Wireless mobility, innovation; social, individual and organizational intelligence: Lessons learned from CEOs

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Abstract

Knowledge management by organizations and individuals has been a focus of recent research in business management. Strategic knowledge arbitrage and serendipity (SKARSE) describes skills involved in recognizing events that may add to knowledge and enhance management skills. This study investigated the intuitive application of SKARSE principles by CEOs in their use of mobile electronic devices. A pilot study consisting of semi-structured interviews of 33 CEOs addressed the question, How and why do CEOs use wireless mobile devices and what is their perceived usefulness? Response domain analysis revealed three principle domains: serendipitous discoveries, productivity and process, and social/individual networking behaviors. In a qualitative study, 15 CEOs of small to mid-sized organizations were interviewed for 1 hour each. Analysis of transcripts yielded 3 themes (e.g., cultural mobility evolution) and 9 subthemes or properties (e.g., cultural shift for necessity). In a quantitative study, the same 15 CEOs used electronic self-observation logs to record their use of mobile technologies in 3-hour intervals over 2 weeks. Questions were explored as to how and why the CEOs used mobile devices as a tool for learning, an opportunity for serendipity, to practice SKARSE concepts, and as a mechanism for knowledge transfer. Behaviors were recorded for 3 types of devices, 5 locations, 9 uses, and 16 actions (e.g., learning, reviewing), with 5 effects (e.g., satisfied, chaotic). Smartphones were used in 708/1188 time blocks, tablets in 221, and smartcard laptops in 61. The most common actions were responding, reviewing, and sharing. Patterns of use differed by location and time of day. Overall conclusions: CEOs rely heavily on mobile devices for learning, knowledge management, and communication; they are executive knowledge workers and use SKARSE principles on an individual level. Being connected to colleagues and clients 24/7 has major advantages but some drawbacks. A number of cultural shifts were also noted.

Dedication

There are a number of people without whom this thesis might have been written, and to whom I am greatly indebted.

To my wife Stacey, who has been a source of encouragement, support and inspiration while I have been pursuing this journey since 2009. I am truly thankful for having you in my life.

To our children Sophia and Nolan who have traveled this journey with us. Sophia was 2 years old when I attended the first workshop and came along with us. Sophia is now almost 9. Nolan was not born when I started this journey and he is almost 5. Both children have been very understanding of their dad's dedication to complete this program.

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Declaration

This declaration is made on the 6 day of November, 2015.

Student's Declaration:

I Steve Clark, hereby declare that the work entitled

Wireless mobility, innovation; social, individual and organizational intelligence: Lessons learned from CEOs is my original work. I have not copied from any other students' work or from any other sources except where due reference or acknowledgement is made explicitly in the text, nor has any part been written for me by another person.

Steve Clark

Date

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Definitions of Terms

Category: In the coding of transcribed interviews, a category represents a key theme or concept (universal code) which was derived from two or more participant transcriptions identifying the patterns of word usage.

Coding: "Coding consists of identifying chunks or segments in textual data and giving each a label (code). Coding is the analytical strategy that many qualitative researchers employ to help them locate key themes, patterns, ideas, and concepts that may exist within their data" (Hesse-Biber & Leavy, 2011, p. 330).

Creative destruction: This principle says that inefficient or unnecessary individuals, functions, ideas, processes, products, divisions, corporations, or entire industries will fall by the wayside and be replaced by those better suited to fulfilling the demands of the marketplace (Schumpeter, 1943).

Self-observation Log Definitions: (displayed in Appendix A).

Paradigm: "A set of linked assumptions about the world which is shared by a community of scientists investigating the world" (Deshpande, 1983, p. 101).

Property: In the coding of transcribed interviews, a property is a focus code or sub-theme.

Strategic knowledge arbitrage and serendipity (SKARSE): A concept describing processes of "unlocking and capturing the value added by creative destruction" (Carayannis, 2013, p. 34).

CHAPTER 1 INTRODUCTION

Overview

As with any other major human endeavor, business practice has been the subject of an enormous body of academic research. Since the business executive and especially the chief executive officer (CEO) has a disproportionate effect on business practice, much of the research is directed at improving his or her efficiency and effectiveness. This focus is not socially disadvantageous, however, as a gradual improvement in some businesses' ability to maximize profits, within limits imposed by law and ethics, may eventually result in the improvement of all.

Within the vast body of work dedicated to discovering means of improving the efficiency and productivity of both organizations and CEOs, recent research has focused on *knowledge management*, a concept popularized by Nonaka (1991), and learning, especially higher, organizational, and technological learning. Knowledge management is a set of strategies and practices that an organization uses to define, create, organize, and disseminate knowledge, in the form of insights and experiences either embodied in individuals or embedded in organizations as tacit or explicit processes or practices (Khan & Halabi, 2009).

Business and society have become globally connected. This interconnectedness has placed additional emphasis on reaching and sustaining competitiveness from an individual and organizational level (Mustaffia, Ibrahim, Amizah, Mahmud, Ahmad, Kee, & Mahbob, 2011). Research conducted by Earl and Scott (1999) has specified that focusing on knowledge is a necessity to become a competitive force in any industry. They stated that "knowledge is displacing capital, natural resources, and labor as the basic economic resource" (p. 32). Consequently, organizations that have more extensive and thorough knowledge resources create more opportunities for learning to occur (Leiponen & Helfat, 2010). Therefore, knowledge and learning are interrelated, collaborative practices that shape each other.

The rest of this chapter will introduce knowledge management and *strategic knowledge arbitrage and serendipity* (SKARSE), which is a set of skills for making use of knowledge, and mobile technologies, which are focused on in this study as means for the effective practice of SKARSE. In addition, the problem to be addressed will be summarized, and transdisciplinarity, the research approach of the study, will be described.

Knowledge Management

Knowledge management is a set of strategies and practices within an organization to ensure that knowledge is both available to and directed towards persons in the organization who would benefit from having that knowledge (Alavi & Leidner, 2001). Several topics are implied in this definition. These will be discussed in more detail in the following chapter.

- Knowledge management is not simply providing a library of facts. Knowledge is more than information; it includes intuition, experience, habit, and organizational structure.
- Knowledge management must take into account how people acquire new knowledge, that is, how people learn.
- Knowledge must come from somewhere. Sources can be as varied as ancient Greek philosophy, voting records, scientific publications, or sales figures. It can come from personal observation or the *Bible*, the *Wall Street Journal* or the *Hunger Games* movies, Rush Limbaugh or the *Daily Show*, a CEO or a homeless person. Knowledge management must find a way to combine information from these sources into a unified system.
- Knowledge can be abstract or concrete, an implicit philosophy or an email address.
- Knowledge can be of different types: religious, scientific, etc.
- Knowledge can vary in quality, from confirmed facts, to speculation, to misinformation.
- Knowledge can be large-scale or small-scale, a directory of thousands of phone numbers or a specific one, and knowledge management must supply the information on the appropriate scale.
- Knowledge can be tacit (unverbalized) or explicit (expressed in some concrete form).
- Knowledge can be unstructured (a collection of information) or structured (well-organized).
- Unlike most resources, knowledge is not diminished when passed on to others, although its value may become diluted.
- Knowledge can be acquired via a number of different routes:
    - Formally, as in a college program of study, a new employee orientation, or an organizational chart showing who reports to whom.
    - Informally, by reading or observing others.
    - Incidentally, while focusing on something unrelated.
    - Creatively, by having an original idea.

- Knowledge management must distribute knowledge selectively. Not everyone in an organization needs to know everything. Furthermore, too much knowledge pushed onto people leads to information overload and a loss of a sense of what is important; even simply making knowledge available to all can be distracting and redundant.
- On the other hand, knowledge must reach persons who need it; that is, knowledge must be proactively distributed to some persons.

Thus, the theoretical foundation of knowledge management must draw on a wide variety of theoretical underpinnings, which will be described in the literature review in chapter 2.

The goal of knowledge management is the deployment of meaningful information to the appropriate people at the best time with profit maximization in mind (Huseby & Cho, 2003). A knowledge management system provides information on potential or existing markets, innovation, products, suppliers, competitors, regulators, skills, collaboration, and new or existing processes that can be leveraged for strategic initiatives and decision making (Plessis, 2005).

Personal knowledge management. In the same way that the goal of knowledge management is to deploy meaningful information to the appropriate people at the best time, the goal of personal knowledge management is to make meaningful information available to individuals (both the person practicing personal knowledge management and others he/she communicates with) at the best time and in the best form on the personal level. In order to achieve a competitive advantage, CEOs are faced with various challenges including differentiating themselves from their peer group in a quest to become better leaders. Historically, differentiation strategies included self-enrichment, networking groups, professional development such as workshops, and seminars and direct experience (Interview with Steve Bernstein, President of Wells Fargo Bank, Pacific Western Division, April 2, 2013). These executives and the organizations they lead continually seek innovative ways to accomplish these goals. Within this context, business literature has introduced concepts related to knowledge, learning and knowledge, and learning hubs as means to achieve competitive advantage and differentiate oneself as a business leader.

Learning occurs from the foundation and application of knowledge, which includes an individual's openness to explore and ability to continuously change (Boutellier, Ullman, Schreiber, & Naef, 2008). For example, Clough, Jones, McAndrew, and Scanlon (2007) found that learners use reflection as a means to construct knowledge from their past lived experiences. These actions result in practicing the elasticity of change exploring the

unknown, seeking new ideas and having the foresight to consider future events (Rahmandad, 2008). The new ideas and foresight of the future are the impetus to create strategic initiatives, described by Geng, Lin, and Whinston (2009), which surround these ideas, while collaborating with others of authority. Finally, Cole (1989) found that successful learning outcomes are a direct result of the effective management of learning strategies. Personal knowledge management, therefore, is the application of knowledge management principles to the individual executive.

The research described here concerns knowledge management, *personal knowledge management*, and *strategic knowledge arbitrage and serendipity* (SKARSE).

Strategic Knowledge Arbitrage and Serendipity (SKARSE)

SKARSE is probably best described as a skill set, in the same sense that playing tennis involves the complex coordination among knowledge of strategy, good vision, fast reflexes, strong muscles, etc., all in the service of achieving a specific long-term goal (winning the game) via many specific moves (moving quickly, placing a shot, out-maneuvering the opponent, etc.). Possibly one could become a skilled player without ever considering the interconnections of the game as a whole, but there are advantages to making them explicit, especially in coaching others to attain a high level of skill.

SKARSE requires a high level of thinking, reflection, and implementation, encompassing specific attributes while enhancing creativity, invention, innovation, and entrepreneurship. The framework of SKARSE is divided into two components, referred to as *strategic knowledge arbitrage* and *strategic knowledge serendipity*. Strategic knowledge serendipity is "the unintended benefits of enabling knowledge to 'spill over' between employees, groups and functional domains," while strategic knowledge arbitrage refers to "the ability to distribute and use specific knowledge for applications other than the intended topic area" (Carayannis, 2008, p. 4).

SKARSE on the individual level. Although most prior research and writing on SKARSE has focused on the business organization, the present research proposes that its principles can be adapted to the individual level. This has been suggested previously, as in Carayannis and Stewart (2013), who referred to technology entrepreneurs as SKARSE enactors. That is, in the same way that personal knowledge management is an adaptation of the principles of knowledge management to the individual, it is proposed here that SKARSE can also be applied to individuals. This would allow for a clearer theoretical understanding of the skill set already intuitively used by CEOs, as well as enabling better "coaching" of

individuals. For example, based upon an array of experiences, CEOs are able to draw from a variety of intricate and tactical tangible and intangible resources to grow and sustain the organization that they represent (Denrell, Fang, & Winter, 2003).

From a tangible perspective, the CEO may review, change or leverage brick and mortar facilities in various geographies in order to enhance cost, resource, and distribution efficiencies or perform an analysis on technological competence within the organization to seek new ideas to increase production, increase quality, or reduce costs. From an intangible resource perspective, CEOs are able to use their left and right brain to draw knowledge from diverse experiences, combine internal knowledge resources and leverage these inherent or trained sets of skills, and in the process create strategic opportunities for the organization and its stakeholders. This example of the CEO combining and reallocating strategic knowledge assets could be viewed as similar to the prior example of the professional tennis player; where prior matches, practice, reviewing and learning result in a transformation of the player during each of their present or future matches.

The present study (including the pilot study, see chapter 4) appears to be the first application of SKARSE to personal knowledge management. This study introduces the process of SKARSE as a bottom up component to knowledge management as well as personal knowledge management. These three constructs begin with the individual. Within the context of individualism and the paradigm of knowledge and technology, meaning their global view or "a set of linked assumptions about the world which is shared by a community of scientists investigating the world" (Deshpande, 1983, p. 101), one theoretical foundation for this study is personal knowledge management. This theoretical framework is based on the concepts of technology as a key driver in assisting the "individuals to be more effective in personal, organizational, and social environments" (Pauleen, 2009, p. 221). Although the practice of SKARSE can be intuitive in nature for a cultural group such as CEOs due to their vast array of experiences, as on the organizational level, the effective practice of SKARSE requires an understanding of the interrelated components relating to its makeup, including learning and knowledge.

Mobile Technologies

A review of the field suggests that it would be useful to investigate the current affordances of mobile technologies and how these technologies are perceived as useful by CEOs. Technology and mobile technologies are an integral component of a comprehensive knowledge management platform. Technology is an intangible resource, comparable to

knowledge. The comprehensive makeup of technology such as software which facilitates or supports information communication technology and mobile devices, are in themselves knowledge of how to perform certain things to facilitate or achieve human goals (Bianchi, Chiesa, & Frattini, 2011). Based upon this premise, technology can be viewed as a tool for CEOs to manage their individual lives or the organization they are representing.

Technology affords the CEO the opportunity to stay organizationally active and facilitate the various forms of strategic knowledge that they possess. It is a key component of the organizational game taking place, to be competitive and win. The importance of technology and the tools which augment the facilitation of the organizational win can also be explained by the tennis metaphor presented above. The competitive tennis player is unable to take part in the game or ultimately win the match if they do not possess the proper tools such as the ball or racket. Technology is to the CEO or organization as the ball and racket are to the tennis player.

This usefulness is further studied within the context of mobile devices acting as mobile hubs for the effective practice of SKARSE and personal knowledge management including learning and knowledge transfer. The evolution of technology has allowed it to become an integral tool for organizations and their leaders within the aspects of competitive advantage. Technology has evolved from the organization level in uses such as computers and automation to the individual level through the use of information communication technology (ICT) or mobile technologies. Hemp (2009) acknowledged that mobile communication devices are an efficient way to seek information. This information is a construct of knowledge and a component of learning.

As noted above, Cole (1989) found that successful learning outcomes are a direct result of the effective management of learning strategies. These learning strategies become the foundation for leaders to incorporate technological advances. The concepts of learning and knowledge also relate to research conducted by Teece (1986), which concluded that technology plays an integral role as an enabler to effective learning. The concepts of personal knowledge management and SKARSE are put into practice by chief executive officers to differentiate themselves while using and leveraging mobile devices for their individual or organizational needs.

Statement of the Problem, Gaps in Literature, and Purpose of Study

Due to a sociological paradigm shift in industrialized nations evolving from a production based economy to a service or technological based economy, it is recognized that

knowledge is a valuable intangible resource. Additionally, the practice of SKARSE and the components within its framework are key drivers enabling professional mastery. Furthermore, telecommunications including mobile devices have become a common means to communicate within this paradigm shift.

Thus, there are two significant gaps in the literature relating to knowledge management. The first concerns the lack of any empirical research exploring whether individuals (in particular, CEOs) make use of the same set of competencies combining serendipity and arbitrage that has been demonstrated on the organizational level. The second concerns a lack of knowledge of how CEOs currently make use of mobile electronic devices. The problem to be addressed, then, is whether chief executive officers perceive mobile communication devices as a useful telecommunications tool personally or professionally. An additional problem this study seeks to address is whether mobile devices afford CEOs the opportunity to engage in the practice of SKARSE or its various components including the facilitation of knowledge transfer within the exchange of knowledge, encountering unforeseen events or serendipity, and leveraging the device for purposes of self-development such as learning. Finally, the purpose of this mixed methods study is to examine how CEOs are using wireless mobile technologies and their perceived usefulness.

Transdisciplinarity

In summarizing the first International Interdisciplinarity Conference, held in Zurich in 2000, Häberli, Bill, Grossenbacher-Mansuy, Thompson Klein, Scholz, and Welti (2000) stated,

> For important challenges, such as sustainability, expertise is not restricted to academic circles alone…. Transdisciplinarity…is an essential tool for creating new insights that lead to new solutions and engage creative processes of mutual learning…. Although "transdisciplinary" is a relatively new word, the concept of taking up concrete problems of society and working out solutions in cooperation with scientists and other actors has a long tradition…. The emergence of the information society, with its attendant societal and economic changes, has fostered a new democratization of knowledge and involvement of industries in the production and management of knowledge. (p. 8)

In the business context, transdisciplinarity comprises a multitude of theories, frameworks, models and its connection to practice to solve "real life problems" through an understanding of science and society. The approach involves an evolution of knowledge though an investigative process where a gap or issue in practice is identified and the researcher employs a rigorous research design in an effort to gather data from participants in

a managerial role and integrates academic ideas / frameworks / research / theories, etc. into the overall process.

Transdisciplinary research developed in opposition to the continued narrowing of focus of specialized disciplines (Bergmann, Jahn, Knobloch, Krohn, Pohl, & Schramm, 2012). As most research approaches became more and more specific to a specialized field, a need was felt for transdisciplinarity to address societal problems (Jahn, Bergmann, & Keil, 2012). In general, a transdisciplinary approach incorporates not only experts from several fields relevant to a broad issue (e.g., climate change), but persons outside the academic establishment with practical knowledge of the issues (e.g., in the case of climate change, politicians and farmers).

Transdisciplinary practice goes beyond disciplinary, multidisciplinary, and interdisciplinary contexts in that a problem-oriented integration of knowledge and methods occurs at the interface between societal problems and scientific issues that emerge at the boundaries between different disciplines (Jahn, 2008). In the research process that emerges from transdisciplinarity, societal issues are defined in real-world terms but are handled scientifically.

The present study was designed to apply a transdisciplinary research process to the topic under study. According to Bergmann et al. (2012), ideal transdisciplinary research includes a number of elements. At the start, a description of a real-world problem must be developed through iterations among both scientists and "active actors," that is, those directly engaged with the problem. The authors recommended "an exact description of the problem" (p. 37) at the start. In this, the present research fell short of the ideal, as the definition of the problem evolved over the course of the study. On the other hand, it seems appropriate that a study focused largely on serendipity should take advantage of unanticipated findings to change its focus somewhat. Although typically a transdisciplinary study is performed by a team including scientists from several disciplines, this was inappropriate for a doctoral thesis. The sole researcher was thus obligated to do broad preparatory literature research so as to perform the functions of an expert in leadership, organizational behavior, communications, research methodology, and personal electronic devices. Mitigating this limitation was the fact that he also had extensive real-world experience in the setting in which the study was conducted, thus helping to bridge the gap between the scientist and the active actor.

Other characteristics of transdisciplinary research include considering the interests, knowledge, and goals of non-academic actors, dividing the project into subprojects, openness to non-traditional methods and especially measures, a necessary reduction in the complexity

typically found in real-world problems, and checking results with the whole team (Bergmann et al., 2012). The present study was designed to follow these recommendations, and the descriptions of the various stages of the research below will note how the actual practice of the study reflected these considerations. It is hoped that the study will enhance transdisciplinary practice in management by providing researchers and practitioners in the field of management with a broad example of a study of CEOs that draws on theories from leadership, knowledge management, and communications, and that uses a variety of research methods.

Significance of the Study and Research Questions

Knowledge management is a very broad field. There are dozens of important topics in need of closer study, but the research presented here will focus on a very new topic, one that has only become relevant to business management in the past decade. The research is intended to meet the need for more information, particularly on two topics: the use of SKARSE by individual CEOs, and how CEOs use mobile technologies. The goal of the research is to establish a theoretical framework of how these two topics are combined. The overall research question is:

1) How and why do CEOs use wireless mobile communication devices and what is their perceived usefulness?

The following four secondary research questions were also addressed:

2) How and why do CEOs leverage mobile devices as a tool for learning?
3) How and why do mobile technologies afford CEOs an opportunity to experience serendipitous events?
4) How and why do CEOs practice the concepts of SKARSE through the use of their mobile devices?
5) How and why do CEOs use smartphones as a mechanism for knowledge transfer?

Overview of Methods and Summary of the Thesis Structure

Chapter 2 will consist of a review of the relevant literature on learning on both the individual and organizational levels, knowledge, knowledge management, SKARSE, and mobile technology. The three parts of this study were designed to be a logical progression to gain progressively deeper insights into understanding the topic: *How and why do CEOs use wireless mobile devices and what is their perceived usefulness?* Chapter 3 will describe overall theoretical foundations of the research methods and the rationale for choosing mixed

methods. It will also provide a general description of qualitative methods, and will then focus on several techniques used in the current study: interviews, focus groups, and self-observation logs. Quantitative methods will also receive a general introduction, and the chapter will end with sections on assumptions and limitations.

Rather than tailor the current approach to any theory, which tends to narrow the method to only those variables addressed by the theory, the present research sought to cast a wide net for data and explore how a number of variables were related to each other. The research began with an exploratory pilot study consisting of 33 qualitatively analyzed audiotaped interviews. Spradley's (1979) domain analysis was used to define terms used and analyze them as to cause and effect, means-end, and attribution aspects. This part concluded that the research question warranted further study, but that additional themes needed to be developed.

Stage 1, a qualitative study, was based on 15 CEO participants, each interviewed for approximately 1 hour. Transcriptions of audiotapes were closely analyzed by the researcher and a colleague to determine common categories and properties, defined in Appendix A.

Stage 2 included a quantitative study with the same 15 CEO participants. In this stage, the categories and properties derived in Stage 1 were developed into a self-observation log to be completed by the participants. As part of this process, a focus group of five additional executives was formed to help design the format and procedure to be used with the self-observation log.

Chapter 4 will present results of the pilot study, Stage 1, and Stage 2. Finally, chapter 5 will encompass an overall discussion of results and present conclusions. Ultimately, a full picture of how, when, and where CEOs used the mobile devices emerged, and was summarized in the development of six factors.

CHAPTER 2 REVIEW OF THE LITERATURE

Chapter Overview

This review will progress from a general theoretical background on learning and knowledge, to details of knowledge acquisition, transfer, and diffusion. Certain themes were found to run through many separate topics. For example, it was found that constructivism and collective learning are important processes both at the individual level and the organizational level. Individual personal characteristics such as support and trust are relevant to many theories and observations on knowledge management, and social relationships are always considered vital. SKARSE will be described in detail, including what it is and how it is used in business practice. A section on information and communication technology will focus on smartphones. A final section will summarize the linkages among these topics.

Learning on the Individual Level

Learning is the acquisition of new knowledge or skills (Webster's, 1976). Many of the principles of learning theories can be applied to both individual and organizational development. As Liaw, Hatala, and Huang (2010, p. 453) noted, "Learning activities include complex cognitive and social processes that are necessary to interact with the world around it." Modern research into the root of learning originated with psychologist Jean Piaget (1952), who believed that learning is self-constructed as children grow to become adults. Throughout this quest, all the experiences from the children's previous years are used to construct any new knowledge they require. This acknowledgement of children's previous years of experience is referred to as constructivist learning principles (Piaget, 1952). Within this context educators Piaget (1952) and Lévi-Strauss (1963) further described learning as a spiral, whereby information that one has learned is used as the foundation for sharing new information. This depiction of a spiral is a continuum throughout the process of learning and constructing meaning from previous experiences. Constructivism was further developed by a number of theorists such as Papert (1993) and particularly by Vygotsky (e.g., 1962). Constructivism is a set of assumptions about learning. Fundamentally, it is proposed that knowledge is "constructed" in a social context and is then adopted by individuals. Vygotsky contributed the concept of the zone of proximal development, "the distance between the actual developmental level as determined by independent problem solving and the level of

potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Vygotsky, 1978, p. 86).

