporate dial plan and volume discounts. Additionally, calls to colleagues within the company are generally free, as calls over the Internet and company data network incur no toll charges.

2.3.4 Extending Productivity Zones on the Road

The wireless LAN, cellular and VPN technologies are combined to extend network connectivity to traveling workers on the road through "hotspots". Major hotels, airports, convention centers, coffee shops and other public locations are providing network hotspots, offering broadband Internet access to traveling employees. These hotspots enable employees to stay connected to customers and company resources while engaging in nomadic activity. Using secure VPN client software on their laptops, employees can plug in and access the company network just as if they were working from their own desktop. Analysys Consulting (Cisco 2003) predicts that by 2007, the number of wireless hot spots in public venues will grow to 41,000, serving 21 million users. Hotspot locator

tools are also available to help nomadic workers find hot spots in cities around the world. Some tools help workers to create an itinerary with driving directions to hotspots.

Wireless aircards are also creating more instant and available connectivity to the Internet without the need to connect to hotspots. The wireless aircard is a WWAN network card that can be used to gain instant access to a variety of cellular networks. Thus wherever cellular phone service is available a connection to the Internet can be made.

As increasing numbers of public venues adopt wireless connectivity technologies, and as the use of aircards become more widespread, nomadic workers enjoy even closer connection to customers, and companies realize greater return on their investment in mobile technology. In addition to accessing computing services from hotspots and cellular networks, organizations also provide connectivity to their employees through their own wireless or third party WWANs.

2.3.5 Productivity Gains from Deployment

Numerous industry studies have been carried out to assess the productivity gains from the deployment of nomadic environments. The International Data Corporation (IDC) estimates that between 2002 and 2006, the number of U.S. mobile workers will grow by almost 13 million, from 91.8 million to 104.5 million individuals (Drake, Glasson et al. 2002). Gartner Consulting reports that professional mobile users with access to nomadic computing environments report a 41 percent increase in productivity and efficiency than wired professionals with notebooks. The time value of this gain is estimated at 7.5 hours per user per week (Gartner 2001). From a technical perspective, IT departments are encouraged by more established wireless standards, better security,

higher data transmission rates, better integration across wireless and fixed devices, and the declining cost of mobile devices and applications. Consequently, more IT departments are aggressively implementing mobile systems to reap the benefits of improved productivity and effectiveness.

Even so, actual use extends far beyond what IT departments can imagine and plan for. As the following quote suggests, users are becoming more and more inventive in the ways they exploit nomadic computing environments.

> "A Chicago user was so determined not to miss a single business opportunity that he logged on in a Silicon Valley hot tub after learning that his fellow soaker was an IT executive. He started a demo of the business software his company made" (Newsweek 2004).

Mobilizing the business by extending network access to nomadic employees yields benefits in the following areas (Cisco 2003) (Air2Web 2002):

- Increased flexibility in where and how employees do their jobs.
- Increased employee and workgroup productivity.
- Improved responsiveness to customers, partners, and colleagues.
- Improved workgroup collaboration.
- Increased use of the existing wired network infrastructure.
- Enhanced employee satisfaction and retention.
- Enhanced customer acquisition, satisfaction and retention.
- Reduced costs.
- Revenue generation.
- Competitive advantage.

2.4 Deconstructing Access—Anytime, Anyplace

The phrase “access, anytime, anyplace” is commonly used to give an understanding of the benefits of mobile technology and to serve as a rhetorical device for the sale of mobile technologies (Perry, O'Hara et al. 2001). For instance, consider the following excerpt from the marketing literature of a vendor of wireless components (Intel 2003).

> “With Intel Centrino mobile technology's integrated WLAN capability, you can access information to respond to a tough client question on the spot. Or collaborate instantly with team members across the globe. Or update documents on the fly and send revisions to the home office. It's the kind of experience you expect from your primary workspace. But now you can have it on the go, when you're away from home your small business or the office. Without the wires.”

As the excerpt suggests, use within the nomadic computing is often depicted as unproblematic, with the insinuation that once equipped with the appropriate technology one has instant access from anywhere to organizational resources in a usable format.

To further illustrate the characteristics of the nomadic environment when a nomadic computer user is appropriately equipped, Muller-Veerse has described the defining characteristics of nomadic environments as ubiquity, reachability, security, convenience, localization, instant connectivity and personalization (Muller-Veerse 2000). Ubiquity is the most obvious advantage of a wireless terminal. A mobile device in the form of a smart phone or a PDA can fulfill the need both for real-time information and for communication anywhere, independent of the user’s location. Reachability implies that with a mobile terminal a user can be contacted anywhere, anytime. The wireless device also provides users with the choice to limit their reachability to particular persons or times. Where security is concerned, SSL (Secure Socket Layer) technology may be

employed to encrypt data being transmitted. A smart card within the mobile terminal, the SIM (Subscriber Identification Module) card, provides authentication of the owner and enables a higher level security than currently is typically achieved in the fixed Internet environment. In terms of convenience, the device stores data and facilitates access to diverse applications and services. Also, mobile technology is also increasingly easy to use. Localization of services and applications implies that at any point in time the exact location of the user is known allowing relevant services to be driven across the network to the user. Instant connectivity to the Internet from a mobile device is also possible. Personalization involves the ability to use mobile technology to deliver personalized services to the user based on access to the user profile and user preferences. Thus, users are given a consistent and familiar environment as they move from one device to another. Users can control personalization or it can be controlled by the organization by which they are employed.

Though the benefits may be so convincingly depicted, the difficulties faced by mobile workers are sometimes misrepresented. An idea of the unintended consequences of nomadic computing environments is captured in the following excerpt (Bostock 2003).

> "Recently I was writing at Starbucks and someone plopped himself in a chair near mine and began calling friends on his cell phone. He had one of those earphone contraptions that make people look like schizophrenics as they go about jabbering and gesturing to the air. He spent 30 minutes reporting to a variety of friends (and everyone in my immediate vicinity) that he was at Starbucks after working out and getting his hair cut before going to dinner where he planned to have a high protein meal and avoid carbs because he had a hot date in a few days and wants to look his best. You can imagine what hearing this speech repeated about five times would do to your nerves. Finally I spun around in my chair and said:" You know, I can't hear myself think your phone etiquette sucks. Can you perform your soliloquies outside?"

Thus, though this nomadic user had access to people, anytime anywhere, this unfettered access was at the obvious discomfort of the other nomadic user and possibly others nearby. Access was possible but it seemed highly inappropriate. It is therefore evident that in order to fully understand nomadic computing, the terms access, anytime, anyplace need to be reinterpreted as multifaceted terms, each having different implications for the way we think about nomadic work (Perry, O'Hara et al. 2001).

With regards to access, there are two facets which impact on the pattern of use: access to resources and access to the nomads themselves. With respect to access to resources, the major premise of mobile technology is that the mobile worker may be able to access information, communications and human resources located at their primary office base wherever they go. This office base is typically where a desktop environment is established (Sherry and Salvador 2001). It is where individuals make use of heterogeneous channels of information including a variety of forms of personal contacts which may be synchronous or asynchronous, a variety of media including the web, paper and electronic documents and various means of maintaining contact information and posting reminders. The office base can thus be viewed as a command center (Sherry and Salvador 2001) that supports much of the cognitive, social and communicative work process. However, trying to replicate this environment for the nomadic user is problematic. While mobile, nomads cannot easily deal with information that they routinely process at their office base, as the environments in which they find themselves often prevent them from doing so. For instance, different kinds of tasks require different kinds of access to the resources in the office environment. In the scenario where a document may be required, whether or not it is in an appropriate form for viewing and

interaction within a specific context impacts on the level of accessibility. Hence reading a lengthy document may be more suited to a paper format than via a PDA. Thus though access is available, access is limited and is below the level initially promised.

With respect to access to the nomads themselves, in an organization where mobile technology is widely deployed, organizational members assume that no one is inaccessible even if they are away from their primary base. This may seem desirable from the perspectives of productivity and efficiency, yet when "unfettered access" means the possibility of being interrupted by anyone at any time, the potential disruptions to work and concentration may outweigh the benefits (Sherry and Salvador 2001). A set of opposing forces therefore emerges. On the one hand, people expect colleagues, family and friends to be always accessible. On the other hand, people try to control access to themselves by employing various mechanisms. For example, some individuals may leave their cell phones off except when making calls. Others may implement complex email inbox management schema. Thus, nomads try to balance the ability to have unrestricted access while filtering access to themselves. If power plays an integral part of the relationship between parties who are trying to establish contact while mobile, tensions arise based on the value of obtaining status by establishing direct contact versus the cost of giving up one's sense of autonomy and freedom of surveillance. Thus tensions are created between control and autonomy.

In terms of anytime access, there are windows of opportunities within which resources are needed. However there are practical limitations. A document may be required instantaneously in a meeting within a short window of time, but download from a network may require a larger amount of time than provided by the window of

opportunity. Social norms may also affect access behavior. For instance, many people might consider it inappropriate to receive a personal call during work time and work calls during leisure time. Thus though access to people may be possible anytime, those being accessed may choose to limit their accessibility by engaging in avoidance and deliberate disconnection.

Anytime access also affects individual management of work (Davis 2002) as it may cause unnecessary and unproductive interruptions to work. The ease of interruptions may also increase their frequency and change the expectations of the organization by making interruptions and immediate responses to them the norm. Individuals may be expected to accept and process interruptions, and productivity may drop as they are distracted from focusing on important activities. Such interruptions may result in avoidance of some activities, as uninterrupted concentration requires cutting off communications that interrupt. The anytime assumption is also based on a linear execution of activities over time or monochronic activity. But people as they are interrupted might also engage in multiple activities simultaneously or polychronicity. Thus tensions are created between carrying out planned and unplanned activities simultaneously.

The notion of “anywhere” suffers from the same complexity. Firstly, it is assumed that all spaces and places are functionally equivalent. Thus, no matter where a mobile device is used or where it is accessed, the same level of utility is possible. However, this is rarely the case. Research in social ecology has shown that different settings for social behavior sharply affect the way people act and the expectations they have of others (Gant and Kiesler 2002). People derive the social meanings of different places or behavior

settings from a variety of cues such as architecture and artifacts and how most people dress and behave. These social meanings also provide scripts for what people say and do and help organize people's social and work experiences. For instance, a mobile phone conversation that a person can have in a public place is different from one that one can have in a secluded area. So though access is possible anywhere it may not be socially acceptable.

Anyplace access also creates tensions between personal and work life. Up until the beginning of the twentieth century, most people lived in close proximity to the places they worked such as above stores and on farms. Co-workers were often members of the same family, associates or neighbors (Gant and Kiesler 2002). With the rise of modern transportation and communication systems and the emergence of the bureaucratic work organization, the separation between work and personal life became more distinct. In some ways, mobile technologies facilitating anytime, anyplace access have brought us full circle back to earlier times when the boundary between work and personal life was less distinct. Thus, the environment has the potential for intruding into personal space as well as facilitating the intrusion of personal life activities such as those associated with family and friends into the workspace.

In summary, though productivity gains have been widely reported, knowledge of how the nomadic computing environment is used and how these gains are achieved need to be supported by rigorous research rather than marketing literature, industry publications, stories and anecdotes.

CHAPTER 3

THEORETICAL LENS

One of the more pervasive approaches to exploring the role of action in MIS research is the use of Gidden's social structuration theory (Giddens 1979; Giddens 1984). This approach typically emphasizes how models based on structuration can be used for explaining technology adaptation and organizational change by exploring the duality between agency and structure. A contrasting perspective is the temporal theory of human agency (Emirbayer and Mische 1998), which gives us an opportunity to explore how human action emerges. To set the stage for the development of the research framework, this chapter begins with an overview of structuration theory followed by a discussion of the temporal theory of human agency. An extension of the temporal theory of human agency is then proposed for application to the nomadic computing environment.

3.1 Structuration Theory Applied to Information Systems

Historically, theoretical explanations of human agency in the IS field have been tightly bound to structuration theory. Structuration theory (Giddens 1979; Giddens 1984) recognizes a duality of agency and structure whereby agency and structure are not two separate phenomena but represent a duality, where structure is drawn upon in human interactions, but in doing so social structures are produced and reproduced. Structures are systems of ongoing action, which are continuously produced and reproduced through time and, as such, make it possible for discernibly similar social practices to exist across varying spans of time and space. Agency is human action and refers to capability rather

than intentionality. Human agency is viewed as a stream of actual or contemplated interventions which interrupt and act upon an ongoing process of events.

Although, Giddens (Giddens 1979) defined the moves or activities by which agents produce and reproduce structure as modalities, he says little about how articulations between the realms of structure and action develop and evolve through technology use. As such, researchers have attempted to fill this gap by combining structuration theory with various theoretical concepts such as scripts (Barley 1986), appropriation (DeSanctis and Poole 1994), and enactment (Orlikowski 2000). Taken individually, these structurational models make different assumptions and focus on different issues, namely organizational change (Barley 1986), group decision outcomes (DeSanctis and Poole 1994), and enactment of technologies resulting in improvisation, emergence and change (Orlikowski 2000).

One major contribution of structuration theory lies in its conception of the duality of agency and structure and its operationalisation of appropriate linkage mechanisms (Walsham and Han 1991). Based on this intent, it is difficult to apply the theory without consideration of the interplay between action and structure. However, the human agency view (Emirbayer and Mische 1998) relaxes many of the constraints and assumptions of IS structurational models and allows us to examine diverse individual experiences and novel, sporadic instances of action which may not have structural properties.

3.2 The Temporal Theory of Human Agency: An Overview

Emirbayer and Mische (Emirbayer and Mische 1998) defined human agency as follows:

> "Agency is the temporally constructed engagement by actors of different structural environments- the temporal-relational contexts of action – which through the interplay of habit, imagination, and judgment, both reproduces and transforms those structures in interactive response to the problems posed by changing, historical situations."

They conceptualized human agency as a temporally embedded process of social engagement, informed by the past (in its "iterational" or habitual aspect), but also oriented toward the future (as a "projective" capacity to imagine alternative possibilities) and toward the present (as a "practical-evaluative" capacity to contextualize past habits and future projects within the confines of the present moment).

Human agency has a temporal dimension. The interaction of the past, the present and the future is fundamental to the notion of human agency. Because human agency is temporally situated in the flow of time, human actors continually reinterpret their orientation and action towards the past, the present and the future in response to emergent events. As actors encounter problems, they may reflect on the situation at hand and how it relates to the past, present and future. As such, human agency is a reflective process. In considering emergent events in the context of the past, present and future, actors may also interact with surrounding persons, places, meanings and events. Hence, human agency is also an intersubjective process. Reflexivity and intersubjectivity may result in repeated actions from the past or the reinvention and creation of new practices. Consequently, human agency is reproductive and transformative.

The analytic elements of human agency are defined as *iterational*, *practical-evaluative* and *projective.* Although distinctly defined, all three elements are manifested in varying degrees within any concrete empirical instance of agentic action. Further, in any given case, one or more of these elements dominates and shapes the way in which actors relates to the other two elements. The three elements are also multi-dimensional.

These agentic elements, as defined by Emirbayer and Mische (1998) are described in more detail below:

3.2.1 Iterational Element

The iterational element relates to the past. An underlying assumption is that subconsciously, past social experience is schematized and the actor has the ability to recall, to select and to appropriately apply these tacit or taken for granted schemas or patterns of action. This does not suggest primarily habitual behavior, but instead defines the way social actors engage with prior patterns or schemas of action. Consequently, the iterational element allows actors to sustain identities, meanings and interactions over time. As shown in table 1, the conceptual elements within the iterational dimension include *selective attention*, *recognition of types*, and *categorical location*.

Table 1 - Components of the Iterational Element

COMPONENT	DESCRIPTION
Selective Attention	Actors can only focus on a small part of reality.
Recognition of Types	Actors must identify typical patterns of experience and predict their recurrence in the future.
Categorical Location	Actors compose matrices of socially recognized categories of identity and value of past experiences. In doing so, they not only identify similarities between past and present types of experiences, they also locate these typifications in relation to other persons, contexts or events.

The *selective attention* component recognizes that at any given point in time in the flow of transactions, social actors are only able to focus upon a small area of reality.

The *recognition of types* acknowledges that once attention has been focused upon this small area of reality, actors must identify typical patterns of experience and predict their recurrence in the future.

The *categorical location* component recognizes that social actors compose matrices of socially recognized categories of identity and value of past experiences. In doing so, they not only identify similarities between past and present types of experiences, they also locate these typifications in relation to other persons, contexts or events.

Emirbayer and Mische (Emirbayer and Mische 1998) suggest that social actors *maneuver among repertoires*. The employment of routines is not mechanically or situationally determined but involves a process of selection from practical repertoires of habitual activity which may involve levels of ingenuity and resourcefulness. The iterational element provides social actors with reliable knowledge of social relationships and a *pattern of expectations* which allows them to predict what will happen in the future. The patterns of expectations give continuity and stability to action and reassures actors that actions in the past can successfully be repeated, and other social actors can be trusted to act in predictable ways.

3.2.2 Projective Element

The projective element is related to the future. Here, social actors do not merely repeat the structures and action of past routines but reconfigure and invent new possibilities in accordance with their hopes, fears and desires for the future. The

imaginative construction of the future is critical to this process. As actors respond to the challenges and uncertainties of social life they distance themselves from schemas, habits and traditions and then reconstruct and innovate upon those traditions, generating alternative possible responses to the problems being confronted in accordance with evolving desires and purposes. In summary, actors move beyond themselves to the future and construct changing images of where they think they are going, where they want to go and how they can get there from the present.

As shown in table 2, the elements within the projective dimension include *narrative construction*, *symbolic recomposition* and *hypothetical resolution.* In addition secondary underlying elements include *anticipatory identification* and *experimental enactment.*

Anticipatory identification involves a process where human actors draw upon past experience in order to clarify motives, goals and intentions so as to locate possible constraints within the future and to identify appropriate courses of action. This anticipatory work is done by means of retrospective engagement with prior stock of knowledge as stored in typifications, repertoires and social narratives. Alternatives are seldom clearly and neatly presented.

Table 2 – Components of the Projective Element

COMPONENT	DESCRIPTION
Narrative Construction	Based on the assumption that all social groups possess repertoires of stories that provide maps of action and can be used to experimentally posit new resolutions to emerging problems.
Symbolic Recomposition	Actors take elements of meaning apart in order to bring them back together again in new and unexpected combinations
Hypothetical Resolution	Actors propose resolutions to respond to the moral, practical and emotional concerns arising from lived conflicts. Proposed resolutions may attempt to resolve several conflicts simultaneously and to incorporate different courses of action.
Anticipatory Identification	Actors draw upon past experience in order to clarify motives, goals and intentions so as to locate possible constraints within the future and to identify appropriate courses of action.
Experimental Enactment	Hypothetical resolutions may be put to the test in tentative or exploratory social interactions. Individuals try out possible identities without committing themselves to the full responsibilities involved.

Narrative construction is based on the assumption that all social groups possess repertoires of stories or narratives that serve as cultural resources by which actors can develop a sense of movement forward in time. These stories have plots which help actors to visualize proposed resolutions to lived conflicts. Narratives provide maps of action and can be used to experimentally to posit new resolutions to emerging problems.

Within *symbolic recomposition,* actors take elements of meaning apart in order to bring them back together again in new and unexpected combinations. Actors place themselves in a variety of possible scenarios each with its own means-ends possibility and in doing so expand the flexibility of their responses to a given problem.

After surveying possible scenarios of action, actors propose *hypothetical resolutions* to respond to the moral, practical and emotional concerns arising from lived conflicts. Proposed resolutions may attempt to resolve several conflicts simultaneously, and to incorporate different courses of action.

Within *experimental enactment*, hypothetical resolutions may be put to the test in tentative or exploratory social interactions. Individuals try out possible identities without committing themselves to the full responsibilities involved.

3.2.3 Practical Evaluative Element

The practical evaluative element is related to the present. It entails the capacity of actors to make practical and normative judgments among alternative possible trajectories of action, in response to the emerging demands, dilemmas and ambiguities of presently evolving situations. Routine and newly imagined projects must be adjusted to the present. Judgment and choices are made in the face of considerable ambiguity, uncertainty and conflict, as means and ends sometimes contradict each other, and unintended consequences require changes in strategy and direction. As shown in table 3, the three components within the practical evaluative element are *problematization*, *decision* and *execution*.

Table 3 - Components of the Practical Evaluative Element

COMPONENT	DESCRIPTION
Problematization	Recognizes that the situation at hand is ambiguous, unsettled or unresolved and something must be done to render the given situation unproblematic, settled and resolved.
Charcterization	Problematic circumstances at hand must be related to principles, schemas or typifications from past experiences
Deliberation	Involves considering how best to respond to situational contingencies in the light of broader goals and projects.
Decision	The resolution to act here and now in a particular way. A highly discrete and circumscribed choice is made.
Execution	Involves responding at the right times with reference to the right objects toward the right people with the right aim and in the right way

The *problematization* component recognizes that the situation at hand is ambiguous, unsettled or unresolved and something must be done to render the given situation unproblematic, settled and resolved. There are two elements within the problematization component: characterization and deliberation. Within *characterization*, the problematic circumstances at hand must be related to principles, schemas or typifications from past experiences. *Deliberation* involves weighing plausible choices in the light of perceptions and understandings, against the backdrop of broader fields of possibilities and aspirations. It involves considering how best to respond to situational contingencies in the light of broader goals and projects.

Decision is the resolution to act here and now in a particular way. A highly discrete and circumscribed choice is made.

Execution involves acting in the right manner within particular concrete life circumstances. The term “right” is interpreted as the most appropriate for the particular

actor in question, and is that which makes them effective. What may be “right” for one person may not be “right” for all. Execution therefore, involves responding at the right times with reference to the right objects toward the right people with the right aim and in the right way.

3.2.4 Strengths and Limitations of the Temporal Theory of Human Agency

The primary strength of the temporal theory of human agency is its structural dimensions and how well they fit the study of nomadic computing environments. Markus and Robey (1988) tell us that a theory has three structural dimensions, namely, causal agency, logical structure and level of analysis. Two advantages of the theory of human agency lie in its causal agency and logical structure. Causal agency refers to beliefs about the identity of the causal agent, the nature of causal action and the direction of causal influence among the elements in the theory. Markus and Robey (1988) identified three conceptions of causal agency: the technological imperative views technology as the causal agent; the organizational imperative views human beings as agents of social change, and the emergent perspective attributes causality to the complex interactions between technology and human actors. The temporal theory of human agency can be applied to technology use with an emergent perspective, and therefore can account for conflicting research findings about impacts by demonstrating the different meanings that the same technology acquires in different social settings or even the same settings.

The logical structure refers to the nature of the relationship between elements identified as antecedents and those identified as outcomes. There are two types of theories that describe this relationship: variance and process. Variance theories see antecedents as necessary and sufficient conditions for the outcomes to occur. Constructs

and variables can take on a range of values. In process theories, antecedents are necessary but not necessary and sufficient, and constructs are not conceived of as variables. Instead, outcomes are discrete and are represented as a change of state from one to the other. As such, process theories provide a richer explanation as to how and why outcomes occur when they occur. The temporal theory of human agency is a process theory, which can be suitably applied to explain the sequence of activities between the antecedents and consequences of use in nomadic computing environments.

Thirdly, the content of the theory allows it to account for surprising actions as well as repetitive actions or structure, as it demonstrates the ways in which the agentic dimensions interpenetrate with forms of structure present in the schemas of past action, which may be referenced or repeated in the iterational element or changed in the projective element. Thus, it is possible to examine varying degrees of inventiveness and reflective choice shown by actors in relation to their present contexts of action (Emirbayer and Mische 1998).

The primary limitations of the temporal theory of human agency result from its early stage of development. The theory has not been subject to much empirical testing. Though Emirbayer and Mische (1998) use prior studies to explain components of the theory, not much empirical work exists which serve to test and further build the theory. Thus prior literature gives little empirical support to how the theory should or can be applied.

Finally, an assessment of the third structural dimension of the theory shows the failure of the temporal theory of human agency to address sufficiently different levels of analysis. According to Markus and Robey (1988), the level of analysis can be macro,

which focuses on societies and organizations, micro which addresses individuals and small groups, or mixed levels, which allow researchers to explore the dynamic interplay among individuals, technology and society at large. The authors claim that the theory of temporal agency can be applied at both a micro level and a macro level. Despite these claims, the theory itself does not give insight as to how this can be achieved.