The focus of most research on learning has been children and youth, as a basis for improving the educational system. However, learning principles also apply to adults, including in their roles as employees or as units of an organization. The principles of constructivism were verified by Sharples, Corlett, & Westmancott (2002) in adult learners, stating that learning occurs when there is interdependency between each participant, whereby students become teachers, as well as learners. The interdependency which is also referred to as reflective listening reinforces the constructivist principles.

Subsequently, this process of managing knowledge was further described by Clough et al. (2007), who found that learners construct knowledge from their past lived experiences. This has also been referred to as the process of reflection, whereby leveraging past occurrences, individuals are able to act on opportunities in the present while influencing the future (Carayannis, 1999). Reflection-based learning is acknowledged by Ben-Ner & Lluis (2010), who drew on a survey of 110 public firms and claimed to be the first to evaluate a wide spectrum of variables and firm characteristics that influenced learning during the 1980s. They referred to reflection as the construct of knowledge or action based learning, while Kerin, Varadarajan, and Peterson (1992), in a critical review of the literature, described reflection as consumption-based learning activities. Another example of learning was presented by Ben-Ner and Lluis (2010) as an action-based learning style using reflection which leads to performance and action. This process has been described by Freire (1970) as *praxis*.

Sharples et al. (2002) also researched learning from the perspective of being spontaneous and found unstructured learning provides flexibility for acknowledging change. Rahmandad (2008) supported Sharples et al.'s notion of unstructured learning and provided a framework for explaining effective learning within this context, stressing the importance of exploring the unknown, seeking new ideas and having the foresight to consider future events.

The components of learning are also approached by some researchers from a hierarchical perspective. This perspective of learning presents three interrelated conceptual levels within the framework which include operational, tactical, and strategic (Carayannis & Kassicieh, 1996). These levels are:

Operational: This is a short to medium perspective of learning comprised of accrued practice and learning through action. Additional focus is on innovative competencies, which are constructed through content learned.

Tactical: A medium to long term perspective is applied. This is a process of re-designing and re-manufacturing, creating new models of decision making by changing the rules for making decisions or creating new ones. This approach generates learning opportunities in an efficient and effective manner by leveraging or linking existing core competencies (Carayannis, 2000).

Strategic: Strategic learning is a long term commitment; therefore a long term perspective is applied. The goal of strategic learning is "to increase the slope of the learning curve as well as the rate by which the slope per se increases by means of enhanced and innovative organizational routine" (Carayannis, 2001a, p. 11; see also Carayannis, 2001b). Learners must create new methods, tactics, procedures, and circumstances, continuously evolving themselves. In a pilot study by Carayannis (2001a), 19 firms from four industries (pharmaceutical, chemical, energy, and biotech) were studied. It was concluded that technological learning is multi-dimensional, and that the relationship between learning and firm performance can change with the analysis context.

A customary view of learning is through a formalized education as Vavoula and Sharples (2009) explained, whereby people continuously evolve by enhancing their professional or personal development. Dahl and Pedersen (2004), who conducted a survey of 346 engineers in the wireless industry, developed this notion and found that people who obtain a university degree tend to hold an influential position within an organization. Social science researcher Eng (2005), who mapped networks using surveys and interviews of 500 respondents in nine companies, found 215 connected firms. Eng concluded that "Learning has become the only source of sustainable competitive advantage in today's intense global competition" (p. 68). Learning is also described as a tailored process and therefore managed at the individual level (McDougall & Beattie, 1995). Clearly, continual learning is good for both the individual and organization.

The individual concepts of learning including collaboration, technology, reflection, commitment, leverage, and experience were also studied by Cole (1989), who found successful continual learning outcomes are a direct result of the effective management of learning strategies. A suggested management tool was introduced by Barclay (1996) through the continuous practice of self-observation logs, where the learner records various ongoing activities and evaluates those activities in the future. Subsequently this process of recording was later referenced as information mapping, which is a circular process of documented activities used for continuous reflection, learning, and growth. Embracing learning concepts and related strategies for growth accelerates individual and organizational knowledge.

Learning on the Organizational Level

Theories of learning on the organizational level incorporate the principles of individual learning, but go beyond them to account for the added complexity of individuals working together. As noted above, Vavoula and Sharples (2009) linked constructivist principles of learning to interdependency between participants. Expanding this to organizations, Rahmandad (2008), who built a simulation model of learning that simulated 1,000 organizations, substantiated the concept of organizational interdependency, but specified that the result of the interdependency is a cause and effect of actions taken by the organization which impact the results of the current learning outcome.

The concepts presented by Piaget and Ben-Ner were acknowledged by Teece, Pisano, and Shuen (1997), who explained that organizational learning occurs when the behaviors of the organization are repeatable or organizationally mastered resulting in a global change. Prahalad and Hamel (1990, p. 82), in parallel with the description of the levels of learning, also specified strategic learning as an integral part of the core competence of the corporation, and described its presence as "collective learning." This collaborative process was referred to by Teece (1986) as learning from others. It was also noted that firms that embrace these concepts will gain economic improvements in functional areas such as sales, research development, purchasing, distribution, and manufacturing. Economic improvements or learning results were acknowledged by Whee, Ngah and Seng (2012), who introduced the concept of leveraging as an accelerator of such outcomes.

The concept of leveraging as it applies to individual and organizational learning is the process of strategically identifying events in learning, while also allocating one's knowledge assets towards a present or future circumstance with a potential benefit in mind. Leveraging provides the foundation for alternative opportunities in business and broadens one's potential to achieve greatness, giving them more strategic options to pursue, while gaining more flexibility than their rivals (Denrell et al., 2003). Leveraging learning activities is an imperative function for innovating firms. In order to leverage these activities one must acknowledge the variations of learning. These concepts are further developed in the section on SKARSE below.

Knowledge: Introduction

Definitions of knowledge. Definitions of knowledge vary, as well as interpretations of its fundamental meaning, based on who is describing it. This variation and delineation is due

to the breadth and depth of the individual researcher, as well as the disciplines where the specific context of knowledge is derived. For example, disciplines such as business, philosophy, religion, and education describe knowledge using variations of the meaning (Zhang, 2008).

Within this context, several interpretations and meanings of knowledge are described from a macro, as well as micro perspective. From a macro perspective, researchers (Nonaka, Toyama, & Konno, 2000, p. 7) described knowledge as vibrant and fluid through various forms of socialization, being a "justified true belief" where information is functional, leveraged, and transitioning into knowledge. In a preceding review of theories of organizational knowledge, Nonaka (1994, p. 15) evolved their prior definition of knowledge, stating it is created from what people already know being a "personal belief," and its generation requires transference in one's approach. Wiig (2004) concurred with the statements made by Nonaka et al., while also elaborating on the meaning of knowledge, as well as information: defining information as a process to identify pieces of artifacts, which are used to explain variables located within one's personal environment and defining knowledge as a process to appraise and disseminate culture, literature, and past experiences, as well as the current environment related to the various situations that could occur. Another definition provided by Tiwana (2002) defined knowledge as "a fluid mix of framed experience, values, contextual information, expert insight, and intuition that provides an environment and framework for evaluating and incorporating new experiences and information" (p. 4). Tiwana's definition was supported by Liaw et al. (2010), who explained that knowledge is the ability people possess to transform information they receive into an application-related product, service, or mutual dialogue, and the practice of concepts for their benefit. These various definitions of knowledge relate to the evolution of information between people.

Additionally, from the micro point of view, other researchers define knowledge using linked variables such as information, practicality, innovation, and sub-components of knowledge. Various examples from the literature include Gupta, Iyer, and Aronson (2000), who refer to knowledge as information which has value, but which does not become viable until collaboration takes place and knowledge is transferred. Peter Drucker (1992, p. 23) defined knowledge from a practical position, noting that "If we apply knowledge to tasks we already know how to do, we call it 'productivity.' If we apply knowledge to tasks that are new and different we call it 'innovation.'" From an innovation perspective, knowledge is viewed as a key component in the evolution of industrial sectors, such as manufacturing

(Thomas, Sparkes, Brooksbank, & Willams, 2002) where organizations are consistently seeking alternatives to ensure measures of creativity and continued success. The components of application and creativity were also noted by Hansen, Nohria, and Tierney (1999) as the underpinning for industrialization.

Other researchers define the foundation of knowledge from an evolutionary perspective. For example, Earl and Scott (1999) specified that focusing on knowledge is a necessity to become a competitive force in any industry. Applying labor as a foundation, a study by Wong (2005) concluded that although knowledge is intangible it is also accepted as a tangible resource. Berman and Machin (2000) acknowledged this aspect of knowledge in their study, which added the evolution of technology through knowledge resulting in a greater demand for skilled or knowledge workers in developing countries. Within this context, Drucker (2001) also presented the intangibility of knowledge and further described it as a borderless and valuable resource for developed countries in the 21st century, traveling more efficiently and with less effort than currency. The borderless travel of knowledge has led to a skilled workforce, forcing organizations to transition their resources from production functions, such as fixed capital, to workforce capital, according to a literature review of knowledge workers' characteristics (Carleton, 2011). This is also referred to as "human capital," being a force which drives efficiency, as well as individual and organizational development (Ito & Lechevalier, 2010).

The concept of knowledge as a driving economic force has been substantiated by many researchers, while other researchers have also verified negative implications, which need to be considered. For example, Freeman, Soete, and Efendioglu (1995) analyzed public data on production, employment, and productivity from a number of countries in Asia and Latin America. They concluded that a knowledge-based economy may have a negative impact on the engagement, continued employment, and wages of unequipped workers. This has also been acknowledged through the studies of tacit knowledge presented by Kim and Mauborgne (1997) as the struggles organizations face during transition periods. Additionally, it was found that underlying basic principles such as engagement, explanation, and clarification during workforce transition can navigate firms through organizational obstacles during these challenging periods.

Scientists also include parallel concepts of knowledge to describe its context based on individual research disciplines. For example, Gupta et al. (2000), in their literature review of basic definitions of knowledge and its management, stated that knowledge is a key element within the development of innovative products and services. Aspects of knowledge need to

be identified since several elements of business include spontaneity and segmentation (Alvarez & Barney, 2005). Wang, Su, and Yang (2011) explained knowledge from a cultural perspective, highlighting communalism as a key component of knowledge. Expanding on the work of Nonaka and colleagues, Boutellier et al. (2008) compared two office environments within the same site with the same activities. They observed 2000 face to face communication events over 120 hours. Contrary to the organization perspectives of knowledge, Boutellier et al. explained knowledge from an academic frame of reference where knowledge is explicit or codified, in written form using theories published in over one million new articles each year.

Kinds, types, qualities, and properties of knowledge. The term "knowledge" is an exceedingly broad one, and while most definitions are consistent with that of "a justified true belief," there are many different kinds of knowledge, for example, religious, scientific, and that gained from perceptions. These sometimes are contradictory, as in creationism vs. evolution, we would consider this a justified belief even if it later emerges that the letter was a prank [Gettier, 1963].)

> De Jong and Ferguson-Hessler (1996. p. 105) listed
> a wide variety of properties and qualities [including] generic knowledge and domain specific knowledge, concrete and abstract knowledge, formal and informal knowledge, declarative and proceduralized knowledge, conceptual and procedural knowledge, elaborated and compiled knowledge, unstructured and (highly) structured knowledge, tacit or inert knowledge, strategic knowledge, knowledge acquisition knowledge, situated knowledge, and metaknowledge. For example, in an article by Reif and Allen (1992), at least eight different knowledge terms are used: main interpretation knowledge, general knowledge, definitional knowledge, ancillary knowledge, supplementary knowledge, case-specific knowledge, entailed knowledge, and concept knowledge. Reif (1987) also used the terms declarative knowledge, procedural knowledge, formal knowledge, compiled knowledge, special knowledge, general knowledge, procedural interpretation knowledge, and coherent knowledge. Apparently, researchers need many and fine-tuned terms for describing the knowledge state of individuals.

Knowledge in knowledge management. Since a complete discussion of the concept of knowledge is beyond the scope of this review, it will be narrowed to those aspects relevant to knowledge management. De Jong and Ferguson-Hessler (1996) studied knowledge used to solve problems, specifically problems in basic physics (e.g., the effect of friction on a sliding body), but their principles seem suitable as a foundation for the present study. They described four types: situational ("knowledge about situations as they typically appear in a particular domain" [p. 106]), conceptual ("static knowledge about facts, concepts, and principles that apply within a certain domain" [p. 107]), procedural ("actions or manipulations that are valid within a domain" [p. 107]), and strategic (helping to organize a problem solving process by

directing which stages one should go through to reach a solution) knowledge. The authors further described a number of qualities of knowledge, including level of knowledge (deep vs. surface), structure (e.g., chunked, hierarchical, held in schemata), automated vs. non-automated (the degree of conscious attention required), modality (concrete or abstract verbal representations vs. images), and general vs. domain-specific.

Furthermore, knowledge in organizations can be defined in a much more pragmatic way (Gupta, Iyer, & Aronson, 2000). These authors, in a summary of the practices and challenges of knowledge management, accepted that for their purposes a definition that includes the concept that knowledge is information that has value and that provides a framework for evaluating and assimilating new experiences and information is appropriate. Even in this more limited definition, knowledge can be broken down into a wide variety of types. For example, Blackler (1995) described five types, and this was expanded upon by Lam (2000). These included embrained, embodied, encultured, embedded, and encoded knowledge. Furthermore, organizational knowledge can be divided into various "dimensions": private-public, component-architectural (that is, discrete parts of operations vs. how they are combined), individual-collective, etc. (Chua, 2002).

One distinction between knowledge types that is commonly drawn is that of tacit and explicit. Some theorists (e.g., Nonaka & Takeuchi, 1995) argue that this is a continuum, others (e.g., Spender, 1994) that they are qualitatively distinct phenomena, or even that one type cannot be converted to the other (e.g., Cook & Brown, 1999). In the discussion of tacit and explicit knowledge below, it will be accepted that knowledge falls on a continuum of explicitness, but that most tends to fall nearer one or the other end of the range.

Evans and Easterby-Smith (2001) studied the exchange and creation of knowledge between two large high tech firms engaged in a merger. They proposed a model of organizational knowledge with three dimensions, each with tacit and explicit forms: Systemic knowledge (embedded in systems, policies, etc.) is contained explicitly in formal procedures and the like, and tacitly in the understanding of why things are designed in a certain way. Socio-political knowledge (of the social and political structure of the organization) in its explicit form consists of formal decision structures, organizational charts, etc., and in its tacit form includes understanding who is influential, how things "really" get done, and other knowledge of relationships that is seldom formally acknowledged. Strategic knowledge (of the organization's external environment) includes explicit knowledge such as mission statements and tacit knowledge of the hidden meanings behind the statements, including the foundations of the organization's culture.

Quality of knowledge in knowledge management. Rech, Decker, Ras, Jedlitschka, and Feldmann (2007) published an article that proposed a new theoretical organization of knowledge "concepts to describe common, recurring patterns of how to describe, structure, interrelate, group, or manage knowledge elements" (p. 74). The authors stated that "no quality model for knowledge (components) exists right now" (p. 83), although they and others have suggested some examples. Rech et al. argued that quality is partly a function of certain properties (e.g., that it be independent, durable, correct, and complete). Yoo, Vonderembse, and Ragu-Nathan (2011) proposed that for organizations, quality of knowledge takes three forms. Intrinsic knowledge quality is the accuracy, reliability, and timeliness of the knowledge. Contextual knowledge quality is the degree to which knowledge is relevant and appropriate to the environment in which a task is performed. Actionable knowledge quality is the degree to which knowledge can be applied to tasks. The authors went on to confirm the presence of these as factors in data collected from 208 project teams.

Tacit and Explicit Knowledge

Two distinct types of knowledge, tacit and explicit, are of particular importance to the present research. This section explains and discusses how tacit and explicit knowledge are defined and the circumstances of how knowledge is used. The section also identifies how tacit and explicit knowledge is related to understanding what happens to information that becomes knowledge when it is shared.

Tacit knowledge. Song, Almeida, and Wu (2003) stated that the majority of knowledge is submerged within individuals or "knowing more than we can tell" (Polanyi, 1966, p. 4). Within this context, submerged knowledge is viewed to include a human being's emotions, insights, intuition, or internalized information such as one's collection of previous experiences (Nonaka, 1991). These submerged or internalized experiences are categorized in clusters within the form of tacit knowledge (Karnani, 2012). The knowledge research community has validated that tacit knowledge is a form of knowledge which is internal and difficult to communicate (Huseby & Chou, 2003; Nonaka, 1991; Teece, 1986), but researchers have also approached the study of tacit knowledge from different viewpoints resulting in numerous definitions recorded for this term.

Karnani (2012) conducted a survey of 148 startup companies that had been spun off from German research universities. The study focused on the assumption that research findings provide the basis for spin-off projects at universities, and found that this idea is too limited. The majority of spin-offs used tacit knowledge, knowledge beyond research findings,

rather than codified research findings from the university. Using a definitive approach, Karnani described tacit knowledge as non-coded, hidden knowledge, or practical intelligence. Using the same premise as Karnani, while integrating communication, Nonaka (1994) approached the description of tacit knowledge as a sense of knowing, similar to intuition, which is difficult to articulate as well as extrapolate, making it difficult to ratify. Huseby and Chou (2003) explained tacit knowledge as knowledge which is created through individualized encounters which are difficult to record.

The study by Song et al. (2003), published in *Management Science*, used a novel approach to study tacit knowledge. They examined 534 patents filed by engineers in the semiconductor industry and traced the path of knowledge carried by engineers through various firms. That is, they were able to assess the advantage gained by "learning through hiring."

Explicit knowledge. Explicit knowledge is defined as knowledge which is able to be codified or documented for others to review (Huseby & Chou, 2001). This practice of sharing through documentation or codified knowledge as discussed by Newman and Conrad (1999) and Earl and Scott (1999) may result in tangible references such as books, articles, records, data files, and technologies such as an organization's intranet, websites, or software applications. Other forms of explicit knowledge are presented by Song et al. (2003), who argued that patent rights are a form of explicit knowledge.

Since explicit knowledge is codified, it is more transparent for others to use. This transparency results in explicit knowledge being more susceptible to organizational espionage or arbitrage compared to tacit knowledge (Teece, 1986) since it is prescribed and communicable in nature (Nonaka, 1994). Knowledge from both tacit and explicit expression is the impetus for the acquisition, transfer, or diffusion of such knowledge.

Transitions between tacit and explicit knowledge. Although a few researchers (e.g., Cook & Brown, 1999) have argued that it is not possible to make tacit knowledge explicit or vice-versa, most accept that this occurs. Thus, the theoretical description of how tacit knowledge is converted into explicit knowledge has been a major goal and objective of the knowledge research community, as well as knowledge management professionals (Gupta et al., 2000). This is further explained by Huseby and Chou (2003) as a circular flow of knowledge, initializing as tacit, transforming into explicit through various mechanisms such as collaboration, moving through an implicit to explicit process and through a social process internally returning to tacit, when knowledge learned through explicit sources becomes internalized.

With this objective in mind, transformation of knowledge is a difficult task to accomplish since tacit knowledge is internalized. This internalization can result in distorted messaging during the transfer, ultimately being counterproductive by losing a portion of the knowledge, according to Schneckenberg (2009). Schneckenberg's literature review focused on the work of Mintzberg (e.g., 1998) and Polanyi (e.g., 1966). In order to remedy these consequences, researchers have studied effective knowledge conversion from tacit to explicit knowledge and explicit to tacit knowledge. Tseng (2010) sent surveys to 650 senior human service managers of the largest Taiwanese companies, receiving responses from 131. Tseng studied consequences of ineffective knowledge conversion such as distortion, and concluded that effective tacit to explicit knowledge conversion occurs when organizational culture supports the practice of converting knowledge through trust and collaboration.

Knowledge Acquisition, Transfer (Sharing), and Diffusion

Knowledge acquisition, transfer, and diffusion are viewed as an integrated, spiral process (Eng, 2005). This exchange is fostered through collaboration, beginning and ending with each individual through the creation and exchange of valued information and management related activities (Eng, 2005). Although the knowledge continuum involves individuals or human beings, the continuum is also practiced by organizations fostering knowledge through observations and partnerships with other individuals or firms (Lindstrand, Eriksson, & Sharma, 2009). An individual's or organization's values, behaviors, and psychological environment complimented with commitment towards collective objectives play a key role in the continuous flow of knowledge (Wang et al., 2011). Those authors studied 212 Chinese firms with a mixed method survey including interviews at each. The attributes identified by Wang et al. (2011) are imperative aspects to any leadership position (Ibarra & Hunter, 2007). Positive individual attributes contribute to the building of trusted relationships which are the primary aspects for not only generating new knowledge, but for learning to occur (Westerlund & Rajala, 2010), once knowledge has been shared (Boutellier et al., 2008). This exchange presents a new paradigm of scientific exploration and technological discourse resulting in the circular pattern presented above.

Knowledge Acquisition

The importance of acquiring knowledge is globally recognized by researchers and business practitioners (Carleton, 2011). According to a study conducted by Chan and Chao (2009), effectively harnessing knowledge can reduce redundancy in workflow, ensuring

increased profitability and productivity. Within the framework of efficiency, Key, Thompson, and McCann (2009) reiterated that knowledge initiatives need to reinforce the importance of harvesting new knowledge, accessing knowledge resources, and having individuals advocate their vision to others within the organization. In order for effective harnessing or acquisition of knowledge to occur one must first recognize who has knowledge, and build systems supporting its acquisition (Gupta et al., 2000).

Some researchers explain that the process of acquiring or creating knowledge requires the knowledge seeker to gain access to a person's or a group's tacit knowledge, including a human being's emotions, insights, intuition, and previous experiences (Nonaka, 1991). Kim and Mauborgne (1997) reinforced this explanation of knowledge acquisition by stating that knowledge creation is a powerful intangible and intellectual asset, trapped within the human mind, which must be made explicit. Newman and Conrad (1999), who performed an extensive analysis of the literature to develop a framework for characterizing the tools (methods, practices, and technologies) available for knowledge management, also supported this notion, but added that an individual's tacit knowledge can be commandeered and used by others during the acquisition or exchange process. Therefore, Caldwell (2001) attested that attention must be directed to the importance of managing internal knowledge assets for the acquisition process to occur, including tacit or explicit knowledge. Researchers (Adler, Heckscher, & Prusak, 2011; King, Marks, & McCoy, 2002) agreed with using proper management tools to facilitate the process, but they also stressed the importance of using innovative measures to effectively and efficiently capture knowledge.

Business researchers have identified various ways to facilitate the acquisition or capturing of tacit or explicit knowledge based on its environment as well as through its various stages (King et al., 2002). For example, McDougall and Beattie (1995) studied the development of learning groups such as quality circles, project teams, autonomous work groups, and self-managed teams. They evaluated 85 practicing managers enrolled in a graduate program and how they formed, conducted, and gained from the groups. McDougall and Beattie found that collaborative learning or group learning is a viable strategy for knowledge acquisition to occur. Another example, which was a focus of study for Carleton (2011), found that a strategic workplace design within the organization supports tacit or explicit knowledge acquisition. Within the context of explicit knowledge, research scientists Thomas et al. (2002) concluded that the acquisition of codified knowledge can be accomplished using Information and Communication Technologies, also known as ICT, as a mechanism to obtain stored knowledge on websites or email. This process was confirmed by

Wilson, Goodman, and Cronin (2007). These researchers observed learning over three years at a national computer emergency response center. They formulated a three step system for an individual or group to successfully retrieve codified or explicit knowledge.

> (1) The group or one of its members, faced with some stimulus object, must recognize the need to access stored knowledge; (2) the group or at least one member, must identify where the knowledge is stored; and, finally, (3) the group must actively retrieve the knowledge. Eventually, we must also consider whether the group can apply the retrieved knowledge in the new situation. (p. 1051)

Appropriately assessing the performances of an organization and its management (Boutellier et al., 2008; Mouzas 2006) during the knowledge acquisition process allows individuals or organizations to efficiently and effectively harvest identified knowledge and then redistribute or transfer such knowledge (Nonaka, 1994). This transfer occurs because the process for acquiring knowledge is directly linked to an individual's willingness to share the acquired knowledge. In addition to a person's willingness, transfer of knowledge as explained by Krough (1998) must create a social process with an expected return for either party of the relationship.

Knowledge Transfer

Once knowledge has been acquired, how is it transferred? The process of knowledge transfer includes the sorting and alteration of knowledge to share ideas, perceptions, and experiences resulting in an unstructured flow of exchange (Holtshouse, 2009). Knowledge transfer is explained by Carayannis (1999) as collaborative measures of sharing, not giving knowledge away. Researchers also use the terms *technology transfer* (Karnani, 2012) synonymously with knowledge transfer, describing the exchange between universities, individuals or firms, and business institutions (Fukugawa, 2012; Karnani, 2012). Within the context of technology, Song et al. (2003) noted that knowledge transfer can be a formalized process where licensing agreements are created between individuals or firms resulting in knowledge transfer.

Transfer process. In order for knowledge transfer to occur the participant must be willing to share their internalized assets or tacit knowledge, as the relationship among individuals or groups who participated in the engagement process may be altered in unforeseen ways (King et al., 2002). Drucker (1999), in a review and analysis of theories related to knowledge learning, management, and innovation, referred to this process of sharing as the concept of the knowledge worker. Drucker's research further elaborated that the circumstances which enable the knowledge worker to become more productive relate to the factor of trust, and relationships in their respective organization. Efimova (2003) further

described the knowledge worker as a shareholder of information who chooses the circumstances and conditions of what and how knowledge is shared and applied.

Internalization and the human element of choice makes the process of sharing knowledge difficult since knowledge is embedded within (Song et al., 2003), and can also include emotional ties (Bratianu, 2011). Research conducted by Earl and Scott (1999) anticipated the findings from Song et al., defining further that desiring to extract knowledge from others can be more prevalent than willingness to share it. Gupta et al. (2000) agreed with this notion and found that managers may face problems convincing people within their organization to share with their colleagues or others within or outside of the firm. Participants who willingly create and share knowledge (Kim & Mauborgne, 1997) seek trust and commitment from other individuals. If commitment is not actualized or the trust is broken, knowledge could be suppressed during the exchange (Fukugawa, 2012). Knowledge suppression can be mitigated by instilling an environment where individuals allow for open suggestions and potential solutions, which are given from others and each interaction is initiated through empowerment and willful acts (Kim & Mauborgne, 1997). Organizational leaders must break down the barriers to seeking knowledge and obtaining useful information from their contacts, which can be used as knowledge contribution for their organization for transfer to occur (Dahl & Pedersen, 2005).

Another form of knowledge transfer is referred to as knowledge spillover (Carayannis, 2008; Knott, Posen, & Wu, 2009; Ring, Peredo, & Chrisman, 2010). There is sufficient evidence as described from these researchers that knowledge is not communicated in a linear fashion, but rather knowledge is transformed by knowledge spillovers between various individuals who are willing to engineer and reverse engineer knowledge related activities. Therefore, knowledge spillovers can significantly add to or take away from a firm's competitive advantage by altering its resources (Mayer, 2006).

Methods of knowledge transfer. Recognizing the potential that knowledge spills or knowledge transfer afford and the ongoing challenges, Gupta et al. (2000) conducted a study to find the most efficient method to transfer or share knowledge. The study concluded that methods need to be flexible, allowing for creativity, learning, and innovation to occur. Within the context of creativity, Carlton (2011) identified that meaning needs to take place during interactions and argued that superiors should not closely observe the work of subordinates or employees. Consequently, researchers have identified direct and indirect methods that can be used for the transfer of such knowledge (Karnani, 2012). Within the context of direct methods, Chan and Chao (2008) suggested that rewards or incentives may

need to be instituted. The incentive plan needs to be properly evaluated since incentives drive different motivations and unintended consequences could potentially occur.

Brodbeck, Kerschreiter, and Mojzisch (2007), in a literature review, created a theoretical analysis for knowledge distribution prior to group decision making. Their model is aligned with research about diversity in the distribution of group member performances. They suggested using collaboration or group interaction as an indirect method of knowledge transfer, stating its benefits as the integration of "dissimilar knowledge and expertise in order to promote cross fertilization, innovation, and high quality group decisions" (p. 465). Similarly, Adler et al. (2011), in case studies of four major corporations, created a transfer model, which suggested designing and constructing a collaborative vision, promoting an environment of sharing, and developing a framework that allows people to exchange ideas in an elastic environment and reward people who value these initiatives. These principles are described by the authors within the context of a "collaborative community," resulting in a teamwork approach embracing values and exceeding individual responsibilities. Also, according to Wilson et al. (2007, p. 1047), increasing the level of sharing within a group forges "two important learning processes: Knowledge storage and retrieval."

Additionally, as a strategy to facilitate these measures, an elastic work environment can be created where workspaces are strategically placed, increasing knowledge flow throughout the organization (Schneckenberg, 2009). Another example was presented by Matson and Prusak (2010), who found in a review of daily knowledge logs in four organizations that communities of practice embedded within the collaboration process would promote interactions and discussions among their members. Huang and Wei Lin (2009) conducted a focus group on collaboration via email with 11 persons, five of whom had IS backgrounds. The study followed up prior studies in which actual emails and their use were examined. These researchers concluded that people who share common interests or backgrounds are more open to sharing with each other. For example, Fukugawa (2012) conducted a study of 723 firms which found that a pool of research and development collaborations occur between Japanese University research incubators and small startup technology companies resulting in improved skill based resources.

Although these examples represent ways to facilitate or manage collaboration, Dahl and Pedersen's (2005) findings suggest that not all collaboration activities among participants result in the transfer of such knowledge. For example, physical barriers such as geography or productivity barriers such as "physical, technical, social or cultural, contextual and temporal" can hinder collaboration (Matson & Prusak, 2010, p. 2). Although geography or productivity

barriers are recognized, Carlton (2011) found that technology can navigate participants by breaking down the geographical barriers. This may be accomplished through the use of web applications such as blogs, discussion boards, instant messaging and communities of practice. Similarly, Rosenkopf and Almeida's (2003) study found that the use of strategic networks could break through geographical challenges, enhancing knowledge transfer through the use of technology and distance. Increasing knowledge transfer or spillovers foster additional opportunities for individual and organizational growth (Ring et al., 2010).

Transferring knowledge then results in the dissemination of this knowledge, molding into innumerable initiatives (Earl & Scott, 1999). Chan and Chao (2008) surveyed 68 persons from small to midsized organizations about knowledge management initiatives launched within the previous two years. They found that individuals need to be careful in how the transfer of knowledge occurs and under what conditions, as unintended consequence could occur if the receiver uses the knowledge for other than its intended purposes. For example, recipients could use knowledge to assist competitors during the innovation process (King et al., 2002). The opposite could also occur where through collaboration, individuals could receive competitor information which can be used to innovate within their own organization, resulting in a positive impact to the ongoing performance of the organization (Tseng, 2010).

Knowledge Diffusion

Definition. According to Newman and Conrad (1999), knowledge diffusion is the application of the original creation of knowledge to business. Diffusion, according to Rogers (1971), is when a worker creates, shares, and transfers information over time. Teece (1986) described diffusion as the utilization of technical tools to disseminate information while adding to their existing knowledge base. Within this context of diffusion, research conducted by Carayannis (1999) found that organizational leaders are challenged with an abundance of information at their fingertips and in order for knowledge diffusion to occur a complete understanding of knowledge concepts in respect to their usefulness must be present. Carleton (2011) agreed with this notion and added to the concepts of individualization, stating that the process of knowledge diffusion establishes a mutual understanding between the members of the information exchange while evaluating the effectiveness of the contribution.

The explanation and application of knowledge diffusion is approached by researchers from different viewpoints. For example, Nonaka (1991) described the fundamentals of knowledge diffusion through the knowledge cycle where the application of diffusion evolves through the acquisition, transfer, and creation of knowledge, eventually cycling back to

diffusion. Nonaka's process is explained graphically through four configurations. This graphical model is explained in written form as: Tacit to Tacit: which is accomplished through observation and practice; transferring tacit knowledge from one individual to another. Explicit to Explicit: this is a compilation of various forms of information organized into one central place and organizationally distributed. Tacit to Explicit: effectively converting internalized knowledge to codified or explicit knowledge where individuals are able to embrace and use it. Explicit to Tacit: individuals are able to absorb explicit knowledge while adding to and restructuring their existing knowledge. The four configurations of knowledge diffusion were presented in a later study by Nonaka et al. (2000). This process was presented in similar form as socialization (tacit to tacit conversion), combination (explicit to explicit conversion), externalization (tacit to explicit conversion), and internalization (explicit to tacit conversion), but the concept of socialization was introduced describing the humanistic elements that are embedded within each respective stage.

Gupta et al. (2000) also incorporated socialization within the framework of their model of knowledge diffusion where dissemination or diffusion is incorporated into its own process, referring to its premise as workshop conversion. This model of conversion is described using four concepts including: Socialization: the interrelationship of individuals as they observe; Capture: the codifying of internal knowledge into written form; Dissemination: the process of sharing knowledge; and Internalization: the practice of reflecting the information shared in order to disseminate the knowledge learned. Kim and Mauborgne (1997) derived another model of dissemination or diffusion through their research, referring to this model as *fair process*. Their research elaborated on the characteristics within the process of knowledge including diffusion. Within the concept of fair process Kim and Mauborgne encompassed three features referred to as engagement, explanation, and expectation clarity. It is further explained that these three elements are needed in order for diffusion to take place. When individuals use the dissemination and diffusion of knowledge to share they are designated as *knowledge traders*.

Knowledge traders. Individuals who have become teachers through the application of the cycle of knowledge, including acquisition, transfer, and diffusion of a specific task or tasks, are referred to as knowledge traders (Hargadon & Sutton, 2000), and knowledge brokers (Huseby & Chou, 2003; Song et al., 2003). These terms will be used throughout this section, having similar meanings within the context of knowledge. Knowledge brokers, traders, or spawners are considered experts in a particular field or industry and are found

outside of an organization. Firms task these experts to acquire, share, and transform new knowledge within the boundaries of the organization. Hargadon and Sutton (2000) referred to the obtainment of knowledge through external workers as the knowledge brokering cycle, where old ideas are used as the impetus for imaging and creating visionary ideas. This cycle is comprised of three interwoven concepts including acquiring, maintaining, and visualizing. Complimenting this cycle of expert practitioners are facilitators of knowledge, referred to as centers of influence (Huseby & Cho, 2003). Examples of people who are designated as centers of influence are consultants, venders, academicians, and customers (Song et al., 2003).

Some researchers view consultants or knowledge brokers as similar to knowledge workers trained by other firms inside or outside of each respective industry. Within this context, Huseby and Cho (2003) found that engaging a consulting firm has benefits such as learning from their past experiences and recognizing the customer base. These activities accelerate the learning process and therefore increase one's knowledge base. This process is described by Song et al. (2003) as "Learning by hiring." Their study concluded that hiring workers from other firms increases organizational knowledge and learning within the organization, which could result in the ongoing development of technology. Another study conducted by Knott et al. (2009) concluded that firms are able to reduce expenses by extracting knowledge from organizations that have greater efficiency measures in place, ultimately leading to greater profitability and competitive advantage.

Although researchers recognize the benefits of these knowledge brokers, the organization may also incur opportunity costs in areas such as employee buy–in, if top down initiatives and changes are placed on employees when they are not actively engaged in the process (Schneckenberg, 2009). Geographical boundaries may also pose an issue for the implementation of such experts; technology may afford the opportunity to break down these boundaries to assist in the proper implementation of these individuals (Rosenkopf & Almeida, 2003). Experts in the field of knowledge traders through the breakdown of boundaries may create an atmosphere of regular exchange that could develop learning hubs to help form business or organizational partnerships.

Knowledge as a Competitive Advantage

Firms use knowledge for the practice of competitive advantage (Nonaka et al., 2000), also referred to as organizational durability (Chan & Chao, 2008). Researchers have studied and acknowledged the advantages and disadvantages of the evolution of knowledge. The

majority of literature represents the positive aspects of knowledge and the competitive advantage it creates. Barney (1991, p. 102) explained competitive advantage as, "implementing a value creating strategy not simultaneously being implemented by any current or potential competitors and when firms are unable to duplicate this strategy." Competitiveness is explained by Kristandl and Bontis (2007, p. 1513) as "how strategically intellectual capital is managed—from capturing, coding and disseminating information to acquire new competencies through training and development, to re-engineering business processes." Using the components of intellectual capital, which is also referred to as knowledge or a "strategic asset," is a differentiation strategy between organizations, their people, and the competition (Chan & Chao, 2008).

Within the context of competitiveness, researchers approach the subject from different perspectives. Viewing competitiveness from an innovation perspective, Nonaka's (1991) research found that firms that continuously innovate through knowledge creating activities have a greater competitive advantage over organizations that do not value knowledge as a sustainable resource (Nonaka, 1991). From the perspective of efficiency, Drucker (2001) identified knowledge as a key driver, in that knowledge has no boundaries, resulting in an efficient flow throughout the organization. This free-flowing approach was also studied by Hansen and Oetinger (2001). In a case study of cross unit interactions of corporate managers of 25 business units within BP, they found that knowledge can transform organizations by providing the tools necessary to compete with business opponents. This study also elaborated on the external components of knowledge and recommended creating strategic alliances with identified organizations. These alliances could result in drivers toward competitiveness such as the reduction of expenses where both individuals and firms are able to extract knowledge from organizations that have efficiency measures in place, while also creating new knowledge for their organization (Knott et al., 2009). These organizational alliances are viewed by some researchers as an "organization-level phenomenon" as they encourage information exchanges over time resulting in organizational or individualized knowledge (Rosenkopf & Almeida, 2003, p. 763).

Any phenomenon is also paired with several challenges which need to be identified and mitigated. For example, when a free flowing approach to information exchanges or collaboration is leveraged, the organization or individual may face the challenge of when to know which direction the organization should follow at any given time period and its best course of action for the present, as well as the future (Hansen & Oetinger, 2001). This notion is supported by Song et al. (2003), whose study presented the concepts of linking knowledge

to competitiveness and the challenges of the process, as well as recommending creativity (Csikszentmihalyi, 1990) or the use of non-traditional business methods within the respective process to overcome these challenges. Leiponen and Helfat (2010) approached these challenges from more traditional methods, as their study outlined specific objectives to promote such knowledge. The objectives included measures such as replacing outdated products, improving product quality, expanding product assortment, entering new markets or increasing market share, increasing flexibility of production, reducing labor costs, reducing use of materials, reducing use of energy, fulfilling government regulation or standards requirements, and mitigating environmental damage.

Although previously presented above from the perspective of efficiency, Peter Drucker's (1999) research also approached knowledge and the competitive advantages it affords from an individualistic point of view. This was recognized by Drucker as the knowledge worker, which further delineates knowledge as the interconnectedness of experience along with productivity. These findings were supported in a 2011 study conducted by Carleton, which also found that in order to reach an optimal level of effectiveness, the knowledge worker's frame of mind must also continuously evolve parallel with environmental challenges, external input, and additions / deletions.

Knowledge and Learning Hubs: Facilitation Through Networks and Clusters

Knowledge diffusion can be greatly facilitated by the establishment of knowledge and learning hubs. Lindstrand et al. (2009) gathered questionnaires from 494 CEOs of small- to medium-sized manufacturing firms. They concluded that in order for a knowledge or learning hub to occur, firms and their leaders learn from continued business partnerships. The quality of the outcome is derived from their knowledge base. Other researchers have concluded that the force of competition has required individuals and firms to be more streamlined by informally networking and building relationships (Cross, Liedtka, & Weiss, 2005). Additionally, the development and management of networks enhance the individual and organizational knowledge and learning processes. For example, according to Bygrave (1987), venture capital firms use various forms of networks to partner and exchange knowledge regarding potential investment opportunities.

Anderson, Hakansson, and Johanson (1994) performed quantitative network analysis with managers at two firms, focusing on dyadic business relationships within their networks. They found that by connecting to individuals or firms, individuals may have their views altered or shape the views of their partners, therefore leveraging each other's experience to

the fullest extent. Networks are defined as a group of like or unlike individuals who choose to create links which result in social relationships (Hoang & Antoncic, 2003; Nelson, 1988) allowing individual or collective environments to emerge (Nonaka, 1994). Network analysis can be traced back to German sociologist Georg Simmel, who studied social and cultural interactions through forms or contents; "This type of analysis, developed primarily by economic sociologists, has been a useful tool in exploring the economic and social relationships among firms and leadership and power relations among company employees" (Musacchio & Read, 2007, p. 854).

An effective network includes personal and business connections that offer each network participant support, feedback, and insight. This encourages information exchange while providing additional resources (Ibarra & Hunter, 2007), resulting in a loyal and trustworthy learning environment (McDougall & Beattie, 1995). Individuals are needed to create single connections, as well as organizational connections. Within the context of multiplicity, networks are referred to by researchers as inter-firm networks, management networks (Eng, 2005), institutional networks, and organizational networks (Bell, 2005). These networks can be segregated into single or interrelated networks creating a master network, but the premise is creating connections. For example, management networks can present opportunities for leaders to learn from one another creating expanded products and services (Eng, 2005). Another example includes the formation of business or individualized networks, which become the impetus for strategic alliances or quasi-organizations (Hakansson & Ford, 2002).

Consequently, network connection quality and characteristics influence a firm's ability to act and compete in domestic and foreign markets (Lindstrand et al., 2009). The incorporation of networks brings together various types of tangible and intangible resources such as knowledge, resulting in growth and innovation (Hakansson & Ford, 2002). Subsequently, individuals who have the ability to generate additional resources through network activities are more accomplished than those participants that are not able to generate resources (Kristiansen, 2004). According to Giles (2010), in order for the formation of benefits within a network to occur, individuals need to use technology to increase collaboration and information sharing with others, resulting in a more robust network. Building upon these concepts, Leiponen and Helfat (2010) argued that firms that recognize network benefits have the ability to leverage many resources within a network to acquire knowledge and innovate, resulting in a greater competitive advantage. This concept was explained further by Giles (2010), whose research recognized the concept of professional

networks which may grant an un-presented competitive advantage. Professional networks could also include connections between firms and university researchers resulting in additional knowledge resources and collaboration activities such as advancements in R & D (Fukugawa, 2012).

Bell (2005) also studied the competitive advantages of networks, and added placement within the framework of a network as a factor impacting competitive advantage. The study concluded that placement has an impact on the type and amount of information each participant may receive. For example, being a central network component will increase the data flow and richness to the organization or the manager (Bell, 2005). These central positions afford the individual an opportunity to influence others, naturally acting as a knowledge or learning hub, which collects new ideas from others and diffuses them into knowledge driving activities (Lindstrand et al., 2009).

The data suggests that business network structure plays a significant role in the flow of information and goal attainment between network participants (Ring et al., 2010). Another study of competitive success factors found that specific interactions between inter-firm business relationships may affect the culture inside the firms themselves, stating that the characteristics of one relationship will forever change all linked relationships (Hakansson & Johanson, 2001).

Although the literature represents positive implications such as increased learning or knowledge related activities within the context of competitive advantage, maintaining a network may have opportunity costs which could ultimately lead to a decrease in productivity or resources from the participant or their respective firm (Egbert, 2009). This premise was also substantiated through research conducted by Dahl and Pedersen (2004), which discussed how networking defined as knowledge partnerships may have negative ramifications once knowledge is shared through the networking process. The receiver of that knowledge may have a competitive advantage over the communicator which weakens the originator's position. In order for participants to receive benefits from their network investment, learning how to build a network becomes an important aspect of their business model. However, in order for knowledge to be transferred into meaningful action, participants, according to Dahl and Pedersen (2005), need to leverage horizontal networks which encourage amorphous information to spill over from one participant to another. Similarly, Hakansson and Johanson (2001) studied the concept of leverage and explained that network participants will receive additional benefits such as knowledge from investments and interactions that take place for the benefit of productivity.

Building a knowledge network. According to Drakopolou, Jack, and Anderson (2006), building and maintaining networks drive innovation and entrepreneurship. Leaders need to become more strategic and determine what the design of their network should look like based upon the complexity of their problem and what they would like to accomplish to reach their desired outcome (Cross et al., 2005). Numerous researchers consider the building of relationships as a central component in the formation of a network (Westerlund & Rajala, 2010), which gives executives the tools necessary to cope with continuous technological changes (Hakansson & Ford, 2002).

In order to effectively create these tools for technological change, Dahl and Pedersen (2005) explained that useful information is more likely to flow from one participant to another within a network when the foundations of the relationship are built upon trust, confidence, and reputation. Hakansson and Ford (2007) built upon Dahl's premise of relationship building and added that building an architecture of connected relationships within a network is dependent upon the history of the relationship, the past learnings and takeaways from other relationships, exchanges, and value added from the respective relationship, the current state of the relationship between firms themselves and other related parties, current and future expectations on goal outcomes and the influential relationships that begin to form within the expanded network (Westerlund & Rajala, 2010). The research from Cross et al. (2005) anticipated the need to incorporate relationship building within a network, but also explained that individuals need to omit relationships with participants who don't add value to the development or learning process. Similarly, Lindstrand et al. (2009) stated that network relationships are built utilizing individual and collective knowledge which can impact future network interaction. This process is referred to as homophilious by Rogers (1983), which is the impetus for relationship building and professional development.

Hakansson and Ford (2002) approached relationships as a component of network topography and argued that establishing a well-planned network topography is the foundation for building a network. Ibarra and Hunter (2007) observed 30 managers transitioning into leadership positions over a two-year period, although the report, published in *Harvard Business Review*, did not go into detail on the sample and methods used. According to the authors, a network topographical design should incorporate three types of interconnected sub-networks, referred to as operational, personal, and strategic. Operational assists the participant in managing internal organizational responsibilities. This strategy includes the establishment of trust between employees within and outside the organization. These individuals can have direct or indirect links to the organization. Personal includes a structured

plan which includes contacting individuals outside their span of control. Personal networks are mainly links of choice between external participants and may be established through various means such as professional organizations, alumni groups, clubs, and communities of interest and practice. Ibarra and Hunter further divided personal networks into three categories, which include individuals you currently know or have had prior interactions with, individuals whom you casually know, and individuals who you do not personally know, but could contact through another individual. The third sub-network is strategic, which is reflection based, continuously looking for new ideas and directions to drive performance.