3.3 The Temporal Theory of Human Agency: An Extension

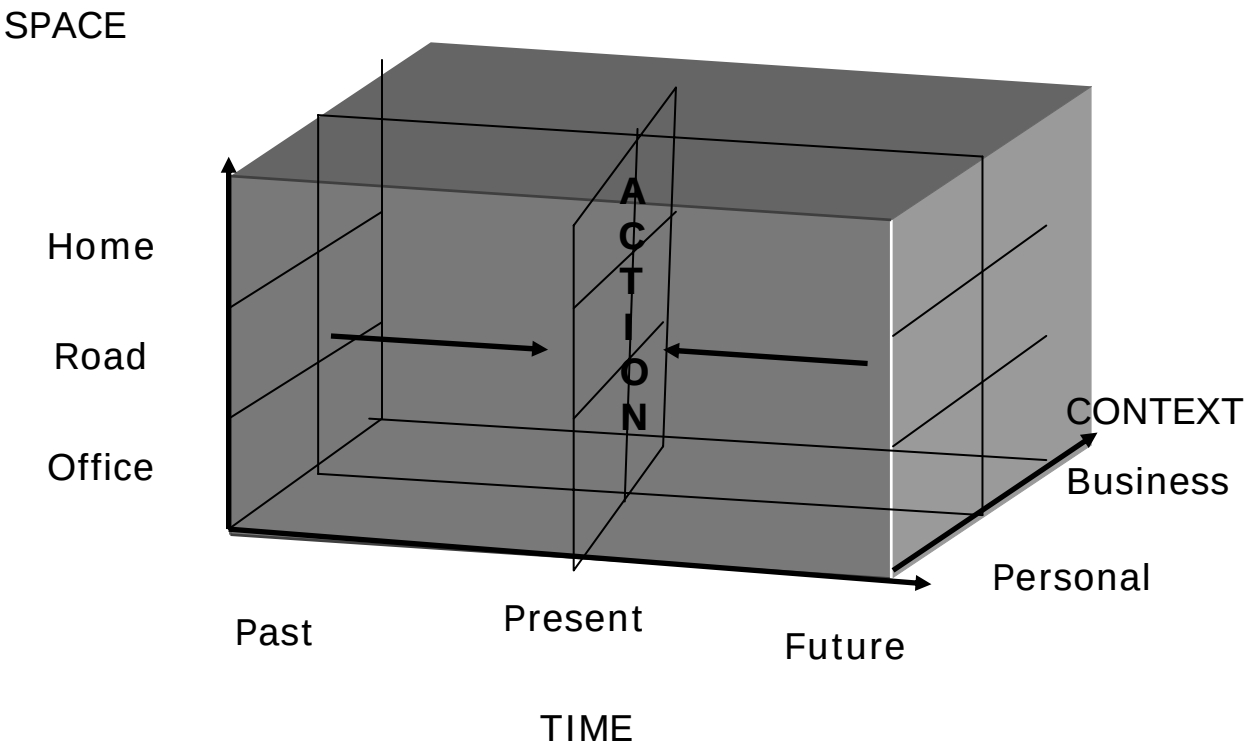
Mobility research has long acknowledged that as people travel, three dimensions of mobility become prominent: spatial, temporal and contextual mobility (Kakihara and Sorensen 2001). Spatial mobility, while primarily concerned with the physical movement of people also involves mobility of objects, symbols and space. Temporal mobility occurs when people organize and manage their work activities with fewer time constraints, thereby increasing the flexibility of the work environment through the use of stationary and mobile applications (Kakihara and Sorensen 2001). When implemented successfully, the introduction of technology within organizations can accelerate the speed of work and save time, hence influencing the temporality of work activities. Contextual mobility occurs when a mobile worker experiences a range of different contexts such as clients' offices, hotel rooms, airports and vehicles, both in transit and at their final destination (Perry, O'Hara et al. 2001). The agent may play different roles in each context, such as mother in one and CEO in the next. Thus, the temporal theory of human agency and the practice of nomadic computing have the temporal dimension in common. More significantly, the temporal theory of human agency can be practically extended to explain

different forms of action embedded in time across different contexts within the nomadic environment by combining it with the spatial and contextual dimensions of mobility.

The temporal theory of human agency is particularly suited to a study of nomadic computing environments. In response to emergent events, actors continually reinterpret their orientation and action towards the past, the present and the future. In a similar vein, the central idea of nomadic computing is the notion of providing access, anyplace while being temporally situated in the flow of time. Nomads situated within a specific space and context must exercise agency and appropriate their devices to respond to emergent events. This may result in the repetition of past routines, or innovative and different approaches to both old and new problems. Consistent with the *execution* element of the *practical evaluative* agentic element, the nomadic user must respond at the "right" times with reference to the "right" objects toward the "right" people with the "right" aim and in the "right" way. For these reasons, the temporal theory of agency fits the study of use within the nomadic computing environment.

The research framework is graphically represented in figure 2 and summarized in table 4.

Figure 2 – Nomadic Computing Environment Framework.



The research framework combines the temporal dimensions from the temporal theory of human agency with the contextual and spatial dimensions which characterize mobility, and explains their combined influence on an instance of human action.

The temporal dimension explains how action is informed in the present. Past patterns of action or schema are reflected upon in the iterational element, while possible forms of action in the future are contemplated in the projective element. At any instance, all three of the agentic dimensions may be present in varying degrees. While some agentic elements dominate, others may recede to the background. The decision to act and the actual execution of the act itself take place in the practical evaluative element.

The spatial dimension recognizes that the nomadic user may be either at home, at the office or on the road at the time this agentic process takes place, and that consequent action is informed by location.

The contextual dimension recognizes that a nomadic user fulfills various roles in business and personal life simultaneously, such as CEO, mother, wife or club president. At a specific point in time, a dominant role may be in force but the nomadic user may be called upon to play alternate roles based on an emerging event. The agentic process is therefore informed by roles in force and how conflicting interests are resolved.

In summary, the temporal, spatial and contextual dimensions combined may explain the decision to act or not based on past patterns of use, future goals, and possibilities and present time, location and social roles in force.

Table 4 - Research Framework

	DESCRIPTION	RELATED ACTIONS
TEMPORAL DIMENSION		
Iterational	• Past social experience is schematized. • Schema of past social relationships give continuity and stability to action and reassures actors that actions in the past can successfully be repeated and other social actors can be trusted to act in predictable ways.	• The actor has the ability to recall, to select and to appropriately apply these tacit or taken for granted schemas or patterns of action that they have developed through past interaction. • Actors maneuver among repertoires. Selection from practical repertoires of habitual activity may involve levels of ingenuity and resourcefulness. • Social actors use past social experience to predict what will happen in the future.
Practical Evaluative	• Focus on the present. Actors make practical and normative judgments among alternative possible trajectories of action, in response to the emerging demands, dilemmas and ambiguities of presently evolving situations.	• Routine and newly imagined projects are adjusted to the present. • A decision to act and execution of the act takes place.
Projective	• Focus on the future • Future plans and possible courses of action are schematized. • Construction of changing images of where actors think they are going, where they want to go and how they can get there from where they are at the present.	• Actors draw upon past experience in order to clarify motives, goals and intentions. • Possible constraints within the future are located and appropriate courses of action identified.
SPATIAL DIMENSION	• Focus on present location of actor when agentic process takes place.	• Actors may be at home, at their office location or on the road. • Physical location may constrain or enable courses of action.
CONTEXTUAL DIMENSION	• Focus on social role in force and interplay with other roles when agentic process takes place.	• Actors may play different roles in their business and personal life. • Interplay between different social roles may place constraints upon or enable courses of action.

CHAPTER 4

RESEARCH APPROACH

4.1 Research Paradigm

4.1.1 Epistemological and Ontological Assumptions

Mason (1996) advises qualitative researchers to clearly define and express the essence of their enquiry, which will govern the conduct of their research. The first step in doing so, is the articulation of the epistemological and ontological position of the researcher, after which the research questions, the methodology, methods and purpose of the research can be expressed, based on these positions (Mason 1996). The ontological position is concerned with the nature of social reality under investigation; that is, whether the empirical world is assumed to be objective and hence independent of humans, or subjective and socially constructed through human action (Orlikowski and Baroudi 1991). The researcher's chosen epistemology gives guidance on the principles and rules by which knowledge and explanations about entities in the world should be generated (Mason 1996), and is concerned with research methods (Orlikowski and Baroudi 1991). The researcher's epistemological, ontological and methodological premises may be termed a paradigm – a set of beliefs that guide action. According to Orlikowski and Baroudi (1991), principles most commonly used for guiding IS research can be classified into the positivist, interpretive and critical paradigms.

IS research can be classified as positivist, if there is evidence of formal propositions, quantifiable measures of variables, hypothesis testing and drawing of inferences about a phenomenon from a representative sample (Klein and Myers 1999). Within the positivist

paradigm, epistemological assumptions are based on the pursuit of realism through the empirical testing of theories, while the ontological position is based on objectivity.

IS research can be classified as critical if the main task is seen as one of social critique and the emancipation of those who may be restricted, alienated or dominated, so that their true potential can be realized (Mason 1996). The underlying assumption is that people can act to change their social and economic positions, and consequently, an important objective of critical research is to create awareness and understanding of the various forms of social domination so that people can act to eliminate them (Orlikowski and Baroudi 1991). Critical researchers believe that social reality is historically constituted and hence human beings, organizations and societies are not confined to existing in a particular state (Orlikowski and Baroudi 1991). As such, critical research is focused on the process of development and change of the phenomena under study. The critical ontology assumes that social reality is subjective as it is produced and reproduced by humans, but also as possessing objective properties. As such, the critical epistemology differs from the interpretivist and positivist paradigms, in that both participants' interpretation of the social world, as well as a critical analysis of the conditions of domination through a particular theoretical framework are required.

The interpretive paradigm assumes that our knowledge of reality is gained only through social constructions such as language, consciousness, shared meanings, documents, tools and other artifacts (Klein and Myers 1999). The ontological assumptions of the interpretive paradigm are based on subjectivity. The fundamental difference between the interpretive and positivist perspectives is that interpretivism asserts that reality and our knowledge of reality are social products and thus must be

understood through the eyes of the social actors involved in the construction and sense making of that reality, including the researcher (Orlikowski and Baroudi 1991). Within the interpretivist paradigm, epistemological assumptions are based on the belief that there are multiple realities or relativity. Interpretive research focuses on the complexity of human sensemaking as the situation emerges. It attempts to understand phenomena through the meanings people assign to them. Understanding social reality requires deriving constructs from the field by in-depth examination of and exposure to the phenomenon of interest. More importantly, interpretive methods of research within IS are aimed at producing an understanding of the *context* of the IS and the *process* by which the IS influences and is influenced by that context (Klein and Myers 1999).

Some view constructivism as similar to interpretivism (Denzin and Lincoln 2000) and use the terms interchangeably. As such an umbrella paradigm, contructivist-interpretivist has been defined. In a similar vein, some view the constructivist-interpretive perspective as differentiated (Orlikowski and Baroudi 1991) with the weak constructionist and the strong constructionist views as the two primary variants, discernible based on the role of the researcher in investigating the phenomena. In the weak constructionist view, the researcher only describes the existing meaning systems shared by the actors and interprets their action and events. In the strong constructionist view, the researcher's involvement is more evident. The retelling of the actor's story cannot be achieved without the intervention of the researcher's own interpretive scheme, and hence the researcher, in part, helps to create the social reality being studied through the constructs used to view the world. The followers of the strong constructionist view also believe that interpretive methods should replace positivist ones. My beliefs as a

researcher can be classified as moderate, as they lie midway between the reticence of the weak constructionist and the excessive claims of the strong constructionist.

Walsham's (1995) discussion of interpretive work in IS describes four primary rhetorics. The *rhetoric of the exploratory study* argues that interpretivism exists in service of positivism. Interpretive studies therefore can only be of an exploratory nature and their findings can later be subject to a more positivist approach. The *complementary approach rhetoric* is a pluralist one which sees interpretive approaches as complementary to positivism and of equal status. The *rhetoric of appropriate research issues* advocates the fit of the research problem to the paradigm. It argues both for complementarity, but also for the claim that certain research issues are best suited to an interpretive approach. The *replacement of positivism rhetoric* suggests that positivism should be fully replaced by interpretivism. Based on the foregoing, I support the claims of the school of *rhetoric of appropriate research.* I believe that the positivist and interpretivist approaches are complementary and of equal status and that the selection of an appropriate paradigm should be based on the compatibility of the chosen perspective with my own research interests and dispositions (Walsham 1995).

Based on theoretical and practical considerations, I selected the interpretive paradigm to guide this study. Firstly, there is little knowledge from prior research on nomadic computing environments whether of the positivist, critical or interpretivist genre. Based on this gap in knowledge, the intent was to understand the diverse contexts within which the nomadic computing environment was used. Accordingly, I chose to study the process of use and how that process was influenced by the diverse contexts in which the nomadic users found themselves. In this way, a baseline theory could be

developed which could be used to guide future research. Secondly, the nomadic computing environment had to be uncovered through an intensive methodology which involved intimate interactions with informants who used the environment heavily. Accordingly, I encouraged users to make sense of their own use of the environment and to share this sensemaking with me using their own language, expressions, shared meanings, documents, and other artifacts. Such deep immersion of the researcher into the environment is one important principle of interpretive research (Klein and Myers 1999). Thirdly, the primary intent was to develop a process theory explaining the effectiveness of nomadic users. Because the process of use varied across different contexts, I adopted a perspective that allowed more flexibility to investigate emergent phenomena (Orlikowski and Baroudi 1991; Mason 1996).

4.2 RESEARCH DESIGN

4.2.1 Case Study Design

The phenomena being researched always dictates to some extent the terms of its own dissection and exploration (Leonard-Barton 1990). Since I focused on "how" questions and was addressing a contemporary phenomena within a real life context that was not yet thoroughly researched, a case study methodology was a logical choice (Yin 1994).

The case study is a history of past or current phenomenon drawn from multiple sources of evidence (Leonard-Barton 1990). It can include data from direct observations and systematic interviewing as well as public and private archives. Some consider the case an object of study, while others consider it a methodology (Creswell 1998). Hence, the case study is both a process of inquiry as well as the product of that inquiry (Stake 2000).

Stake (2000) identifies three types of case studies: *intrinsic, instrumental* and *collective.* The *intrinsic* case study is undertaken when the researcher wants a better understanding of a particular case, for example a particular child, clinic, curriculum or technology. In this instance, the case study is undertaken because it is of particular interest and not because it represents other cases. The interest therefore is not theory building or understanding an abstract construct or generic phenomenon.

The objective of the *instrumental* case is to provide insight into an issue or to make a generalization. In this instance, the case plays a supporting role and facilitates understanding of a particular, but also a more general, phenomenon. The case may or may not be typical of other cases. Whether intrinsic or instrumental, the single case study has several limitations. There are limits to the level of generalizability which can be attained through a single case. Methodological biases can also be introduced such as misjudging the representativeness of a single event or case (Leonard-Barton 1990). To overcome these constraints, a *collective* or multiple case strategy can be employed.

The objective of the *collective* case study is to jointly study a number of cases so as to investigate a phenomenon, population or general condition. It is the instrumental case study, extended to several cases. Individual cases may or may not be known in advance to manifest some common characteristic. As such, redundancy and variety are important in case selection because theorizing about a larger collection of cases will lead to better understanding and better theorizing.

Yin (1994) advises that for multiple case study research, a replication strategy should be pursued rather than a sampling strategy where a number of subjects are assumed to represent a larger pool. Miles and Huberman (1994) identify four strategies

for multiple case studies multiple exemplars, forming types or families, meta-ethnography strategy, and case oriented strategy, which is similar to Yin's replication strategy (Yin 1994).

The multiple exemplar strategy requires the researcher to deconstruct prior conceptions of a particular phenomenon, collect multiple instances or cases, bracket them, and inspect them carefully for essential elements or components (Miles and Huberman 1994). The elements are then rebuilt into an ordered whole and put back into the natural social context.

Forming types or families requires an inspection of cases to see whether they fall into clusters or groups that share certain patterns or configurations (Miles and Huberman 1994).

The meta-ethnography strategy requires synthesizing interpretations across cases even if different researchers with different assumptions conducted them (Miles and Huberman 1994). Sub-strategies include making reciprocal translations (using findings of one study to predict those of another and vice versa), refutational syntheses (looking at contradictory cross-case findings), and lines of argument syntheses (building a general interpretation grounded in the findings of separate studies).

With case oriented strategies, a theoretical framework is used to study one case in depth and then successive cases are examined to see whether the pattern found matches that in previous cases (Miles and Huberman 1994). The cases should serve in a manner similar to multiple experiments with similar results (a literal replication) or contrasting results (a theoretical replication) (Yin 1994). The theoretical framework needs to state the conditions under which a particular phenomenon would be found as well as the

conditions under which it is not likely to be found. If the cases turn out as predicted, then compelling support for the initial set of propositions would be found. If the cases are in some way contradictory, then the initial propositions must be revised and re-examined with another set of cases (Yin 1994).

Since my interest was in human action, and I intended to produce theory relevant to a number of nomadic computing users, I required a methodology that accommodated both theoretical and literal replication. A multiple case study approach was employed where the unit of analysis was the individual nomadic computing user. The methodological choice was also made to complement retrospective cases with the simultaneous conduct of longitudinal cases. This dual case methodology had many advantages. Within wholly retrospective research, participants tend to forget key events or may not recognize an event as important (Leonard-Barton 1990). There is also the risk of reconstructed logic, whereby informants later recognize a particular event as critical, which they would not have known at the time it occurred. This results in some distortion in retrospective sensemaking. Including longitudinal cases overcame this limitation by using the longitudinal cases to confirm themes identified in the retrospective cases and to ensure the stability of the themes across time (Leonard-Barton 1990). Within retrospective research it is also difficult for participants to recall the process of events as they unfold. Including longitudinal cases allowed participants to tell the story and facilitated my own observation of many of the events they described. A more complete understanding of use in nomadic computing environments and changes in use was therefore achieved. The advantages of the cross-case analysis were that generalizability was enhanced (Miles and Huberman 1994). Multiple cases, which are typical and diverse,

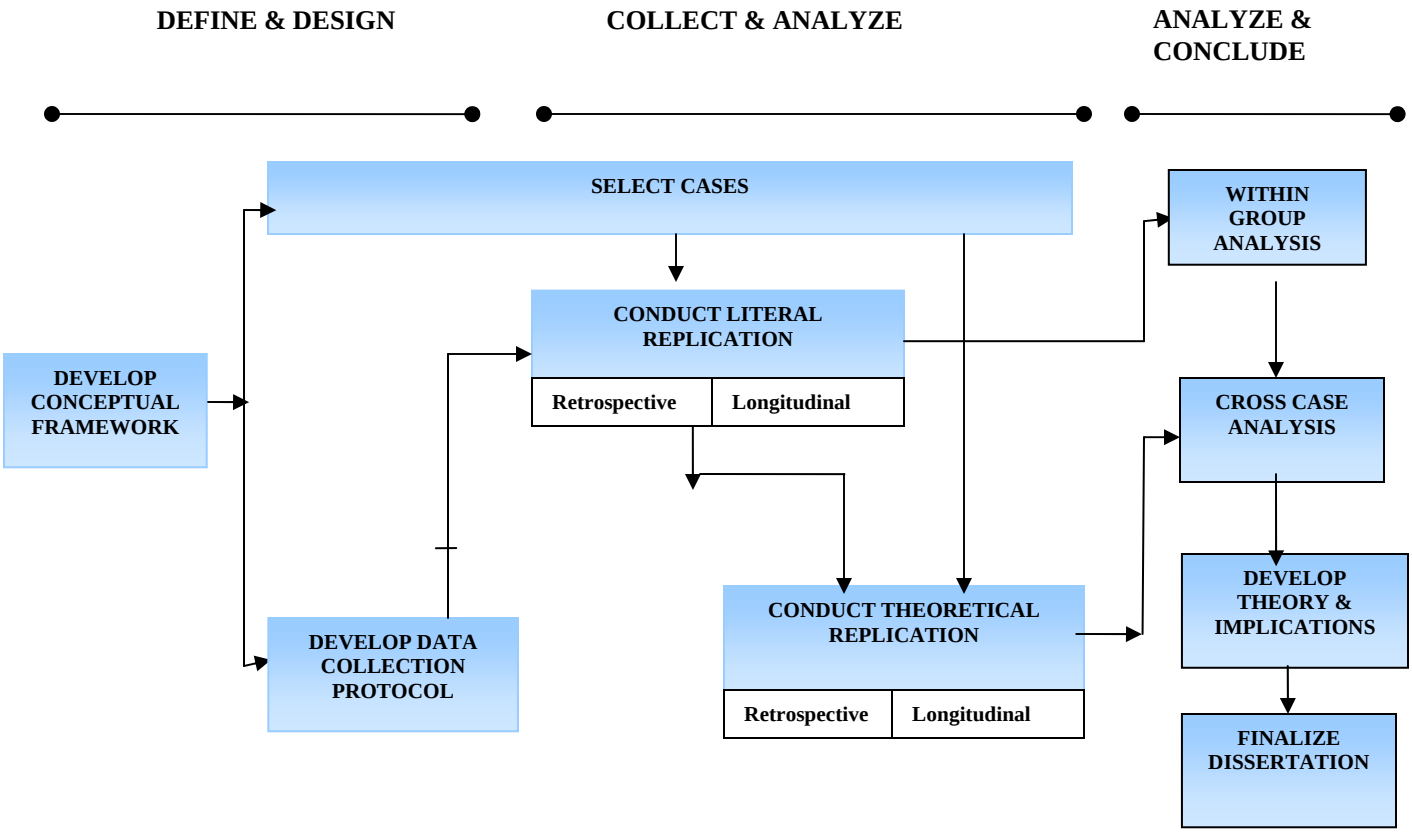
gave insight as to whether the findings make sense beyond a specific case (Miles and Huberman 1994). Multiple cases also deepened understanding and explanation and strengthened the theory being built through examination of similarities and differences across cases.

4.2.2 Case Study Process

As shown in figure 3, I followed a cross-case replication strategy which incorporated a dual case methodology. This first involved developing the conceptual framework which was used to guide data collection and analysis. A data collection protocol was then designed after which case selection began. Case selection took place concurrently with literal and theoretical replication. There were two groups of cases: a group which facilitated literal replication, and a set group comprising all the cases which facilitated theoretical replication. Within each group, the dual case methodology was employed where some nomadic computing users were studied retrospectively while others were studied longitudinally.

The literal replication facilitated a within-group analysis and this was carried out first. For the literal replication group, I assessed an initial case study and then applied the results to each successive case individually. As the process was repeated for each case, the results from each case built upon the results of prior cases. When all the cases were assessed, the process was repeated to ensure that all the results were applied to all the cases in the literal replication group.

Figure 3 Dual Case Methodology Incorporating Literal & Theoretical Replication Strategies



Theoretical replication facilitated a cross-case analysis which began by applying the results of the literal replication to each case which lay outside the literal replication group. Similar to the within-group analysis, the process was repeated until all the results obtained were applied to all the cases in the theoretical replication group.

The study was carried out in two phases. Initially all the cases were carried out retrospectively. After a period of three to six months, data for the longitudinal cases were collected. The results from the within-group and cross-case analyses were then used to develop theory and derive implications.

4.2.3 Case Selection

The selection of cases was made on conceptual rather than statistical grounds (Miles and Huberman 1994). Because I was employing both theoretical and literal replication strategies, I looked at a range of similar and contrasting cases as it strengthened the precision, validity and stability of the findings.

My first concern was how many cases to study. Again this question was not answerable on statistical grounds. It had to be dealt with conceptually. Miles and Huberman (1994) advise that the number of cases selected depends on the number of cases that would give confidence in analytic generalization and also on the richness and complexity of the within case analysis. With high complexity, a study with more than fifteen cases can become too unwieldy. Following this advice, my initial target was fifteen cases. However, that target was not reached because there came a point when the content of the interviews became repetitive and no new themes emerged.

In all, I carried out eleven case studies. I selected typical cases (Miles and Huberman 1994), that is, nomadic computing users who would be good representations

of the nomadic computing user population in general. To qualify for the research study, nomadic computing users had to be physically mobile at least 50 percent of the time. Based on referrals, I contacted potential subjects via e-mail providing them with a brief overview of the study and the name of the person who had suggested that I interview them. Of the thirteen persons contacted only two declined.

For the literal replication, six nomadic computing users came from a large home mortgage finance institution in the south eastern United States known as HomeLender (a pseudonym). These users all had different backgrounds and job functions but initially used the identical nomadic computing environment. Literal replication in multiple cases requires that the phenomenon being studied be defined by some characteristic common to all the research scenarios (Leonard-Barton 1990; Yin 1994). In this situation, the laptop computer and applications initially given to each user were identical and represented a common factor across all the cases. In addition, all users were employed by the same organization, HomeLender.

The other five cases came from diverse organizations with different backgrounds. Combining them with the cases from the literal replication created the diversity required for theoretical replication.

There were three categories of nomadic computing users: six office-based, three teleworkers and two self-employed.

The six office- based nomads all came from HomeLender who provided them with an equipped office at the corporation's site. They spent a certain amount of time at the office base (i.e., less than 50%), and the rest of the time traveling to carry out work. They

were also provided with a nomadic computing environment to facilitate the continuity of work while they were mobile.

They were also three telecommuters. Telecommuting refers to a way of performing work away from the principal office, typically at home or at a nearby telecenter (Locke and Kelly 1999). Two telecommuting nomads in this study functioned from a home office furnished by the organization with office furniture and equipment, such as a land-line phone, fax machine, photocopier, laptop computer and Internet access. One telecommuter was an IT Territory Manager for a major IT services vendor. Another was a Pharmaceutical Sales Representative for a large pharmaceutical firm. The third was a Customer Service Engineer who worked for a major manufacturer of automotive parts. He operated out of the offices of a major customer, from which he serviced other customers as required.

Finally there were two self-employed nomads who operated independently out of a home office. They purchased their own equipment to furnish a home office and were also equipped with a nomadic computing environment. They were both Microsoft Certified Trainers and IT consultants.

The demographics of the cases studied can be found in table 5.

Table 5 – Demographics of Nomadic Computing Users

CASE GROUPINGS		METHOD	CASE NAME	CATEGORY	GENDER	AGE	OCCUPATION
THEORETICAL REPLICATION GROUP	LITERAL REPLICATION GROUP HOMELENDER	Longitudinal	Top Gun	Office Based	Male	30s	Vice President of Sales & Loan Officer
		Longitudinal	Superwoman	Office Based	Female	30s	Junior Sales Officer & Sales Assistant
		Retrospective	Nonchalant	Office Based	Male	30s	Assistant Vice President of Sales
		Retrospective	Rookie	Office Based	Male	20s	Loan Officer
		Retrospective	Boundary Enforcer	Office Based	Female	20s	Assistant Vice President of Marketing
		Retrospective	Merlin	Office Based	Male	20s	Network Administrator
	DIVERSE CASES	Retrospective	Mr. Security Issues	Teleworker	Male	30s	Customer Service Engineer
		Longitudinal	Young Gun	Teleworker	Male	20s	IT Territory Manager & Client Services Representative
		Retrospective	Timenator	Teleworker	Male	30s	Pharmaceutical Sales Representative
		Retrospective	Mr. Gadget	Self Employed	Male	40s	Microsoft Certified Trainer & IT Consultant
		Retrospective	Technoholic	Self Employed	Male	30s	Microsoft Certified Trainer & IT Consultant

4.2.4 Data Collection

The techniques that were used to collect data were interviews, observations and field notes. In total, I conducted 20 interviews. Eighteen interviews were conducted with 11 case subjects. Two others were interviewed at HomeLender to provide background information on the organization.

During the interviews, observations were made possible by encouraging participants to continue their interaction with the nomadic computing environment wherever possible. Meetings with participants were sometimes arranged in a location outside their office base. This allowed me to observe in real time the patterns of use and their experiences as they occurred. For instance, one participant was interviewed over the cell phone while he traveled by train. One participant was also interviewed at a coffee shop with a hotspot as he installed a newly acquired wireless card. As such I was able to participate in the nomadic computing users' experiences and to grasp first hand an understanding of the issues they faced.

I took field notes sparingly during the interviews, because any observations that I made during the interviews were discussed at that time and the details were tape recorded. However, after some interviews it was necessary to make notes of the observations and insights I had drawn from the interviews.

Over a period of six months, I carried out two waves of data collection for both literal and theoretical replication. For each replication strategy, in the first phase, a detailed interview protocol with general open ended questions was designed and used to guide free flowing conversations with subjects participating in both the retrospective and longitudinal studies. On average, interviews lasted 90 minutes. Interview topics included

the background of the organization and the user, travel patterns, devices used, past practices, current interaction patterns and future goals with regard to technology use. Users were also asked how they collaborated and used the environment within their personal and business lives. They were also asked to evaluate how use of the environment made them effective or ineffective. Subjects were encouraged to continue to respond to the nomadic computing environment during the interviews, to demonstrate features of their nomadic computing environment and to illustrate their patterns of use by telling stories.

The second wave of data collection took place three to six months after the initial interviews. A second interview protocol with more specific questions was used to guide free flowing conversations which lasted on average for 45 minutes. Topics discussed included any changes in practices, travel patterns and personal and organizational roles and the reasons for the changes. All interviews were tape-recorded and fully transcribed. Anonymity of all respondents was ensured. The interview protocols are available in Appendix B.

4.2.5 Data Analysis

I carried out an iterative process of data collection and analysis (Glaser and Strauss 1967). This approach allowed me to use insights drawn from prior cases to direct the interviews and observations of successive cases. Analysis involved subjecting the interview transcriptions to interpretation using coding as the analysis technique. I developed three types of codes: descriptive, interpretive and pattern codes.

Descriptive coding entails the assignment of codes based on the nature of the phenomena and involves little interpretation (Miles and Huberman 1994). Descriptive codes can be

converted into interpretive codes by assigning meaning to them. Given a working set of interpretive codes that describe the phenomena, the researcher can move to a second level by developing pattern codes. Pattern codes are explanatory or inferential codes that identify an emergent theme, configuration or explanation. They can also represent themes, causes/explanations, relationships among people and theoretical constructs. They are meta codes which pull material into more meaningful and parsimonious units of analysis (Miles and Huberman 1994). Pattern coding has four main functions (Miles and Huberman 1994):

1. It reduces large amounts of data into a smaller number of analytical units.
2. It gets the researcher into analysis during data collection so that later fieldwork can be more focused.
3. It helps the researcher elaborate a cognitive map: an evolving, more integrated schema for understanding local incidents and interactions.
4. For multiple case studies it lays the groundwork for cross-case analysis by surfacing common themes and directional processes.

4.2.5.1 The Coding Process

There were two stages of coding where each stage comprised an iterative process of many rounds of code assignment and induction. In the first stage, I developed a master list of descriptive and interpretive codes based on themes from the conceptual framework and the research questions (Miles and Huberman 1994). These themes included iterational, practical evaluative and projective agentic processes, the context and place of technology use and the effectiveness of users. As the study was interpretive, the data reflected mainly the interpretations that the nomadic users formed about their usage of

the nomadic computing environment. As such, the codes were intended to serve as tags rather than values.

I used Atlas/ti to carry out coding. Atlas/ti is a visual qualitative analysis tool with a graphical user interface, used for text management, text interpretation and theory building. It was used for storing all the transcribed interviews and memos as well as to facilitate the coding process.

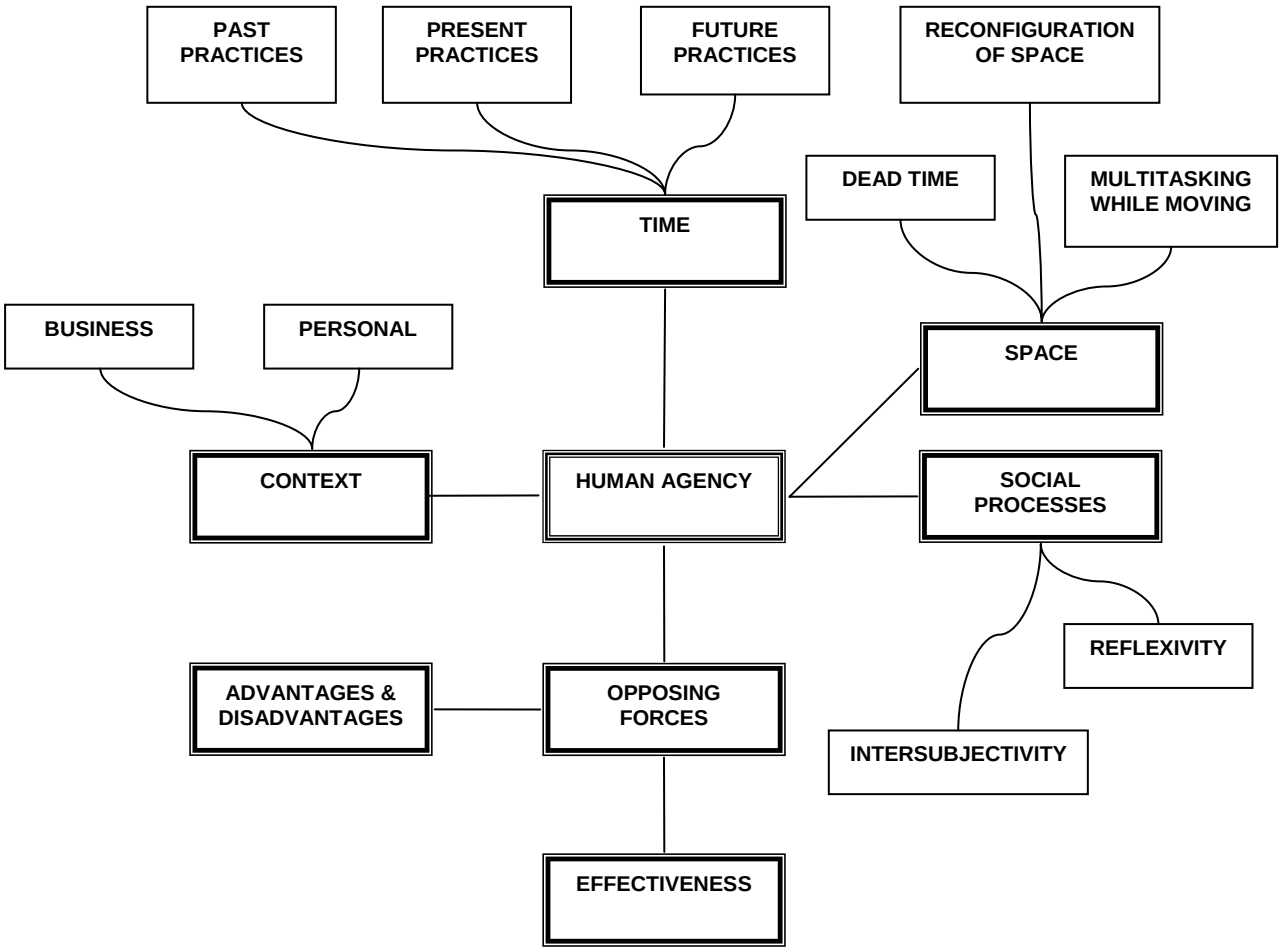
I performed the analysis case by case. For each case I looked for sections of the interviews which spoke about incidents, events, processes, actions, assumptions, and consequences surrounding nomadic computing technology use, to which I could assign the descriptive and interpretive codes I had developed. Because of the difficulty in identifying each agentic dimension with analytical precision (Emirbayer and Mische 1998), a single quotation was sometimes assigned multiple codes. During the first round of coding I noticed several themes emerging from the data and created descriptive and interpretive codes for these themes as they emerged. These themes mostly centered on the advantages and disadvantages of the nomadic computing environment and opposing forces in play, such as the tendency of nomadic computing users to allow unrestricted access at some times, while at other times, restricting access to themselves through use of the technology. Themes also emerged which centered on the different ways nomadic computing users utilized space.

Subsequent rounds of analysis of interview data collected in phase 1 of the data collection process resulted in applying the newly created codes to the interview data. This gave me the opportunity to confirm all the themes found across all the cases. At the end of the first stage as the data collection for the retrospective stage of the literal replication

was complete, I wrote an interim report detailing the initial findings of the within-group analysis.

In the second stage I subjected the interview data from the longitudinal cases collected in phase 2 to analysis based on changes in practices and reasons for these changes. In addition quotations were also coded for themes identified in phase 1 of the analysis, thus validating the stability of themes identified in phase 1 across the passage of time and situations. Throughout the process of analysis, codes were added, dropped and merged based on new theoretical insights. Codes were also grouped into categories that were conceptually similar thus creating pattern codes (Miles and Huberman 1994). The pattern codes represented existing and new theoretical concepts, and linking them together facilitated the development of a theoretical explanation. See Appendix C for samples of the codes. Figure 4 shows the interrelationship of the major pattern and interpretive codes.

Figure 4. Interrelationships Between Major Interpretive & Pattern Codes



KEY

Pattern Codes Interpretive Codes

CHAPTER 5

RESULTS

In this chapter, the results of six nomadic users are presented in two sections. To facilitate literal replication and a within-group analysis, the first section centers on three loan officers within a large mortgage finance institution known as HomeLender (a pseudonym). Literal replication is facilitated because the loan officers were initially all given the same nomadic computing environment. To facilitate theoretical replication the second section focuses on three independent nomadic professionals from different organizations. Theoretical replication is facilitated because of the differences in occupations, roles and technologies in use. In both groups, longitudinal cases have been included. The results of all eleven cases, including the five cases which are not included in the results, are summarized in Appendix A.

5.1 Literal Replication - The HomeLender Group

In this section I describe the institutional context surrounding the use of the nomadic computing environment. I then describe details of the technology in use. The three cases of the nomadic loan officers are then presented. The results show the usefulness of the dimensions of the nomadic computing framework in explaining the diversity and similarities in use across these three users who were provided the identical nomadic computing environment.

5.1.1 Institutional Context

The data were collected in 2003 at HomeLender (a pseudonym), a home mortgage corporation which served the southeastern United States. HomeLender was a major player in the mortgage financing industry and was ranked as the number one lender for homebuyers in its area for 12 years in a row. At the end of 2003, HomeLender employed 1400 associates, of whom 950 were loan officers. One of the organization's main objectives was associate satisfaction. In 2003, HomeLender was ranked as the number one place to work in its area by local business publications and ranked highly on Fortune 100's list of best companies to work for in 2004.

The company was founded in 1985 and in 1995 the organization became the first mortgage lender in its area to introduce laptop computer loan origination, which gave loan officers the capability to accept and process loan applications at either HomeLender stores or customer locations. In 1999 the organization added the capability to accept mortgage loan applications over the Internet. Associates could access a consistent computing environment, anytime anyplace through use of organization supported laptops as long as they had a connection to the Internet. This paved the way for a true nomadic computing environment within the organization.

The organization created a special sales unit known as the E-unit to service loans which originated over the Internet. The E-unit had six mortgage consultants and 14 support staff. The E-unit was the most profitable sales unit in the company. As stated by one loan officer:

> "The purpose of the E-unit would be to pilot new programs and technology and once the pilot is in place then it is exported out to the rest of the company. I would just say the E-unit is the most efficient, highly productive, cutting edge department in the company for the sales force."

The "integration of technology, talent and focus" was given as the reason for the outstanding performance of the E-Unit.

In 2000, HomeLender was ranked in the top ten of online lenders. Though a significant amount of business was received through online applications, four of the mortgage consultants within the E-unit were highly mobile, spending 50 percent of their time traveling to bring in business. In addition to visiting HomeLender locations, they also visited real estate offices with which they had formed partnerships. These real estate offices were known as alliances. A significant amount of technical resources was dedicated to the E-unit, as it was where the Information Technology (IT) department piloted technology initiatives. The loan officers within the E-Unit were the focus of this case study.

Before the implementation of laptop loan origination, a manual system for managing customer relationships had been instituted through use of a composition notebook. The composition book was used as a journal to track work related activities. Three of the loan officers interviewed had been with the organization for more than 10 years and were able to trace their initial use of the composition book back to the moment they were employed by HomeLender. As one senior loan officer recalled, on joining the organization his boss had introduced him to the composition book and had taught him how to use it.

> "This is something HomeLender taught me. The composition book. When people called me to be pre qualified, they would call me on the phone and say I am just wondering what amount of money I can borrow. Well I would say, how much money do you make and what debt you have? This is the old fashion way. Let me write down your name and I write down your salary and I write down your debt and have you fixed your credit yet and I write down basically just a note to myself so I can refer back to it. To this day all loan officers carry these things around so people still use them. Some people use it as a to-do list too. They just flick a page every day and just start writing down the stuff to do. The company buys them. My boss who now runs this company was the one who taught me to use this."

More recent hires were introduced to the composition books in other ways. Some were able to trace their initial use of the composition book back to days at school when they used the books to track details of school assignments. Their subsequent use of the composition book evolved to other purposes in their working life: to track details such as things to do, expense claims, phone numbers and notes of conversation and other work related activities. Thus the use of the composition book was a traditional practice, still prevalent in the organization.

5.1.2 Technological Properties of the Nomadic Computing Environment

The hardware in use was a laptop computer, which was a standard company issue to loan officers. The laptop computer had wired network capability. The IT department was slowly making the transition to wireless and some loan officers had wireless modems. The Microsoft Office Suite was the standard office application. Outlook was used for scheduling, maintaining contacts, tasks, and email. The main application in use was LoanSoft, which facilitated the processing of loan applications while the user was mobile. Loan processing could take place anytime, anyplace once a connection to the Internet was established. Loan officers could enter a loan application, check credit and pre-qualify a loan within minutes. The HomeLender website had a page for each loan officer as well as information on the organization and its products. They could also

accept loan applications from applicants through the website which appeared as an email message in their Outlook inbox. The organization also provided an Intranet to distribute information to its associates. Each department had its own knowledge repository. The loan officers were able to retrieve information on bond rates and loan products from the Intranet. Official training was held in all the applications for the associates, setting expectations for how the applications should be used, though attending training sessions was optional.

5.1.3 Three Cases of Nomadic Computing Use

The three cases selected represented loan officers within HomeLender all engaged in the processing of loans. The users were the Vice President of the Department, a Sales Assistant and a loan officer. Literal replication in multiple cases requires that the phenomenon being studied be defined by some characteristic common to all the research situations (Leonard-Barton 1990; Yin 1994). In this situation, the laptop and applications initially given to each user were identical and represented this common factor across all the cases.

5.1.4 Retrospective Cases

5.1.4.1 Case # 1 –Rookie

"If you sit around you are usually going to miss out"

Rookie was a loan officer who had been with HomeLender for four and a half years. He was single and had no children. His father was his only surviving parent and he had no siblings. He was involved in tennis, soccer and hockey clubs. He also met with a group of young professionals on a monthly basis.

Rookie used a company issued laptop and personal mobile devices, which included a PDA, cell phone and pager. He synchronized contact information and email across his laptop, PDA and cell phone. His PDA and laptop were wireless, giving him the capability to use hotspots and to connect to the Internet via cellular services. Rookie was highly mobile, traveling to meet real estate agents, customers and attorneys on a daily basis. In comparison to the other loan officers interviewed, he was fairly new to the mortgage financing business and his performance was not ranked. He was driven to bring in as much business as possible in order to prove himself as a successful loan officer and to become established in the business.

Rookie engaged in several practices demonstrative of the practical evaluative element of human agency. Rookie was faced with the predicament of bringing in as much business as possible in as short a time as possible. As a result, he made himself highly accessible to others through several means while mobile.

> "I have got my email, I have got my office phone here, I have got my cell phone and I also got my pager so they can always page me. So there is really no way that they can't get in touch with me. I am on call basically."

However this high level of accessibility made keeping track of each piece of communication across the three devices difficult. The decision was therefore made to integrate his work and personal devices so as to be more in control of the flow of communication.

> "I called Merlin over in IT. I just asked him. I have got the wireless card in my Compaq laptop, I have got my Sony PDA, and I have got my cell phone with the same carrier. I know I can forward emails and rates to my cell phone. Can I coordinate my PDA with my cell phone and the laptop all to be synchronized? Is there anyway I can connect all three to where I am never out of the loop? You know, if I have one device where one is down and one is missing, I am still alive in some sort of fashion."

Since the PDA and cell phone were not company issues, it was surprising that the IT department would give support to this synchronization. Rookie was the only loan officer in the E-unit who requested this service though several loan officers throughout HomeLender engaged in this practice.

Rookie was highly accessible and this led to him working during weekends and on vacation. In order to facilitate customer requests while on his personal time, he frequently used hotspots and his cellular phone to connect his laptop to the Internet.

> "I try not to work on the weekend. But usually I end up having to. Like if an agent calls me on the weekend, and my agent says I need to pre-qualify somebody. Can you do that now? I keep my laptop in my car with me, load it up, plug it into my cigarette lighter in my car, power it up and I can upload and take a loan app."

Even so the disruptions proved to be sometimes frustrating. As a result, Rookie expressed the desire to set and maintain boundaries between his business and personal life.

> "It's like I do this all day. I try to get the mindset where from these hours it's all about taking care of customers and between these hours it's about taking care of me. I try to separate my business and personal life. If you combine the two then you really don't have an identity."

Viewing Rookie's actions through the iterational element shows the reinforcement of past practices. Like all the other loan officers, Rookie used the corporate applications as intended. Even though he was one of the more technologically savvy users, the use of the composition book was a practice that persisted. The composition book was useful for jotting down information needed only in the short term and provided continuity in case of technology failure. It was also more suited for use in certain contexts and places such as a point of reference to make calls while sitting in traffic.

> "If I have like six messages after I come out of a meeting I will write down what the call is about.-- It is also a reference point in case sometimes technology crashes. My laptop crashed two weeks ago and I was without it for a day. If I hadn't written down all the calls and things I had talked about that day and people called me I would not know what to tell them half the time. So I guess it's my hard drive back up."

An analysis of Rookie's behavior through the projective element shows that his will to succeed drove his actions and as such he was always focused on how he could keep abreast of technology to make himself more effective.

> "Well in our business we always say you are as good as your last deal, because we are on commission. So if I don't have a deal and if I am not working I don't get paid. So if you are not on top of your game you are going to lose. So I don't have a choice but to be proficient in the use of these devices."

Consequently, the Rookie was willing to upgrade and acquire new technology with the belief that it could only enhance his effectiveness.

> "What would be my pie in the sky? Gosh, something that would be voice activated so that I would not have to call or dial or do anything. Just maybe a headset or a little video screen in front of my eyes like a pair of shades and I could talk. Whatever I am thinking or saying, it does. That's lazy but how efficient would that be? So kind of how the movies are going. Like the Matrix but to the point where it is totally user friendly. If I did not have a keyboard I could just talk. And just free my mind, whatever comes to my mind I can say. Like take a note, enter this, put it on calendar for Thursday and done. That would be efficient."

Rookie was faced with the challenge of proving that he could be a successful loan officer. He used technology intensively as he felt that it was key to his eventual success. Past practices persisted when he felt that they were essential to his survival as in his use of the composition book which was used as a backup in the event his other devices failed. Upgrades and the acquisition of new technology were welcome as it was felt that they were necessary ingredients to his business success.

5.1.5 Longitudinal Cases

5.1.5.1 Case # 2 - Top Gun

"I am just not a technology person"

Top Gun was the Vice President of Sales and a senior loan officer within the E-Unit. Top Gun's responsibilities included strategic planning, administration, mentoring, training and public speaking on behalf of the company. However 99 percent of his income came from loan origination. Top Gun had been with HomeLender for 10 years. In 2003, he was ranked as HomeLender's number two producer. Top Gun was married with children and served on the board of a prominent national charity. Top Gun traveled to the alliances three times a week to meet with real estate agents and their customers as well as to provide a presence within the alliances.

When Top Gun first joined HomeLender in 1993, he used a date book in which he wrote details of his appointments, meetings and events. Loan applications were hand written. Like most of the other loan officers, his sales manager also trained him to use the composition book. The car phone[4] and the pager were his major modes of communication within his business and personal lives.

More recently, Top Gun used a corporate issued laptop, and personal mobile devices which included text and digital pagers and a cell phone. Though one of the organization's top producers, Top Gun described himself as a caveman, reluctant to change because of the time required to learn how to use the technology. This disinclination was manifested in his patterns of use.

Viewing Top Gun's practices through the practical evaluative element shows that Top Gun was faced with the agency dilemma of either clinging to past practices, which were comfortable and familiar, or moving into the uncertainty that using the technology would present. As a top producer and vice president, he received a great amount of daily communication in the form of emails, phone calls and voice mails. He also had a busy schedule. In the past, monitoring this activity was achieved through use of the date book and composition book. Based on the volume of activity, the prospect of converting to Outlook was overwhelming. However, a potential consequence of not using Outlook was the loss of his esteemed position within the organization. His practical evaluative dilemma thus centered on how the new technology could be incorporated in such a way that the comfort and familiarity of past practices were preserved.

[4] This car phone was fixed in the automobile and was not carried with the user. Though based on radio frequencies cellular technology was not used.

Top Gun resolved this dilemma by delegating the task of using Outlook to his assistant, Executrix. This allowed Top Gun to remain in his comfort zone and not to deal directly with the Outlook application. This also led to the elimination of the composition book. Executrix took his calls, retrieved his voice mail, maintained his contact lists, calendar and task lists which were printed and given to Top Gun before he left for the alliances. This allowed him to make calls while driving. The lists produced by Outlook were in a form which could be comfortably used by Top Gun, thus minimizing his interaction with the application. Another consequence was that since most communications went through Executrix she also acted as a way to restrict his access.

Top Gun spent a large portion of his day traveling from place to place in his car. As such his car became a place of work. In the absence of the composition book, he would call his office phone and leave notes to himself on his voice mail. In this way, both he and Executrix had access to this information.

> "I took down some information last night from a lady and she had two important points that she wanted to make sure I remembered. So I called my voice mail and left it on my voicemail."

Another instance in which past practices were preserved was Top Gun's use of the pager. Top Gun viewed the pager as outdated because his cell phone could also be used as a paging device. Instead of retiring the pager, however, it became his primary means of communication with Executrix while he was mobile. When alerted by Outlook about an upcoming appointment, Executrix would page Top Gun to remind him of the appointment. Thus, Top Gun was able to maintain some distance from the technology while indirectly exploiting its usefulness.

One application that Top Gun used extensively was LoanSoft. The ability to enter and process loans online was integral to Top Gun's productivity and success, and he used it as intended by the organization. To capture critical information from the customer upon first point of contact, Top Gun and his sales assistant, Superwoman, designed a customer timeline form which was independent of LoanSoft. This new form included contact information and preferred mode of contact. The use of this form also removed the need to make notes in the composition book. Top Gun and Superwoman were the only two people in the E-unit who used this form and consequently their use of the composition book ended.

Since the well being of associates was paramount, HomeLender made every attempt to ensure that loan officers were able to relax while on vacation by encouraging them to leave their laptops behind, to be monitored by other loan officers. In the past, without mobile devices, the organization did not have easy means of contact with the loan officers and they were able to enjoy their vacations uninterrupted. Leaving their laptop behind was an attempt to ensure the continuity of this traditional activity. However, Top Gun complained that he lost business and that it took him a long time to catch up on work once he returned. Hence it was a practice he no longer engaged in.

> "Having my laptop gave me the opportunity to check messages on my own time, prioritize them and then deal with them accordingly."

Thus, his desire to have dedicated personal time conflicted with his will to stay abreast of business while away from work. However, he enforced personal boundaries by making those around him aware of his limited accessibility while on vacation.

> “I may say that I will be accessible from 2:00 to 4:00 on this day or I won't be accessible”

Viewing Top Gun’s behavior through the iterational element of human agency reveals several enduring practices. One persistent practice was the use of the date book. This was used when Top Gun set appointments for himself and later replicated some of the appointments in Outlook. It was also an easy reference to appointments when he was mobile. The delegation of the use of Outlook to his assistant can also be analyzed through the iterational element. Historically, secretaries have been in charge of their managers’ schedules, and Top Gun’s delegation of the use of Outlook to his assistant was reflective of this traditional practice.

> “The only reason it’s on Outlook is so that Executrix who runs my schedule can see where I am and what I am supposed to be doing or she would be very ineffective.”

Top Gun’s cell phone use was not reflective of the full features and functionality of the device and his usage mimicked how landlines were used in the past. Top Gun did not maintain a list of contacts in his cell phone but dialed numbers from memory or from the task list generated by Outlook.

With respect to the projective element, Top Gun placed low priority on learning about and improving his own technology use. When asked how the future use of mobile technology could make him more effective Top Gun responded:

> "My mind doesn't work like that. If I have the time to think, it's not about technology. It's about how I can bring in more business, or how I can be a better Christian, or how I can be a better father or how I can be a better husband or something totally different from the technology part. I don't spend my free time on that. Other people enjoy that and I think that's great. But I am just not a technology person."