Other researchers approach the design of a network from a technological perspective, rather than from a relationship perspective. According to the literature (Cross et al., 2005; Hakansson & Ford; 2002; Ibarra & Hunter, 2007), there is no distinction between the terms social network, enterprise network, and business network when referring to technology as a network integrator. Therefore, these terms can be used interchangeably.

Enterprise Networking Sites can be defined as internet based services which facilitate human interaction through a connected network of relationships. These sites allow network participants to create and manage personal profiles and connect with family, friends, colleagues, and strangers (Boyd & Ellison, 2007). Users are also able to create and manage customized filters allowing them to accumulate, tag and assess various forms of knowledge and information from their system (Hemp, 2009). Current online networking sites allow participants to manage consistent contact with their immediate social groups. Networking facilitates the social learning process (Ben-Ner & Lluis, 2010). Waters, Burnett, Lamm, and Lucas (2009) agreed with Boyd and Ellison stating that online networking sites can be used as tools to build and manage relationships, but Waters et al., also argued that it is the participant's responsibility to source and foster the growth of the relationship.

Conclusions regarding background on knowledge management. The synergy developed in networks can result in the effective knowledge of the group being greater than the sum of its members. For maximum advantage, individual persons or organizations are mutually supportive, creating loyalty and trust. The size and complexity of networks can vary greatly, and smaller ones can be nested in larger ones.

As with intra-organizational communities of practice, new technology can be used to further the goals of knowledge networks. Knowledge managers should also be aware of how networks are structured. In particular, it is advantageous being in a central position, or hub, through which most information passes on its way to others. As with previous discussion of

knowledge management principles, there can be negative consequences of sharing valuable information with others whose primary loyalty may be to a different organization.

Rather than being passive participants, leaders need to actively build knowledge networks. Focusing again on human factors, theorists emphasize that knowledge flows more freely under conditions of trust, which is based on the history of the relationship. To put it simply, members must contribute value in order to receive value. Some researchers (Hakasson & Ford, 2002, 2007; Ibarra & Hunter, 2007) have argued that the structure, or topography, of a network should be made explicit and controlled by a knowledge manager.

Summary of Background Literature on Knowledge Management Theory

The foregoing sections of this literature review noted relevant theoretical models and interrelationships observed among individual behavior, learning, organizations, organizational structure, information, technology, and especially knowledge. The challenge is to combine this into a coherent system to mobilize current understanding of learning and knowledge for competitive advantage. Knowledge management comprises such a system. From the great mass of theoretical and practical research on knowledge reviewed above, certain findings and conclusions stand out as particularly relevant to the present study. These can be summarized under four general topics.

Learning is a process of construction. The acquisition of knowledge is cumulative and continuous. It builds on, rather than replaces, what has gone before. This applies both to individuals and groups.

Knowledge beyond simple facts and behaviors is usually acquired in a social context. In fact, Gupta et al. (2000) implicitly included this in their definition of knowledge, implying that information is not knowledge unless it is available to others. A great deal of evidence shows, at least, that learning is most effective in an interdependent group, both among adults (Sharples et al., 2002) and organizations (Rahmandad, 2008). Many theorists studying knowledge in organizations have emphasized the need for an interdependent group (e.g., Drucker, 1999) or collaborative community (Heckschler & Adler, 2007). Brodbeck et al. (2007) argued that group interaction alone was itself a method of transferring knowledge. Communities of practice can arise organically (Matson & Prusak, 2010), especially if members share common interests and backgrounds (Huang & Wei Lin, 2009). Learning is also aided by such a group in that individuals can understand each other (Carleton, 2011).

Whether arising naturally or artificially, effective networks of communication are principally social relationships (Hoang & Antoncic, 2003) that offer each participant support,

feedback, and insight. Cross et al. (2005) even argued that individuals who do not contribute to others should be dropped from the network. According to Hakansson and Johanson (2001), inter-organizational relationships result in organizational culture changes. Thus, even on the group level, learning is not merely an exchange of information but a process of internal development, as constructivists argue.

Learning is also continuous. It is never completed, and this is particularly true in a dynamic, changing business environment (Eng, 2005). Learning strategies must evolve (Carayannis, 2000). Methods must be flexible, allowing for innovation (Gupta et al., 2000), and may be unique to each individual (Earl & Scott, 1999). Thus, executives who hope to manage knowledge must be astute in balancing control and freedom.

Knowledge is complex. Knowledge contains elements of belief, truth, experience, and values. In order to effectively create, locate, organize, transfer, control, and gain from knowledge, and to put it into practice, an executive must have a deep understanding of theory and empirical findings related to knowledge. The review above described many aspects of knowledge that must be taken into account for effective knowledge management. For example, the distinction between tacit and explicit knowledge is important, and in fact knowledge management can be seen largely as a process of making tacit knowledge explicit, and then tacit again (Huseby & Chou, 2003).

Knowledge is not communicated in a linear fashion, and it requires selection among an abundance of information (Carayannis, 1999, 2008). Transfers of knowledge occur in a collaborative framework that, ideally, should be consciously designed and controlled (Adler et al., 2011). A knowledge manager must stay in contact with a broad array of sources: close colleagues, unknown employees, institutions, bodies of information (e.g., reference books, online resources), etc. He or she must know when to hire a knowledge broker (Song et al., 2003) and how to build a network (Cross et al., 2005; Dahl & Pedersen, 2005).

Managers must understand the complexities of how knowledge is transferred from one person to another or one organization to another. For example, a knowledge manager may need to understand how individuals may resist sharing their knowledge with others, and how to induce them to cooperate (Kim & Mauborgne, 1997). Other challenges or pitfalls to managing knowledge must be met. What knowledge should be distributed to whom? How can one keep valuable knowledge within the circle of those who will not use it for selfish gain?

Individual characteristics are important. Tacit knowledge is stored internally, and individuals vary in the degree to which they are willing and able to communicate it to others.

Personal values, habits, and commitment to the organization affect knowledge acquisition, transfer, and application. So do trust, confidence, and reputation (Dahl & Pedersen, 2005). Personality clashes and power relations (Musacchio & Read, 2007) can hinder effective communication.

Technology is vital to learning and knowledge management. Geng et al. (2009) found that effective learners tend to use state of the art technologies. Teece (1986) added that technology could break down organizational boundaries, allowing for freer flow of information, and this was confirmed by Rosenkopf and Almeida (2003) and Carlton (2011). Giles (2010) found that use of technology increased collaboration and information sharing in networks.

The technologies studied in relation to knowledge management range from the simple, such as hand-written learning logs (Barclay, 1996), to increased use of the internet. A particular advantage of modern technology is the feasibility of gathering real-time data, rather than having to rely on recollection. The study reported here made use of real-time data recording to track the use for knowledge management of various electronic devices.

Conclusion. The literature review above provided the extensive background necessary to understanding how knowledge is managed. The sections below will focus on the practical application of knowledge management.

Knowledge Management in Practice

Knowledge Management Systems

The goal of knowledge management is the deployment of meaningful information to the appropriate people at the best time with profit maximization in mind (Huseby & Cho, 2003). Thus, a knowledge management system provides information on potential or existing markets, innovation, products, suppliers, competitors, regulators, skills, collaboration, and new or existing processes that can be leveraged for strategic initiatives and decision making (Plessis, 2005). Researchers also acknowledge the influence a knowledge management system has on a firm's management structure, technology, creativity, and innovation (King et al., 2002). In terms of management structure, an administrator in charge of organizing and managing organizational knowledge or a knowledge management system is referred to by many researchers as a Chief Knowledge Officer or resource director (Earl & Scott, 1999). Some organizational executives view these systems as an extension of the Information Services platform (King et al., 2002).

Research conducted by Lichtenstein and Hunter (2006) described a knowledge management system as a social process of flexibility, strategy, and vision resulting in a strategic resource for business leaders. This social process confirms the relationship between the management and the knowledge worker. In order to build an effective system, the resources need to be viable for both knowledge management and the knowledge worker.

Building a system. The design and survivability of a knowledge management system is contingent upon properly allocating human resources, resulting in an increase in success factors and a decrease in failures (Alvarez & Barney, 2005). Although the proper allocation of resources can enhance implementation, a study of approximately 2,000 knowledge professionals conducted by King et al. (2002) identified several organizational issues surrounding knowledge management including employee morale and engagement, financial considerations, security issues, motivation, and the identification of relevant knowledge. Acknowledging organizational issues surrounding knowledge management systems, Freear, Sohl, and Wetzel (2002) conducted a literature review of the angel segment of the venture capital market. The authors specified that in order to ensure reliability of decision making an analysis of risk versus return must be performed.

Organizational culture and cultural shifts. Social science writers have recognized the risks and rewards associated with the organizational issues related to knowledge management and have used the general term *variable* to describe them. Supporting this notion, Gupta et al. (2000) and Markus (2001) stated that organizations need to recognize the variables or cultural shift which influence or hinder the creation and ongoing management of knowledge management programs. Karnani (2012) acknowledged these variables, while adding that in order to design an effective knowledge management system additional attention must be placed on how organizational culture impacts current and future initiatives surrounding tacit and explicit knowledge within the knowledge management platform. Wang et al. (2011) also acknowledged the holistic approach within the context of culture from a macro perspective, but additionally addressed the firm's need to evaluate each aspect of culture within the organization. For example, Bratianu (2011), in a literature review, built upon Nonaka's "Dynamics Model" and analyzed dominant metaphors in knowledge management thinking. He concluded that

> In knowledge management important ideas [in] knowledge dynamics models are based on the metaphors that have their source domain in Newtonian dynamics. These metaphors have limitations coming from some characteristics of the source domain that cannot be mapped onto the target domain, like the conservation law and linearity, [and] these metaphors hide the fact that knowledge and emotion go together. (p. 160)

Bratianu (2011) recommended replacing these with a new set of metaphors that have as a source domain the paradigm of thermodynamics, and suggested evaluating and building initiatives around cultural sub-sets such as "Energy" to investigate and design a system for knowledge which would take into account social constructs including an individual's inner spirits or passions.

The concept of culture from a micro level was addressed by Chan and Chao (2008) within their unity of knowledge management diagram, which also highlighted additional model characteristics including organizational structure and technology. Their diagram consists of three elements (structure, culture, and technology) which are represented at each point of the unity triangle (see Figure 1). The inside of the triangle, which can also be viewed as the intra-organization, represents acquisition, conversion, application, and protection, which are all interrelated and affect the flow of the outer points of the triangle.

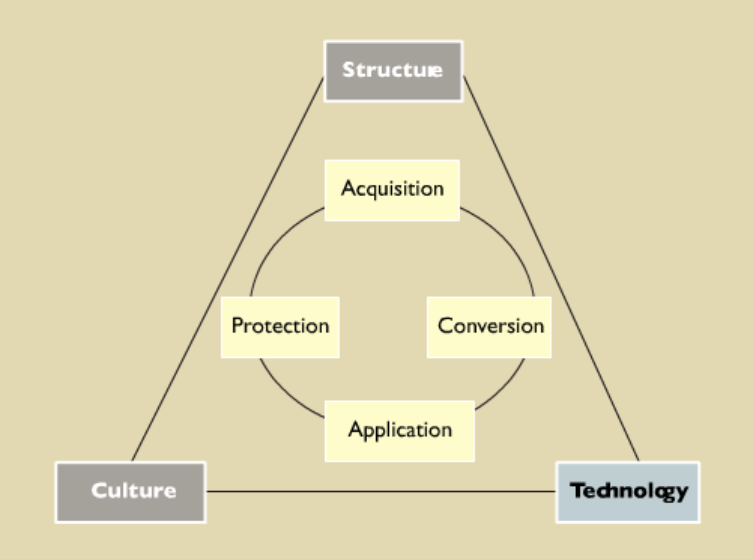

Figure 1. Chan and Chao's (2008) Unity of knowledge management capability. Reprinted with permission (pending) from "Knowledge Management in Small and Medium-sized Enterprises: A Balanced Combination of Management Support, Technology, and Organizational Structural Factors is Necessary for Successful Knowledge Management Program Implementation," by I. Chan & C. K. Chao, 2008, *Communications of The ACM*, *51*(4), 83-88.

Earl and Scott (1999) interviewed 20 chief knowledge officers with an average of nine years experience at their organization. The authors developed a three step system for knowledge management: First, companies need to build and implement formalized activities specific to the creation, capture, and use of recognized knowledge. Second, companies need

to create and foster an environment for the mutual sharing and dissemination of unrecognized knowledge. Third, leaders need to consistently share the vision and value of recognized and unrecognized knowledge with others inside the organization converging it with other strategic initiatives and programs. In support of the second step of Earl and Scott's process, Gupta et al. (2000) argued that senior leaders must create a collaborative environment allowing for a seamless transition between individuals to occur, ensuring knowledge asset maximization.

Technological distractions such as email may impact a person's wellbeing (Hemp, 2009). During an interview with the *Harvard Business Review*, Tony Schwartz presented four performance dimensions to productivity and balance. These include: (1) Physical: proper fitness, sleep, diet, and rest. (2) Emotional: nurturing and sharing positive feelings. (3) Mental: prioritizing and balancing tasks while shifting processes between the right and left brain. (4) Spiritual: inner drive. "Knowledge management can incorporate emotional knowledge and emotional intelligence in a new framework; organizational knowledge dynamics can be explained in a more adequate way, and the decision-making process can be better understood in both terms of rationality and emotionality" (Bratianu, 2011, p. 168).

Technology Acceptance Model. Following some major failures of organizational IT adoption in the 1970s, researchers turned their attention toward understanding what variables led to the acceptance or rejection of new technologies (Chuttur, 2009). Davis (1986) developed the technology acceptance model (TAM), based on Fishbein and Ajzen's (1975) theory of reasoned action. The original version of TAM proposed that use of a technological system is a function of attitude toward use, which is itself a function primarily of perceived usefulness and perceived ease of use, presumably determined by system design characteristics (X_1-X_3 in Figure 2).

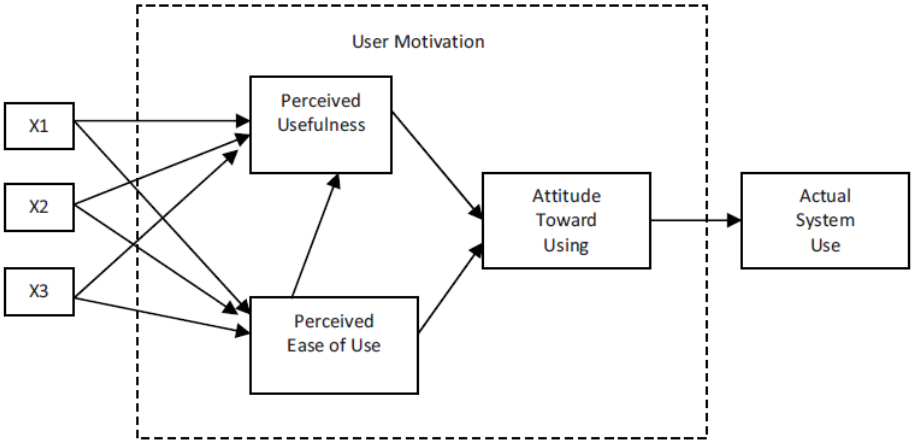

Figure 2. Technology acceptance model. (Reprinted from Chuttur, 2009, p. 10.)

The key variables in TAM were defined by Davis (1989, p. 320) as:

> Perceived usefulness is… the degree to which a person believes that using a particular system would enhance his or her job performance…. Perceived ease of use… refers to the degree to which a person believes that using a particular system would be free of effort.

Since 1986, TAM has evolved considerably in recognition of its simplicity and consequent failure to capture the complexity of real-world behavior. Modifications include adding a direct causal link between perceived usefulness and behavioral intentions (Davis, Bagozzi, & Warshaw, 1989), and replacing attitude toward using with behavioral intention to use (Venkatesh & Davis, 1996). TAM2 (Venkatesh & Davis, 2000) was developed to include a number of additional variables, such as subjective norm, job relevance, and output quality, as predictors of perceived usefulness, and Venkatesh (2000) proposed a number of antecedents (e.g., perceptions of external control and computer anxiety) to perceived ease of use. Chuttur (2009) has summarized reviews including meta-analyses on hundreds of applications of TAM as showing significant support for the high informativeness of perceived usefulness, and mixed results for the proposition that perceived ease of use affects intent to use.

However, a number of criticisms have also been raised about its use. First, according to Dingel and Spiekermann (2007), the construct of perceived ease of use is defined rather narrowly as the "individual expectancies concerning the likely personal performance results of system usage" (sec. 4.1.1). These authors argued that this is quite close, conceptually, to the second construct of perceived usefulness, and that it is questionable whether these two constructs cover all relevant aspects of performance expectations. They argued that TAM's applicability to knowledge management systems (KMS) is limited, as the decision to use a

KMS is subject to a much wider variety of behavioral beliefs. Taking too narrow a focus not only reduces the predictive validity of the acceptance model, but also underestimates the power of this new, socially enriched generation of KMS to successfully shape the motives and mitigate the barriers of potential users. (Dingel & Spiekermann, 2007, sec. 5)

A second major criticism of TAM is that many of its conclusions are trivial or obvious (Chuttur, 2009). A recent example of this might be that of Lim and Ting (2012), who studied the acceptance of e-shopping in Malaysia using TAM. Among other things, they concluded that their study "contends that consumers would only develop favorable attitudes toward online shopping if online shopping sites are easy to use…. Online retailers are recommended to make their digital marketplace simple to learn and… as user friendly as possible" (p. 54).

Finally, serious concerns have been raised about the implicit assumption that actual use of a technology is a simple and direct function of intention to use. Bogozzi (2007), in particular, has pointed out that TAM ignores the social consequences of IS use, and noted that intention to use often fails to strongly predict actual use. A recent example of this can be found in Turner, Kitchenham, Brereton, Charters, and Budgen (2010). These researchers reviewed 79 TAM studies that examined both intention to use and actual use. They concluded that while behavioral intention tends to be correlated with actual use, correlations directly between perceived ease of use or perceived usefulness and actual use are weak.

Knowledge exchange and SKARSE. Effectively establishing a knowledge management system facilitates technical advances and knowledge exchange leading to a natural environment for learning to take place. A study conducted by Key et al. (2009) confirmed that if a knowledge management platform is built and managed properly it can speed up the employee learning curve, prevent duplications in research and development efforts, and improve knowledge sharing throughout the organization. Within the context of organizational learning and economic stability it begins with the individual level and is obtained when a firm is able to increase their learning capacity through knowledge management activities (Cohen & Levinthal, 1989; Hong & Nguyen, 2009). Increased knowledge trading with individuals outside of the organization advances learning activities and outcomes resulting in greater technological knowledge in research and development (Cohen & Levinthal, 1989). Porter and Donthu (2008) acknowledged Cohen and Levinthal's findings and further stated for increased knowledge trading to occur, quality interactions and content exchange must cultivate trust within the exchange. The impetus of knowledge trading is the framework of SKARSE.

SKARSE consists of components including: knowledge, learning, knowledge and learning hubs, and information communication technologies. SKARSE has a direct link to essential business elements of creativity, invention, innovation, and entrepreneurship. The components could impact the potential success associated with each of these elements in business. A brief summary of the literature will be presented below giving the reader a basic understanding of these elements.

Invention, Innovation, and Entrepreneurship

Invention. Inventions or new product and process developments can be created through the use of one's explicit or tacit knowledge. Inventions which heavily rely on tacit knowledge are typically created and managed through an inventor created startup company. On the other hand, a service based organization has the explicit knowledge of sharing or imparting information for advancement of the company (Karnani, 2012).

Innovation. According to Van de Ven (1986, p. 591), "an innovation is a new idea which may be a recombination of old ideas, a schema that challenges the present order, a formula, or a unique approach which is perceived as new by individuals involved." Schumpeter (1934) delineated the difference between an invention and an innovation. He described an invention as discovering something new, where an innovation is taking an invention and transforming it into a commercialized product. Navigating through the invention to innovation cycle is highly complex due to variables such as individual motivation, capital requirements, and disconnect between applicable parties (Auerswald & Branscomb, 2003).

Successful navigation through the invention to innovation cycle allows early innovators of products and services to create brand awareness, directly establishing recognition and buyer preferences with less resistance from customers (Kerin et al., 1992). Innovation is an integral component of corporate sustainability and continued competitive advantage.

Innovative companies are defined by Teece (1986, p. 285) as "those firms which are first to commercialize a new product or process in the market." Moreover, differentiation advantages occur when an enterprise is a serial innovator enhancing existing product lines (Kerin et al., 1992). The innovation process, also known as strategic innovation (Ito & Lechevalier, 2010), can be difficult to formulate and manage as prospects of innovation can be concealed within an individual's tacit knowledge (Karnani, 2012), collaboration, and ongoing communication (Schneckenberg, 2009), and an individual's approach and

enthusiasm will play an important role in the innovation process (Carleton, 2011). If managed appropriately, economic stability may occur through change management initiatives (Vohra & Mukul, 2009), when a firm continually introduces new products and services to the marketplace (Auerswald & Branscomb, 2003), leading to a greater long term competitive advantage as firms that are first to innovate products or services control a higher percentage of market segments compared to firms that follow (Kerin et al., 1992).

Jaruzelski and Dehoff (2010) conducted a survey of innovation executives of 1,000 leading research and development companies, who were asked to rate capabilities they considered most important for innovation success. The authors identified three approaches to creating a system surrounding innovation. These included (1) Need seekers: a collective between the firm and its customers where they are both actively engaged in the design and engineering of potential products or services, which could be utilized to enhance their respective business and then ultimately introduced to potential product markets. (2) Market readers: a process where the innovator observes their clients and the competition while noting smaller, systematic changes which would enhance existing products and services. (3) Technology Drivers: involves the proper diffusion of emerging technologies which are used to develop new innovative products for their clients to leverage.

Ding and Eliashberg (2002) recommended the use of a formalized pipeline process to effectively manage the innovation process. Additionally, Freear et al. (2002) have argued that technological innovation requires capital outside of what the founder is capable of providing on his/her own.

Entrepreneurship. "Innovation and entrepreneurship have to become an integral, life sustaining activity in our organizations, our economy, our society" (Drucker, 1985, pp. 254-255). West and Bamford (2005) developed Drucker's macro perspective by emphasizing it from the micro perspective, identifying the impact entrepreneurship has on the sustainable financial success of local and regional governments including allocated resources and the importance it plays at the collegiate level as well. Entrepreneurs experiment with new concepts while leveraging identifiable gaps in existing markets (Alvarez & Barney, 2005). This may be accomplished through "entrepreneurial spawning" where key employees exit their current firm in order to originate a new business venture within their industry. Chatterji (2009) came to this conclusion in a study of 650 entrepreneurs at 191 firms in four geographical clusters in the medical device industry.

Tacit knowledge is the foundation for entrepreneurship as individuals leverage their internal knowledge and apply it to form a company (Karnani, 2012). Fuzziness may be

viewed as the spirit of entrepreneurs since the activities are driven by an evolving process of knowledge and learning, according to Barney, Wright, and Ketchen (2001) in a *Journal of Management* literature review of strategic management and entrepreneurship, resources, and environment. The creation of opportunities occurs when visionaries recognize and leverage resources (Barney et al., 2001). These entrepreneurs initially operate under degrees of "uncertainty" while existing or more established firms operate while evaluating various forms of risk (Alvarez & Barney, 2005).