However, Top Gun was able to visualize how his pending acquisition of a wireless modem would make him more effective in the short term. This he was able to do since using the wireless modem would not require an investment in time to learn how to use it. It was simply a device he plugged into his laptop.

> "I am supposed to have one where all I have to do is to be able to plug in and it powers up. I won't be restricted. I probably will be able to boot up during meetings and conference calls and it will allow me to be in other places in my house besides tied to just my office at my house."

Three months later, significant changes in Top Gun's practices occurred. As he had projected, Top Gun had obtained a wireless modem. In addition, though he had previously claimed to be disinclined to acquire new technology, he had made two other technology acquisitions which were not corporate initiated issues. Firstly, Top Gun commissioned the installation of a wireless network at his house to maximize the use of his wireless modem and to enhance his productivity at home. Use of the wireless network at home enabled him to convert personal dead time into productive time by allowing him to spend time with his family and work simultaneously.

> "I can be downstairs while the kids are watching a movie or I can be in the bed and typing while I am in the bed. It gives you freedom like the cordless phone does."

Secondly, he acquired an aircard which gave him the capability to access the Internet anywhere cellular service was available without the need of a hotspot. The transition to the aircard was relatively easy as it could easily be inserted into the laptop when needed. The aircard also allowed increased flexibility in carrying out his work and also facilitated the transformation of dead time into productive time.

> "I have got a satellite card. And that is pretty neat because I don't have to plug into the network. I picked up a power adapter for my car so that I can actually work in my car when my wife is driving or when somebody else is driving. So I can be online while in the car. I did that when I went to Florida last week. I was online working in the car on my cell phone and with the aircard for about four hours. This is a big step."

Top Gun described how observation of a colleague's use of the aircard influenced his decision to acquire one for himself.

> "I saw him working with the little antennae sticking out and it looked pretty efficient. So I said, "what's that"? And so he told me and then I said, "where did you get it"? And then he told me and then I ordered it. And I have ordered it for my two partners. We just look at somebody and if they look like they are being effective we ask them what it is that they are doing."

Thus, social processes influenced Top Gun's changes in practices. Discussions with his colleague about the usefulness of the aircard caused him to reflect upon how acquiring the device could contribute to his own effectiveness. This intersubjective and reflexive process where the effects of future technology acquisitions were contemplated was representative of the projective element. The decision to procure the device was reflective of the practical evaluative element, where the future technology acquisitions contemplated were actually implemented. Of interest too was the change in Top Gun's

attitude towards technology due primarily to a process of reflexivity. Technology use was previously given low priority, but now there was a growing appreciation of how it could be incorporated into his every day practices to make him more effective.

> "If I can see how it makes me more efficient then it becomes a priority. But technology on a whole I am not that interested in. But if I can find a tool that I see that somebody else is implementing, then I get very intrigued very quickly. So I just have to see the value of something whether it's technology or anything else. If I see the value in it I will implement it very quickly."

Top Gun initially considered learning to use technology as a time consuming activity and one of low priority. Yet over time, he recognized the importance of technology use to his success and raised the priority of technology use when it became apparent that doing so would increase his effectiveness. To remain in his comfort zone there was a tendency to cling to past practices. Some traditional practices were also reinvented but with the objective of minimizing interaction with the technology. The use of new technology was contemplated only when it was critical to business success, or when a large time investment was not required to learn how to use it.

5.1.5.2 Case # 3 –Superwoman

"My computer is my first resource for everything"

Superwoman was a sales assistant and junior loan officer within the E-unit, a position she had occupied for two years. Superwoman had been at HomeLender for six years and had occupied positions such as that of receptionist, processor and underwriter before being promoted to her current position. As junior loan officer, she provided sales support to the vice president of sales, Top Gun, by meeting with customers, originating

loans and ensuring expeditious processing of customer mortgage loan files. Because she touched every customer file, her effectiveness was measured through a point of sale (POS) quality score, which was a measure of deficiencies or missing information in a customer file. Her POS score for 2003 was 3.5 percent, which meant that only 3.5 percent of information within files processed by her was inaccurate or missing. The average for the organization was 15 percent. Superwoman considered herself to be highly effective and one of the top performers in the position she held.

Superwoman was issued a laptop with wireless capability that she used at the alliances, although she did not connect to hotspots. Her personal mobile device was a cell phone. She traveled to the alliances approximately three times per week. Though a career woman, Superwoman was also a busy wife and mother of two children. Her agentic dilemma was the challenge of balancing her career and family life.

Superwoman engaged in several practices indicative of the practical evaluative element of human agency. Superwoman also used a composition book but ended the practice when she became a junior loan officer. Like most other HomeLender employees, she had used the book as a phone log. However, when she became involved in loan origination she found the use of the book unnecessary because the gap was filled through direct entry of applicants' details into LoanSoft, and through use of the customer timeline form, which captured the supplementary information which LoanSoft could not accommodate. Superwoman and Top Gun were the only ones who used the customer line form.

> "Well I used it when I was processing and I got a lot more phone calls from borrowers and everything. Then I used it at that point to keep up with whom I had talked to. But most of the phone calls go to Top Gun now. Usually it's me making the phone calls and not somebody calling me. So I don't really have to have one of those. I used it as a phone log and not as note taking. I am not a note taker. I don't do that. I don't like to."

To cope with the challenges of her business and personal life, Superwoman multitasked across a wide range of personal and work activities through use of her mobile devices. This was manifested in how her use of company email was expanded to include not only business associates but also those involved in her personal life. Folders for contacts in her business email were next to folders for personal contacts. It was not uncommon for her to read and send work-related email from home before coming to work, claiming that it made things less stressful when she arrived at work.

> "I could wait until I get here. Top Gun would not expect me to be online at 6:00 in the morning although we were emailing back and forth. But if I wasn't online and checked my email then I would have a lot more to do when I got here."

Because of time constraints, most of her personal business was handled online and it was not uncommon for her to switch between personal and business tasks within the same temporal and spatial dimensions. One novel use of email was the purchase of a pet for her children. Traditionally, this task would have required a visit to a pet shop or to the seller of the pet. In her case, the seller of the pet was a work associate in another location who emailed pictures of pets so that a selection could be made. This removed the need to physically go to the pet store to select the pet. Thus for Superwoman the location of herself, goods, services, customers, family and friends was irrelevant.

> "And I asked her to get me a kitty for my kids for Christmas and she picked it out and said here are your pictures. I mean that's kind of different but cool. And we arranged the whole thing by email. This has nothing to do with work. "

In the past, Superwoman communicated with family and friends by phone, but with her demanding work schedule and high mobility, she found it less time consuming to communicate with family, friends and her children's teachers by email during the day. Email became her preferred mode of communication.

> "During the day I email my children's teachers, I email my parents, aunts and uncles. That's basically the way I talk, through email, because I don't have time to talk on the phone a lot. I email out my son's baseball schedule. I email it to everybody who wants to come so I don't have to sit down and call every single one of them. We communicate about the holidays where we are going to meet and when and what we need to bring. It is all done via email."

Even though personal and work tasks were intertwined there was still an attempt to separate work and personal activity by dedicating certain devices to certain types of tasks. As such the major modes of communication with business associates were through email and the office phone. The cell phone was reserved for personal calls or for communicating with Top Gun and Executrix.

> "I don't want them always calling me on my cell phone. I want all of my borrowers to call me here (office phone) just to keep it all in one place. Because if you are in the car, driving down the road and a borrower calls, then there you are, trying to take notes on a piece of paper, with your kids screaming in the back seat."

Viewing Superwoman's goals and objectives through the projective element, reveals how her future use of the nomadic computing environment could evolve. Superwoman

did not intend to acquire a PDA to access email while mobile, as she thought it would make her life more complicated. Even though there was a desire to accomplish more things in less time, there was also the need to control the flow of information in terms of how, where and when and to keep the flow manageable.

> "I mean like I don't have the Blackberry thing [PDA]. This [the laptop] is enough. This is simple. This is easy. Everything is in one place. And I think this is just enough for me. I just don't want to get that complex. Just too much gets overwhelming I think. I am sitting down at my computer, answering all my emails. That's enough. I wouldn't want to be working at them all day long."

Six months later, changes to Superwoman's practices were minimal. A mandatory adoption of a new version of LoanSoft resulted in the elimination of the customer timeline form which was used to capture supplementary information about the customer and had previously replaced the composition book. This was made possible by the inclusion of a comments field in the customer file. Thus it was no longer necessary for Top Gun and Superwoman to carry blank forms while mobile as the supplementary information could now be entered and accessed through the LoanSoft system via their laptops while they were traveling.

> "The number one improvement is the comments section because being able to put comments in will make the work we do more effective. Like right now if we are on the phone with the borrower we can go in and type notes in the loan and then you can email the notes and it's never gone from the loan -- It's there forever, not just on a piece of paper that's going to get thrown away."

The decision to change their practices by eliminating the use of the customer timeline form was the result of a discussion between Top Gun and Superwoman during

the training session for the new upgrade of the system where they rendered the form unnecessary.

Top Gun had also discussed his acquisition of the aircard with Superwoman and she expressed the desire to acquire one. This he promised to do on her behalf by placing a request through the IT department.

> "I want one of those because if you go on vacation you can email somebody from the car. And it's supposed to be really easier. If it's really easier and really simple then I am all into that. Like when I go on vacation or something I can't read and access all my emails and get all my stuff done. If I can be emailing from the car, while my husband is driving we can reach [the vacation spot] 3 hours sooner."

The desire to acquire the aircard so that email could be read and accessed in her car indicated a change in her attitudes towards the practice of using email while mobile. Previously, Superwoman expressed reluctance in acquiring the Blackberry device as it would intensify her daily routines by making her always accessible by email while mobile, and also would introduce another communication channel to monitor. The use of email while mobile, was viewed at that time as possibly reducing her productivity. Over time, as a result of dialogue with Top Gun, she saw the possibility to increase productivity by adding functionality to a device that was already in use by acquiring the aircard. The projected practice in this instance was conceived as being useful during personal dead time so that the transition from business to personal life could be more easily effected. And so her perspective towards future acquisitions and practices changed due in part to social influences.

Superwoman was faced with the challenge of balancing her career and family life. There was a tendency to use technology aggressively to carry out both business and

personal activities within the same temporal and spatial spheres so as to achieve this balance. Traditional practices were replaced or modified as long as the end result contributed positively to the balancing act. The acquisition of new technology and upgrades were contemplated but only if the balance could be maintained.

5.2 Theoretical Replication – Three Diverse Cases

The three cases presented in this section include a customer service engineer employed by a manufacturer of automotive parts; a self employed, certified IT Trainer; and an IT sales territory manager and client services representative employed by a major IT services vendor. These three cases facilitate theoretical replication because the nomadic computing users have different backgrounds, come from different organizations, and have different technical environments than those involved in the literal replication. Two retrospective cases and one longitudinal case are presented.

5.2.1 Retrospective Cases

5.2.1.1 Case # 4 – Mr. Security Issues

> "If you are revealing sensitive information not only would you be fired, you would be sued."

Mr. Security Issues was a customer support engineer employed by the Quality Control Division of Quality Parts (a pseudonym), a manufacturer of automotive parts. His customers consisted of six automotive original equipment manufacturers (OEM) and approximately 200 motor vehicle dealerships in the southeastern United States. He experienced a high level of mobility as he frequently visited these manufacturing plants and dealerships to rectify problems. His area of expertise was in safety systems such as

airbags, steering wheels and brake systems. His responsibility was to communicate problems being experienced by customers in their assembly lines to Quality Parts so that they could be rectified. Mr. Security Issues had been employed by Quality Parts for 14 years. For the first seven years he served as a test engineer and was not required to travel. He served in his current position for the past 7 years. He was married and had no children.

As customer service engineer, one important function was the ability to accurately communicate the nature of problems being experienced with parts or assembly lines to relevant parties at Quality Parts and to affected customers. This was usually done by phone or by creating a report, supplemented with photographs of the failed parts or faulty assembly lines.

When Mr. Security Issues first started off as a customer support engineer, his mobile tools consisted of a pager and calling cards so that he could use pay phones to return calls while on the road. Conventional cameras were used with the disadvantage of having to wait for the film to be processed before photographs of failed parts or faulty assembly lines could be viewed and sent through the postal service to parties concerned. Multiple users shared laptops, and local area networks were inefficient and unreliable. It was easier to share information by copying files to a diskette than by transmitting it over a network. As such he could only support one customer and four locations.

More recently Mr. Security Issues became an intensive user of nine mobile devices, which he carried with him. These included a laptop, two cellular phones, a pager, two two-way radios (walkie talkies), a CB radio, a digital camera and a video camera. He also carried testing devices such as multimeters and stethoscopes. His laptop was wireless

enabled but because of client confidentiality requirements, he could not connect to public wireless networks such as hotspots at the risk of disclosing top-secret design information. His cellular phone was used to connect to the Internet using proprietary equipment to secure data transmission by providing encryption of the data being sent. All applications used were web enabled. Training was received through an annual meeting of all the customer support engineers employed by Quality Parts in the U.S. This was a forum to deploy new devices, install new applications, conduct formal training, network and share ideas.

As a teleworker, Mr. Security Issues' office base was at the assembly plant of his primary customer, from which he serviced other customers. He also had a home office.

Viewing his practices through the practical evaluative element of human agency, we see that Mr. Security Issues is faced with serving a high volume of customers who are all competitors. This requires that each customer's design information not be revealed to the competition. Thus his agency dilemma concerned communicating with multiple competing customers while maintaining the confidentiality of the information belonging to each competitor. This had to be accomplished while visiting multiple customer locations.

The need to maintain security and confidentiality of information resulted in the use of multiple devices of the same type even though the level of convergence available could easily support a reduction of the number of devices required. Some customers issued their own communication devices and refused to communicate using any other medium. The availability of multiple devices, however, resulted in the novel practice of multitasking while moving.

> "I could program one of my work phones for two different lines but they want us to be able to compute and talk on the phone at the same time. Sometimes they would say we want you to get two people on that phone. And then they say we want you to get two people on the other phone. And as you work, as you get an answer from one phone, you pass it on to the other one."

One disadvantage of having multiple devices was the inability to walk with them easily around a customer's site. Mr. Security Issues thus devised a mechanism to transport the devices easily by wearing a coat with multiple pockets, where each pocket was dedicated to a specific device.

> "You get to that point where your belt is bent over because you are hanging everything everywhere. So I wear coats when I don't need to because it's just so much easier to have the extra pockets. In each of the pockets I have a specific device. And that becomes a problem in the summer because it is getting warm now. So when the coat goes, well generally things on my belt get heavier. When you walk and you jingle, there are so many annoying things about technology."

Having to transport multiple devices while traveling between customer sites, also had an impact on the chosen mode of transportation. After the 9/11 terrorist event and the tightening of airport security, Quality Parts initiated an effort to avoid air travel as much as possible by reducing the geographical area within which customers would be serviced, allowing the area to be traversed easily by car.

> "It's really inconvenient going through flights. They will not let me walk through the airport with all those devices. They make you check them. And if I check those devices they get broken. You just don't want to do that. It's easier to drive. So what they have done is they have limited our travel area to what's reasonable to do in a car."

As a consequence, motor vehicles were reconfigured in innovative ways to transform them into places of work. However, neither Mr. Security Issues nor the organization owned the motor vehicles used. Motor vehicles were rented to visit customer sites. The type of motor vehicle rented depended on two main factors. Firstly, it had to have the capacity to be easily transformed into a mobile office by having multiple power outlets and a large console.

> "When I rent a car I don't rent one that's not useful to me as an office. I like trucks. Trucks tend to have big center consoles that fold down in the middle of the seat -- The last truck I rented had 4 power outlets in it. I plugged in my phone. I plugged in my laptop. I plugged in my CB radio. All those things were going at once. If a car did not have multiple power outlets it's not useful. I need to be able to set stuff up so I can see things while I am going some place. Or if I pull over I want a comfortable position to work from."

Secondly, it had to be either manufactured by the customer being visited or of a type and model which did not compete with cars they manufactured.

> "If you show up at a customer site, you had better be in a vehicle that is not competitive with them."

Practices were also instituted to facilitate work while driving.

> "You put the laptop on the passenger's seat. And it's kind of best if you fix it across the console so that if you hit bumps and stuff it doesn't wobble or anything. And as things were taking place, if there is input needed from me periodically I would look down and enter that information. If I am sitting at a red light I start to download. I attach that item to an email. I hit send. While I was working I may have been on the phone with somebody else or I may not. When the light turns green I start driving."

A PDA was thought to be unsuitable under those circumstances, as it did not have the capacity to handle high-resolution photographs.

While contributing to effectiveness, the ability to multitask while moving sometimes proved overwhelming. This occurred especially when different customers tried to communicate with Mr. Security Issues at the same time. Because all these events were critical, they had to be processed as they occurred.

> "For example on this whole trip there was a problem in five different assembly plants. So there were an awful lot of phone meetings and conference calls. I am behind the wheel trying to pay attention to this conference call trying to avoid that truck. And I am multitasking with multiple customers. So what do I do? Do I stop and tell my first customer that I can't talk? He would be very angry."

The high level of multitasking sometimes created the need to stop the car and work. However this made trips longer and more frustrating.

> "I stopped two or three times because these conference calls were getting to the point where I could not concentrate and avoid climbing underneath the truck. So we have a 15-hour trip. Stops are a penalty because that 15-hour trip got extended by 30 minutes when I sat in that gas station parking lot on the phone. Two hours later, we stop for 45 minutes because of these calls. So now 15 is now 16. At the end of 17 hours I don't care who is calling, I am not a fun guy to deal with. So it turned out to be an extremely long day. A day that started at 4:00 in the morning and ended at 1:00 in the morning. Then I had to get up at 6:00 that next morning and keep going."

Having multiple customers also necessitated the use of eleven business email accounts so as to preserve the confidentiality of information as well as to give the perception that he served primarily the customer being visited. Even though there were six main OEMs, eleven accounts were required in order to communicate at different levels of security and encryption. For instance, highly confidential email messages were

encrypted and sent through specific email accounts and only those recipients, authorized to decrypt these messages were able to read them.

> "I need an email account for each customer. Because Customer X doesn't want people sharing their account. Customer X does not want to be sending me information when there is a guy from Customer Y that could be standing behind me while I am at their facility. To eliminate that, when I open up my computer, the only thing they see is the guy that works for Customer Y helping Customer Y to solve problems. They don't see anything from their major competitor."

In addition to his eleven corporate accounts, Mr. Security Issues also had five personal accounts. He attempted to separate personal communication from business communication.

> "I use one strictly for family. Some accounts I use when I am surfing for general things online and if you fill out a form at a website to receive email and you get a thousand different junk mail in that account. Some of them I use exclusively for school."

The preferred mode of communication of design and assembly problems was by phone because of its synchronous nature, and because departmental norms dictated that email be used only under circumstances where documentation of the problem became necessary. The use of email to transmit information otherwise was viewed as inappropriate.

> "If I have to resort to email, somebody screwed up some place because I am documenting this formally for the world to see. I have to be really careful about what I email because that documentation ends up on an Intranet and is accessible by all different sorts of people. So I first contact people by phone and I might ask if they want me to send a picture. But I am not really going to start emailing and putting in details unless I know it's a problem. So that when other people come across it they will know, well this is not just information or an inquiry, this is an issue."

However, the use of the business email account by some of his business associates for transmitting non-business communication such as jokes was sometimes viewed as being inappropriate.

> "They don't treat email the same way we do. So when they send me jokes, they don't recognize that my entire joke file is open to my boss and everybody else in the quality department. Because everything you send me will be stored as a back up at headquarters. Guess what boys and girls, that is really interesting to know you like these kinds of jokes. You really should not be sending that. You have to be careful about that."

Mr. Security Issues was a known expert in his field and even though there were counterparts at Quality Parts who could fill in for him in his absence, there were areas of expertise they could not cover. He therefore made himself constantly accessible even when on vacation.

> "I handled nine calls from work driving home from Texas. There are other guys like me that handle other portions of Quality Parts' business. So when I go on vacation there I slide over my responsibilities and they take care of them for the most part. For some of my customers we can't do that. They just don't have the training for some of the products. So for the most part I just tell them I am out of the office today. I can't get back to you immediately but I will get on that first thing in the morning."

He described how he had to provide customer support while on vacation.

> "We had a problem related to a safety device, an airbag that happened in another plant. And they wanted to know if their plant was vulnerable. So what I had to do was to review the two designs to see if the same weakness was there as well as communicate back to my plant -- go test for this particular weakness. And then to report back and say okay, we are not vulnerable, and here is proof that we are not vulnerable. And it cost me a couple hours but it needed to be done."

However there were times when he disconnected himself in order to have dedicated personal time.

> "My father in law is sick. And when I go to visit him in the hospital I really don't care what you have to say to me. The phone is off. The phone will be sitting in the car and I might be in there for nine hours. But until I leave his side I don't have time for you or anybody else. That's his time. And when I am attending religious services, if you want to talk to me you will just have to wait. Some things just come first."

Even so, there were certain benefits to being able to work from home as it reduced the amount of time required to spend at his office base, especially after a long day on the road.

> "The nature of my business is that I travel. And I do things on the way home. So I will leave the plant at about 1:00 and I will go visit a couple of dealerships or something and now I have this information that needs to get out. Some of it I will send on the way. And if it's convenient not to go the plant that stuff gets done at my home office."

One job function was to perform investigations at customer sites in order to determine the reason for part failure, or accident investigations to determine liability for a motor vehicle accident. One novel practice was to use the voice mail on his cell phone as a voice recording device. This allowed him to record the responses of persons being interviewed during an investigation without being detected.

> "I use my phone to record conversations. I will call my voice mail and then I will put my phone down and we will have a conversation. Frequently I do accident investigations. And you have people who are just down right dishonest. And what they say in front of you is different from what they say to the police officer over there and we need to protect ourselves. And people don't look for cell phones. They don't care that you have something in your ear and you just sit down talking to them because people are used to seeing that now."

He also described how he personalized his laptop so as to prevent unauthorized access.

> "I personalize my desktop. For example I like to see a picture of my little niece anytime I turn my computer on. On the other hand I also like to hide things so that an average user wouldn't necessarily find something. If you tap on the left eye of my niece's picture you get a menu. And if you tap on the right eye you get into another process that I use for security. Because if I get into an accident and they haul me away in an ambulance to some hospital, if they open up my computer I only want them to get into the information that says general."

Mr. Security Issues found manipulating his devices in order to maintain the security and confidentiality of information inconvenient.

> "There are certain security problems in logging in to other people's networks, so we do our mobile computing through our phones. There is no question which server I am dialing into. But it's somewhat more inconvenient because now I got 12 different devices that I have to carry around and plug in and you have to do the hokey pokey and turn yourself around just to make all this stuff talk and work together."

The introduction of the nomadic computing environment also resulted in the transformation of past practices. One such practice was how the planning task evolved. In order to manage time, Mr. Security Issues had previously used the Franklin Covey Planner, a paper planning system used to increase personal and professional productivity by identifying values, setting goals, prioritizing tasks, and capturing important information. The Franklin Covey Planner was provided by the organization and its use was mandated. He replaced the planner when he was assigned his own laptop and began to use Outlook as a planning tool. The advantages of having access to Outlook via his

laptop while he traveled were described as faster access to information, ease of use and flexibility.

> "Think about the size of the Franklin Covey Planner. It will not fit in your pocket. If you lose it you lose everything. If I had an incident that happened 6 months ago, it's not going to fit in my Franklin. With my laptop it's going to be right there at my fingertips. It takes me seconds to get to that issue. So from that standpoint of versatility, the Franklin could not compete. From the perspective of size and bulk it's terribly annoying"

Being able to communicate clearly the nature of customers' problems was critical. Photographs were often used to aid in problem description. Thus the digital camera was an important mobile device. He described how the use of a digital camera made him more efficient as compared to previous practices of scanning in pictures taken by a conventional camera.

> "One of the things that I use probably every day is a digital camera. And as a communications device it enables me to save words. Instead of me trying to describe the problem it's much easier for me to send them a picture or a video in certain cases."

He described how the practice used to take place in the past.

> "You took a picture and you had your picture developed. You put it on a scanner and then you took that magnetic picture and you sent it to the people you needed to send it to. So it was kind of complicated to get things done. It was better than doing it manually. It saved time but it was tedious. Now, it's second nature. What used to take me days takes literally minutes."

Viewing Mr. Security Issues' practices through the iterational element of human agency shows that there was a reliance on older technology to facilitate continued access

to him in areas where their use was still prevalent. For example, Mr. Security Issues still used a pager in the event that he could not be reached by mobile phone or two-way radio.

> "There are places where cell phones still cannot communicate but there are dealerships there and you got to go. If I cannot be contacted by phone, they will page me.

The two-way and CB radios were also technologies that existed before the advent of mobile technologies such as the cellular phone and laptop. The use of these devices persisted because they were still considered to be more instantaneous and secure means of communication.

> "In the plant environment or inside of a closed system, the walkie talkies provide encrypted communication at an instant, and are much cheaper than going through expensive cell phone encryption. So if I am a mile away on the other side of the plant, somebody can call me up and tell me I need you right now without having to access a phone number or having to access me using the regular cell phone which can be eavesdropped on by your competition. So those walkie talkies are essential. And unfortunately technology hasn't quite caught up with them but they are going to stick because of the encryption stuff. "

Of interest was how Mr. Security Issues resorted to past practices when the IT department phased out the PDA because it was found to be inadequate. Mr. Security Issues had become accustomed to using the PDA to record notes, and when it was removed he reverted to a prior practice of writing quick notes on the palm of his hand.

> "I was using one of the earlier generation PDAs and they really didn't have enough memory to support our activities. We pretty much had to choose what you would save on it versus saving everything on it. It really wasn't effective for the type of communicating that I did. The wireless function was slower than 56K so you didn't want to do anything other than text messaging on it. When they took it away I started to write on my hands. I just wanted to write things down quickly and move on."

After a while he began to make the notes on flash cards instead of his hands. The cards were easily stored and retrieved from his wallet and could be scanned into his computer or shredded when no longer needed.

With respect to the projective element, Mr. Security Issues' intentions to upgrade and acquire new technology were dictated by the organization and modified by his demand for secure communications. One new device being contemplated by the organization was the camera phone which combined the functionality of a cellular phone with a camera. This would take advantage of the convergence of devices and reduce the number of devices engineers had to carry. However Mr. Security Issues expressed doubt as to whether this was a feasible option because some customers did not allow the use of cameras within their facility. If the devices were converged, this rule would leave him not only without a camera but also without a phone.

> "A camera phone may not be the best thing. If you go in the Customer X facility with a camera, not only will they confiscate everything on your person. They can also send you to jail. Their policy is very strict."

The organization was also contemplating the introduction of Tablet PCs with built in camera functionality. However Mr. Security Issues doubted that he would adopt the Tablet PC. The use of jargon, codes and acronyms was prevalent within the quality department and misreading a letter could change the entire meaning of a sentence. Thus handwriting had to be legible and handwriting recognition had to be accurate. It was preferable to type so as to prevent misunderstandings.

However he could see himself acquiring an integrated phone and PDA in the near future onto which he could transfer the customer relationship management system which currently resided on his laptop. Remembering the names and responsibilities of his numerous contacts was difficult and this would help him to load pictures of contacts so that he could easily associate names with faces.

> "Well one of the problems is that I don't have all the pictures of these individuals in my laptop. It's much easier if I could put that in a PDA that's attached to my phone. You know I could keep it open and as I go through my numbers list, I see the names and the pictures pop up. And that saves me time. Time is of the essence to me. So I might consider a PDA if it has enough memory to stay on the road with me."

Mr. Security Issues' agentic dilemma was the need to service multiple customers who were all competitors while maintaining the confidentiality of their information. Consequently there was a high level of security required in technology use. This resulted in the tendency to have multiple devices with the same functionality. There was also a tendency to cling to the past by using older, more secure forms of technology. Because of the high level of security required in technology use, upgrades and acquisitions were governed by the organization though their projected use was modified by how well they could serve his demands.

5.2.1.2 Case # 5 – Mr. Gadget

> "If I am in business class on the jet, I am the guy with two computers connected to each other. I am as gadgeted out as one can get. People think it's kind of cool."

Mr. Gadget was a self employed, independent IT consultant who provided IT services and Microsoft certified training to organizations. He was a very successful

trainer and in 2004 was ranked as one of Microsoft's top certified trainers. Mr. Gadget was highly mobile, traveling 90 percent of the time nationwide, to carry out training at various organizations. He was an intensive user of mobile devices and traveled with at least two laptops: one personal and the other for professional activities. Other devices included a PDA, a cell phone and a satellite aircard. He also sometimes traveled with fifteen laptops which he used at customer sites to set up a mobile computer classroom.

As an independent consultant, Mr. Gadget had a home office equipped with twelve desktop computers to support accounting and business administration, cell phone messaging and email, and the technical activities required for training such as software installation, making DVDs and CDs, desktop publishing and the download and storage of course material.

The Microsoft training community was a close knit virtual community where trainers could form close relationships and collaborate through a private virtual meeting place on the Internet. Thus business associates were also friends. Training jobs were procured by bidding for assignments broadcast to this training community.

In his mid-forties, Mr. Gadget was formerly a musician for over 20 years and had been a Microsoft certified trainer for only 5 years. As a musician, he had used a laptop and a cell phone. He had also had a website with his contact information and a calendar used to book engagements. These practices were carried over into his profession as a trainer.

In his personal life Mr. Gadget was engaged to be married and a single father of an adult son.

Viewing his practices through the practical evaluative element, he acquired and used devices for business rather than for pleasurable activities, even though the devices were used for both business and pleasure.

As an independent consultant who was often located away from business associates, family and friends, being constantly in contact was extremely important and so he made himself accessible through his cell phone.

> "My cell phone, I don't think it ever goes off. I use it as my personal phone. In the house I make my outgoing calls using my land based phones. But all the phones forward to my cell phone. That way I don't miss a message, I don't miss a call. I am depended on by my clients, by my family. And it just makes me reliable to be accessible and I try to make myself as accessible as possible to everyone."

Instant messaging and email were also viewed as useful business and social tools. In the classroom it allowed him to communicate with those in his personal life in a non-intrusive way. Thus, communications of this nature were welcome and not viewed as interruptions, especially when he was located apart from loved ones for extended periods. This resulted in business and personal activities sharing the same time and space.

> "On a personal level my fiancé and I have access to each other almost 24/7 if I am online and she is online at work. It's very convenient especially being away so much. I could be in a middle of a lecture and up would come a question [from her] and I would just make note of it so that at the next opportunity I can respond to it. I don't consider them interruptions. I consider them part of normal communications."

Though he preferred synchronous forms of communication such as phone or instant messaging, asynchronous forms of communication such as email were found to be useful when establishing direct contact with parties was difficult. Instant messaging and email

were also viewed as good ways to make social engagements with business associates while traveling.

> ”We instant message each other and we enter newsgroups as well. For instance, someone might announce that they are in New York for the week of such and such and we will arrange a get together because they are in New York. Or wherever I am, we will arrange a get together for whichever trainers would like to at that particular city. So we use it as a business and social tool.”

As a self employed professional who worked from home and used the nomadic computing environment for both business and pleasure, Mr. Gadget had difficulty creating dedicated personal time. However, he found ways to spend personal time in conjunction with business travel.

> “I took a course in Germany. Spent a week, more than a week, maybe 10 days in Europe recently. Just to get away from the teaching, teaching, teaching. I did not do any work while I was there.”

However, Mr. Gadget was uncomfortable when uncontrollable disconnection from Internet and cellular services occurred, making it difficult to keep in contact with business and personal associates. This typically occurred when traveling to a foreign country or to areas where access to Internet or cellular services was problematic.

> “I was helpless for the most part. I did not have access. I felt a little cut off. During the course I did have some access. So I was able to email and check on things at home and do 10 or 15 minutes of instant messaging back home. But for the most part I was disconnected from all my tools and I had a little bit of withdrawal. I am used to being connected.”

Mr. Gadget usually made his travel plans so as to make dead time as productive as possible. When traveling to destinations that could be reached by car, he would sometimes take the train so that he could be free to work. Being on the train gave him the capability to access the Internet by using his aircard, as well as to make and take phone calls. In addition to increased productivity, it was less stressful than driving.

> "Just this week I opted to take a train from New York to Vermont and the train back from Vermont to New York just so that I can have the hours on the train to do work rather than drive. I prepared images for a class that I will be teaching. They are virtual images. It's a whole long drawn out procedure and I needed time to do that and with my hectic schedule there is very little down time. So I chose to ride the train rather than drive and have 6 hours of dead time. I took the train so I could utilize those hours. And I found myself more relaxed as well."

Being able to continue work as long as possible during dead time was also important. One practice was to make use of publicly accessible power outlets so as to preserve the longevity of the power sources of mobile devices.

> "When I sat down here at the station, almost by instinct I gravitated towards the area where there were outlets so I could plug in [the mobile devices] if I had to. Having to locate a power outlet is such a big disadvantage because of the disparate systems that we have available out there. There is no one almighty power source that you can port from one to the other. So everybody has their own power supply. Everybody has their own adaptor, everyone has their own gadget to work with their gadget, and that creates bulk in mobility."

In addition to being accessible, access to remote resources such as accounting applications located in his home office was critical. This allowed him to maximize his productivity while on the road by continuing the administration of his business.

> "If I have access I might be doing some book keeping by remote access to my computer at home. My daily execution of my business activities doesn't stop because I am on the road. All the programs I am running on my computer at the home office I can run remotely -- With remote access to my home computers it makes life easier. I don't have to be a victim of being stuck out on the road. I can take advantage of my downtime."

The Delorme application loaded on his laptop, which was used for finding the closest location of services, was important especially during an emergency. One incident involved repairing a lock on a damaged case carrying laptops to a training site.

> "Recently I flew out of New York to Seattle with two cases of laptops. When I got to Seattle one of the cases was damaged. I went in my mapping program and looked for a locksmith. I put it [the laptop] on the dashboard of the car and it turns green when it finds all the satellites and finds where I am. And then I just follow the line on the map. So that's how I find my location. It's very convenient. I don't have to ask directions. I don't have to get lost."

One important device was his PDA which had wireless access to the Internet. The PDA was useful for quick reference to his schedules and for setting reminders for appointments. However the PDA was not useful for accessing office documents in Excel and Word as the user interface was too small to navigate large documents easily. His laptop was found to be more useful for office applications.

> "I don't use the PDA for Word and for Excel It's just kind of cumbersome. I can see a whole spreadsheet on the laptop. I can't see a whole spreadsheet on the PDA. It's cumbersome going left and right. I don't have one of those little typewriter things. If I am going to do that I might as well just pull out the laptop.

Viewing Mr. Gadget's practices through the iterational element, we see that his past experiences influenced many of his current practices. The practice of always being

accessible was influenced by incidents in his prior profession as a musician and in his personal life as a single parent who needed to be in contact with his son while away at work.

> "Very early on when cell phones were very expensive, I got my first cell phone for personal reasons. I was a single parent and I was raising my son alone, and being a performer at night he needed accessibility to me. And I made sure that he could find me at any given point. He could press one button on the phone and I would answer on the other side."

The practice of having a website with all his available information was also derived from his prior profession as a musician. He also had an online calendar through which musical engagements could be booked. When he made the transition to a Microsoft Trainer, the website and calendar were modified to reflect his new profession.

> "I first started to use email, I believe it was for business use for my music business. I wanted to be accessible. So I put up a website and I put up an email for people to be able to contact me and booked my music engagements through email. I put up my calendar so that everyone can see when I am available and they can kind of prejudge whether or not they should ask me for a particular date."

In reference to the projective element, Mr. Gadget tended to acquire the latest technology as long as it was useful and affordable. However even though technology may be available and affordable, the final decision to purchase and upgrade depended on how useful the device would be for him. One device that he did not intend to acquire was the camera phone.

> “I don't have need for a camera phone. The camera that's in the camera phone is not as high quality as a camera. So I would get a camera for shooting pictures rather than a camera phone. And why spend the differential for having a digital camera inside of a phone even though you send it to another phone? It's cool that you can do it but what's the practical use of it? I would rather send a nice picture and send it to them by email.”

Mr. Gadget had very few intentions to acquire new technology. However because of his busy schedule where he was constantly traveling for work, he intended to acquire a health monitor.

> “Well there is something that I want to do because of my travel and all. I am a little more health conscious lately and I want to monitor my heart rate and all that. So I might get a gadget like a watch that monitors my heart rate as well as tell time with a little alarm. When it's time to take some vitamins or drink another pint of water or whatever.”

Mr. Gadget looked forward to the time when the seamless integration of information, networks and power supplies across devices could be achieved so that carrying devices would be easier.

> “Integration of devices, integration of information topologies, integration so that information from one device can be integrated into the information of the other. The topologies are similar, the electronics are similar, power supplies. They can all be powered through one thing. Less to carry. Interoperability and integration would certainly be very important to me.”

Mr. Gadget was an independent consultant who depended on being highly accessible to carry out business. As such, he willingly acquired the latest in technology geared towards business use as long as it was useful and affordable. However the use of technology was not seen as a pleasurable activity, and there was a tendency to give the acquisition of devices geared towards entertainment and pleasure low priority. His past

practices derived from his prior profession were updated using the latest tools to make them relevant to the present. So the past clearly had an influence on his present practices.

5.2.2 Longitudinal Case

5.2.2.1 Case # 6 – Young Gun

"If using technology is not going to make your job easier then I am not going to use it."

Young Gun was a sales territory manager and client services representative employed by IT Corp (a pseudonym), one of the top IT services companies in the world. He had responsibility for a specific customer segment within five southeastern states in the United States. Consequently he spent 50 percent of his time traveling to customers' locations. His job function was to understand business issues faced by customers and to recommend IT solutions. The development of the solution typically required input from a number of sales specialists who focused on different parts of the solution, and Young Gun's responsibilities included coordinating the activity of the sales specialists.

Young Gun was a teleworker who did not have a local office base and operated out of his home office, which was equipped by the organization with a photocopier, fax machine, printer and laptop with DSL access. His personal devices included a PDA and a cell phone. All equipment provided was mailed to him and training was web based. All applications were web enabled, facilitating their use once access to the Internet could be established.

Young Gun was unmarried with no children. He was very close to his immediate family which consisted of his parents, a brother and a sister in law.

Young Gun considered himself to be highly effective. He was in his mid twenties and had a B.S. degree in Business Administration. He had been in the position of sales territory manager and client sales representative for three years. He was in a position normally reserved for more experienced professionals with MBAs. His performance was outstanding, having exceeded 100 percent of his sales quota in the past year.

Viewing Young Gun's practices through the practical evaluative element of human agency reveals his engagement in several novel practices designed to make him as productive as possible, by using technology features that he thought were useful. Often he did not exploit the full functionality of technology available as he felt they were either unnecessary or unfriendly.

Seeing that being in constant contact with customers and business associates was critical, Young Gun tried to make himself as accessible as possible to them by making himself available around the clock.

> "I always make a point to tell my customers whenever 24 hours 7 days a week 365 days a year – 366 -- it doesn't matter. They can always get hold of me. So I use my mobile phone, my laptop, my regular phone and my PDA."

Though Young Gun came from a technology-driven organization that could provide him with wireless access if needed, he did not see the need to use a wireless modem and hotspots. He felt that waiting to get to a location where he could plug into a network was adequate as, in the event of an emergency, he could be reached by phone.

> "I will wait until I get to a hotel or an IT Corp office and check email. I use my cell phone which is like an extension of me. If somebody needs me they will call me on my cell phone. I have never had a problem in finding a phone line, an ISP or an Internet cable to get my information."

One way to get around the lack of access to the Internet while traveling was to depend on team members who were always willing to send email on his behalf.

> "And the great thing is it is very team oriented. If I have a critical situation, if somebody sent me something or if I need to send somebody something, 8 times out of 10 times that document or email is going to be in the hands of another one of my team mates. So if in a pinch if I can't send it to a customer, I can call Girl Friday[5] and say "can you send this to such and such?"

The mobile phone was his primary mode of communication because it supported synchronous communication. It was also a more personal form of communication and enabled him to sense the meaning behind what the speaker on the other end of the line was saying, and to use persuasive tactics in order to seal a deal. In his opinion, it was the next best thing to being face to face.

> "I do most of my work over the phone anyway. It's not just that I don't like email. Email is very quick. And I much would rather use email than write a letter. But in order to get an idea across I really need to hear the person's voice at the very minimum. And be able to talk things through. And email is great but there still is that delay in terms of the response."

One novel use of his cell phone was to use it as a recording device to leave messages for himself. This he did when walking and unable to access his PDA or his composition notebook to write.

> “I have left messages for myself on my cell phone to remind me where I park. Every time I go on a trip I will say, “Young Gun, how are you doing? You parked in 21H, second level, today is today's date. Have a good trip”. I am usually in a rush. I am usually walking so I can't write it down.”

Customer opportunities were managed through a customer relationship management system known as Siebel. Siebel was disliked by the sales force because it had more detail than was useful, and required knowledge of SQL in order to retrieve information. Although Young Gun found it extremely difficult to use, he devised a method whereby a remotely located associate could help him to use the application when he was away from his colleagues, either at his home office or on the road. He admitted that the introduction of Siebel made him less effective.

> “With Siebel I have to go figure out how to write this query and that query. That's database talk, and I am not a database person. If I don't have time, I'll ask Girl Friday to put it in for me.”

The PDA was one of Young Gun’s most important tools, and he used it for scheduling, maintaining contact information, and storing Word, Excel and PowerPoint documents. This enabled quick access to these documents in meetings and other settings. He synchronized the contact information in his PDA with the contact information in his laptop even though the PDA was a personal device. However, he did not synchronize the contact data in his PDA with the cell phone even though he attempted to keep the lists of numbers in both devices the same. The PDA was not wireless enabled.

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[5] Girl Friday was an administrative assistant at the corporate office.

> “This [the PDA] is definitely my most important tool because it has my calendar on it, it has got all my contacts. I know where I am going, when I am going, and what I am supposed to be doing when I get there. It’s basically like my own assistant. Certain files that I know I am going to need on the fly I put them there. If I am in a meeting and I know before hand that I am going to need to reference a certain document, I put it on my PDA.”

The PDA was important for alerting him on upcoming events. This was critical especially when he was on the road.

> “Any business meetings I have an alert for. I got to pick such and such up from the airport I have an alert for that. Because you get going in the day and if I don't have an alert sometimes I don't remember. Sometimes I will, but you are doing a whole bunch of stuff and you are really focused on whatever you are doing”

Even though the phone was his preferred means of communication, email and instant messaging were also important tools. The instant messaging tool was a proprietary tool known as Sametime, provided by the organization. He used it only to communicate with colleagues, as he preferred to speak directly with his customers. Though phone and email were used for both business and personal activities, Sametime was used only for business. Other instant messaging applications such as MSN and AOL were used to communicate with personal associates.

> “And we also have an instant messaging application as well which I use a lot too. It’s called Sametime. And I have got a whole bunch of people on here, actually all IT Corp colleagues. We also have an application where we can do instant messaging with customers but I don't set that up with any of my customers.”

However, he preferred the phone to email and instant messenger, because it was a more personal form of communication. In the absence of the ability to meet with

associates face to face, he perceived communicating by phone as a rich form of communication, where one could sense the meaning behind what was being said.

> "Typed words don't share emotions. You can't really figure out are they lying, are they telling the truth, is there something behind it, what is their incentive, what else are they doing while they are talking to you? You can't really get that. You can get some of that on the phone but you can get more of that in person. So I prefer to get the minimum by calling him or her. Ideally I would like to be there in person so that I can read the novel cues and all that kind of stuff to get the impression that I want."

Even though Young Gun preferred synchronous forms of communication he believed that email was useful when the recipient was in another time zone or when he had to perform work outside of business hours, or when he did not require an immediate response.

> "If it's two o'clock in the morning nobody is going to be in their office anyway, nobody is working except perhaps for me, I will send them an email. If I need to tell more than a couple of people the same thing I will send them an email. If I need some documents. If I need an answer it doesn't have to be right now. If I know they are out I will send an email. They can get it and respond. And some people just prefer email".

Even though he used certain tools in certain situations, Young Gun felt that one key to his success was how his mobile devices and applications gave him the ability to multitask.

> "I feel like I get a lot more done because I can be on a conference call while instant messaging somebody about another opportunity, and sending email or reading email about something else -- I love it. I feel so good about myself that I can be on a conference call and instant messaging somebody and talking about something else and sending an email."

However being a nomadic worker faced with multiple demands, all of which had to be addressed, sometimes proved to be overwhelming.

> "I feel rushed this morning simply because there is a lot of stuff to do. I am always multitasking. I try not to be talking on my cell phone and my home phone at the same time but that doesn't always happen because there are just so many different things that are going on. You always have to respond to customers when they want the response. So you try to juggle between what you have to do for work and what you need to do for customers."

Young Gun was very close to his immediate family and always made himself accessible to them even during the business day. Consequently, business and personal activities sometime shared the same time and space.

> "If my Dad calls or my brother calls or my Mom calls, I am going to pick up the phone. Only if I am in a meeting, it will be rude to pick up the phone and take calls but if I am in a meeting and I am kind of in the background and I can stay out of the way, I will. I may tell them I am in a meeting and let me call you back. But I am going to pick up the phone."

However, even though his office was at home, Young Gun attempted to create dedicated personal time, although he also allowed himself to be interrupted if he felt the need to communicate with him was urgent. Thus, access was maintained yet restricted during those self-imposed personal time periods.

> "Usually my lunch that's my time to watch West Wing. If it's an important call I'll take it. If it's not an important call, I won't take it. Like for example, today I was working with a customer and a couple of colleagues to try and get this quote out the door. And so they called around 12:00 clock and I picked up the phone because I wanted to make sure that it got out the door. But if it is nothing really pressing, then it can wait an hour until I have finished watching West Wing and eating."

Sometimes personal requirements intruded on the business day. However these were viewed favorably and were welcome as well needed breaks.

> "I feel that they are breaks rather than interruptions. You can't run 100 percent all day. I like occasionally to be able to handle some amount of personal business because a lot of personal business still happens between the hours of 8:00 and 5:00. So if it's [the personal interruption] during lunch or if it's during like a 5 minute break between conference calls or whatever I see it as, hey, I have a chance to get some personal stuff done too."

However the need to be accessible resulted in him prolonging his working day by leaving his interconnection constantly on till bedtime. This allowed him to respond to instant messages or email that were received after hours.

> "I always leave my laptop on so I am always connected until I go to sleep. But most people stop working between 5:30 and 10:00. So I can't really call anybody. Because a sales job is mostly talking and communication. And you need people to communicate. So once it hits like 5:30, 6:00, I leave my connection on. I might do some administrative stuff that I need to do. But I will sit down on my couch, I will eat dinner, I will watch television, or talk on my phone, whatever. I will still have my instant messenger up, so people who need to contact me immediately and are up that late they still can. But at 5:00 I pretty much shut down but I am still accessible. Just in case somebody needs to get a hold of me."

However sometimes he felt the need to disconnect himself and so he sometimes restricted access to himself.

> "Sometimes I just don't feel like talking. Sometimes I don't feel like doing anything. Sometimes, with sales it's a roller coaster. One day you will be up in a peak. The other day you will be down, you lost a deal or whatever. Customers aren't calling you back and you just feel like I don't want to deal with it. And I just won't pick it up and they will get a voice mail. And I'll just pick it up later in the day and if it's urgent I'll return the message. If it's not it will go till the next day when I feel like answering the phone and talking to somebody."

Even when he was on vacation and desiring not to work, Young Gun still wanted to be reachable and to be in control of whether he could be reached or not. He did not view unavoidable disconnection without access to Internet and cellular services, as a desirable situation. This typically happened when visiting a foreign country.

> "The ideal would be to have my cell phone working to where I can be contacted if I need to be contacted. As long as my cell phone is working, if somebody calls will I pick it up? Probably not. But at least I can check my voice mail. I can know that the person called. I can check to see ok, if you know, is it important? Can it wait till I get back? I can make that decision. So I am still in control as opposed to if I don't even have that option.
>
> I am still going to leave my laptop behind because it's still too much of an opportunity to work. Vacation is vacation. It is time to be away from work and since I work from home, I am never away from work. So I have to leave my laptop at home. But if I have my cell phone, I will feel more comfortable."

Viewing Young Gun's practices through the iterational element shows the tendency to cling to past practices. Young Gun's dislike of Siebel led to continued use of Lotus Notes which was Siebel's predecessor.

> "We used to use Notes which is our opportunity management database to keep track of key customers, our contacts, how big the opportunities are and the stages of the opportunity. We would put in a note about what is happening and what hasn't happened into that. We just migrated to Siebel which as I said is a more robust application. The tool that I use the most is the database in Lotus Notes."

Other ways Young Gun avoided using Siebel, was to use a composition notebook to keep track of discussions with customers and other client and sales specialists. Details of discussions included date, participants and subject. He carried the notebook with him when he needed to travel for work.

> "We will usually do a telephone conversation with the customer and as it gets more detailed and then we will go through more discussions. We keep track of our discussions. Some people keep track of discussions in Siebel. I just keep an email record and if there are telephone conversations I'll just put it in a notebook because it's just easier for me to read it."

Young Gun devised the work-arounds because of the inadequacy of Siebel. One alternative he contemplated was the use of the PDA, but the notebook was found to be easier to use and a backup in case of technology failure. Thus he used the composition notebook to facilitate business continuity.

> "I don't necessarily trust technology as much as others do simply because I had a terrible experience with my PDA a couple years back where I downloaded software, and it made my PDA crash and it erased all the information off my PDA. And then when I tried to get the backup copy off my laptop, it erased everything off of my laptop. You can't really lose with paper."

Viewing Young Gun's practices through the projective element, shows satisfaction with his work practices as they were, and very few intentions to acquire or upgrade to newer technology. He did not consider himself a good candidate for wireless access for his laptop or PDA.

> "I don't really have a need to get wireless [capability for the laptop or PDA]. It's available if I ask for it and if I had a real need I would get it. I have a couple colleagues who use it. But I don't really need it so I don't use it. And all IT Corp's laptops are wireless enabled, so if I wanted to I could. But I don't really use it."

He also did not consider himself a good candidate for the Tablet PC, as he thought that using the device would not result in an improvement in his productivity unless there

was an improvement in handwriting technology, to the extent that the ease of use would be similar to writing on paper.

> "With the Tablet PC you are writing on the screen and there is a little bit of delay. And I really don't like that. When I am in a hurry and I am writing stuff down that's annoying to me. Once it gets better to where I can write just like this on a tablet pc (demonstrates on notepad), I am good to go."

Though he did not see himself going wireless in the future he considered the use of the Blackberry as a possibility if provided by the organization. He did not feel that it would be a necessity but that it would be a nice toy.

> "I would not mind having a Blackberry, that would be kind of nice. But considering I get 50 million emails a day I don't know if that's the best thing to get. It would be nice to have but it would be another toy. I would be actually able to do email while I am sitting on the plane and actually send it to people and get a response back. Or if I am in a meeting and I need information that I don't have, I can email somebody and say, "please email me this." "

Six months later, I observed major changes in Young Gun's practices. Even though in the past he was adamant that he did not need wireless access while mobile, he had acquired a wireless network card. He acquired the wireless card because of several changes in the nature of work. Young Gun was now more mobile, being away on business for days at a time. With these changes, he now believed that work had also become more intense with several large potential sales opportunities on the horizon. Real time, online access to information while mobile had become very critical.