In order to project beyond limitations the innovator must recognize the psychological limitations of their historical professional positions (Chatterji, 2009) and formulate a process which includes filtering through, evolving and changing concepts into operational practices (Weitzman, 1998), creating higher levels of performance (Chatterji, 2009). Moreover, many times these evolving processes are being managed under degrees of uncertainty. Alverez and Barney (2005) have identified three types of entrepreneurial firms which operate within this environment: (1) Clan-based: lateral decision making organizations where individuals within the firm are collectively building the organization through unified decision making and perceived trust between each respective party until the entrepreneurs who manage this process are eventually replaced by a highly skilled executive. (2) Expert-based: firms that are managed by entrepreneurs who have a specialized skill which is needed for the survival and continued success of the firm. The distribution of tasks and decision making capabilities are controlled by the specialist. (3) Charisma-based: firms which are organized and managed by individuals who have created inter-firm value through encouraging others around them to achieve greatness. These leaders have created individualized opportunity by having others follow their lead.

Once a process has been implemented the entrepreneur is able to enhance their ideas resulting in greater success (West & Bamford, 2005).

Song et al. (2003) suggested that securing market experts from outside the firm advances and exposes innovative processes, practices, and schemes. These contributors can be identified and recruited from larger organizations within the same industry (Chatterji, 2009). Entrepreneurs who specialize in technology are a vital contributor to the global economy (Freear et al., 2002). As the entrepreneurs recognize the importance of technology and how and to what extent it impacts the individual's wellbeing, managing knowledge can be an integral piece of the decision making process.

Processes of Knowledge (Introduction to SKARSE)

Using various words such as *intangible, tangible, information,* and *creativity* to define knowledge, several researchers have introduced various processes to augment, incorporate, and leverage knowledge at the same time. For example, Barney (1991) referred to the application of intangible and tangible resources as the "resource-based" view within the context of knowledge and its processes. Consequently, Barney's intra-organizational and external model argues that a firm must recognize and allocate resources appropriately in order to maintain a competitive advantage. Barney referred to these resources as unique organizational practices, such as constructs of knowledge. A practice of this business model from an organizational perspective is described by Carayannis (2008), who created a framework that specifies competitive success as valuing concepts to disassemble or dismantle the old ideas, developing a space for creating and establishing new conceptual frameworks. He further stated that knowledge should be allocated, but also reallocated emphasizing resources, improving innovation and technological partnerships which can be accomplished through skills such as those represented in SKARSE.

From a strategic management perspective, Denrell et al. (2003) suggested that firms perform evaluations of the intangible knowledge resources they possess, identifying one of the resources as serendipity. The authors presented and enhanced the description of serendipity as using luck created through one's own effort, combining it with the intellectual resources of agility and knowledge recognition. Another resource which was identified in this study was the concept of arbitrage, describing it as the process of identifying hidden assets which most people are unable to see, and applying the assets to identified areas of development. The study concluded that the application of these knowledge assets transforms the organization into a learning organization where "beating the market" (Denrell et al., 2003) can occur. The recommended recognition and action of serendipity and arbitrage presented by these researchers have similar benefits to the recognition and application of the SKARSE framework. SKARSE is also considered an intellectual asset or a skill set, which can be seen as a broad but clearly defined package of particular abilities that must be coordinated in the service of a concrete goal. SKARSE is a set of skills on the organizational level that came to be associated because, together, they efficiently work to maximize competitive success.

What is SKARSE?

> Within the context of knowledge, reflection and creativity have been leveraged. At the heart of the design, implementation and leveraging of such initiatives are strategic knowledge and serendipity (SKARSE). Companies compete in a given

> space. As already noted, critical to their developing a competitive advantage is the development of strategic knowledge arbitrage and strategic knowledge serendipity (SKARSE). Learning, especially higher-order learning, is the basis for SKARSE. (Carayannis 2008, p. 3)

SKARSE is a process that requires a higher level of thinking, reflection, and implementation, which encompasses specific competencies enhancing creativity, invention, innovation, and entrepreneurship. This section will provide the reader a general description of SKARSE, the potential benefits of its process, and a basic introduction to the strategy of creativity, invention, innovation, and entrepreneurship. The proceeding section will provide the reader with an applied analysis, further defining the individual components of the SKARSE framework. SKARSE begins with the concept of Strategic Knowledge Serendipity.

Strategic Knowledge Serendipity:

> This term refers to the unintended benefits of enabling knowledge to 'spill over' between employees, groups and functional domains ('happy accidents' in learning). More specifically, it describes the capacity to identify, recognize, access and integrate knowledge assets more effectively and efficiently to derive, develop and capture non-appropriable, defensible, sustainable and scalable pecuniary benefits. (Carayannis 2008, p. 4)

The terms *unintended* or *accidental* are interchanged with the term *serendipity* (Denrell et al., 2003; Foster & Ford, 2003; Koen et al., 2001; Schneckenberg, 2009). Serendipity is defined as the faculty or phenomenon of finding value or agreeable things not sought for (Webster's, 2013). Serendipitous moments can be traced through all disciplinary areas, playing a role in discovery, creativity, and connection building (Foster & Ford, 2003).

A study by Foster and Ford (2003) consisted of lengthy qualitative interviews of 100 researchers from organizational research groups and departments. The focus was on information-seeking behavior. Serendipity was found to be an important process in research, "a phenomenon arising from both conditions and strategies – as both a purposive and a non-purposive component of information seeking and related knowledge acquisition" (p. 321). Other authors have described the formation, components, mystic presence, and results of serendipity in various ways. For example, Silver (1985, p. 16) described serendipity using the business practices of organizations and entrepreneurs as the basis, stating, "Entrepreneurship is a series of collisions. Sure you start with a plan and follow it systematically. But even though you start out in the alternative energy business, you are just likely to end up in real estate development."

Schneckenberg (2009) presented serendipity from the view of the individual, finding that serendipitous events surface when streams of knowledge are internalized and linked; presenting organized clusters of knowledge, which are connected, allowing participants to

extract and combine various concepts leading to something new. Koen et al. (2001) also used an individualistic interpretation describing serendipity as passive, yet efficient when using building blocks of experience and one's current environment as contributing factors to the retrieval of hidden knowledge during acts of information seeking or learning. Conceptualizing how and why hidden knowledge and/or prior knowledge can be used to refine current knowledge, while exploring new knowledge assets, could be a foreign process for individuals, as internal psychological battles may occur when an individual attempts to rationalize and comprehend the internal process (Bratianu, 2011).

Expanding the process of serendipity further, Dew (2009) noted the recognition and practice of serendipity alters one's thinking which could affect his or her style of leadership either positively or negatively. These results are dependent upon the individual's ability to properly identify and allocate newly discovered knowledge assets and the presentation of each varied form throughout a multitude of situations. Regardless of the situation and outcome, serendipitous events in learning, according to Foster and Ford (2003), can be leveraged to benefit the learner in a variety of circumstances ending in unanticipated outcomes. The proper utilization of leveraging is the impetus for the foundation of Strategic Knowledge Arbitrage.

Strategic Knowledge Arbitrage:

> This refers to the ability to distribute and use specific knowledge for applications other than the intended topic area. More specifically, it refers to the capacity to create, identify, reallocate and recombine knowledge assets more effectively and efficiently to derive, develop and capture non-appropriable, defensible, sustainable and scalable pecuniary benefits. (Carayannis, 2008, p. 4)

Supporting the premise of capture and allocation, Dew found that individuals need an additional skill, understanding how the retrieval of unintended information affects their day to day business activities (Dew, 2009).

The definitions of serendipity and arbitrage appear quite similar, but there are distinct differences. Strategic knowledge serendipity includes skills such as recognize, access, and integrate, while strategic knowledge arbitrage includes skills such as create, identify, reallocate, combine, and leverage. The skills which are embedded within strategic knowledge serendipity are actions of seeking or finding, finding relevance and combining newly acquired knowledge assets with other knowledge assets. The skills which are embedded within strategic knowledge arbitrage are effectively drawing identified knowledge assets, evaluating their core competencies and combining them with other knowledge assets with a goal or intention in mind. The terms serendipity and arbitrage are integrated within this

process, combining several intellectual assets such as identifying and leveraging which are presented above.

SKARSE consists of the skillful combination of the components of serendipity, such as searching or finding, and the components of arbitrage, such as reallocating knowledge resources for the purpose of leveraging discoveries or ideas. That is, SKARSE is distinct from a mere list of important capabilities because they need to work together to achieve goals. In terms of the analogy of competence at tennis, players can be fast running from place to place, and have a good swing when balls come right to them, but gain maximum advantage by being able to swing while running, or at least to smoothly combine run, stop, and swing. SKARSE is essentially descriptive—it describes the processes that lead to successful knowledge management in organizations. But in this sense it is also prescriptive, in that organizations (and individuals) that are successful in a particular endeavor can probably serve as models for emulation.

The effective practice of SKARSE involves the understanding of several interrelated components relating to its makeup, which include learning and knowledge. Within the context of learning, SKARSE incorporates learning from a purposeful perspective. For example, it involves understanding the conceptual types of ways to gain knowledge, including operational, tactical, and strategic learning (Carayannis, 1994). Operational learning is comprised of accrued practice and learning through action at the organizational level. Tactical learning is a process of creating new approaches for future problem solving, and strategic learning is whereby the learner organization creates new methods, tactics, procedures, and circumstances, continuously transforming itself.

For example, from an organizational perspective Wells Fargo Bank has become one of the largest financial institutions in the United States with 88 different lines of business (Interview with Rob Myers, Wells Fargo Bank CFO for Pacific and Midwest region, February 4, 2013). The majority of the growth was attained through not only the ongoing practice of the bank's vision and values, but also through a tactical learning and growth plan such as identifying and executing on continuous growth opportunities. An example is acquiring organizations which can be integrated into Wells Fargo Bank in support of the company's goal of helping customers succeed financially. Although the company has seen tremendous growth over the past few decades, Wells Fargo Bank has been viewed as a late adopter and had not refined their organizational learning processes.

Historically, many attempted acquisitions were failures due to poor systems integration, which occurred in both pre- and post-acquisition phases. These failures occurred

in areas such as customer satisfaction and risk management mitigation. For example, proceeding the merger of Wells Fargo and Norwest Bank customers did not receive billing statements for their business or personal loans or checking and savings accounts on a regular basis. Another example from the perspective of risk is that Norwest and Wells Fargo coded the collateral of their loans differently. Norwest was inconsistent in their approach and used a series of letters (Aab) and Wells Fargo used an industry standard, referred to as CQR ratings, which are also represented by letters but are placed within a pattern and consistent. When the systems integrated, the risk ratings didn't merge properly, which resulted in a large loan portfolio in which the managers couldn't identify which loan was coming due, missed loan payments, or failed to recognize large concentrations of risk within a particular industry or property type.

In order to become a strategic learning organization, Wells Fargo documented detailed descriptions of each of the acquisitions using electronic or written tools similar to learning logs. The organizational learning data was recorded over many years and was analyzed by a selected group of executive leaders prior to the acquisition of Wachovia Bank. The identification, combination and reallocation of prior successes and failures resulted in the creation of a specialized team that was responsible for the facilitation of the latest acquisition of Wachovia, the largest bank acquisition to date in the United States. The specialized team focused on several strategic areas such as individual and organizational knowledge, technology, and learning. For example, in support of knowledge Wells Fargo created a buddy banker program where the organization integrated employees from the West Coast over to the East Coast. This increased the organization's ability to transfer knowledge and culture from regions with a large Wells Fargo presence to regions with a dominant Wachovia presence.

From a technological perspective, the executive leadership team started systems migration in less redundant geographies and then transitioned into heavily populated areas such as New York. Each business line was also separately managed and integrated as well. In addition, it was determined that the completion of the acquisition needed a longer timeline of 24 months versus immediate integration of culture and technology as in the past. Taking a tactical and strategic approach to learning and applying prior lessons learned to the present enabled Wells Fargo to complete a successful acquisition with limited unintended consequences. (Interview with Rob Myers, Wells Fargo Bank CFO for Pacific and Midwest region, February 4, 2013).

The application of the principles underlying SKARSE is supported by research. A study conducted by Rahmandad (2008) found that competitive success is derived through

exploring the unknown, seeking new ideas, having the foresight to consider future events and learning and unlearning from experience. This premise is also acknowledged by Boutellier et al. (2008), who found that one's openness to explore, learn, and continuously change are important characteristics for innovating, efficiency, and creating value for an organization.

How SKARSE is Used in Business Management

SKARSE can be a means of "unlocking and capturing" (Carayannis, 2013) value in an effort to create individual or organizational value or an enhanced set of knowledge assets. The skills of SKARSE can be learned through experience, self-evaluation, or intuition. SKARSE encompasses strategy, empowers aspects of knowledge and learning fundamentals and is an integrated two-step process. Step one of this process is the ability to recognize either foreseen or unforeseen events in learning, strategically analyze the events, draw new knowledge from the events, add or combine the new knowledge to one's existing base of knowledge assets, and enhance or create new individual or organizational skill sets. Step two is drawing from past experiences, extrapolating internal tacit knowledge and leveraging this knowledge for personal or organizational gain. The integration of both steps results in learning, unlearning, relearning, and leveraging. Therefore, SKARSE is a learning process tool or set of tools which encompasses the identification and combination of both serendipity (recognition of advantageous foreseen or unforeseen events) and arbitrage (leverage for benefit) becoming a collective group of knowledge assets fueling one another during the learning process.

One model of knowledge management was introduced by Jafari, Akhavan, and Ashraf (2009), who viewed the concepts of serendipity and arbitrage as factors integrated within intellectual capital. That study approached knowledge management through the representation of a pyramid with seven layers (see Figure 3). The bottom layer is the foundation for the pyramid, represented as the refinement and evolution of the knowledge management program. The top of the pyramid represents the leader of the organization, a CEO or chief executive officer. One layer down from the CEO is the strategy of the knowledge management initiatives. This layer of knowledge management strategy is framed as consisting of intellectual capital or strategic knowledge serendipity and arbitrage. Thus, in the Jafari et al. model of knowledge management, SKARSE operates at this second level.

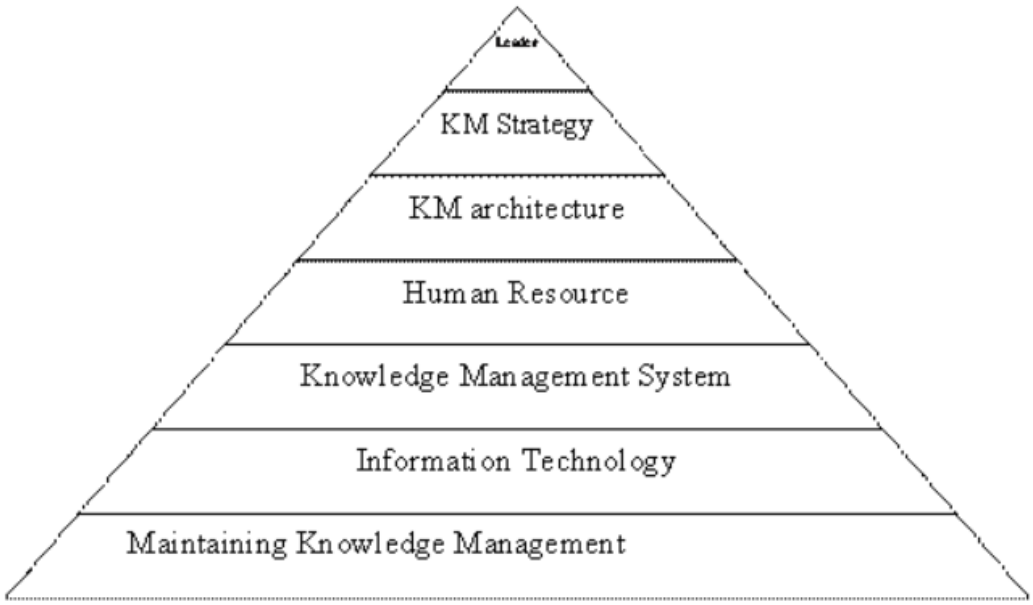

Figure 3. Jafari et al.'s (2009) representation of knowledge management as a pyramid. Reprinted with permission (pending) from "A Review on Knowledge Management Discipline," by M. Jafari, P. Akhavan, and M. Ashraf, 2009, *Journal of Knowledge Management Practice, 10*(1), sec. 4.1.

This comparison of intellectual capital and arbitrage by Jafari et al. (2009) is consistent with a study conducted by Metaxiotis, Ergazakis, and Psarras (2005). Metaxiotis et al. described serendipity and arbitrage as factors of learning, which are integral components of the design of an effective knowledge management system. The subjects of the study were learning, knowledge, and knowledge management, which are all elements of SKARSE. Similar to SKARSE, the study stressed the importance of arbitrage, but within the context of a knowledge management design study. Within this knowledge platform arbitrage was referenced as combining several knowledge assets and leveraging the "collective" as the basis for the design of the knowledge management system. The collective was described as the pool or combination of various knowledge assets which are combined or altered in situations of change or confusion. Thus, where there is confusion, opportunity lies, resulting in arbitrage.

The refinement and evolution of knowledge assets is stimulated by change, which is an unavoidable element in business practice. Change takes many forms, being positive or negative, foreseen or unforeseen, and can have intended or unintended consequences. These aspects of change are recognized by both academics and business practitioners and result in

various models or management tools to embrace and leverage change. As represented in this literature review, knowledge and learning are in themselves a process of change since effective management practice includes evolution. Both learning and knowledge are factors of SKARSE that are presented from an individual or organizational perspective within knowledge management models. Knowledge management models include value added processes, including SKARSE, and encompass (a) organizational or individual learning; (b) identification, transfer, and applications of knowledge resources; (c) micro level knowledge assets such as serendipity, arbitrage, and learning how to learn or unlearn from prior experiences; and (d) leveraging technology as a facilitator or enabler of knowledge.

Most research and writing on SKARSE has treated it as a set of competencies of the organization, although at least one empirical study (Carayannis & Stewart, 2013) has used the concept in relationship to individuals. Specifically, these authors referred to successful technology entrepreneurs as "SKARSE enactors," that is, individuals who put into practice the skills represented by SKARSE. Their interviews of 33 technology entrepreneurs sought to define distinctive characteristics of these individuals. They concluded that two "terse descriptors," *obsessed maniacs* and *clairvoyant oracles,* encapsulated critical attributes leading to entrepreneurial success. However, the research did not address the individuals' use of SKARSE skills per se. In addition, Carayannis (2008) and Carayannis, Provance, and Givens (2011) referred to SKARSE practices as being conducted by entrepreneurs, but did not study individuals.

Information and Communication Technology

Technology is constantly evolving (Antonelli, 2010), while its uses are also fluctuating within various economic cycles, making it a fascinating area of research for economists and social science researchers (Arrow, 1962). Dosi and Grazzi (2010, p. 173) defined technology as "a set of pieces of knowledge ultimately comprising selected physical and chemical properties, know-how, methods, experiences of successes and failures, and also, of course, physical devices and equipment."

Technological advancements are presently adopted in many forms and are being embraced from the micro and macro level due to increased global competitive pressures (Berman & Machin, 2000). These advancements are also referred to as technological ingenuity, affording a multitude of options explained by Danneels (2007), including the facilitation of information management or the dissemination (spillover) of initiatives (Nonaka, 1994). Research conducted by Berman & Machin (2000) analyzed industrial

production data from 1980 to 2008 and compared patterns and conditions across high-, middle-, and low-income countries. Their findings were consistent with those of Nonaka and Danneels, while also noting that emerging technologies have migrated across international borders.

One subset of these emerging technologies is Information and Communication Technology (ICT), which has a global impact among firms from a macro, as well as a micro level (Freeman et al., 1995). ICT affords opportunities to individual users such as constant and consistent communication (Kim, 2008). For example, a focus group conducted by Huang and Wei Lin (2009) showed that email has changed the fundamental way we channel information. Liaw et al. (2010) expanded on this concept and referred to email as an integrator and an essential part of people's lives. Thomas et al. (2002) concluded that ICT enabled information exchange conducted through websites and email correspondence, and allowed for increased communication in small agri-food companies. In addition, their research showed that ICT influences the social and cultural behavior of less populated areas, such as rural communities. Although technological exchanges may enhance channels of communication, they also pose challenges for the users, such as one's ability to process information as quickly as it is received (Hemp, 2009). Within this context, Huang and Wei Lin (2009) reported that people are dependent upon the use of email to communicate with one another and to accomplish initiatives and/or perform activities. They further explained that many business professionals are emotionally drawn to email as a chosen means to conveniently communicate with others. This emotional integration can pose challenges such as continuous interruptions and task deficiencies for the users (Hemp, 2009).

Another challenge ICT poses is the potential loss of jobs, which could affect internal or external organizational forces. For example, from an internal perspective, job losses could affect employee morale (Freeman et al., 1995). Additionally, emerging technologies such as email have resulted in an evolution from face to face communication to remote communication. If not managed correctly the results could have a negative impact on the firm (Huang & Wei Lin, 2009).

Danneels (2007) studied a single CEO over a two-year period, including 11 interviews and extensive observations. He concluded that in order to leverage technological options in a positive way the user must synergistically amalgamate the existing knowledge of the functional uses and the expedition of foreseeable uses. Consequently, it is imperative for ICT users to manage and diffuse communication technology properly (Freeman et al., 1995). Danneels (2007) referred to the management of this process as the technological process of

"de-linking and re-linking." The term de-linking describes the benefits and features of the technology and the potential attributes it could afford the user. The process of re-linking is the application of the technology and the benefits the user receives, evolving into leadership characteristics. Therefore firms that lack management processes or technological leadership are indirectly creating a barrier to entry into their marketplace (Kerin et al., 1992) as technology drives organizational performance (Ito & Lechevalier, 2010).

Processes of technological leadership and management were studied by Danneels (2007), who found that technologies are fluid, which affects the potential they could afford a user since they are not consistently leveraged to their full potential. Thomas et al. (2002) found that ICT created social issues for individuals or organizations that don't have the necessary capital to implement the technology.

Technological competence drives higher revenues, increased profits, and diversification strategies (Danneels, 2007). Through advancements in technology, new paradigms (social shifts; Kuhn, 1970) are created as ways of learning within the uses of technology. Liaw et al. (2010) conducted a study of 152 persons (characteristics not described) on their use of devices for "mobile e-learning… (m-learning)" (p. 446). The authors developed an m-learning system as a knowledge management tool and had the participants, who were familiar with the system, report on their experience. Results showed that enhancing learners' satisfaction, encouraging learners' autonomy, empowering system functions, and enriching interaction and communication activities had a significant positive influence on the acceptance of the m-learning system. The new paradigm, as Liaw et al. explained, is related to Sharples et al.'s (2002, p. 222) "personal contextual learning." The eight tenets which focus on lifelong learning as an impetus for the technology are highly portable so they can be available whenever the user needs to learn. These include individual, unobtrusive, available, adaptable, persistent, and useful tenets.

- Individual: adapting to the learner's abilities and learning styles and designated to support personal learning rather than general office work.
- Unobtrusive: so that the learner can capture situations and retrieve knowledge without the technology obtruding on the situation.
- Available: anywhere to enable communication with teachers, experts, and peers.
- Adaptable: to the context of learning and the learner's evolving skills and knowledge.

- Persistent: to manage learning throughout a lifetime so the learner's personal accumulation of resources and knowledge will be immediately accessible despite changes in technology.
- Useful: suited to everyday needs for communication, reference, work, and learning, and easy to use by people with no previous experience with the technology.

According to Huseby and Cho (2003), technology can be a key driver in efficient management initiatives. For example, Holtshouse (2009) noted that experts believe there will be a significant increase in virtual work through the use of technology. This supports current practices of accepting ICT which include mobile technologies.

Mobile Technologies

Due to functionality, portability, and unlimited access to the internet, the use of mobile devices is forever changing the way people do business, communicate, and learn (Liaw et al., 2010). According to Sharples et al. (2002), mobile technologies are facilitating communication within a multimedia, multi-dimensional learning process. Users of mobile devices are able to customize and tailor features of these devices to suit their informal and formal learning needs (Clough et al., 2007).

Mobile device users, as reported by Clough et al. (2007), are able to use the technology to create or construct knowledge for the use of learning output. This process is supported by Holtshouse (2009), who reiterated the importance of the acceptance of mobile devices for use in work related tasks. For example, adopting mobile technologies allows the user to detect and handle incidents and problems in a more timely and cost effective manner resulting in more efficient communication and information exchange (Kim, 2008; Liang, Huang, Yeh, & Lin, 2007). Expanding the concepts of accepting and adopting mobile technologies further, Liang et al. (2007, p. 1154) stated "the most significant features of mobile technology are mobility and portability." This allows users to handle changes with minimal impact on availability. Zyl (2009) concluded that mobile technologies entwined with the internet have allowed for cost effective communication and collaboration to occur without any geographic and time constraints. Therefore, due to their portable nature, it is critical to acknowledge that mobile technologies enhance efficiencies in time management, access, and balance (Liang et al., 2007).

Through the use of mobile technologies individuals are able to be more effective due to their ability to obtain information quickly in many different ways. Individuals seeking

information use ICT applications, such as text messages, Facebook friend alerts, virtual and visual voicemail, instant messages, twitter tweets, email, online industry data, blogs, wikis, corporate internet, discussion forums, and continuous updates from other participants who are part of their various networks (Hemp, 2009). This practice can be performed through various mobile devices including, but not limited to, tablets such as the iPad or Android and Smartphones such as the iPhone, Blackberry, or Google phone.

Smartphones

Smartphones are mobile devices manufactured with a computer processor which allows the device to be programmable. These phones have sensors, additional storage capacity, networking capabilities, and the ability to access the internet (Raento, Oulasvirta, & Eagle, 2009). Smartphone applications create a remote office environment allowing individuals to perform many activities without the limitation of geography and creating more efficient time management (Liang, et al., 2007). Avid users of smartphones widely use this device in a collaborative manner during various activities, such as informal learning. Therefore, learners from various backgrounds are able to use the technology as a facilitating tool in both formal and informal learning environments (Clough et al., 2007).

It is also recognized that in order for effective learning to take place smartphone users must perceive the device as useful. A recent study by Kim (2008, p. 390) acknowledged that the "relevance made the relationship between perceived usefulness and users' behavior strong. As individuals use a smartphone to perform their job, they feel that the technology is useful, which affects their positive intention to use it." This observation applies to other mobile devices as well. Thus, a major goal of the present research is to determine whether a sample of CEOs do find the various devices to be a practical business tool.

Smartphone devices are becoming widespread throughout industrialized nations. This device incorporates flexibility among the users and promotes authentic communication in a timely manner (Raento et al., 2009). Smartphone users are able to gain and diffuse knowledge through the use of web-enabled applications backed by Web 2.0 technologies. According to Liaw et al. (2010), Web 2.0 applications have the ability to administer or draw upon participant interaction and the flow of information, creating a source of competitive advantage. Expanding this concept further, Zyl (2009, p. 907) stated, "Social Networking, incorporating Web 2.0 technologies, has been credited with the ability to expand social contacts, accelerate business processes, the improvement of customer relations, cost effective

recruitment of high caliber staff, and the improvement of morale, motivation and job satisfaction."

Linkages Among Topics

SKARSE, considered as a skill set, can be seen as a broad but clearly defined package of particular abilities that must be coordinated in the service of a concrete goal. Many aspects of learning, knowledge, knowledge management, and mobile technologies are relevant to this combination of skills.

Learning and SKARSE. SKARSE acknowledges many of the qualities of learning highlighted by constructivism. Notably, it assumes that learning builds upon prior knowledge and is continuous and constantly evolving. It sees learning as reflection-based, rooted in the past to inform actions in the present and influence the future. It provides a mechanism for actualizing learning as, according to Eng (2005, p. 68), "the only source of sustainable competitive advantage."

As noted, SKARSE can be seen as a package of abilities. The creation and enhancement of this package of abilities begins with the process of learning and knowledge, which is enhanced through evaluating positive or negative experiences, drawing from these experiences and extracting beneficial information which becomes new knowledge built upon the old. This action of learning was described by Metaxiotis et al. (2005) as the movement from single loop learning to double loop learning. Single loop learning, in their model, is identification and correction labeled as a change asset, and double loop learning is revaluating, strategic correcting, and applying, changing previous assumptions.

Knowledge and SKARSE. The beginning of action and reflection or praxis is the concept of knowledge, which is therefore included as a component of SKARSE. In relation to this study the individual characteristics of knowledge relating to SKARSE are tacit and explicit knowledge, how knowledge is acquired, transferred, and diffused, including the practice of connection building and knowledge management related activities. From a bottom up perspective, Nonaka et al. (2000, p. 7) described knowledge as vibrant and fluid through various forms of socialization, being a "justified true belief" where information is functional, leveraged, and transitioning into knowledge. Liaw et al. (2010) supported Nonaka et al.'s premise and explained that knowledge is the ability people possess to transform information they receive into an application-related product, service, or mutual dialogue, and the practice of concepts for their benefit.

If knowledge is the ability to transform information into an application, then, as Song et al. (2003) noted, sharing knowledge is difficult since it is often held internally. SKARSE is particularly useful in transforming knowledge from tacit to explicit (by means of reflection), by drawing from several micro forms of individual or organizational assets, transmitting knowledge to a form in which it may be communicated to others. It is a set of tools for knowledge management. Strategic knowledge serendipity is defined as "the capacity to identify, recognize, access and integrate knowledge assets more effectively" (Carayannis, 2008, p. 4), and strategic knowledge arbitrage emphasizes creativity and the ability to reallocate and recombine knowledge assets.

For example, a knowledge transfer study within the healthcare industry conducted by Pentland, Forsyth, Maciver, Walsh, Murray, Irvine, and Sikora (2011) found when people focus on how to exploit newly discovered clusters of knowledge they are increasing their chances of success factors occurring. These success factors could be directly or indirectly related to intra-organizational initiatives such as knowledge acquisition or transfer activities, or to creating items of action inter-organizationally such as finding appropriate growth initiatives or the proper person to implement strategic opportunities.

However, as the literature review has shown, SKARSE has been studied almost exclusively in organizations. SKARSE principles logically could apply equally well to individuals, especially those in a position to have maximum impact on the organization: CEOs. Thus, the review has identified the first major gap in the literature that the present study was designed to help fill: whether SKARSE tools are used by CEOs, and if so, in what ways.

Mobile Technologies and SKARSE. As constructivism argues, all higher-level learning is acquired in a social context (Vavoula & Sharples, 2009). Knowledge and learning hubs depend on building relationships (Westerlund & Rajala, 2010) and establishing trust (Ibarra & Hunter, 2007). Modern mobile technologies are superb at easily and quickly integrating a group into a CEO's thinking and learning.

Acknowledging the framework of unstructured learning or spontaneous learning explained by Sharples et al. (2002), Vavoula and Sharples (2009), and Rahmandad (2008), Geng et al. (2009) found a key role of an effective learner is to acquire information about state of the art technologies and create strategic initiatives that surround these ideas while collaborating with others of authority.

The utilization of technology within the context of learning was also studied by Foster and Ford (2003), who added that for the learning process to be effective one must recognize

and manage knowledge related activities, pose problems, and be open to new ideas. This paralleled work by Teece (1986), who supported the inclusion of technology in learning and added that it functions as an enabler, breaking down organizational boundaries, allowing individuals to learn from others outside traditional organizational boundaries, resulting in effective learning.

However, there has been very little research into how CEOs make use of mobile electronic devices. This is a second gap in the literature that the present research was intended to help fill. Thus, the purpose of the present study was to investigate how CEOs make use of SKARSE through the mechanism of mobile technologies to improve their learning and acquire and manage knowledge. The goal was to develop a model of CEO knowledge management using SKARSE principles through the mechanism of mobile devices.

CHAPTER 3 RESEARCH METHODS

OVERVIEW OF METHODS

Introduction

The objective of this study was to research knowledge management within the context of the use of wireless mobile technologies, and how these technologies are being applied to individual and organizational knowledge and learning. While reviewing the literature on knowledge management, innovation, and mobile technologies there appeared to be a gap in the literature on the relationship between CEOs and their ability to manage knowledge through the use of SKARSE and wireless mobile technologies.

The existing literature supports the use of technology within a knowledge management system but doesn't explain the practical usefulness of how organizational leaders are applying wireless mobile technologies in order to exchange tacit and explicit knowledge for individual or organizational use. Filling this gap in existing research is important for a knowledge management system in the 21st century to be designed and implemented.

The main research question for this study is: *How and why do CEOs use wireless mobile communication devices and what is their perceived usefulness?* In order to thoroughly investigate this question, the research design consisted of a three part, sequential mixed methods, expanded mobile business case study. The application of several research techniques provided the researcher a deeper understanding of the research topics as well as of the individuals studied (Chung & Smith, 2008; Healy & Perry, 2000). The study may be regarded as a mixed method design, primarily qualitative with a significant quantitative component. This mixed method approach provided real time, hourly insight (Creswell, Hanson, Plano Clark, & Alejandro, 2007) into the various uses of wireless mobile technologies. The subjects studied were chief executive officers (CEOs). A sequential mixed method approach was chosen for this study since CEOs are a specific cultural group that provides data that tends to be more abstract, because of their higher intellectual functioning and the complexity of their decisions, compared to that from other types of research participants (Chung & Smith, 2008). In this way, also, the subject matter was suitable for a transdisciplinary research method. In order to conduct a robust analysis of the research question the researcher combined a pilot study with qualitative and quantitative research techniques. Qualitative methods were used to develop themes within the context of

the research question. The themes were investigated and evolved into several additional research questions which were then answered using descriptive (quantitative) statistics (Creswell et al., 2007).

The researcher followed a high-level framework suggested by Creswell et al. (2007) as a methodological approach to this study. Such a high-level framework enables researchers "to both understand the differences between these [case study] strategies and further help the selection of the strategy most suitable in answering the particular questions the study addresses" (Shakir, 2002, p. 191). Therefore, the study began with a qualitative design in which the researcher studied how participants viewed their surroundings (Creswell, 2003), also referred to as "a basic set of beliefs that guide action" (Guba, 1990, p. 17). The emerging themes or knowledge provided from open-ended interview questions created the basis for additional variables, hypotheses, and questions, which were answered quantitatively (Creswell, 2003).

The sequential mixed method research design consisted of three distinct parts as follows. First, a qualitative pilot study consisting of semi-structured interviews was conducted to investigate the need for further study. Stage 1 was a qualitative study that consisted of open ended interviews. Stage 2 included a quantitative study that leveraged self-observation logs as an instrument to collect data. Flowcharts and detailed descriptions of the pilot study and two stages are presented below.

Pilot (Qualitative: Semi-structured Interviews) → PHASE 1 (Qualitative: Open Ended Interviews) → PHASE 2 (Qualitative: Focus group; Quantitative: Self-observation Logs)

Theoretical Foundations of the Research Methods

Evolution of the research approach. Most research is very narrow, building incrementally on a solid foundation of similar work done previously. This is very productive, but it need not be the only possible approach. The present researcher has broad interests, encompassing both theory and practice. As business is an applied, practical discipline, the researcher chose to address a problem with direct applicability to business practice.

As noted in the discussion of transdisciplinarity in chapter 1, as the research developed to answer a pressing real-world problem, the ultimate goal was not clear at the beginning, but emerged from early work on the problem. As Newman, Ridenour, Newman, and DeMarco (2003) noted, "research projects are not linear but instead twist and turn and sometimes lead in unforeseen directions. Purposes drive the research question, but purposes can change over the course of the study…. which can lead to methods changes" (p. 172).

This was particularly true of the present research. Thus it may be helpful to trace the evolution of the research approach over the six years during which it took shape. The purpose began with an investigation into the use of personal electronic devices by the researcher's employer, a large international bank. This is described in the following section. That work resulted in a study, treated here as the pilot study of the present thesis, which produced publications including the researcher as co-author (Carayannis & Clark, 2011; Carayannis, Clark, & Valvi, 2013).

Further development of the project was necessarily rather inconsistent, since matters important to an early stage were irrelevant later. A good example of this is the fact that concerns about confidentiality in the use of smartphones were important during the initial study in the researcher's bank, but were not even considered later.

Although a researcher may begin with a philosophy that determines or at least influences his/her research approach, in the present case the philosophy grew out of experience with the phenomena under study. That is, the philosophy was developed intuitively, and only labeled subsequently. The act of labeling the stance does not necessarily change it, but does provide a more precise vocabulary in which to describe it. The researcher's philosophy is described in the second section below.

Initial research leading to project. The pilot project described here was conducted at a large international bank, which will be represented by the pseudonym "West Coast International Bank" (WCIB). Banks are typically late adapters of new technology for several reasons, including the complexity of complying with federal and state regulatory requirements and a high level of concern over customer privacy and security. WCIB did not provide employees (at any level) tablets or smartphones to use for business activities. With some difficulty, middle level managers could remotely log onto the company's systems. Blackberrys were available but severely restricted for reasons of security, privacy, and potential misuse including any use of social media websites (including Facebook, LinkedIn, etc.). Very little functionality was available beyond access to email.

In 2009 a project team was formed to review internal policies and procedures in relation to the telecommunications technology. The formation of this group was partially in response to company-wide results from a survey conducted by an external vendor. The specific questions which yielded negative responses were: "I have the materials and equipment I need to do my work right" and "[WCIB] provides the support I need to exceed customer expectations." The project team was composed of eight individuals from several core lines of business within WCIB: retail, business banking, and SBA, and included the

researcher. The DBA pilot study was performed as part of the exploratory phase of the WCIB project.

The project also involved a third party company to use electronic journals to capture tasks from managers which included what they were doing and when. A pilot was rolled out in late 2010 to high level executives and the project team. The pilot allowed for an Apple iPhone or iPad to be used on the server. In 2011 the pilot was expanded to selected mid-level managers including approximately 150 people. In 2012 the pilot was opened to all mid-level managers in the retail organization (district managers or above, business banking managers and SBA regional managers), essentially managers of managers. In 2013 the ability to use an iPhone with limited restrictions was added to the WCIB policies / procedures / objectives regarding mobile technologies. As the student's research progressed results were shared with strategic management and project management teams. This evolved into what is now called the "business banking mobility project." At the time of this writing, use of mobile devices has been largely accepted by executives, even in the banking industry, so issues of privacy and confidentiality are less of a concern than they were at the beginning of the study.

In 2014 and 2015 the researcher was part of the mobility project team, which is being piloted within business banking. This team participates in focus groups to document areas which could be enhanced through the use of mobile technologies and their associated software applications. Each identified and documented area of interest is also accompanied by a suggested solution. The major milestone is to provide every banker and manager within business banking a tablet. The goal is to create a mobile application for the customer retention management system. This will allow employees to access the companies' internal system, log customer calls, document site visits, and take and upload visual images of real property collateral such as commercial real estate and/or production equipment. Access to mobile learning such as training is currently available. The mobility team has also made recommendations for an internal social media platform. A pilot for this rolled out in May 2014. One additional area of interest is a live feed board which allows employees to post questions and receive solutions.

Researcher's philosophy. In terms of epistemology, the researcher would characterize himself as a radical empiricist. Empiricism is a theory of knowledge in which the role of experience, especially experience based on perceptual observations, is paramount. According to Frankenberry (1987), "radical empiricism is defined by the understanding that sense-perception is neither the only nor the primary mode of experience, but is rather derived from

a still more elemental and organic togetherness of the experiencing subject and the experienced environment" (p. 84).

A phenomenological perspective was adopted by the researcher. As described in Bryman and Bell (2011), phenomenology is concerned with how individuals make sense of the world around them. Unlike the subjects of the natural sciences, the subjects of social science have a point of view, and the researcher must attempt to share that point of view.

In terms of social ontology, the researcher is a constructivist. This position acknowledges that an organization is constantly changing due to renegotiation of implicit agreements among actors regarding roles, appropriate interactions, duties, etc. This leads logically to the stance that the researcher's own account of social reality is itself a construction. As noted in the previous section, the present researcher approached the topic of interest with an open mind, from this implicit epistemological position, and constructed his mode of the social reality of CEOs' use of personal electronic devices gradually over time. Broadly speaking, the goal of the research was to develop an ontology, that is, to define entities that may be linked by testable hypotheses to ultimately form a theory of the use of personal electronic devices by top-level executives.

Researcher's approach to design. The researcher's approach was to read and research various business and human behavior literature while also looking for an applied business problem to fill a gap in academic literature. This fulfills two objectives for the researcher: Adding to the existing body of research and providing information with clear utility for readers (answering the question: "So what?").

Once the research question was selected the researcher chose the appropriate methods of research to adequately address and provide a solution or answer to the question. The criteria above were the impetus for choosing a mixed method research design. The need to examine the research question required a thick description of the lived experiences of the individual participants. Mixed method research enabled purposeful sampling specifically choosing participants who have vast experiences, information, and knowledge to address the research question. Within this context the researcher was able to conduct open ended interviews as well as quantitative self-observation log studies. Consistent with the researcher's philosophy of exploring a practical, concrete problem, he considered the appropriate participants to be individuals who could provide insight as well as meaningful real-world data to the researcher in the quest to answer the research question.

The current study represented the problem solving approaches of CEOs intrinsically as a paradigm shift as described by Kuhn (1970). The individuals have a wealth of

knowledge (Creswell, 2003; Yin, 2009) that encompasses their practice and attitude resulting in the researcher's clear understanding and insight in addressing the research question. Verschuren (2003) has emphasized the importance of the researcher's ability to scrutinize the data collected from the participants.

Rationale for Choosing Mixed Methods

When conducting a study, researchers are able to choose from a plethora of research designs (Creswell et al., 2007). In general, qualitative research generates detailed data in a rich context leading to an in-depth understanding of the subject. Quantitative research yields precise data that can be communicated widely with little loss of meaning.

The use of mixed methods, however, allows the researcher to evaluate cases, events, or problems in a detailed and rigorous manner (Patton, 2002). Mixed method research studies have become a common research practice in social science (Bryman, 2006; Johnson, Onwuegbuzie & Turner, 2007). Mixed method research (Creswell, 2003) has also been referred to as integrative studies (Johnson & Onwuegbuzie, 2004), multi-method studies (Brannen, 1992), triangulation methods (Bryman, 2003; Sandelowski, 2003), and blended studies (Thomas, 2003). Although there are various broad terms and definitions of the meaning of mixed method research, the common underlying focus is combining qualitative and quantitative data for research design and analysis (Creswell & Plano Clark, 2006; Hunter & Brewer, 2003; Polkinghorne, 2005; Sale & Brazil, 2004).

Combining both qualitative and quantitative methods mitigates the philosophical issue of which method is the most effective to use in social science research (Venkatesh, Brown, & Bala, 2013). The mixed methods approach is also supported by research conducted by Jauch, Osborn, and Martin (1980), who found that the use of one research method may limit the process and conclusions of the overall research study. Furthermore, a study of academic literature conducted by Sale and Brazil (2004) noted that although the mixed method approach has integrated advantages, each approach within the context of the mixed method need not be held to the same criteria of critical appraisal of methodological quality. This leads to another concern, that the ways and means that quantitative and qualitative methods are joined in common research practice and the priority given to one or the other do not correspond with the principles used to justify their use in the same research (Bryman, 2006). Bogdan and Biklen (1998) noted that some researchers, especially novices, "have a difficult time pulling it off, and rather than producing a superior hybrid, usually produce a piece of research that does not meet the criteria for good work in either approach" (p. 37). Bearing

this in mind, the researcher set out to produce rigorous research in both the qualitative and quantitative components of the study.

The subjectivity and objectivity of mixed methods has a unique purpose, to reinforce understanding specific knowledge from the participants in order to answer the research questions (Creswell, 2009). Therefore within the context of this research study, the subjectivity of the qualitative analysis enabled the researcher to obtain a thick, rich description of the perceived usefulness of wireless mobile technologies. Using quantitative research alone would not have provided the type of human interaction needed to examine the factor of "so what" within the context of addressing the research question. In order to properly examine the research question, the researcher needed to obtain the specifics of perceived usefulness. Consequently, using statistical analysis in quantitative methods in Stage 2 provided the validation of the original themes which were generated in Stage 1. This represents a significant advantage of mixed methods called data triangulation.

***Triangulation*.** Ertzberger and Kelle (2003) described triangulation as a process of locating a concept as a single point in a multi-dimensional space. However, most users of the term seem to have in mind a different metaphor, that of viewing an object in the round; instead of a portrait in two dimensions, the concept is seen as a sculpture. Although the most salient features of the object are well represented in the two-dimensional rendering, the ability to see the object from different angles adds additional information not visible in the portrait. In this usage, the term has become a fixture of mixed-method research, implicitly assuming that all mixed methods involve triangulation.

A close examination of the concept of triangulation shows that, while the present research does contain aspects of the process, they apply mainly to the methods, rather than to the constructs under study. That is, the different methods used helped to yield more accurate data on what was being investigated, but did not necessarily broaden the scope of the investigation. An important exception was that it was possible to perform a factor analysis on the quantitative data to discover how the various themes combined into higher-level components, and how the components differed.

The use of mixed methods in business research allows a more thorough data analysis for comprehending statistical representation and in-depth, personal experiences the participants had with mobile technologies. According to Milliken (2001), "business executives face problems in unique, unstructured, turbulent environments, and require a research approach that offers creativity, flexibility, and spontaneity" (p. 72). Therefore, a

mixed method approach to this research study provided the researcher a unique research model while also triangulating the data.

In the use of mixed methods in the present research, a qualitative component using open ended interviews (in Stage 1) provided an in-depth understanding or thick description of how mobile devices were being used and their perceived usefulness. The use of self-observation logs (Stage 2) elicited numerical data analyzed by principal component analysis. This presented the researcher with valuable information supporting the themes that emerged from the qualitative data in Stage 1. This combination of research approaches, developed in a variety of disciplines and requiring subprojects, is consistent with transdisciplinary research (Bergmann et al., 2012).

Qualitative Methods

Within the context of mixed methods, McMillan and Schumacher (1993, p. 479) defined qualitative research as, "primarily an inductive process of organizing data into categories and identifying patterns (relationships) among categories." This definition implies that data and meaning emerge "organically" from the research context. Qualitative research methods have a research history in human disciplines (Milliken, 2001), evoking ingenuity (Polkinghorn, 2005) while offering a global perspective via an evolutionary process in order to provide insight and solve problems extrinsically (Healy & Perry, 2000). "The strength of qualitative research is its ability to provide complex textual descriptions of how people experience a given research issue. It provides information about the 'human' side of an issue" (Mack, Woodsong, MacQueen, Guest, & Namely, 2005, p. 1). Qualitative methods have evolved over the past 40 years, playing a significant role in the social science disciplines, allowing for creativeness and experimentation to occur during the process (Polkinghorne, 2005).

Specific qualitative methods used in this study are described in the following sections. These include the case study, open-ended interview, focus group, and journaling/self-observation logs.