> “Lately I have been gone for 2 to 3 days at a time and haven't had connectivity, which is not all that good in my line of business. So right now I am installing a wireless card. As long as there is a wireless hotspot anywhere like in a coffee shop or anywhere I can catch on to a wireless signal, it should work.”

Young Gun described the defining moment when he decided to get the wireless network card.

> “There was an incident where I wanted to show my customers the way that IT Corp does business as far as how our intranet goes, and how our intranet is integrated with instant messaging capabilities, and web directory and things like that. And I couldn't do that because I couldn't connect to their network, and it would be easier for me to able to show stuff to my clients.”

At the time of this interview, Young Gun had not yet begun to use the wireless card intensively. However he had certain expectations as to how it would improve his productivity.

> “I expect to be able to one, be faster, to get to stuff quicker, especially when I am running to the airport, sitting there waiting for the plane to take off, or at a customer site. People can email me and get a response a whole lot quicker than if I wasn't connected wirelessly or had a mobile device. It allows me to do more in 24 hours than I could do before.”

Young Gun still had no intention to make his PDA wireless, as he had made the decision to use the PDA for planning and organization but not for communication. As such wireless access was not required. His current plan was to perform all other activities, including communication by using the laptop.

> “I have got the laptop wireless. I don't think I am going to need the PDA wireless. I am going to use my PDA for organization. Like my schedule, Outlook, for making notes, Word documents, Excel spreadsheets. The reason why I would want to have wireless on it is to be able to download my email and read my email. But if I can do it on my laptop I will be fine.”

However Young Gun could see some disadvantages to going wireless. He would be constantly available and would no longer have a reason not to be responsive to his business associates and customers.

> ”The fact that I have no excuse anymore especially with this wireless card, I have no excuse. Unless I am aboard a plane or I am in a place where I cannot get a wireless signal, I have no excuse not to be able to get contact with people and that's just the reality. It is a disadvantage but I mean you could see it as an advantage as well.”

Young Gun was an ambitious, young sales professional who was rising quickly through the ranks of his profession in an organization which was a major player in the IT services industry. He had the tendency to cling to traditional practices and tools that he found more comfortable and viewed as a more effective way of working. His decision to acquire and use new technology was not driven by the availability of the latest devices or tools but by what he believed would result in an increase in his productivity.

As shown in table 5, the other cases, Merlin, Boundary Enforcer, Nonchalant, Timenator and Technoholic, are not reported here because their patterns of use can be similarly explained through the nomadic computing environment framework. Where they would confirm or contradict a pattern, their practices will be elaborated upon in the discussion section.

CHAPTER 6

DISCUSSION

My inquiry into the experiences of nomadic computing users resulted in a greater understanding of *how* practices occurred across time, space and context, and *how* effectiveness was enabled. The nomadic computing environment framework developed prior to the conduct of the research, was a combination of the temporal theory of human agency (Emirbayer and Mische 1998) and mobility theory (Kakihara and Sorensen 2001). Combining these two theoretical perspectives allowed me to examine stakeholders' temporal, contextual and spatial experiences through a single theoretical lens. Not only was I able to examine users' practices through the temporal, spatial and contextual dimensions individually, but I was also able to investigate the impact of the interplay of these dimensions on their practices. I observed that the resulting practices though contradictory and diverse, enabled their effectiveness.

The temporal theory of agency (Emirbayer and Mische 1998) facilitated an explanation of nomadic computing users' practices by showing how use is influenced by stakeholders' past, present and future. The temporal dimension consists of the iterational, practical evaluative and projective elements (Emirbayer and Mische 1998). The iterational element is focused on past ways in which nomadic computing users engaged with the nomadic computing environment. Based on emerging events, nomadic computing users may decide to repeat a past pattern of use. The projective element is focused on the future. Based on current circumstances, nomadic computing users may contemplate ways in which they can engage with the nomadic computing environment,

by creating new forms of use, upgrading technology or acquiring new technology. The practical evaluative element is focused on the present. The practical evaluative element represents nomadic users' decision to engage in a particular pattern of use and the actual execution of the practice in the nomadic computing environment. Based on current situations, users may decide to reinvent a past practice or create a new practice based on past patterns of use or plans for the future, thus adjusting the past and the future to the present.

Users' practices in the nomadic computing environment are also informed by their multiple personas such as CEO, mother, wife or club president. The contextual dimension represents the various business and personal roles that nomadic computing users may play, and their engagement with the nomadic computing environment based on the demands placed on them by these various roles. At a specific point in time, a dominant role may be in force but the nomadic user may be called upon to play alternate roles based on an emerging event. Their use of the nomadic computing environment is therefore informed by these multiple social roles in force and how conflicting interests are resolved. This is consistent with the temporal theory of human agency (Emirbayer and Mische 1998), that stakeholders are embedded in multiple and overlapping contexts of action which influence their agency. Results from the study also build upon the temporal theory of human agency by showing that these multiple, overlapping contexts of action are a result of stakeholders' multiple business and personal identities.

Users' engagement with the nomadic computer environment is not only informed by how events transpired over time, or by their role in force, but also by their location when they engaged in a specific pattern of use. The spatial dimension of the nomadic

computing framework represents stakeholders' usage of the nomadic computing environment in different spaces. The nomadic computing user may be either at home, at the office or on the road at the time of their interaction with the nomadic computing environment.

The analysis through the spatial dimension extended the temporal theory of human agency (Emirbayer and Mische 1998) in two main ways. Firstly, it was observed that the use of nomadic computing technology permits the boundary between personal and work lives to be intermittently enforced and withdrawn within the same physical space.

Secondly, different spaces have various facilities to support nomadic computing practices, but also place constraints on how the environment can be used. This results in users manifesting specific practices which maximize the use of dead time, or facilitate multi-tasking and reconfiguration of space to support usage of the environment while mobile. These practices vary in intensity and complexity.

Considering the interplay of time, context and space also resulted in an extension of the temporal theory of human agency (Emirbayer and Mische 1998), and contributed to a better understanding of the diverse and contradictory practices that resulted in the effectiveness of nomadic computing users. Consistent with the temporal theory of human agency (Emirbayer and Mische 1998), an examination of the interplay between time, space and context uncovered the role of social forces such as intersubjectivity and reflexivity in stimulating the adoption of nomadic computing technologies.

Altogether these insights about time, space and context, in illustrating and extending the temporal theory of human agency (Emirbayer and Mische 1998), offer a rich, theoretical account of how practices emerged and the circumstances under which

nomadic computing users attained effectiveness. These insights are examined in greater depth in the following sections.

6.1 Insights from the Temporal Dimension of Human Agency

A temporal human agency perspective proposes that stakeholders' actions are influenced by their ability to recall the past, respond to the present and imagine the future (Emirbayer and Mische 1998). Because this research focused on how stakeholders' past, practices and future technology goals influenced their present usage of nomadic computing technology, the results illustrate the temporal theory of human agency (Emirbayer and Mische 1998).

The persistence of past practices is associated with the iterational element of human agency. Within the HomeLender group, diversity in practices occurred when some users chose to retain past practices while others chose to depart from those practices. Top Gun delegated the use of some features of Outlook to his secretary so that she could monitor his schedule while he was mobile. This use of technology is reflective of a traditional practice of secretaries monitoring their managers' schedules when it was in book form. Top Gun entered numbers on his cell phone from memory while traveling, appropriating the device in a manner similar to how landlines were used in the past. Though Rookie was the most sophisticated in terms of his technology use, he was the only user who continued to use the composition book as a phone log and a backup device, in the event of technology failure while mobile.

Outside of the HomeLender group, we also see diversity in practices all related to nomadic users' past experiences and their resolution of emergent events. Mr. Security Issues continued to use older technologies such as pagers, CB and two-way radios as he

perceived the devices as reliable and sometimes more secure communication mechanisms than newer devices such as cell phones and wireless networks. Mr. Gadget's use of a website, email and a web calendar in his prior profession as a musician had proved valuable in making him highly accessible. Consequently, he updated the tools, making them relevant to his current profession as a Microsoft certified trainer, where a high level of accessibility was also necessary for success. Therefore, his past practices influenced his present practices. Young Gun sought to be highly productive but his dislike for the customer relationship management system, Siebel, led him to use a composition notebook to keep track of discussions with customers and business associates. Even though he had a PDA, Timenator still relied heavily on his Franklin Covey planner for scheduling activities, even though the PDA was intended to replace it.

The perpetuation of past practices occurs when individuals faced with emerging problems seek the certainty of outcomes associated with past practices. Reinforcing past practices is symbolic of security, convenience, the comfortable and the familiar. Relating this to the temporal theory of human agency (Emirbayer and Mische 1998), the repetition of past experiences though habitual sometimes required innovation and ingenuity.

The creation of new behavior through add-ons, workarounds and slippage is associated with the practical evaluative element of human agency. Again, diversity in practices across users and how those practices changed over time can be explained by differences in actors' temporal orientations and their responses to emerging events.

Within the HomeLender group, the practice of using the composition book was eliminated in three of the four cases, although the transition away from the tool occurred in different ways. Top Gun delegated time-consuming, technology-related tasks to his

assistant who alerted him of upcoming appointments through his pager while he traveled, thus ending his composition book use. Superwoman ceased her use of the composition book by designing a form to capture supplementary customer information, which she carried with her when she traveled. Rookie made himself constantly accessible when he traveled by synchronizing contact data across his personal and company-issued devices, creating an overlap in business and personal ownership and usage. However he continued to use the composition book because it was convenient and as a backup mechanism in case his devices failed.

Outside the HomeLender group, various patterns of use were also observed. To protect customer information, Mr. Security Issues personalized his laptop in such a way that clicking on certain images on the screen revealed certain menus which led to confidential information. In the event of an accident while mobile, others could only access insignificant information. Mr. Gadget made travel plans so that dead time on long trips could be converted into productive time. By choosing to travel by train instead of car, his work could be facilitated by using mobile devices. Young Gun used the voice mail on his cell phone to record important reminders in circumstances when it was inconvenient to use his PDA or his composition notebook to make notes while on the move.

Users' future goals and objectives are associated with the projective element of agency and show how nomadic users look forward to using new technology. Within the HomeLender group, the study shows that users had diverse intentions for future technology acquisition. Top Gun did not intend to acquire a Blackberry device because he was focused on other priorities, such as his family life and maintaining his position as

a top producer in the organization. Superwoman did not intend to acquire a Blackberry device as she saw it as further blurring the boundaries between her business and personal life. Conversely, Rookie intended to adopt the Blackberry device. Rookie was the only stakeholder who viewed the acquisition of a wearable computer with voice recognition as a future possibility.

Outside the HomeLender group diversity and similarities in intended technology upgrades and acquisitions were also observed. Mr. Security Issues intended to acquire a device with combined phone and PDA functionality onto which he could transfer a customer relationship management system with photographs of customers, as it was a practical way to associate names with faces when making calls. He hoped that this would remove the need to refer to his laptop when making calls and would save time. Mr. Gadget intended to acquire an integrated watch and health monitor which would keep track of vital signs. This he felt was needed because of his intense nomadic lifestyle. Young Gun contemplated the acquisition of a Blackberry device because it would be a nice toy. However, he did not intend to acquire wireless functionality for his laptop and PDA because he felt it was unnecessary. Young Gun, Mr. Gadget and Mr. Security Issues did not intend to acquire the Tablet PC until the handwriting recognition technology had significantly improved. However, Technoholic was an avid user of the Tablet PC and intended to acquire phone functionality for the device so that he could phase out his phone enabled PDA.

The goals, objectives, dreams and aspirations of individuals were all different and this was reflected in the variation in technology acquisitions contemplated.

The results show that stakeholders' intentions cannot be relied upon as a prediction of future use as present contingencies place limitations on what can be achieved. Top Gun was able to predict his adoption of a wireless card but his inability to foresee the adoption of an aircard and a home wireless network is indicative of this predicament. This occurred because it was impossible for him to imagine the social processes that would take place, which would persuade him to acquire the devices. Similarly, Young Gun was adamant that he did not need to acquire a wireless card but eventually he did so, when the need to access organizational resources and to serve customers while traveling increased. He was unable to foresee this acquisition due to the inability to imagine the events that would stimulate his own reflection and reconsideration of the usefulness of the device.

6.2 Insights from the Contextual Dimension

The contextual dimension reflects the numerous roles that users play within their personal and business lives, which are sometimes in conflict, and influence the nature of the agentic action which takes place. The results show that the interaction of social and technical forces within stakeholders' personal and business contexts created specific agentic dilemmas or predicaments which had to be resolved. Therefore, two main elements within the contextual dimension have been identified: personal and business. These elements are also multi dimensional as stakeholders can have multiple personal and business identities. Nomadic computing technology use reflects the demands of these numerous personal and business identities, which may result in the blurring or the reinforcement of boundaries between personal and business lives. These theoretical insights from the contextual dimension support the premise of the temporal theory of

human agency (Emirbayer and Mische 1998) that stakeholders are embedded in multiple and overlapping contexts of action. The research results also extend the theory by segmenting these contexts into personal and business categories.

Within the HomeLender group, Superwoman was challenged with fulfilling her role as wife and mother and this conflicted with her role within her business context as a high performer. To resolve her agentic dilemma, she used technology aggressively to balance personal and business activities. Rookie's agentic predicament was his desire to become an established loan officer. Because he faced few demands from his personal context, he was able to accommodate intrusions into his personal life quite easily. To resolve his agentic predicament, Rookie used technology to make himself constantly available to carry out business. Top Gun was a successful loan officer but also a devoted husband and father. He used the nomadic computing environment to blur the boundaries between his personal and business lives by converting personal dead time into productive time. This allowed him to work while traveling with his family during periods of inactivity.

Outside the HomeLender group, the contextual dimension also lends insight into the diversity of practices observed. Mr. Gadget and Technoholic were self-employed so their personal and business contexts were merged. As a result they used their mobile devices for both business and personal purposes. Mr. Security Issues had specific demands from his business context, which required that he communicate confidential information securely to business associates. Consequently, there was a distinct separation of business and personal activities through use of multiple devices and email addresses. Further, the demand of multiple customers in multiple professional contexts also resulted in the need for multiple yet similar devices. Thus, these demands placed restrictions on the blurring

of the boundaries between his personal and business lives. Young Gun worked from home and had few demands from his personal context. Both his business and personal devices were focused primarily on business activities although personal activities were always facilitated.

Relating social context to the temporal theory of human agency, Emirbayer and Mische (Emirbayer and Mische 1998) state that actors are situated in nested and overlapping relational contexts. As past research has shown, actors are members of different social systems arising from both work and non-work related activities and as such they engage in agency by responding to the contradictions imported from their multiple business and personal organizational memberships (Sahay and Walsham 1997). In these cases, nomadic computing technology permits the intrusion of business activities into personal life and vice versa. As nomadic computing users responded to their own changing contexts, they were also influenced by the viewpoints of others within those individual and institutional contexts. Consequently, different requirements were created for how users modified and manipulated the nomadic computing environment.

6.3 Insights from the Spatial Dimension

The spatial dimension recognizes the physical mobility of people and the requirements of the different physical spaces they traverse: at the office, on the road and at home. As the spatial dimension is not recognized by the temporal theory of human agency (Emirbayer and Mische 1998), the current research extends the theory in two main ways.

Firstly it exposes the circumstances under which the boundaries between personal and business lives would be enforced or blurred in certain spaces. The spatial dimension

plays a critical role because the issues raised by nomadic work would not exist without the demands placed on users as they traversed physical space. Removing the spatial dimension from the analysis relegates the application of the framework to use within a fixed location, where the boundaries between personal and professional life may be more clearly defined than in nomadic work. For the most part, the blurring of boundaries that occurs in fixed work tends to be minimal and unidirectional, where personal activities would tend to infringe on work life rather than vice versa. The spatial dimension thus plays an important part in the definition and the blurring of boundaries in nomadic work. The boundary between personal and work lives of the nomadic worker is fluid, bi-directional and subjective, as it can be intermittently enforced and withdrawn within the same physical space. The use of nomadic computing technology fosters this dynamic property of the boundary, accounting for the variation in practices observed across stakeholders.

Secondly, an analysis of the spatial dimension reveals insights into the different ways various nomadic users addressed the challenges of working across diverse spaces with different attributes and facilities. The various challenges confronting nomadic users as they traversed space have important design implications on how our environment should be configured to accommodate the practices of the nomadic worker.

6.3.1 Standard Practice - Communicating While Moving

All nomadic computing users engaged in the use of the cell phone to communicate while moving, either through use of an ear piece or hands-free capability. This standard practice in different spaces was unsophisticated and did not require ingenuity on the part of the user.

6.3.2 Multitasking While Moving

Nomadic users often engaged in novel practices to facilitate working while moving. For instance, Top Gun and Young Gun used the voice mail on their cell phones to record important information while moving. Mr. Security Issues wore a coat with multiple pockets so that the devices could easily be transported and accessed when needed and also used his laptop while driving. Technoholic also used his laptop while driving. These practices, enabled by mobile technologies, contributed to the effectiveness of the individuals employing them by allowing multiple tasks to be accomplished at the same time. The mobile workers studied repeatedly mentioned such multitasking as a resolution to their practical evaluative dilemmas.

The tendency of nomadic users to work while moving has safety implications that could be addressed in the design of ubiquitous computing environments. The design of user interfaces to accept inputs in a way that require minimum intervention by nomadic computing users would enhance multitasking while preserving safety. For example, speech recognition technologies may prove to be invaluable not only for applications that recognize voice commands, but also those that talk back to the nomadic computing user. Applications that talk back, though presently in existence have limited capability to do so and are not widely available. Another useful technology may be the use of brain computer interfaces to control real-world applications using brain signals (Moore 2003). Current research on brain computer interfaces focuses primarily on use by the disabled but such interfaces are potentially useful to the nomadic computing user (Wolpaw, Bribaumer et al. 2002).

The ability to carry out work while moving with as few devices as possible is also important, and so the results emphasize the importance of the convergence of mobile devices and the need for wearable and embedded devices. However, as shown by the case of Mr. Security Issues, the ability to combine the functionality of several devices into one or the use of publicly available embedded devices, may be constrained by a number of other factors such as security.

6.3.3 Reconfiguration and Use of Space

The ability to reconfigure space into a mobile office and to exploit the facilities offered by diverse spaces was also important for nomadic workers. For example, Technoholic installed wireless networks at locations that he frequently visited such as relatives' homes, so that he could be constantly connected to the Internet. Mr. Security Issues only rented trucks which had multiple power outlets and a large console so that it could be easily converted into a mobile office. In public places such as airports and train stations, Mr. Gadget gravitated towards areas with power outlets, so that the power in his mobile devices could be conserved. It is evident that ergonomics to support nomadic computing need to be extended to modes of transportation such as motor vehicles, trains and airplanes and public areas such as airport lounges and hotel lobbies. As such organizations need to be concerned not only with the design of traditional office space but also with the design of the mobile office. In designing ubiquitous computing environments, specifically those in public places such as trains, airplanes and airport lounges, embedded and mobile devices need to be reconfigurable on demand to adapt to the unique needs of each nomadic computing user.

6.3.4 Use of Dead Time

There were also attempts to convert dead time into productive time. The results show that there are two types of dead time: personal and business. In terms of personal dead time, Top Gun used his aircard and laptop to access the Internet while his wife drove to their vacation spot. Superwoman also utilized personal dead time at home by working while her children prepared for school in the morning or watched TV. In terms of business dead time, Mr. Security Issues positioned his devices in such a way such that during long trips he could occasionally reach for a device so that he could work while in traffic or at a stoplight. Mr. Gadget chose to travel by train so that he could use dead time to be free to work. Timenator utilized time between appointments with doctors to use his handheld computer to research doctor and product information.

The results show that users attempted to leverage dead time in different spaces with some practices resulting in the blurring of boundaries between business and personal lives. As such organizations may consider how they may assist nomadic computing users to plan ahead so that the use of dead time can be maximized.

6.3.5 Patterns of Space Utilization

As table 6 shows, looking at patterns according to how space was utilized in terms of the use of dead time, multi tasking while moving and the reconfiguration of space, results in four distinct patterns; low, basic, moderate and high space utilization.

Low utilization of space occurs when nomadic computing users exploit the nomadic computing environment very little while moving, but use it intensely once they arrive at their location. They make no attempt to use dead time, to multitask while moving or to reconfigure space to perform work optimally. This may be because the

nomadic user is faced with few demands while he or she moves or there may be a conscious choice to delay a response to those demands until arrival at a destination. Thus the nomadic computing environment is leveraged in a traditional sense where interaction is restricted to an off-site or home office location or at home. Nonchalant, Boundary Enforcer and Merlin, who were all office-based workers at HomeLender were the only ones who engaged in this pattern of use. These workers may also be more attached to their corporate office than the other office-based, teleworkers and self-employed professionals investigated, and therefore were more successful at defining the boundary between business and personal lives.

Basic utilization of space occurs when nomadic computing users use the nomadic computing environment during periods where they have dead time. This use of dead time occurs primarily between moving episodes or while stationary at an off site location. Rookie, an office-based worker, and Timenator, a teleworker manifested this characteristic.

Moderate utilization of space occurs when nomadic computing users not only use dead time while they are stationary but also begin to use the dead time which becomes available while they move to carry out work. This may occur when the user needs to respond to demands while in transit to a destination. Top Gun and Superwoman who were two office-based workers, and one teleworker, Young Gun, showed this characteristic.

High utilization of space occurs when the user engages in practices to reconfigure space in such a way that their dead time multitasking is supported optimally within the constraints of the space available to them. Mr. Security Issues, a teleworker and Mr.

Gadget and Technoholic who were two self employed professionals engaged in this pattern of use. Thus, the results indicate that those who spend most of their time in the field, away from their institutional context, engage in high space utilization. The value of the theoretical replication is also made evident. Within this group of cases, only cases which lie outside HomeLender showed high space utilization.

The results indicate that in utilizing space, the first tendency may be to try to use dead time while stationary. After doing so, users may think of ways to make the mobile dead time more productive and begin to multitask while moving. Subsequently, users may plan ahead how to utilize dead time optimally while moving, which may result in novel travel arrangements and strategies to configure different spaces to carry out diverse forms of work. The results suggest a progressive complexity in utilization of space as workers' experience with the nomadic computing environment matures.

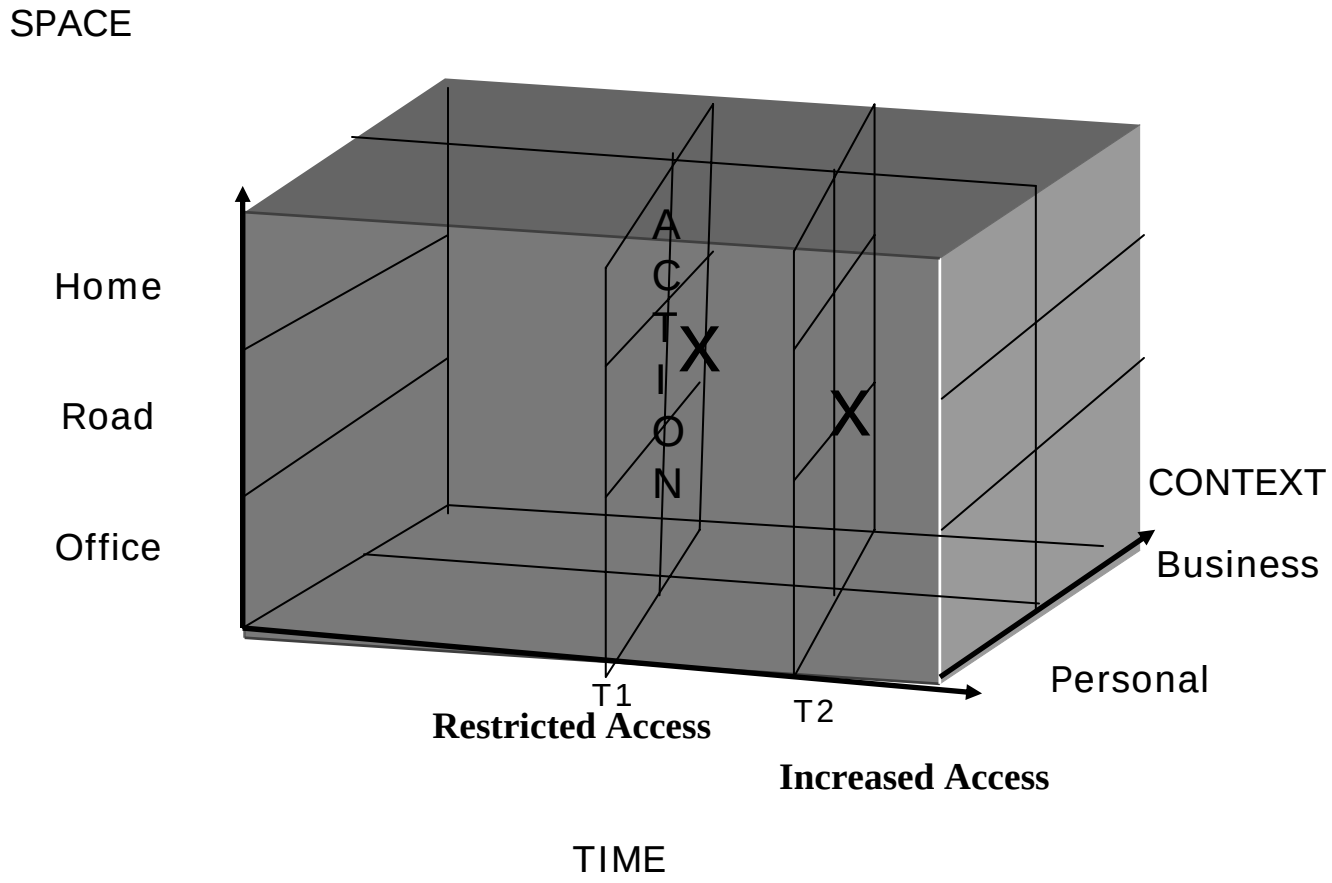
Table 6 - Patterns of Space Utilization

SPACE UTILIZATION	CASE	CATEGORY	PRACTICES		
			Use of Dead Time	Multitasking While Moving	Reconfiguration of Space
Low	Nonchalant	Office Based			
Low	Boundary Enforcer	Office Based			
Low	Merlin	Office Based			
Basic	Rookie	Office Based	X		
Basic	Timenator	Teleworker	X		
Moderate	Top Gun	Office Based	X	X	
Moderate	Superwoman	Office Based	X	X	
Moderate	Young Gun	Teleworker	X	X	
High	Mr. Security Issues	Teleworker	X	X	X
High	Mr. Gadget	Self Employed	X	X	X
High	Technoholic	Self Employed	X	X	X

6.4 Consequences of the Interplay of the Temporal, Contextual and Spatial Dimensions

Theoretical insights obtained on the consequences of the interplay of the temporal, contextual and spatial dimensions also build upon the temporal theory of human agency (Emirbayer and Mische 1998). The results show that as stakeholders traversed across different spatial, temporal and contextual arrangements, their evaluation of the advantages or disadvantages of specific practices changed. For instance, as illustrated in figure 5, at time T1 in a business context, Superwoman evaluated the prospect of checking email while mobile using a Blackberry positively, because she anticipated that it would increase her accessibility in space where it was previously lacking. However, she also anticipated that using a Blackberry would also introduce an additional channel of communication to monitor, which she interpreted as a likely disadvantage. However at time T2, in a personal context, she evaluated the prospect of checking email while in transit to her vacation destination through use of her laptop and an aircard as an advantage because it extended access to new locations. In one scenario there was a willingness to increase accessibility, while in the other, she sought to restrict accessibility. Opposing forces therefore emerged in the practices of a single user.

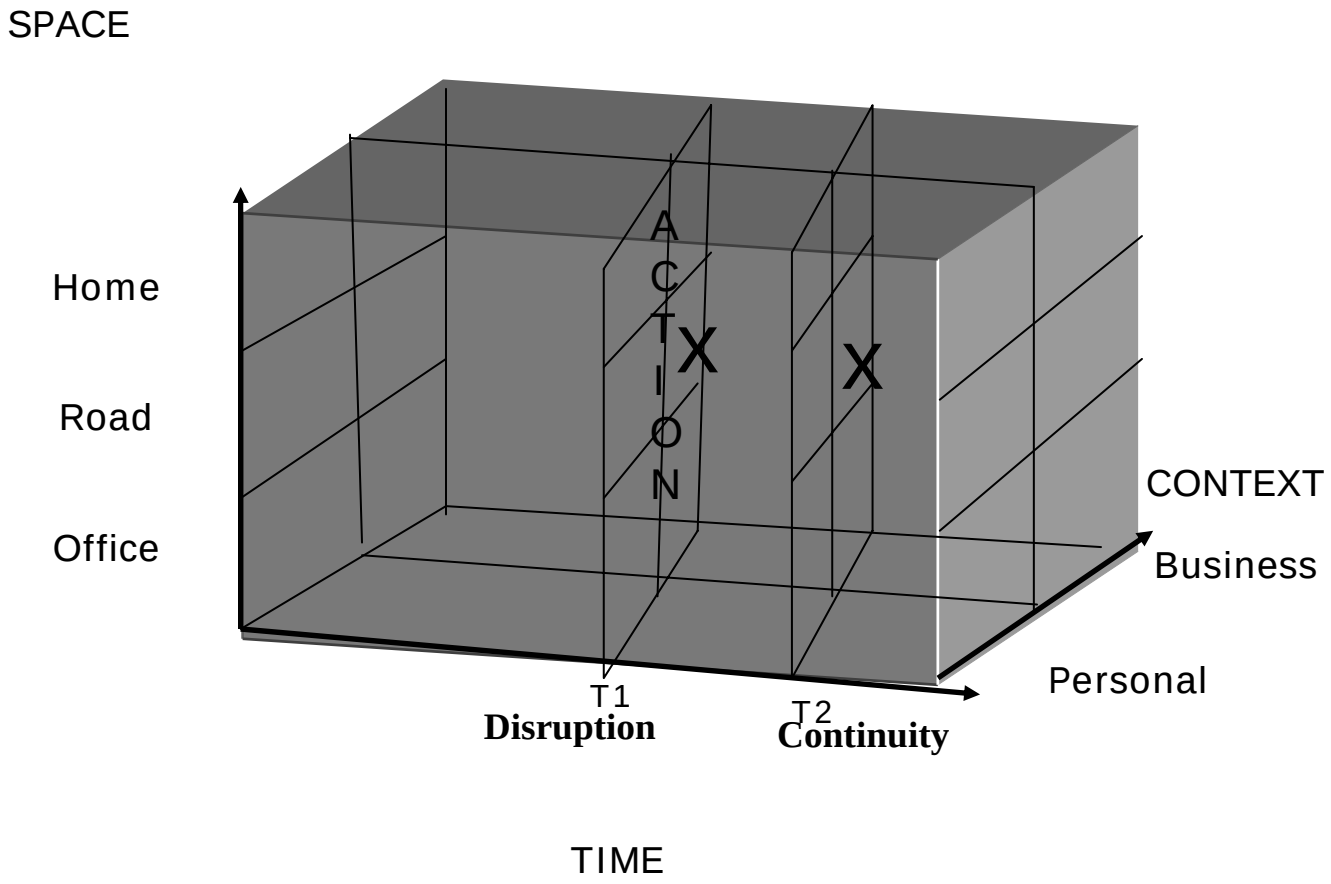
Figure 5. Case of Superwoman
Emergence of Opposing Forces in the Nomadic Computing Environment Due to Changing Perspectives of Email Use While Traveling



A similar analysis can be performed for Young Gun. As figure 6 shows, at time T1 Young Gun evaluated the use of a wireless modem while mobile as unnecessary. However, at time T2, he considered the prospect of having a wireless modem to connect to the Internet while mobile as critical to his continued productivity. Again in one scenario Young Gun was willing to allow disconnection. In another scenario he desired to facilitate continuity as much as possible. Opposing forces again emerged in the practices of a single user.

Relating this to the temporal theory of human agency (Emirbayer and Mische 1998), we have shown that social actors are capable of changing their relationships to temporal-relational contexts of action as they move and as they continually refer to their past and future, in response to emergent events.

Figure 6. Case of Young Gun
Emergence of Opposing Forces in the Nomadic Computing Environment Due to Changing Perspectives of Wireless Modem Use While Traveling

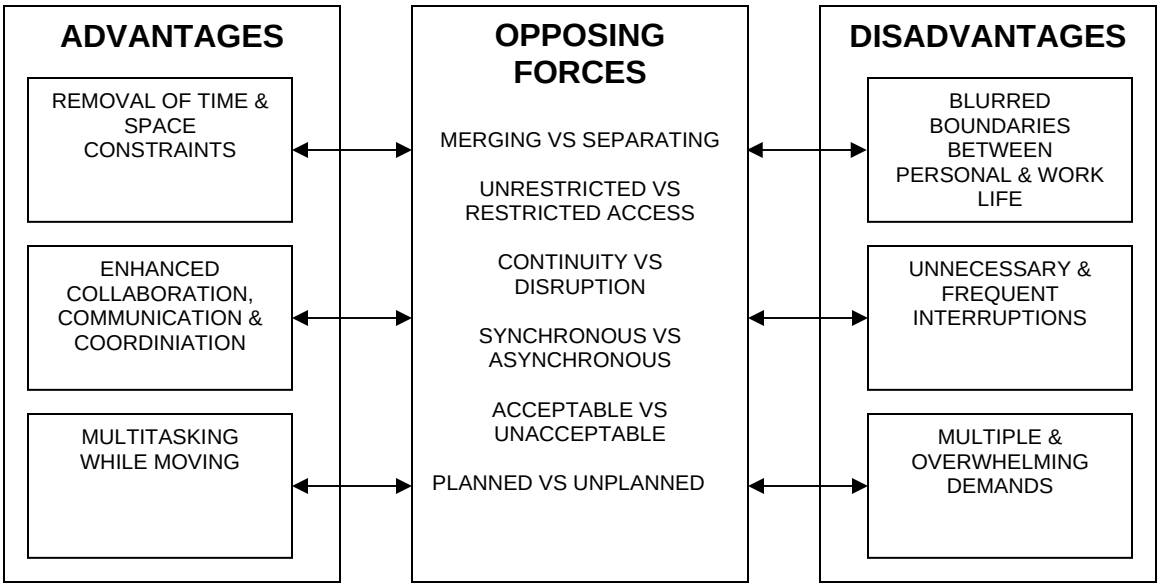


6.5 Insights on Effectiveness

This study also broadens the temporal theory of human agency (Emirbayer and Mische 1998) by offering a novel perspective on the context of effectiveness in nomadic computing environments. Across all cases, users achieved effectiveness by engaging with the environment in diverse and contradictory ways. As their practices evolved, they achieved effectiveness by attempting to resolve the conflicts between the possible beneficial and undesirable effects of nomadic computing environments. Consistent with the temporal theory of human agency (Emirbayer and Mische 1998), stakeholders had varying evaluations regarding how, when and where a practice was an advantage or a disadvantage. The simultaneous presence of advantages and disadvantages results in the emergence of opposing tensions.

As illustrated in figure 7, nomadic computing environments promise the removal of temporal and spatial constraints for carrying out work (Davis 2002). Stakeholders exploited this advantage by facilitating unrestricted access to themselves, as in the case of Rookie who carried his devices around with him constantly, even on weekends. Consequently, the environment may also weaken the boundaries between work and personal life (Davis 2002). An attempt to reinstate these boundaries may occur by restricting access in certain situations, as in the case of Top Gun who made it known when he would and would not be reachable while away on vacation. Thus, tensions arise between facilitating access and restricting access.

Figure 7. Effectiveness in the Nomadic Computing Environment



To reinforce the boundaries between work and personal life, nomadic workers may try to compartmentalize their lives into more distinct and clearly demarcated work and non-work segments and reserve certain places and devices for certain activities (Avery and Baker 2002). They may also try to capitalize on the freedom of working without temporal and spatial constraints by carrying out both work and personal activities side by side. For example, Superwoman separated business and personal email by creating specific mailbox folders, but tended to carry out work and personal activities in the same spatial and temporal spheres whether at work, at home or on the road. In attempting to maximize the advantages presented by the removal of the temporal and spatial constraints and to minimize the disadvantage of blurring boundaries between work and personal life, actors engage in a balancing act: both allowing and restricting access and both merging and separating business and personal contexts.

Nomadic computing environments also promise enhanced coordination, collaboration and communication (Davis 2002). To facilitate this, some may allow unrestricted access to themselves, as in the case of Rookie, who engaged in the synchronization of contact data across all devices so that he could more effectively manage the flow of personal and business communications. However the nomadic computing environment can also trigger frequent and unwelcome interruptions. This was evident in the case of Top Gun and Nonchalant who used their assistants as filters for incoming communication in order to restrict access to themselves. Thus, tensions existed between allowing unfettered access and restricting access. Other opposing forces identified include, carrying out planned versus unplanned activities, facilitating

continuity versus allowing disruption, and engaging in acceptable versus unacceptable behavior.

The nomadic computing environment also provides the ability to multitask while moving. The capability to multitask while moving is particularly important when nomadic workers face multiple demands simultaneously, which require their immediate attention. Allowing unrestricted access may result in these simultaneous and multiple demands occurring. This was evident in the case of Mr. Security Issues who handled the needs of multiple customers at the same time, through various communication mechanisms while traveling. Mr. Gadget also engaged in this activity by carrying out work using his laptop, cell phone and aircard while traveling by train. Top Gun also engaged in this activity by using his laptop and aircard to carry out work while traveling to his vacation destination. However the nomadic computing environment can result in the level of demands rising to a point where they become overwhelming, resulting in the frustration of the nomadic worker. This was most evident in the case of Mr. Security Issues, who became so inundated by the number of customer demands during a long trip that his safety was at risk. As such he stopped to work, lengthening the trip even further. In this case Mr. Security Issues chose not to engage in the balancing act by allowing unrestricted access to himself. Restricting access while traveling would have probably resulted in a shorter, safer, less frustrating trip but disconnection from customers. Thus tensions once more exist between allowing access and restricting access.

Concerns have been raised about the possible difficulties presented by the use of nomadic computing environments. Davis (2002) suggests that providing access anytime anyplace may enable unnecessary and unproductive interruptions to work and in fact may

change organizational expectations, making such interruptions the norm. Productivity may even decline in such a scenario. However, these cases show that interruptions did indeed become the norm, but the informants in this study perceived them as contributing to effectiveness. Another possible undesirable outcome is the intrusion of business into personal time and space that takes place. Our results show that users are acutely aware of these intrusions and considered them to be a necessary part of the job. In various ways, they implemented measures to control these intrusions such as using devices to facilitate or restrict their access at certain times and in certain spaces.

Users were also aware of the organization's expectations of service to the customer, which users translated to mean that they should be accessible all the time and available and equipped to work, if necessary. In this particular case, no one was explicitly told that they had to make themselves available. These expectations were self-imposed, based on an understanding of the customers and the organizations that they served. The implications for organizations lie in how they can better assist their nomadic users to recognize and manage the multiple and sometimes conflicting expectations.

6.6 Shifts in the Nature of Boundary Control

A fascinating theoretical insight was how there seemed to be a shift in the nature of boundary control. Traditionally, boundary control refers to the ways in which managers in organizations cajole, encourage, coerce, or otherwise influence the amount of time employees physically spend in the workplace (Perlow 1998). It refers to managers' ability to affect how employees divide their time between their work and non-work spheres of life (Perlow 1998). Conventional management techniques subject employees at the lower hierarchical levels to more personal surveillance or behavior control whereas

persons at higher hierarchical levels experience more output control with the overall amount of both behavior and output controls decreasing as they move up the hierarchy (Perlow 1998). Citing Whyte (1956), Perlow (1998) suggested that senior executives are "non-well-rounded men" who typically work long hours in the office on weekdays and part of most weekends and therefore had no time for anything else. Hence increased work hours are expected of those higher in the hierarchy while the time of the people at the bottom is fixed and tend to be more regulated by the clock rather than by their activities.

Even though the nomadic workers in this study belonged to all levels of the organizational hierarchy and included some self employed professionals, some individuals by the nature of their variable and extended working hours simulated the behavior of the "non-well-rounded" men that Whyte (1956) mentioned. Hence a shift in the nature of boundary control from behavior control to output control was noted. This occurred because the nomadic nature of work outside the physical jurisdiction of their managers made it difficult for managers to monitor employees' activity through behavior control. Therefore measurement of outputs as an indicator of productivity was more applicable. This was evident in the way nomadic computing workers were able to cite measures of performance and output as evidence of their effectiveness.

As mentioned previously, nomadic workers were expected to be reachable through use of the nomadic computing environment during working hours but their need to be accessible outside those hours was not explicit. Instead users' individual work ethic dictated their availability based on an understanding of the organization's norms and culture and the customers that they served. Thus, a form of cultural control was in effect. A transition in the nature of bureaucratic control, from physical monitoring to virtual

monitoring could also be occurring, though the participants made no mention of being monitored electronically even when asked directly. Instead they spoke of meeting the expectations of those that they interacted with.

Perlow (1998) also mentioned that employees may resist or accept boundary controls enforced by management. However, in the case of the nomadic workers in this study, boundary controls, seemed to be self imposed and managed by using the nomadic computing environment to enforce or blur boundaries between work and personal life, rather than to resist or accept boundary controls. However more investigation is required to determine the precise nature of boundary setting, control and management.

6.7 Informing the Future Use of Nomadic Computing Environments

In support of the temporal theory of human agency (Emirbayer and Mische 1998), a theoretical explanation of the role of social forces in the adoption of new nomadic computing technologies is also provided through this study.

Though designers may create nomadic computing artifacts that might be considered useful, we cannot judge with certainty that these artifacts will be adopted or that usage patterns will follow a certain path because we do not know what comprises stakeholders' temporal orientations and how those orientations may change. For example, Young Gun was adamant that he would not need a wireless network card in the very near future. Yet he went on to acquire one. His decision to acquire the wireless network card was influenced by his inability to access the Internet during a sales presentation resulting in his own reflection as to how wireless access could enhance his future productivity. Top Gun projected that he would acquire a wireless network card, yet he went on to also install a home wireless network and acquired an aircard. His decision to acquire the

aircard was informed by the observation of a colleague who had adopted one and seemed to be more effective. Based on an understanding of Top Gun's agency dilemma, his social engagement with others and his own reflection on the usefulness of devices facilitated his own adoption. Based on these results we are unable to say whether or not nomadic workers would adopt and use a specific technology. However, we can point to the social processes that persuade users that new technologies will increase their effectiveness. Thus, the nomadic computing framework is a powerful tool in explaining how use evolves over time.

One important conclusion from this study is the central role that social forces play in determining the diverse outcomes of use. Relating such social forces to the temporal theory of human agency (Emirbayer and Mische 1998), we see that these social forces arise out of stakeholders' differing past, future and present contexts of action and how these contexts of action vary across time. Interactions with others around them (intersubjectivity) as well as self reflection (reflexivity) are also important influences which impact on stakeholders' engagement with technology. In its practical evaluative element, these dialogical processes enable human agents to engage in patterns of use that may challenge and transform their existing practices. But the consequences of their actions cannot be controlled completely and may feed back in ways necessitating new agentic choices.

CHAPTER 7

CONCLUSION

It has been widely recognized that users' engagement with nomadic computing environments can result in new forms of use, new social actions, unanticipated responses and unintended consequences (Davis 2002; Jessup and Robey 2002; Lyytinen and Yoo 2002a; Lyytinen and Yoo 2002b). Until now we have only been informed by anecdotal evidence of these consequences. I have extended and applied the temporal theory of agency (Emirbayer and Mische 1998) to engage in a cross-case analysis of eleven nomadic computing users to explain how opposing forces arise and contribute to users' effectiveness. I employed a methodology which applied literal and theoretical replication to multiple longitudinal and retrospective case studies. The analysis was interpretive with a focus on understanding the contextual nature of the action of nomadic computing users rather than developing causal relationships between human agency and effectiveness.

I have shown that patterns of technology use in nomadic computing environments are influenced by stakeholders' temporal orientations; their ability to remember the past, imagine the future and respond to the present. As stakeholders all have different temporal orientations and experiences, they exhibit different practices even when engaging initially with the same organizational and institutional environments. Opposing forces emerge as users attempt to be effective by resolving the benefits and disadvantages of the environment as they encounter different temporal, contextual and spatial arrangements as they travel. Their perspective as to what constitutes an advantage and disadvantage of use is dynamic and changes over time and so their practices may appear to be contradictory.

The framework presented highlights the need to focus on understanding the diversity in nomadic computing practices by examining how they are influenced by individual circumstances as well as shared social meanings. Though the framework may not be able to predict conclusively how future use will emerge, I have shown that future use is due to social processes and individual reflection. This framework provides a sound theoretical foundation for future research on the social impacts of nomadic computing environments.

Nomadic computing users can also be grouped in terms of how intensely they use space. Utilization of space varied in terms of three strategies: how dead time was used, whether users multitasked while they moved, and whether or not they made attempts to reconfigure space to optimally support their work. Four patterns of space utilization were identified: low, basic, moderate, and high. Users who were not based in an organizational context tended to employ all three strategies of space utilization and thus engaged in the highest utilization of space. Those who were closer to their organizational context tended not to employ any of the space utilization strategies and thus engaged in the lowest utilization of space.

Theoretical insights were also obtained on the shifts in the nature of boundary control, where managers attempt to influence the time spent by employees in the workplace (Perlow 1998). Instead of managers imposing boundary control, strategies for the management of the boundary between personal and business lives were self imposed.

7.1 The Validation of the Theoretical Account

The validation of the theoretical account can be assessed on the basis of how well the research followed the principles of the interpretive research paradigm. This

assessment can be made based on the seven principles suggested by Klein and Myers (1999) to both guide interpretive research as well as to conduct post-hoc evaluation. These principles are summarized in table 7. These principles were incorporated in the research design in several ways.

The *fundamental principle of the hermeneutic circle* suggests that all human understanding is achieved by iterating between the meaning of parts and the whole that they form. This principle is fundamental to all the other principles and was incorporated by the examination of how the temporal, spatial and contextual dimensions contribute to each case and across cases as well as a consideration of the interplay of all three dimensions. The combination of insights revealed by each case into a cohesive description of patterns of technology use, and their relationship to effectiveness also gave support to this principle.

The *principle of contextualization* requires that critical reflection of the social and historical background of the research setting takes place so that the intended audience can see how the current situation under investigation emerged. This was fulfilled by a critical and detailed examination of the social, historical and technical background of the organizations to which case participants belonged (the business context), as well as that of each case participant (the personal context).

The *principle of interaction between the researchers and the subjects* requires critical reflection on how the research materials ("data') were socially constructed through the interaction between the researchers and participants. This was adhered to by close involvement with the informants and by viewing them as interpreters and analysts in their own right. In interacting with them I encouraged them to think about and make

sense of their own use of the nomadic computing environment as part of the data collection process and was acutely aware of the informants' own interpretive and analytical processes in their interaction with me. Aspects of this interaction were included in the data collected and reported.

The *principle of abstraction and generalization* is tightly linked to the principles of the hermeneutic circle and contextualization. This principle requires relating the idiographic details revealed by the data to theoretical, general concepts. This was achieved in three ways. Firstly, a logical chain of evidence (Miles and Huberman 1994) was constructed within each case by: (1) establishing the discrete findings, (2) relating the findings to each other, (3) naming patterns identified and (4) identifying constructs. Secondly, analytic generalization (Miles and Huberman 1994) involved generalizing findings from each case to theoretical propositions of the nomadic computing environment framework. Thirdly, since a multiple case analysis was performed, case-to-case generalization was undertaken by generalizing from one case to the next based on the underlying theory.

The *principle of dialogical reasoning* required sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings (the story which the data tell), with subsequent cycles of revision. This principle also guided a critical assessment of my own assumptions. While not discounting the assumptions of the conceptual framework which guided data collection and analysis, this process in fact resulted in the uncovering of related phenomena which aided in theory building.

Table 7 - Summary of Principles for Interpretive Field Research

PRINCIPLE	OVERVIEW
1. The Fundamental Principle of the Hermeneutic Circle	This principle suggests that all human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form. This principle of human understanding is fundamental to all the other principles.
2. The Principle of Contextualization	Requires critical reflection of the social and historical background of the research setting so that the intended audience can see how the current situation under investigation emerged.
3. The Principle of Interaction Between the Researchers and the Subjects	Requires critical reflection on how the research materials ("or data') were socially constructed through the interaction between the researchers and participants.
4. The Principle of Abstraction and Generalization	Requires relating the idiographic details revealed by the data interpretation through the application of principles one and two to theoretical, general concepts that describe the nature of human understanding and social action.
5. The Principle of Dialogical Reasoning	Requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings (The story which the data will tell) with subsequence cycles of revision.
6. The Principle of Multiple Interpretations	Requires sensitivity to possible interpretations among the participants as are typically expressed in multiple narratives or stories of the same sequence of events under study. Similar to multiple witness accounts even if all tell it as they saw it.
7. The Principle of Suspicion	Requires sensitivity to possible "biases" and systematic "distortions" in the narratives collected from the participants.

The *principle of multiple interpretations* required sensitivity to possible interpretations among the participants as typically expressed in multiple narratives or stories of the same sequence of events under study. This principle related specifically to multiple witness accounts of the same event within the literal replication group at HomeLender and was not related to cases outside that group.

Finally, in employing the *principle of suspicion*, sensitivity to possible biases and systematic distortions in the narratives collected from the participants was required. In analyzing the different cases I was sensitive to the biases and distortions in the narratives collected from participants. I was also sensitive to the possibility that an interpretation of events as more patterned and congruent than it really was might occur and ensured that

this did not occur by making sure findings were grounded in the data and could be supported by the coding process. I was also sensitive to elite biases ensuring that data from articulate, well informed, high status informants was not given more weight than less articulate, lower status ones.

7.2 Implications for Research

The first research implication is the provision of a framework based on the temporal theory of human agency (Emirbayer and Mische 1998), which explores human agency in nomadic computing environments yet recognizes the diverse contexts and spaces that nomadic computing users experience.

Within IS research there has been a recent thrust to move beyond structurational models and to take a practice oriented view which focus on the interaction between people, technology and social action (Orlikowski 2000). This research study builds upon this body of work by showing how a theoretical framework, which is drawn from the field of sociology and privileges human agency, can be applied to understand a contemporary applied phenomenon in the IS field. A major contribution lies in the development of a theoretical perspective which explores the multiple dimensions of nomadic computing use -- time, space and context -- in a single effort. It also constitutes one of the few IS research studies that utilizes the temporal theory of human agency (Emirbayer and Mische 1998). Accordingly, the temporal theory of human agency (Emirbayer and Mische 1998) has been both elaborated upon and extended.

Secondly, because this dissertation focuses solely on nomadic computing environments, it contributes to an area of IS research which currently suffers from a lack of investigation. As said previously, IS research has tended to focus on the technical

aspects of nomadic computing environments. In response, recent calls for the need to build socio-technical theoretical perspectives on use in nomadic computing environments have been raised (Lyytinen and Yoo 2002a; Lyytinen and Yoo 2002b). Application of the theoretical framework facilitated a vivid description of nomadic computing use by several individuals and thus exposed a diversity of practices across occupations, organizations, tools and employment arrangements. In highlighting the important role of social processes in the assimilation of new tools and practices, this research study contributes to the emerging body of literature in this area.