Case studies. As reported by Chung and Smith (2008), Healy and Perry (2000), and Verschuren (2003), social science researchers commonly use case study methodology as a research design due to its in-depth approach and widespread use among the research community (Chung & Smith, 2008; Denzin & Lincoln, 2005; Yin, 2003). According to Zhang and Wildemuth (2009), case studies enable researchers to analyze and comprehend social behavior with subjective evaluation, while incorporating objective (quantitative)

scientific methods. Case study research was defined by Gerring (2004, p. 342) as, "an intensive study of a single unit for the purpose of understanding a larger class of (similar) units." This explanation of case study research is supported by Creswell et al. (2007), Hesse-Beber and Leavy (2011), Merriam (2009), and Yin (2003). More specifically, case study was described by Hancock and Algonzzine (2006) as follows:

> Doing case study research means determining what we know about a research question to establish its importance and the need for further research about it, to identify strengths and weaknesses of previous research, and to identify areas of sufficient and insufficient study as well as methods used to study it. (p. 27)

Within the context of this research study, case studies are deemed appropriate methods to properly answer the research question since the research topics have not previously received much attention (Healy & Perry, 2000).

Although writers commonly present uniform explanations of case studies, variations of the contributing factors, practice, and components of case studies are presented. For example, Creswell (1994) stated that a case study is routinely used in business analysis and can examine a social group or phenomenon using a combination of data collection methods. Verschuren (2003) has critiqued case study research, but has expanded on the usual definition, adding a holistic, and constructivist point of view:

> A case study is a research strategy that can be qualified as holistic in nature, following an iterative-parallel way of proceeding, looking at only a few strategically selected cases, observed in their natural context in an open-ended way, explicitly avoiding (all variants of) tunnel vision, making use of analytical comparison of cases or sub-cases, and aimed at description and explanation of complex and entangled group attributes, patterns, structures or processes. (p. 137)

Leveraging various methods within a case strengthens the case study, according to Baxter and Jack (2008), by providing a multidimensional perspective through the individual viewpoint of each participant. This individualistic approach to a case provides a forum for understanding the various means of addressing the research questions. This multidimensional approach is supported by Darke, Shanks, and Broadbent (1998), who found that robust case studies facilitate the retrieval and conceptualization of data through diverse collection and analysis methods both qualitatively and quantitatively. Expanding on this concept, Vissak (2010) found that a case study should be structured using individual interviews of either individual cases or a group in order to build theories from the conceptualization of the individual interviews, which are then further investigated quantitatively, making it a sequential mixed method (Teddlie & Tashakkori, 2009).

Yin (2003) stated that a case study design could be leveraged when the research questions begin with *how*, *what*, or *why*, when the participants have in-depth knowledge of the subject matter to address the research question, and when the researcher believes the

information shared by the participants will be relevant to explain and describe the benefits to others. The present research question is an open-ended question using the terms "How" and "Why."

Qualitative in-depth open-ended interview. An integral component of a successful case study is to include interviews with investigative questions (Chung & Smith, 2008). According to Mears (2009, p. 13), "the interview offers a powerful point of entry into the world through another's perspective." The purpose of an interview was explained by Brod, Tesler, and Christensen (2009, p. 1265) as "a process to generate new information and confirm or deny known information. The process is an iterative one whereby each interview informs the next, and subsequent interviews are used to explore issues raised in previous interviews." Building on this premise, Stone (Interview with qualitative research specialist Suckie Stone, PhD, Stone Educational Systems, June 2012) agreed with exploring issues through subsequent interviews but also stressed the importance of interviews being structured as in-depth and open-ended, providing the researcher a practical and richer understanding of the respective case. This is substantiated by Kvale (1996, p. 1), who stated that open-ended research interviews are "attempts to understand the world from the subjects' point of view, to unfold the meaning of people's experiences, to uncover their lived world prior to scientific explanations."

The interview approach is the most common qualitative approach for gathering data since the interview usually takes place in an intimate one-on-one environment and tends to be an open-ended format (Opdenakker, 2006; Polkinghorne, 2005). Research conducted by Briggs (1986) also concluded that the interview approach is the most common qualitative approach while finding that approximately 90% of all social science studies incorporate data derived from various forms of interviews. Roulston, deMarrais, and Lewis (2003) reached similar conclusions as Polkinghorne and Briggs but elaborated on the way interviews are fluid, which leaves the researcher in a state of the unknown where anything can happen.

According to Opdenakker (2006), there are four types of qualitative interviews. These include face to face, telephone, messaging, and email. Face to face and telephone interviews should include a tape recorder. This sets the scene for information retrieval, which could include a research participant's experiences, knowledge, and emotion (Patton, 1987). This is explained by Bruner (1987, p. 23) as the research participant's opportunity to speak in a self-telling form, unleashing "hard-core" reality. Interviews can be a powerful source of data since interviewing provides the ability for the researcher to investigate fascinating or unexpected details in a creative face to face environment, and it is tough to ignore the direct

words of participants which represent their thoughts and feelings. Kvale (1983, p. 174) explained the interview process as experiences from a "life world" perspective in order to analyze effectively how the individual believes their experiences relate to the culture of what's being studied.

Although open-ended interviews provide the researcher the ability to generate rich data through emerging themes and triangulation within the process, the researcher must also recognize and mitigate potential drawbacks to the interview. For example, a study conducted by Roulston et al. (2003) concluded that the interview can present challenges for the researcher which must be considered. These include (a) influences due to the researcher's own subjective standpoint, (b) impulsive behavior from the interviewee, (c) managing emotional subjects or issues, and (d) clearly communicating the interview questions. Vissak (2010) and Mack et al. (2005) expanded on these concepts while also stressing the importance of collecting data in a systematic manner when exploring intangible factors. Their research also addressed additional characteristics the researcher should recognize, such as the excess time this method requires, the inability to analyze more complex sets of data, and potential bias emerging throughout the research process. Standard objections to qualitative interviews were also addressed and mitigated by psychology researcher Steinar Kvale, who identified common objections by the research community. These include qualitative interviews not being technical, unbiased, dependable, consistent, formal, and measured. His research then addressed and mitigated each of these statements by arguing that each of these terms is subjective and can be defined or explained through a multitude of interpretations or meanings (Kvale, 1994).

Recognizing these variables, researchers have presented ways to mitigate potential drawbacks of in-depth interviews. For example, it is recommended that interviews be designed so that researchers explore individuals with a specific knowledge base and experience in order to answer the research question. Additionally, the researcher's familiarity with the participant will be advantageous in order for the participant to feel comfortable and relaxed in sharing their insights and knowledge (Chung & Smith, 2008). Another recommendation is to include field notes, giving the researcher a reflective process of impressions during the interview. Field notes are to be written immediately after or as soon as possible following the interview (Bogdan & Biklen, 2007). Field notes contain information such as social cues, body language, voice, and intonation (Hesse-Biber & Leavy, 2011; Opdenakker, 2006). Incorporating a process such as a research agenda and field notes enables the researcher to conduct a meaningful, in-depth interview which affords a given

participant the prospect of responding to questions in their own words and insights (Mack et al., 2005). Finally, Vissak (2010) also recommended practicing situational leadership and being flexible throughout the process.

The forgoing substantiates the current method examining the perceived usefulness of mobile technologies among CEOs. Within the context of this study, interviews provided a rich real time perspective of CEOs since the data could not be created prior to the intended interview (Roulston et al., 2003).

Focus groups. One form of qualitative research is the focus group, commonly used in business and social science to determine people's opinions, beliefs, and attitudes (Lindlof & Tayor, 2002). Typically, a moderator asks questions of the group and group members are allowed to respond freely. According to Heffernan (2010, para. 2), participants "should have been brought together for their commonality rather than for their diversity." It is believed that participants respond in a more natural manner in a group discussion than in a one-on-one interview, and ideas from other participants stimulate a more complete exploration of the topic (Lindlof & Tayor, 2002).

Among other advantages, a focus group is relatively easy and low-cost, and in effect a number of interviews can be conducted at once (Marshall & Rossman, 1999). It is advisable to not use them as the sole resource, however, since they are essentially "one-shot case studies," according to Nachmais and Nachmais (2008). Furthermore, some research (e.g., Milena, Dainora, & Alin, 2008) has suggested that focus groups not be used to explore sensitive topics. For the present purposes, a focus group appeared to be an appropriate research method, as the participants would be articulate and similar in their knowledge of the topic, and the topic would be a non-sensitive one and the group would not be relied upon as the sole source of information.

Journals/self-observation logs. Journals are structured in various formats including learning journals, diaries (Czerwinski, Horvitz, & Wilhite, 2004), dream books, logs, professional journals, storytelling (Bruner, 1987), and electronic forms (Hiemstra, 2001). Self-observation logs afford researchers the opportunity to gather and witness situational incidents while being onsite, where other methods may miss the opportunity (Elliott, 1997). Incorporating journals as a research tool enhances the research process resulting in data triangulation (Janesick, 1999). Learning logs augment open ended interviews since they record behavioral patterns (Borg, 2001), investigate learning activities (Barclay, 1996), and can be used to collect data for a particular purpose (Hiemstra, 2001), emulating reality (Bruner, 1987) while creating stimulation (Borg, 2001).

The study of the reflective process began with Dewey (1933). Dewey's work in psychology for problem solving included the use of journaling to assist his clients with their own understanding of their life experiences. Dewey's practice of reflection was adopted in the field of education whereby teachers used journaling as their own reflective process to change or reinforce their practice. Various fields of social science have incorporated journal writing as a reliable resource to acknowledge the action and reflection process (Janesick, 1999) and action (Freire, 1970) of individuals unfolding "lived time" (Bruner, 1987). Additionally, segments of psychology (Jones & Fletcher, 1996) and business studies such as human resource management and development have used such tools as instruments to gather research data (Friesner & Hart, 2005b).

Journals, learning logs, or self-observation logs record behavioral patterns (Borg, 2001) and investigate learning activities (Barclay, 1996), and can be used to collect data for a particular purpose (Hiemstra, 2001), emulating reality (Bruner, 1987) while creating stimulation (Borg, 2001). Journaling is a circular research method (Friesner & Hart, 2005a), which has been used in mixed method research in the field of business to accurately reflect real time data describing events and solutions (Borg, 2001). It is circular in the sense that recording some data can influence the production of future data. Therefore, it is critical to note that the utilization of journals mitigates variations or unreliability of subjects' memories that other sources of data collection may face (Elliott, 1997). In particular, unusual, striking, or vivid events tend to be over-remembered (Tverksy & Kahneman, 1974). In the present case, relatively small but consistent biases could seriously distort the results.

Furthermore, this real time data is explained by Barclay (1996) as a present time, reflective process that can convert accidental discoveries into reflective learning, by recalling patterns of thought and experiences (Bruner, 1987). This conversion through learning logs (Bray, Lee, Smith, & Yorks, 2000; Jones & Fletcher, 1996) provides researchers with rich, thick, personal, and allegorical data. This data as described by Anderson, Bond, and Cohen (1995) is in the form of writing or numerically recording as a resource for organizing and thinking through new experiences, accessing and reflecting upon them, linking and explicating relationships among them. Journals are task related, allowing the recorder to return to the entry (Borg, 2001), encouraging and organizing reflection and thinking (Hoover, 1994). Holly (1989) endorses journal writing as inclusive, logical, and thorough. Although journal writing can be an effective way to collect data, the researcher must take into account the opportunity costs the participants encounter, such as loss of time and continuous interruption from competing tasks (Czerwinski et al., 2004).

Journals allow the reader to obtain an understanding of activities through a narrative format (Borg, 2005). This format, as Bruner (1987, p. 15) noted, "helps to achieve the power to structure perceptual experience, to organize memory, to segment and purpose-build the very events of a life." Consequently, Czerwinski et al. (2004, p. 2) stated, "Diary studies have high ecological value as they are carried out in situ, in the users' real environments." Therefore, journals afford users the opportunity to record thoughts and experiences while directly having meaningful dialogue with themselves, others, and fictional characters, allowing the user to evaluate aspects of their related activities (Hiemstra, 2001) while situated within their respective environments (Czerwinski et al., 2004). Reflection journals also provide, as stated by Borg, the researcher with data which is derived from the participant's perspective on various personal and professional activities.

Barclay (1996) added that reflection enhances one's ability to leverage experiences as opportunities to learn, hence the term "learning log" is often used for this technique. Hiemstra (2001) agreed with the concept of leveraging experiences and added a deeper understanding of the process, stating that journaling is an accurate yet complex mechanism used to record personal thoughts, experiences, reflections, insights, and personal opinions. Journals allow the users to record their thoughts, which allows them to navigate through their minds, affording the researcher the opportunity to analyze the participant's path, philosophies, and individualized actions (Janesick, 1999). A deeper understanding of reflective journaling also provides the researcher with a rich description of information in the form of storytelling (Friesner & Hart, 2005b). These stories are presented in a series of chronological sections.

From the participants' perspective, a circular approach to journaling includes a continuation of interpreting personal experiences as people reflect upon and instantly record what they believe to be positive and negative. These experiences become re-interpretive as the participants re-read their respective logged entries (Bruner, 1987). Borg (2005) agreed with Bruner and added that recording an experience when it takes place can be a rewarding personal and professional experience for research participants as well as the researcher. This longitudinal research method captures data (Friesner & Hart, 2005b) and provides a structure that serves as a memory device by allowing participants to document and reflect on events that are currently taking place in their lives (Borg, 2001). These experiences become continuous as the participants learn and understand that what affects their perspectives is either reinforced or changed.

The process of recording and reflection does not end with one's ability to learn and understand their direct written word or record. Schon (1987) specified the need to use a continuum of reflection through the use of one's action. Consequently, after reflective practice the participants use what they have learned to make changes in their behavior or the behavior of others. This is supported by Janesick (1999), who stated that the use of journaling is a powerful, proactive procedure allowing research participants to reinforce how they are putting their ideas into action, including specialized methods (Borg, 2001). This action results in what Bruner (1987) stated as the process of one's ability to explore and express a sense of one's respective world.

Quantitative Methods Within the Context of the Case

The underlying principles of quantitative methods are that they are not based on the researcher's opinion; they are based on the premise that multiple variables are funneled to empirical signs which are a representation of certainty where the researcher and the participant are autonomous (Sale & Brazil, 2004). This autonomous process may be accomplished through a process oriented collection of data through the use of various statistical techniques (Johnson & Onwuegbuzie, 2004). Teddlie and Tashakkori (2009) further described the empirical basis for quantitative methods as a mathematical analysis using numbers and correlation to reach a descriptive statistical analysis. Consequently, quantitative methods provide a statistical reference to fill the gap in knowledge and support the emerging themes provided in qualitative data analysis (Hesse-Beber & Leavy, 2011).

Quantitative data is typically gathered by questionnaires. However, "questionnaires are particularly susceptible to the problems of same-source data, single-time collection, and lack of depth regarding dynamic and comprehensive organizational conditions and processes" (Jauch et al., 1980, p. 518). To avoid such shortcomings, the present researcher chose to obtain data on behaviors directly from participants while the behaviors were occurring, rather than relying on retrospective reports.

Quality Criteria in Research

The quality of research is an important concern of all researchers. This section discusses criteria for research quality in both quantitative and qualitative methods, with particular application to the present study.

Quality criteria in quantitative research. The two main classes of criteria for judging the quality of quantitative research are reliability and validity. Stability in reliability refers to

whether a measure is consistent across time. Typically this is tested by administering a measure to the same sample at two different times. However, this concept applies only to measures of characteristics that are expected to be stable over time and unaffected by the measurement process itself (Bryman & Bell, 2011). Thus it is irrelevant for measuring characteristics such as level of skill during the learning stage, in which change over time is expected. Bryman and Bell (2011) noted that "Perhaps for these reasons, many if not most reports of research findings do not appear to carry out tests of stability" (p. 158).

Internal reliability is the degree to which responses to several items, intended to reflect a single characteristic, correlate highly with one another. This does not apply to a set of items, such as demographics, in which each item is intended to capture a distinct quality. In a question on a subject's age, for example, it is generally assumed that the report will be accurate. The reports of the activities on the self-observation log were more like this type of data. Internal reliability therefore becomes a question of whether there is any reason for concern that a respondent might misreport the facts. The principle reason for concern is social desirability, the desire to present oneself in a favorable light. In the self-observation logs, this might be a concern if respondents were required to account for all their use of personal electronic devices, so that time spent in trivial or embarrassing activities might be minimized, or if some activities or opinions might be seen by observers as more desirable than others. However, the locations, activities, and responses assessed by the logs were quite neutral in this regard. A second concern regarding accuracy of self-reports is related to biased or distorted recall. The real-time reporting of behaviors on the self-observation log should help to ensure accuracy.

Beyond the reliability of measurement, research should be reliable in the sense that results are repeatable (Bryman & Bell, 2011). This is clearly a relative question; repeatable under what conditions? If results might be expected to differ under very similar conditions (subjects, time frame, administrators, etc.), the study would be judged unreliable. The degree to which results would be expected to be stable under conditions that vary to a greater or lesser degree is known as generalizability, often discussed as a component of validity. This depends greatly on the subject of the research. Taste preferences for foods might be expected to generalize across a wide range of ages and education, but a study of how CEOs use electronic devices cannot be expected to generalize to high school students. The generalizability of the present study depends upon the degree of similarity to the participants and circumstances of the study. It can reasonably be concluded that CEOs of SMEs in other parts of the U.S. would probably behave similarly to those in this study, but it is possible that

mid-level managers, or CEOs of SMEs in Asian countries, might not. However, it should be noted that while generalizability is a desirable property of most research, it is not an absolute requisite. A study to determine the most desirable qualities of an American astronaut, for example, might not generalize to anyone beyond this tiny group, but could still be quite useful. While it is hoped that the present results may apply to other groups, even if they do not, they could still be valuable for understanding the behavior of CEOs of American SMEs.

Validity refers to the degree to which an observation truly reflects the concept it was intended to. In the narrow sense, this applies to measurement, in that responses to questions presumed to be related to construct X are not significantly affected by some distinct construct Y. In the broader sense, the study itself must be valid ("the integrity of the conclusions that are generated from a piece of research," Bryman & Bell, 2011, p. 42). Internal validity, according to Bryman and Bell (2011), relates mainly to the causal relationships between variables. In the present research, no causal relationships were hypothesized per se, although some causal assumptions are implicit in the background. For example, it is presumed that following the behaviors of SKARSE leads executives to be more competent. These are not tested in the study, but with new insights gained from it, they might be tested in the future.

Ecological validity is the degree to which research findings can be expected to apply to everyday, natural settings. This is frequently a concern when a study is conducted in a controlled, artificial setting. In the present case, research was conducted in the subjects' actual, natural settings, both at home and at work. Therefore, it may be concluded that ecological validity is probably quite high.

Quality criteria in qualitative research. Although concerns about quality in qualitative research parallel those in quantitative research, there are some unique features that must be considered. According to Lincoln and Guba (1985) and Guba and Lincoln (1994), as summarized in Bryman and Bell (2011), trustworthiness and authenticity are the two main concerns in qualitative research. Trustworthiness consists of four criteria:

1. Credibility, which is parallel to internal validity in quantitative research. As applied to the present study, this consists of respondent validation; that is, checking and rechecking the researcher's conclusions with respondents. This practice was adhered to.

2. Transferability, similar to external validity. This focuses on depth, rather than breadth. In qualitative research, a thick description allows others to judge whether findings apply to a different set of individuals or circumstances. In the present case, for example, a reader might be interested in applying results to CEOs of very large firms or to small-business entrepreneurs. Probably, the inference would be that some conclusions are

applicable to the first group, others to the second, and the knowledgeable reader can judge with some accuracy which. Thus it is reasonable to assume that the results of the present study, while proving most valuable for those studying CEOs similar to the participants, can also be useful to a wide range of business managers and leaders.

3. Dependability, parallel to reliability in quantitative research. As applied to qualitative research, Lincoln and Guba argued that dependability is maintained by keeping complete records, which are then audited. In a DBA project, committee members serve as auditors of the large volume of material presented, typically, in appendices.

4. Confirmability, or objectivity. This is the avoidance of research bias. The present study should pass examination on this point. The researcher had no vested interest personally in the outcome, and his lack of a strong theoretical position on the issues at the outset, which was a weakness in some ways, ensured that observations would not be distorted to reach a foregone conclusion.

In addition, authenticity is a major concern of qualitative research (Bryman & Bell, 2011). In particular, authenticity requires fairness. This can be a problem if data gathered from one group have a significant impact on others who were not part of the research, but this was not the case in this study. Other criteria include ontological, educative, catalytic, and tactical authenticity. These refer to whether the research helps members of the target setting to understand their social milieu and the perspectives of others, and to empower members to change their circumstances. Assuming that the results of the present study become widely known among CEOs and other business leaders, it seems safe to claim that the research meets these criteria.

Recruitment and Purposeful Sampling

A recruitment procedure, as explained by Mack et al. (2005), is a deliberate, specific, and framed pre-planning process which is used to choose research participants. This structure, as Mack et al. described it, identifies specific criteria such as similar experiences for the selection of recruitment candidates in the sample population. In this case of purposeful sampling, the researcher chose a homogeneous strategy as explained by Hesse-Biber and Leavy (2011), since the participants had similar historical experiences and were part of a particular sub-group of CEO business people. It was decided that to obtain knowledge on the intuitive use of SKARSE principles, it would be best to study persons demonstrably successful in their business careers, in the same way that one can learn most about excellent tennis skills by studying top-ranked players. On the other hand, CEOs

require ongoing engagement, have extremely busy schedules, engage in multiple simultaneous activities, usually have assistants to schedule meetings and tasks, etc.

Patton (1990, p. 169) stressed the importance of obtaining "information-rich cases for study in depth analysis. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research, thus the term purposive sampling." Participants were chosen using Patton's (2002) description of purposeful sampling. This process of purposeful sampling is used for case study research. The participants are selected due to their breadth of knowledge regarding the phenomena in the subject area of interest (Hesse-Biber & Leavy, 2011). Polkinghorn (2005) suggested building a participant pool of individuals who have the experience necessary to participate in the study.

Morse (2005) argued that the decision as to the number of participants should be determined by the knowledge base the participants have, how much experience they have had in the field, and what information they could share related to the research question. Therefore, sampling in qualitative research is not based on a specific number of participants. According to Morse, one participant could be an adequate sample for a case study providing the participant had the in-depth information and knowledge to address the research question. In the present study, it was desirable to recruit a number of respondents so as to gain insight into a wider range of practices than a single person could supply. Specific recruitment procedures and participant characteristics for the three samples of participants will be described in the following sections.

Pilot study participants. Participants were chosen because they were users of mobile communication devices and were aware of their functionality. In addition, the participants for the pilot study were very knowledgeable in regard to the advantages and disadvantages of using mobile communication devices. The participants were currently chief executive officers of small to mid-sized organizations. All were located in Southern California, so they could be reached for in-person interviews. The CEOs who participated in this study were purposefully selected as leaders of mid-sized organizations with a minimum employee size of 30 and revenues of $10 million US to $100 million US. In addition, these executives used mobile communication devices on a regular basis. Mid-sized organizations were chosen as a criterion for the CEOs for this study based on the researcher's practical working knowledge of the active engagement CEOs with these market demographics traditionally have. Furthermore, these participants have knowledge and experience using various forms of technology, including mobile devices, as a means to communicate.

The 33 participants included 24 males and 9 females; 24 were age 45 or younger and 9 were over 45. Only 2 had had no college education and 3 had attended some college. The remaining 28 had college degrees. Of this group, 14 had graduate degrees, including 2 with a doctorate or equivalent. The industries in which these CEOs worked included 21 in services. Others included 7 in technology, 2 in logistics, and 1 each in retail, distribution, and healthcare.