The final research implication is methodological. A methodology was introduced which combined multiple longitudinal with retrospective case studies and incorporated literal and theoretical replication. Literal replication allowed me to hold the technology and the organization constant and to develop a theoretical explanation as to why diversity would exist in such a scenario. Theoretical replication allowed me to show that the same explanation was credible across different individuals using diverse technology and belonging to a cross section of organizations. Theoretical replication also revealed additional insights on space utilization which were not evident in the literal replication group. Studying multiple longitudinal and retrospective cases in both the literal and theoretical groups was useful in showing how the process of change unfolded. It was especially well suited to studying process because of the opportunities for exploring the historical patterns in the retrospective cases as well as the evolving patterns in the longitudinal studies.

7.3 Implications for Practice

The main implication for organizations lies in how the mobile workforce should be managed. The literal replication showed that in an organizational environment where training was not mandatory, users took the initiative to modify and manipulate the environment to suit themselves and that the IT department supported this activity. Even though this resulted in highly effective employees and a very successful organization, permitting users to act as they choose results in a technical environment which is difficult to support. The problem is made more acute when use occurs predominantly outside the organization and where some users merge business and personal technical resources. The challenge therefore is to permit flexibility in use while maintaining some degree of control and security.

Both the theoretical and literal replication showed that stimulating and fostering the social processes which are so important for adoption of new technology is also vital. Fostering social processes can be accomplished by formal and informal mechanisms through which users and the IT department can communicate with each other. This can be facilitated by developing and testing environments with users and by regularly providing face-to-face forums in which the full range of devices supported by the organization can be demonstrated to employees. Information could be shared in these forums as to how these devices can be incorporated into work practices based on the unique demands placed upon workers by their personal and business contexts as well as the benefits generated through use.

The insights into how the nomadic workforce utilizes space while on the move can help organizations better design environments suited to their nomadic activity. Indeed,

the patterns of space utilization identified in this study can be used to understand the strategies of nomadic employees and can help guide the support of those practices.

7.4 Research Limitations

In order for researchers and organizations to apply the results of this study, the study's limitations must be recognized. Although analytical and case-to-case generalization was achieved across this group of cases, outside of the HomeLender group there were no office-based workers. As such, conclusions about office-based nomadic workers are limited to a single organization from a specific industry. Also the self employed mobile professionals came from the IT industry and belonged to the same online community. Future research could benefit from including a more diverse group of participants to better facilitate theoretical replication.

Additionally, all the participants in the study saw themselves as effective. Though the perception of effectiveness was subjective, this perception was also external to these individuals as they were all successful professionals perceived by others as being at the top of their field. Although they could identify ways in which the nomadic computing environment could make them ineffective, including participants who thought that they were ineffective could allow a more credible explanation of the context of effectiveness to be derived.

7.5 Future Research

This dissertation focused on a single unit of analysis: the individual. Evidently more research is needed which focuses on the role of social processes in nomadic computing environments at other levels: the group, organizational and community levels.

Notwithstanding, further work at the individual level of analysis is required. In this study the longitudinal approach was limited to those nomadic users attached to organizations and who had the opportunity to engage in social interactions with other organizational members. However, with the trend towards outsourcing a focus on the independent nomadic professional also has implications for organizations that hire these individuals. Within organizations at the group level, the role of social processes can be probed more deeply by investigating interactions within nomadic teams. At the organizational level, one possible research direction is the investigation of the role of both administrative and technical management in the socio-technical interactions which emerge in nomadic computing environments.

At the community level, the independent nomadic professionals in this study belonged to online communities geared towards their profession. The online community enabled the formation of business associations and friendships and the nomadic computing environment was viewed as a business and social tool. Future research could focus on how social processes emerge in such a scenario and their role in nomadic computing use and assimilation.

The results also raise intriguing questions about the boundaries between personal and work life and how expectations from both organizations and their employees are changing. Organizations have recognized the advantages of pioneering alternative workplace arrangements such as teleworking and nomadic work, but allowing employees to work in nontraditional ways also requires a cultural and behavioral shift (Mahlon 2000). With the growth in the nomadic workforce, there is evidently a transition in the nature of boundary control taking place from behavioral to output control. Customarily,

management prescribed these controls but the results show that for the nomadic workforce it is not clear who imposes these controls and what are the organizational and personal responses to their imposition. However the results clearly show evidence of nomadic workers employing opposing forces to manage boundaries. The relationship between boundary controls, opposing forces and organizational and personal responses at all levels is a fascinating question certainly worthy of further investigation.

In conclusion, I have offered an explanation for some of the intended and unintended consequences that emerge through the use of nomadic computing environments. Suggestions have been offered for future research directions and management practices as a result of these findings by recognizing the critical role of socio technical influences. It is hoped that this dissertation offers a way to consider these socio-technical influences in both theoretical and practical terms.

APPENDIX A

RESULTS OF CROSS CASE ANALYSIS

LITERAL REPLICATION - THE HOMELENDER GROUP

TOP GUN	**RETROSPECTIVE PHASE 1**			**LONGITUDINAL PHASE 2**	
CONTEXT	**ITERATIONAL**	**PRACTICAL EVALUATIVE**	**PROJECTIVE**	**PRACTICAL EVALUATIVE**	**PROJECTIVE**
INSTITUTIONAL Vice President of Sales E-Unit. Number 2 loan producer in HomeLender **INDIVIDUAL** Married with two children. On the board of major charity. **TECHNOLOGY** Corporate laptop (wired) and personal pagers and cell phones are devices in use **AGENTIC DILEMMA** Tight time constraints conflict with time required to learn to use technology Low priority placed on technology use	Date book replicates details in Outlook Cell phone use mimics landline usage of the past. Phone numbers dialed from memory or list. Assistant assigned task of managing Outlook schedule Use of LoanSoft and other corporate applications as intended.	Task of using some features of Outlook delegated to assistant. Contributes to elimination of composition book. LoanSoft and user designed forms replace composition book. Alerts of upcoming appointments generated in Outlook sent to Pager by assistant. Rejects departmental custom of leaving laptop behind when on vacation.	No intention to acquire Blackberry device because of time required to learn how to use it. Upcoming acquisition of wireless modem predicted to increase efficiency. Device is a plug-in to the laptop requiring no significant time investment.	Acquisition of wireless modem & installation of home wireless network facilitates work in other places apart from home office. Acquisition of aircard enables access on the road to internet, email & applications as long as cellular service is available.	

SUPERWOMAN	RETROSPECTIVE PHASE 1			LONGITUDINAL PHASE 2	
CONTEXT	**ITERATIONAL**	**PRACTICAL EVALUTIVE**	**PROJECTIVE**	**PRACTICAL EVALUATIVE**	**PROJECTIVE**
INSTITUTIONAL Sales Assistant & Junior loan Officer. **INDIVIDUAL** Married with children. **TECHNOLOGY** Corporate laptop (wireless) and personal cell phone are devices in use **AGENTIC DILEMMA** Challenged with balancing career and family life .		Personal and Business activities share same time and space. Dedication of specific devices and spaces to either work or business activities. Email replaces the phone as preferred medium of communication for personal and business activities. Approach seen as less time consuming and more efficient. Laptop carried on vacation. LoanSoft and user designed forms replace Composition Book	No intention to acquire Blackberry. Device seen as possibly blurring further the boundaries between personal and work life.	Upgrade of LoanSoft results in elimination of customer line form.	Intention to acquire aircard. To access email & applications viewed as increasing productivity while traveling during personal time.

NONCHALANT	**RETROSPECTIVE PHASE 1**		
CONTEXT	**ITERATIONAL**	**PRACTICAL EVALUTIVE**	**PROJECTIVE**
INSTITUTIONAL Assistant Vice President of Sales in E-Unit. In the top fifteen of loan producers. **INDIVIDUAL** Married with no children. Late thirties. **TECHNOLOGY** Corporate laptop (wired) and personal cell phone are devices in use. **AGENCY DILEMMA** Happy with achievements and comfortable with position in the organization.	Leaves laptop while on vacation to reinforce boundary between personal and business life.	Ability to enter Loan details into LoanSoft coupled with preference for typing to writing leads to elimination of composition book. Assistant used to filter incoming communications and to restrict access.	Intention to adopt Blackberry device when it becomes convenient. No intention to use hotspots outside of working hours as seen as further blurring the boundaries between personal and business lives.

ROOKIE	RETROSPECTIVE PHASE 1		
CONTEXT	**ITERATIONAL**	**PRACTICAL EVALUTIVE**	**PROJECTIVE**
INSTITUTIONAL Loan officer in E-Unit. **INDIVIDUAL** Early thirties Single, no children. **TECHNOLOGY** Corporate laptop (wireless) and personal cell phone and PDA are devices in use. **AGENCY DILEMMA** Challenged with proving himself as a loan officer and becoming established in the mortgage finance business.	Use of composition book in certain spaces and contexts and as a backup in case of device failure.	Synchronization of data across personal and business devices making him accessible, anytime anywhere. Laptop and hotspots used during personal time to facilitate incoming business blurring the boundaries between personal and business lives.	Intends to acquire Blackberry device. Acquisition of state in the art in technology viewed as further enhancing efficiency.

BOUNDARY ENFORCER	**RETROSPECTIVE PHASE 1**		
CONTEXT	**ITERATIONAL**	**PRACTICAL EVALUTIVE**	**PROJECTIVE**
INSTITUTIONAL Employed to HomeLender as Assistant Vice President Marketing for 1 year. Role included Marketing Communication, Events & programs & Business Analysis. **INDIVIDUAL** In early thirties. MBA Married with no children. Licensed Boxing Judge. **TECHNOLOGY** Corporate Laptop (wired) & personal cell phone. **PAST PRACTICES** Teleworker Composition Book **AGENTIC DILEMMA** Lead by example by maximizing productivity and minimizing interaction with personal associates during business hours.	Composition book used to make notes in meetings, of phone calls & details of expense claims & action items.	Separation of business and personal activities through business & personal devices. Works strictly between business hours unless there is an emergency. Rarely works at home. Accessibility during business day restricted to business communications and top priorities. Communication from family not seen as disruptive.	Intends to include personal appointments in Outlook. Intends to use Instant Messenger to communicate with team members. No intention to acquire PDA. Not viewed as useful. Desires wireless connection from anywhere and unlimited memory & storage space.

MERLIN	RETROSPECTIVE PHASE 1		
CONTEXT	**ITERATIONAL**	**PRACTICAL EVALUTIVE**	**PROJECTIVE**
INSTITUTIONAL Employed to HomeLender as Network Administrator for 21/2 years. Role included support for network servers, end user support & support for field engineers. **INDIVIDUAL** In late twenties. Married with no children. **TECHNOLOGY** Laptop & Cell phone. **AGENTIC DILEMMA** To provide timely support anytime, anyplace to associates at different locations. Requires constant reachability.	.	Accessible through cell phone 24/7 in case of network emergency. Accessibility during business day restricted to business communications and top priorities. Communication from family not seen as disruptive No synchronization of data across devices. Laptop used to remotely maintain servers while at home or on the road. Phone preferred mode of contact due to nature of job and need for synchronous communication.	Acquisitions based on business needs. No intention to acquire new technology.

THEORETICAL REPLICATION – FOUR DIVERSE CASES

MR. SECURITY ISSUES	**RETROSPECTIVE PHASE 1**		
CONTEXT	**ITERATIONAL**	**PRACTICAL EVALUATIVE**	**PROJECTIVE**
INSTITUTIONAL Customer Support Engineer for major automotive parts manufacturer. Primarily responsible for communicating problems experience in customers' assembly lines to manufacturer and assisting in problem resolution. **INDIVIDUAL** Married with no children. **TECHNOLOGY** Corporate devices include, laptop (proprietary wireless), pager, one cell phones, two two-way radios, 1 CB radio. Personal devices include laptop and cell phone.	Use of CB radio, pager and two-way radios reflects need for high security transmission and reachability in areas where cellular service is unavailable. College flash cards used to make quick notes while moving.	Develops mechanism for carrying multiple devices around customer sites by wearing a coat with several pockets. Selection of motor vehicle for rent depends on ease of configuration as mobile office. Mobile devices positioned to facilitate work while driving. Tendency to multitask while driving. Tendency to stop during trips to work if faced with overwhelming demands. Multiple business email accounts with different levels of security used for different customers. Multiple personal email accounts used for different purposes. Personal and business activities share same time and space. During investigations voice mail on cell phone used to record conversations clandestinely.	Acquisition of combination PDA/Phone contemplated if demand for memory and disk space can be met. Viewed as enhancing efficiency when communicating with multiple customers. Acquisition of camera phone not seen as likely because some customers prevented the use of cameras within their facility. This restriction would leave him without a communication device. .

MR. SECURITY ISSUES CONTINUED	RETROSPECTIVE PHASE 1		
	ITERATIONAL	**PRACTICAL EVALUATIVE**	**PROJECTIVE**
AGENTIC DILEMMA Challenged with servicing multiple customers who are competitors while maintaining the confidentiality of information belonging to each competitor.		For security reasons laptop personalized to prevent unauthorized access. Clicking on different areas of laptop screen reveals different menus. Photographs of failed parts and assembly lines taken by digital camera used to assist in problem description. Viewed as more effective than having to describe the problem in words. Carries laptop and accepts calls while on vacation blurs boundaries between personal and business life but increases accessibility. Accessibility restricted in some scenarios reinforcing boundary between personal and business life. Outlook replaces Franklin Covey Planner. Franklin Covey planner described as difficult to carry and to search through. For security reasons, proprietary networking devices used to connect to the Internet and encrypt and transmit data.	No intention to acquire tablet PC because level of handwriting recognition not viewed as enhancing efficiency

MR. GADGET	RETROSPECTIVE PHASE 1		
CONTEXT	**ITERATIONAL**	**PRACTICAL EVALUATIVE**	**PROJECTIVE**
INSTITUTIONAL Self employed certified Microsoft trainer for past 4 years. Previously a musician for 20 years. Provides IT training to organizations. Ranked as one of Microsoft's top trainers. **INDIVIDUAL** Single father of adult son and engaged to be married. **AGENTIC DILEMMA** Use of devices based on business requirements rather than pleasurable activities. **TECHNOLOGY** Devices include two laptops, PDA, cell phone and aircard. Travels with mobile classroom consisting of 15 laptops. Home office equipped with 12 desktop computer to support accounting and business administration, cell phone messaging, email software installation, desktop publishing and download and storage of training material.	Use of online calendar, website as musician modified to reflect new profession as trainer. Practice of making himself always accessible as a musician carried over to new profession as trainer. .	Always accessible by cell phone. Land based phones forwarded to cell phone. Personal and Business activities share same time and space. Instant messaging and email viewed as business and social tools resulting in the blurring of boundaries between business and personal lives Synchronous messaging preferred but asynchronous messaging viewed as useful when establishing contact was difficult Travel plans designed to facilitate multitasking while moving and to make use of dead time by using mobile devices. Access to remotely located resources in home office maximizes productivity PDA used for quick reference to schedule, setting reminders and mapping location. However not viewed as useful for other functions.	Acquisition of devices governed by business needs rather than personal needs. Acquires next new technology as long as it's affordable and useful. No intention to acquire camera phone as photographs not as high a quality as conventional cameras and has no business purpose. Intention to acquire wearable health monitor because of busy lifestyle.

YOUNG GUN	RETROSPECTIVE PHASE 1			LONGITUDINAL PHASE 2
CONTEXT	**ITERATIONAL**	**PRACTICAL EVALUTIVE**	**PROJECTIVE**	**PRACTICAL EVALUATIVE**
INSTITUTIONAL Sales Territory Manager & Client Services Representative employed to major IT worldwide vendor. Teleworker who works from home. **INDIVIDUAL** In early twenties B.Sc. Business Administration. Single with no children but very close to immediate family located in another state. **TECHNOLOGY** Corporate laptop (wired) and personal cell phone and PDA are devices in use. Home office equipped with printer, fax machine, office phone and DSL line. **AGENTIC DILEMMA** Use based on what is necessary rather than by what is available.	Use of composition notebook to record quick notes.	Always accessible through cell phone, email & instant messaging. Personal and business activities share same time and space. Lack of wireless access results in dependence on team mates to send email on his behalf while traveling. Phone is preferred medium of communication. Personal touch seen as important for remote sales. Cell phone used as recording device to leave messages for himself while moving. PDA used for scheduling, maintaining contact information and setting reminders and storing important documents that might be required in a meeting. Mobile tools used for multitasking. Boundaries between personal and business life enforced by leaving laptop behind while on vacation and having designated personal time while at home.	Intention to use Blackberry device if issued by organization. Not viewed as a necessary but as a nice toy. Viewed as increasing accessibility while traveling. No intention to acquire wireless access for laptop and PDA. Not viewed as necessary.	Acquisition of wireless card for laptop to increase accessibility to the Internet and to self while traveling.

TECHNOHOLIC	RETROSPECTIVE PHASE 1		
CONTEXT	**ITERATIONAL**	**PRACTICAL EVALUTIVE**	**PROJECTIVE**
INSTITUTIONAL Self employed certified Microsoft trainer. Intern at state run office. Previous employment includes trainer at training institution and IT consulting services at consulting firm. Appointments were held simultaneously. Does not have office base but works out of virtual office facilitated by mobile technology. **INDIVIDUAL** In early thirties. Divorced and father of one child. Undergraduate student in business school. Member of mobile computing user group. **TECHNOLOGY** 5 laptops but only one used at a time. Tablet PC, 3 Pocket PC's, 2 aircards.	.	Synchronization of data (email, contacts & notes) across laptop, desktop and PDA. Personal and Business activities share same time and space. Devices used for both personal and business activities. Always accessible by email and instant messaging which are preferred modes of communication in comparison to the telephone. Instant messaging and email viewed as business and social tools resulting in the blurring of boundaries between business and personal lives Wireless networks installed at relatives' homes to facilitate constant accessibility. Does not visit locations which do not have an Internet access. Aircard used for Internet access while traveling. Training carried out by using remote tools to access computer resources at home. Eliminates the need to carry multiple devices. Tablet PC preferred device because of convergence of PDA & laptop functionality. Use of tablet PC with handwriting recognition eliminates need for composition book. Overwhelming demands creates the need to deliberately disconnect from the Internet and the phone in isolation from personal and business contacts.	Intention to phase out pocket PC and acquire phone functionality for tablet PC resulting in further convergence of devices. Looks forward to ubiquitous environment where carrying devices would be unnecessary.

TECHNOHOLIC CONTINUED	RETROSPECTIVE PHASE 1		
CONTEXT	**ITERATIONAL**	**PRACTICAL EVALUATIVE**	**PROJECTIVE**
PAST PRACTICES Composition book. Date book. **AGENTIC DILEMMA** Technology use is a hobby & career which dominates time & sometimes interferes with effectiveness and personal time.		Makes use of dead time by working in car using mobile devices while both stationary & traveling. Access restricted by phone. Planning carried out using Franklin Covey Software and Outlook. Travels with multiple devices of the same type in case of device failure. Tendency to multitask while moving. Notifies contacts of location and device being used on instant messenger. Office base is tablet PC. Alerts used for traffic & stock updates, text messages & email. Phone use in meetings viewed as inappropriate.	

TIMENATOR	RETROSPECTIVE PHASE 1		
CONTEXT	**ITERATIONAL**	**PRACTICAL EVALUTIVE**	**PROJECTIVE**
INSTITUTIONAL Employed to major pharmaceutical company as a Sales Representative for past 4 years. Teleworker who works out of home office. **INDIVIDUAL** In early thirties. BA (Communications) Owns own business. Single with no children but close to immediate family. **TECHNOLOGY** 1 Fujitsu handheld computer (wired). Personal cell phone, PDA & laptop. **PAST PRACTICES** Samples issued to doctors using paper forms. Data on doctors & prescribing habits now available on handheld previously available in paper reports. Previous company laptop large & difficult to carry into the field. **AGENTIC DILEMMA** Desires to maximize productivity by sticking to planned appointments while on company time hence known as "The Timenator". Computer use associated with business rather than pleasure.	Uses Franklin Covey Planner for appointments & scheduling because viewed as easier to use and more reliable. Replicates appointments in PDA. Paper reports still used in home office because preformatted reports eliminates the need to generate queries on handheld	Separation of business and personal activities through business and personal devices. Specific office hours designated even though works from home defining boundaries between work & business lives. Accessibility during business day restricted to business communications and top priorities. Communication from family not seen as disruptive. Communication from friends seen as disruptive. Email transmitted & received at home but not on the road. Email compiled on the road. Ability to carry Fujitsu into the field increases access to organizational resources. Samples issued to doctors using Fujitsu which accepts doctors' signatures. Eliminates paper forms & errors. Tendency to work in car before appointments while stationary using Fujitsu making use of dead time. PDA used for contacts, scheduling, location of nearest vendors & services & notes on doctors. Used mostly for personal activities. Replicates some appointments in Franklin Covey Planner. Mobile devices not carried on vacation reinforcing boundaries between business & personal life.	. Acquisitions dictated by organization. Acquisition of tablet PC to replace Fujitsu handheld. Wireless functionality at home not likely because of desire to restrict business activity to home office. Wireless functionality on the road viewed as increasing productivity. Needs for new acquisitions based on requirements for business. No intention to acquire camera phone as not viewed as business tool.

APPENDIX B

INTERVIEW GUIDES

FIRST INTERVIEW

TOPIC/ RESEARCH QUESTION	DATA COLLECTED/ QUESTIONS TO BE ASKED
A. BACKGROUND OF ORGANIZATION	1. Industry 2. Geographic location 3. Type of Business 4. Organizational Structure
B. BACKGROUND OF USER	1. Name 2. Position 3. Responsibility 4. Years with Organization 5. Education 6. Years using technology
C. IT PLATFORM	1. IT departmental structure. 2. What's the IT Platform for mobile workers? (Hardware, applications and networks?) 3. How have the IT systems evolved. 4. What are the organization's future plans for upgrades and acquisitions? 5. How are users trained? 6. How are users supported? 7. Are there any documented or undocumented guidelines as to users should use the technology. 8. What's the policy for integrating personal devices with company devices?
D. PATTERNS OF USE	1. How often do you travel? 2. Where do you travel to? 3. Why do you travel? 4. What devices, applications and wireless services do you use? 5. How did you obtain each device/application/wireless service? 6. How did you learn to use each device? 7. Which device/application/wireless service is most important, least important and why? 8. Which features are most important, least important and why? 9. What are the different roles that you play in a business context? 10. What are the different roles that you play in a personal context? 11. How do you use the environment to interact on a business level? (frequency, who and with what, where, when) 12. How do you use the environment to interact on a

	personal level? (frequency, who and with what, where, when) 13. What were your expectations? 14. Were your expectations met? 15. What are the expectations of colleagues and the organization in terms of your accessibility? 16. What are the expectations of those in your personal life in terms of your accessibility? 17. What are your expectations of others in terms of their accessibility? 18. How do you plan your day while mobile? 19. Does your day ever go as planned while mobile? 20. What are the factors that determine how you use a device to perform a particular task? 21. How do you prioritize tasks while mobile? 22. How do you know the best way to contact someone? 23. How do people know the best way to contact you? 24. Is there anything you do traditionally that you don't think you will replace with technology? 25. Are there things that you do repetitively? 26. Can you tell me of an instance when you used the environment in an unusual or innovative way? 27. How do you personalize the environment?
E. PRODUCTIVITY	1. Do you think you are productive? Why? What are the measures of productivity? 2. How does the environment make you more productive? (Please tell a story) 3. What are the advantages of using the environment? 4. How do you maximize on the advantages of the environment? 5. How does the environment make life more difficult? (Please tell a story) 6. What are the disadvantages of using the environment? 7. How do you minimize the disadvantages? 8. How has life changed overall after acquiring the devices? 9. Are there any practices that have not changed and you do not envisage to change? 10. If there were no limitations to what you could do to improve the technology, what enhancements to the environment would make so as to make you more effective?

SECOND INTERVIEW

TOPIC/ RESEARCH QUESTION	DATA TO BE COLLECTED/ QUESTIONS TO BE ASKED
A. NEW PATTERNS OF USE	1. Have there been any changes in the scope of your responsibilities in both your personal and business life? 2. Have there been any changes in your mobility? 3. Have there been any changes in where you do your work? 4. Have you acquired any new devices or applications? 5. What were your expectations? 6. Were your expectations met? 7. How has life changed since acquiring the new devices? 8. Have any of your prior practices changed in your business and personal life? 9. Have you instituted any new practices in your business and personal life? 10. Do you have any plans to upgrade or acquire any new devices or to change your practices? 11. How do you plan your day while mobile? 12. Does your day ever go as planned while mobile? 13. What are your plans for today?
B. PRODUCTIVITY	1. What are the advantages of using the environment? 2. Do you think you benefit from these advantages? 3. How do you benefit from the advantages? 4. What are the disadvantages of using the environment? 5. Do you think you are affected by these disadvantages? 6. How? 7. How do you prevent yourself from being affected by these disadvantages? 8. Have there been any changes in your productivity? 9. What are the things that contribute to your effectiveness as a mobile worker?

APPENDIX C

RESULTS FROM CODING

PATTERN CODES	INTERPRETIVE CODES
AGENCY	Past Practices
	Present Practices
	Future Practices
SOCIAL PROCESSES	Reflexivity
	Intersubjectivity
ADVANTAGES	Multitasking While Moving
	Removal of Temporal and Spatial Constraints
	Enhanced Communication & Collaboration
DISADVANTAGES	Multiple & Overwhelming Demands
	Blurring of Boundaries
	Unnecessary & Frequent Interruptions
CONTEXT	Individual
	Institutional
SPACE UTILIZATION	Use of Dead Time
	Multitasking While Moving
	Reconfiguration & Use of Space
OPPOSING FORCES	Asynchronous
	Synchronous
	Restricted Access
	Unlimited Access
	Merging
	Separating
	Planned
	Unplanned
	Appropriate
	Inappropriate
EFFECTIVENESS	

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