Stage 1 participants. The recruitment process began by making a detailed list of companies with revenues of less than $100M that the researcher had had interactions with in the past. This list consisted of approximately 300 companies within California. The researcher then reached out to his professional network to acquire other potential participants. An email was sent to approximately 425 professionals with the intent of adding 300 additional potential participants. The email was very brief, describing the study and asking if each person could send the researcher at least one contact who represented a company of approximately 200 employees and revenue size of under $100M. The researcher's network generated approximately 250 additional prospects for a total of 550 CEOs. An email and letter was sent to each of these CEOs describing the study and the basic qualifications which were the participant being a current CEO of a company with fewer than 200 employees and revenues of under $100M. The CEO also needed to be somewhat familiar with mobile devices. The letters, emails, and phone calls resulted in approximately 25 discussions and ultimately 11 committed participants. The process of letter writing, email, and phone calls was repeated a second time which generated 13 additional conversations and 4 committed participants.

The 15 participants included 10 males and 5 females. Six were over 45 years of age, and 9 were 45 or under. One had had no college education, 2 had some college, and 12 had at least a college degree. This group included 6 with graduate degrees, including 1 doctorate. The companies they headed included 5 in services, 2 each in professional, wholesale, or retail industries, and 1 each in healthcare, logistics, manufacturing, and technology. The firms' revenues ranged from $13M to $97M, with an average of $39.6 million. Participants reported network connections ranging from 130 to over 1,000, with a median of 560.

Focus group. Focus group participants were purposefully selected to have the same profiles as the 15 people in Stages 1 and 2 so their opinions would be comparable to those 15. An email was sent to 10 people asking if they would assist the researcher in designing a self-observation log. Five accepted and participated. The five participants consisted of two

females and three males; the average age of the participants was 46. All five of the participants held an undergraduate degree and three of the participants held a master's degree. The industries represented by the participants varied; the service sector had the most representation consisting of two participants.

Stage 2 participants. Participants in Stage 2, other than those in the focus group, were the same persons who had participated in Stage 1. Otherwise, no person participated in more than one group in the study. Tables 1 and 2 summarize the numbers and characteristics of all participants.

Table 1

Summary of Participants

	Pilot	Stage 1	Stage 2	
			Focus group & SWOT	Logs
Development			5 executives	
Data gathering	33 CEOs interviewed	15 CEOs audiotaped →		→ Same 15 CEOs

Table 2

Characteristics of 15 CEOs Participating in Stages 1 and 2

Participant	Gender	Age	Highest Education	Industry	Revenue Size	Network connections
1	Female	<= 45	Undergraduate	Healthcare	$85,000,000	1,000+
2	Female	>45	Terminal	Service	$23,000,000	640
3	Male	>45	Undergraduate	Service	$16,000,000	710
4	Male	<=45	Undergraduate	Service	$41,000,000	560
5	Male	<=45	No College	Service	$18,000,000	1,000+
6	Female	<=45	Some College	Logistics	$35,000,000	215
7	Male	>45	Graduate	Retail	$37,000,000	390
8	Male	>45	Graduate	Professional	$14,000,000	805
9	Male	<=45	Some College	Retail	$71,000,000	160
10	Male	<=45	Graduate	Manufacturing	$47,000,000	460
11	Female	>45	Graduate	Wholesale	$11,000,000	900
12	Female	<=45	Undergraduate	Professional	$13,000,000	520
13	Male	<=45	Graduate	Wholesale	$58,000,000	1,000+
14	Male	>45	Undergraduate	Technology	$28,000,000	130
15	Male	<=45	Undergraduate	Service	$97,000,000	260

Ethical Considerations

A researcher is always obligated to protect the human participants in research. Although some risk is acceptable, this must be in proportion to the expected gain from the research (Belmont Report, 1979). In addition, special protection must be given to certain groups presumed to be at heightened risk, such as children, pregnant women, and prisoners. The foundation of ethical treatment of human subjects is informed consent. Participants must be fully aware of what the study entails for them, including any risk. In the present study, the only likely risk was that of loss of confidentiality. Reasonable steps were taken to protect the individual identities of all participants. Based on the transcribed statements of interviewees, a third party familiar with a participant might in some cases be able to recognize the subject. However, quotes presented in this report do not contain any potentially damaging material (e.g., a disparaging comment about another person). The research was approved by Newcastle University. Copies of the informed consent documents can be found in Appendix B.

Limitations

There are a variety of limitations to this research study. One specific example is that the study consisted of 15 CEOs of small to mid-sized organizations with employee sizes of fewer than 200 and revenue of under $100 million (US). Thus, results of the present study might not generalize to CEOs of smaller or larger companies. Another limitation was the geographical location of the participants which included CEOs located in California only, who might not be representative of those elsewhere in the US or in other countries. Additionally, the CEOs had to have an understanding of and practice with various mobile technologies. Therefore, findings may be limited to this category of persons. Another limitation was the gender differences between the participants. Specifically, in the purposeful sampling more male than female CEOs were available with the specific knowledge to participate in this study, although the gender breakdown probably was representative of the pool of CEOs from which the sample was drawn.

Another limitation in this study is related to time sampling. The self-observation log was organized using three hour blocks of time. The use of three hour blocks of time restricted the research participants to record items solely within these time increments. The in-person observations were predetermined and scheduled. Thus, the participants may have conducted themselves differently from their usual behavior, and these time blocks might not have fully reflected all the participants' activities.

PILOT STUDY METHODS

Overview. In the pilot study of the research design process, semi-structured interviews were included. The results from the pilot study led to the development of the qualitative and quantitative approaches in Stages 1 and 2. Results from these stages were separately examined and integrated with one another in order to understand how the approaches become synergistically linked. The ability to link the data provided the researcher a holistic approach while gaining insight on actions while they were being performed. This provided the researcher emerging, descriptive, up to date information on how the sum is greater than its parts.

Being an observer provided the researcher with nonverbal cues, facial expressions, and visual observation of the environments these CEOs were a part of. This experience as well as the field notes which were taken provided additional context, augmenting the numerical data which was recorded by the participants. In addition, consistent with transdisciplinary research, this study put the interests, knowledge, and goals of non-academic actors at the center of the problem (Bergmann et al., 2012).

Procedure

A pilot study was conducted to investigate the need for a research study regarding the question: *How and why do CEOs use wireless mobile communication devices and what is their perceived usefulness?* The pilot study consisted of 33 semi-structured qualitative taped interviews of 33 CEOs conducted in 2010. The semi-structured interviews were aimed at how and why the participants (CEOs) were using wireless mobile technologies as a means to communicate. The purpose of this pilot study was exploratory. An exploratory research design was chosen because it meets two types of the three basic purposes of this type of research: "(1) to satisfy the researcher's curiosity and desire for understanding, and (2) to test the feasibility of undertaking a more careful study" (Babbie 1992, p. 90). In addition this research was breaking new ground, which is appropriate for exploratory research.

PILOT → 33 semi-structured interviews → Spradley (1979) Domain Analysis.

This pilot study was conducted as verification that the research question was researchable. In addition to the overall research question, the researcher probed the participants to address three additional areas of interest. Each area of interest was aligned

with the literature review on knowledge, learning, knowledge hubs (networks), technology and mobile technologies. The exploratory questions were as follows.

1) *Why are networks important?*
2) *How can technology drive and monitor interactions and innovations within a network through the use of smartphone technology?*
3) *What is the impact of networks on entrepreneurial outcomes and new venture performance?*

Participants and their recruitment were described in a previous section. Briefly, they were 33 CEOs of SMEs. All of the interviews took place in person, throughout the Southern California region. The in-person interviews were conducted at each of the participants' business locations and lasted for about one hour.

The researcher sought to answer the questions of whether mobile technologies could be considered a resource or constraint for organizational leaders. Interviews were aimed at how and why the participants were using smartphone technology to communicate with others on a daily basis. Interviews and analysis followed guidelines for domain analysis from Spradley (1979). These guidelines related to the domain analysis of three aspects: (a) cause and effect, (b) means-end, and (c) attribution. Domains additionally have "semantic relationships that link the included terms together" (Spradley, 1979, p. 100). Spradley used *included term, relationship,* and *covered term* to categorize the individual concepts that each CEO presented as to the advantages of using the mobile technologies.

As explained by Nathan and Jackson (2006):

> In Spradley's (1979) domain analysis, any symbolic category, such as *tree*, can include other (sub-) categories, such as *oak*, *pine*, and *aspen*. Spradley claims that domains are the first and most important unit of analysis in ethnographic and psychological… research and that the discovery of these categories and sub-categories allows for an understanding of cultural knowledge from the perspective of various social actors. Every domain has a boundary, which allows us to ascertain inclusion or exclusion (e.g., "no, this isn't a tree, it's a bush"). (p. 8)

A domain is comprised of a "covered term" and a set of "included terms" belonging to the category of knowledge indicated by the covered term. These guidelines were applied to the domain analysis of three aspects: (a) cause and effect, (b) means-end, and (c) attribution. Additionally domains have "semantic relationships that link the included terms together" (Spradley, 1979, p. 100). The pilot study used included term, relationship, and covered terms to categorize the individual concepts that each CEO presented as to the advantages of using a smartphone.

STAGE 1 (QUALITATIVE STUDY) METHOD

In order to achieve a thick description of understanding the use of mobile communication devices among chief executive officers, the researcher designed two additional stages of this mixed method study to further explore the research question. The first stage provided the researcher with the opportunity for the evolution of themes and ideas to derive and transform directly from the participant transcriptions by allowing them to freely discuss their thoughts, experiences, and/or opinions from an expert perspective. Stage 1 consisted of audiotaping 15 participants (using pseudonyms) during open-ended interview sessions. Recruitment and descriptions of participants were presented above.

Procedure

Each participant was interviewed for an average of 1 hour in a location of their choice. The researcher returned to the participants two additional times for verification of original data collected, as one interview may not yield enough substance to analyze, resulting in unanswered questions (Polkinghorne, 2005). Individual field notes were taken to support impressions of each interview. The first part of data processing was to transcribe all of the audiotaped interviews. Initially, the data collected was read to acquire a broad perspective of the participants' responses to the sub questions.

Thus, Stage 1 consisted of 15 open ended interviews that provided a thick description of the use of wireless mobile communication devices among CEOs. This qualitative process included an analysis using an evolutionary process created by Bogdan and Bicklin (2007). In this process, the transcripts are analyzed and the data evolves into main categories (themes) through the direct words of the participants. The themes then generate properties which can also evolve into categories themselves, becoming an evolutionary cycle. This process was selected as the best process to address the research question. The open ended nature of the Bogdan and Bicklin (2007) process provided the opportunity for the evolution of themes and ideas to derive and transform directly from the participants' transcriptions. The themes were reduced to specifics, which generated additional questions, variables, and hypotheses. According to Bogdan and Bicklin, the effectiveness of this process is linked to the unstructured design of the participants' interview, which allows them to freely discuss their thoughts, experiences, and/or opinions from an expert perspective. After the data was collected and transcribed, the researcher's analysis was also open ended allowing for emerging themes to appear. The entire process was evolutionary, leading to a more creative

and innovative way for the researcher to describe the thoughts, experiences and/or opinions expressed by the participants while maintaining the integrity of addressing the research question.

It was the responsibility of the researcher to delve into the responses of the participants while asking the questions, "What is significant to this participant?" and "What drives them to say this?" As this interpretive process helped acknowledge the participants' professional views, their dialogue became the justification for the developing properties and categories. The researcher was guided by these questions to generate the properties and categories.

For example, the category *Cultural Mobility Evolution* (CME) included the property (subtheme) *Cultural Shift for Necessity* (CSN). Once the categories and the properties were defined, each property had a transcription quote from the appropriate participants to support the evolved properties and categories. These transcription quotes became the supporting data for the rationale of the developing properties and categories. The development of the categories was an independent process completely removed from the research questions. The idea of this analysis was to discover research concepts which were not predetermined. It is the responsibility of the researcher to interpret the interviews, specifically identifying words and phrases from the participants whereby the analysis of these words and phrases are independently structured. These key points then become a link to the research questions.

Categories and properties from the interviews in Stage 1 began to evolve as the researcher read the transcriptions of each participant a minimum of five times. During these readings, similarities and differences between the participants were designated to generate properties and categories. (See Appendix D for a description of these terms.) Keywords were underlined that described or explained key themes. The impetus for the recognition of the theme development was generated directly from the words of the participants through the interpretation of the researcher.

The entire process above was replicated by a university colleague who used the system of identifying concepts by underlining key words and generating properties and categories through the use of the transcriptions. She also wrote down comments and additional terms that were in context. The researcher then reviewed her notes and compared them to his. Once completed, a comparison was made between the terms generated by the researcher and the colleague that identified similarities and/or differences. Any differences were taken into consideration, and adjustments were made as needed. The use of the two different investigators and data sources helped in the process of triangulation of the data

through confirmation of the results. The validity of the data further developed from the participants' ability to commonly share ideas, concerns, positive approaches, and overall attitude in answering the specific research questions. These ideas and common concepts were used to verify and support the generated categories and properties that evolved from the data.

The development of these themes resulted in identifying which themes were global and which were subcategories of the dominant theme. Since this process is an evolution of developing categories and properties, at times a property may have become a category or a category may have become a property. These changes were based on the analysis of the importance and repetition of concepts expressed by the participants. Depending on the commonalities that were identified, both properties and categories evolved from the concepts of the data. Once global themes were generated and specific supports for those global themes were identified, the global themes became categories and the specific supports became properties under each category. According to Hesse-Biber and Leavy (2011, p. 315),

> It is important to note that analysis and interpretation are not necessarily two distinct stages in the qualitative research process. The process is much more fluid, as the researcher often engages simultaneously in the process of data collection, data analysis, and the interpretation of research findings.

Additional context on the development and evolution of themes as well as process is located in Appendix D.

STAGE 2 (QUANTITATIVE STUDY) METHODS

Stage 2 addressed one main research question as well as four additional interrelated sub questions. The main research question was: *How and why do CEOs use wireless mobile communication devices and what is their perceived usefulness?* The four sub questions are stated as follows.

2. How and why do CEOs leverage mobile devices as a tool for learning?
3. How and why do mobile technologies afford CEOs an opportunity to experience serendipitous events?
4. How and why do CEOs practice the concepts of SKARSE through the use of their mobile devices?
5. How and why do CEOs use Smartphones as a mechanism for knowledge transfer?

A triangulated mixed method was used to address the five research questions. This method drew on the qualitative research analysis (Bogdan & Biklen, 2007) in the pilot study to assist the researcher in developing three general themes (referred to as categories) and nine

sub themes (referred to as properties). These themes and sub-themes addressed each of the five research questions through the use of 15 individual case studies in Stage 1 of this study. The identified themes (see Results below) were the impetus for addressing the research question as well as the creation of quantitative self-observation logs which augmented the qualitative data.

The themes which were referred to as properties and categories (Bogdan & Biklin, 2007) in Stage 1 were further investigated by recruiting the same 15 CEO participants as research participants in a second stage of the research study, which used self-observation logs as a mechanism to record data. Although recruitment of a new group of CEOs might have provided the opportunity to broaden the research, it was decided to continue the case study approach in order to gain greater depth of understanding. This stage of the analysis provided an opportunity for the researcher to triangulate the data and add to the literature regarding knowledge, knowledge management, personal knowledge management, learning, and telecommunications, which included newly discovered data pertaining to CEOs and their use of wireless mobile communication devices.

The self-observation log was a practical application which the CEOs used to capture and record real time data based on their individual behavior of using mobile technologies. The use of a survey would not have provided the researcher a detailed report of the frequency of uses and the conditions in which they occurred. For example the self-observation log was able to capture actual practices of serendipity when they happened. A survey would have been a tool of reflection providing Likert scale answers after the fact which would have not elicited real time frequency of use.

The Stage 2 data gathering consisted of the 15 CEOs recording their use of digital devices continually over the course of two weeks, with a two-month break in between. Three devices (smartphone, laptop wireless, and tablet) were listed as choices, with the option of recording "other" and filling in the device. Other choices were five locations, nine uses, five effects, and sixteen actions, each also with the option of adding "other."

Development of Self-observation Log

Journals or learning logs have been used as a research tool across all major social science disciplines (Jones & Fletcher, 1996). According to Ortlipp (2008), researchers globally affirm the practice of journaling as a valid research process. There are various techniques used in journaling, depending upon the specific study, duration of the study, and who is being studied.

In support of this process, Ortlipp (2008) believed that integrating information from journals, also referred to as learning logs or (here) self-observation logs, can enhance the overall research design. According to Friesner and Hart (2005a), a learning log records experience and is formed through a specific timeframe. This process allows the user to construct a self-analysis of their specific understanding (Francis, 1995). They come to understand ("learn" about) their own processes better, hence can describe them more clearly to the researcher.

Due to journals' long-established roots in anthropology as well as education and various characteristics of journals such as the uniqueness of the technique within the context of business and engagement from the micro level as well as the reflection process, this form of data generating was selected to engage high level business executives. As noted above, Milliken (2001) pointed out that business executives struggle with problems in a unique, unstructured, turbulent environment, and therefore require a research approach with creativity, flexibility and spontaneity.

A full review of the journal process is recommended using tools such as a SWOT analysis (strengths, weaknesses, opportunities, and threats), to ensure that the structure of the respective journal supports user friendliness as well as data integrity (Friesner & Hart, 2005b). Additionally, focus groups are used as a means to properly construct learning (self-observation) logs by heeding individuals' thoughts and concerns and executing them into action (Eisenhart, 2001). This data collection approach was used in this study as a means for the participants to log and reflect upon their experiences with the uses and perceived usefulness of mobile technologies in a structured and unstructured manner.

Focus Group Method

A focus group was conducted to help design the self-observation log format and procedures. In this way, the study was consistent with the quality criterion of credibility (Bryman & Bell, 2011) and the precept of transdisciplinary research that results should be checked with the whole research team (Bergmann et al., 2012). Based on the recommendations of Friesner and Hart (2005a, 2005b) and Eisenhart (2001), a focus group of five executives unrelated to the study was formed to provide feedback to the researcher concerning their experience using an open ended self-observation log. The focus group was designed using recommendations from Barbour and Schostak (2004) as well as using business techniques that are practiced by service-based companies such as financial service industries. These underlying focus group techniques were derived from the researcher's

individual knowledge base and personal experience as a corporate executive. An example of a focus group technique included the creation of an equilibrium between participant impulsiveness and the meeting agenda, by obtaining a commitment from the group participants to see the agenda through (Barbour & Schostak, 2004).

As described previously, the focus group consisted of five persons similar in background to participants in Stages 1 and 2. The group met in a small conference room at the researcher's workplace for one hour. The conference table could hold eight people comfortably.

Before the focus group session itself was conducted, a preliminary meeting was held with the members to introduce the problem. Following this, they used their mobile devices for a week before meeting again for the focus session. The purpose of the preliminary meeting was for the researcher to disseminate information relating to the application of the self-observation log. The executives were given the following detailed instructions on how to complete an open ended self-observation log. The participants were advised to record the uses of various mobile devices, how, when, and why they used their mobile device, and the results of those uses. In addition, the participants were directed to record thoughts and perceived usefulness (positive or negative) in real time throughout the day.

The data was collected through the use of an Apple iPad, which was provided to the participants at the initial meeting. The participants recorded entries through the notes application on the device. The notes application had a text box which included eight 3-hour increments. Each participant was also asked to answer a series of open-ended reflection questions. The guided, semi-structured questions that were provided to the participants of the focus group were as follows.

- Provide examples of situations where you were dependent upon your mobile device to communicate with others (business / personal).
- How did you use any of your mobile devices to connect with colleagues, friends, or family? How do you use these devices to connect with others with common interests?
- How have mobile technologies become their own culture?
- Where did you use your mobile device throughout the day? What task did you complete throughout the day which needed an immediate response?
- How are you able to use your mobile technologies to produce more using your own time?

- How did you use your mobile device to find something you didn't expect? What were you originally looking for?
- What was the advantage of what you found? How did you leverage your newly found information?
- How has your life changed through the use of your mobile device (positive or negative)?
- How do you use your Smartphone to share ideas, knowledge, or information on a daily basis?
- What issues keep you from using your smartphone more often?
- How have mobile technologies impacted you in a positive and negative way?

The focus group participants followed the instructional process described above for the duration of one week (Monday through Sunday). After completion, the group reconvened for one hour with the purpose of discussing their individual experiences in a group setting. The researcher asked the focus group to assist with the preparation of SWOT (strengths, weaknesses, opportunities, threats) analysis which was to be used to design the final format of the self-observation log. Throughout the process, the focus group participants were asked to be objective and view the process from the perspective of the researcher to gather data as well as being participants recording data.

Results of SWOT Analysis of Notes on Use of Mobile Technologies

Participants' comments from their open-ended iPad notes were summarized as follows.

- Strengths: Real time, reflection, decision making, problem solving, portable, captures / records, speed.
- Weaknesses: Impeding, limited space, inflexible, complex structure, incongruity between communication and action, interpretation of data.
- Opportunities: Semi-structured, assignment of journal topics, flexibility, buy in from participants, directive, learning, pragmatic, content analysis.
- Threats: Entries can provide a different point of view, participant control, potential dishonesty of the participant, don't see a purpose, competing tasks, loss of data, loss of time.

The SWOT analysis provided a foundation for an open-ended focus group discussion. The discussion provided the following perspectives regarding self-observation logs in practice.

Participants' perspectives:

- An open ended journal structure invites confusion and is too time consuming.
- Executives are extremely busy and need specific direction when given tasks outside their respective business and personal responsibilities.
- There were many competing tasks throughout the duration of the week.
- Liked the use of an electronic device as it provided ease of access and accessibility to the log.
- It was difficult to remember when to complete the log.
- The semi-structured questions were time consuming.
- They stressed that if the journaling process were expanded in a live research study with multiple participants they predicted that many of the executives would not complete the study.
- They were uncomfortable using the notes application.
- Tried individualized short cuts and dissatisfied with the end results.
- It was acknowledged that having a format to record the present and then reflecting upon it was advantageous in improving their professional lives.
- They could use the journaling process to teach others.

Participants' recommendations:

- They would prefer to have one task: Self-observation logs or semi structured questions.
- They would have preferred to have a matrix.
- Preferred to choose from common activities.
- Program a timing device that vibrates when a time block needs to be completed.
- Ease of use.
- Simple display (1 page).
- Larger blocks of time such as 3-4 hour intervals.

Self-observation Log Construction

With focus group results, the researcher re-structured the self-observation log to include the suggested recommendations derived through the SWOT analysis and focus group. This also included recommendations from the literature supporting learning logs as a research method. The literature supported the findings from a broader perspective than the focus group activities suggesting that the self-observation log could be structured with themes

including descriptions of specific actions, decisions from the individual practices, flexibility, and reflection (Honey & Mumford, 1989; Pedler, Burgoyne, & Boydell, 1978). Researchers also stressed the importance of a framework incorporating a thought-provoking (Borg, 2001) and instructive (Carayannis, 2008) structure.

Incorporating varied recommendations, the researcher designed the self-observation log using a matrix. The matrix was designed using topics for efficiency and ease of use. As can be seen in Figure 4, the top of the matrix includes six headings including time, device, location, uses, effects, and actions. The time column is divided into six time blocks beginning with early morning, and then broken into 3-hour intervals, ending with evening. At the bottom of the matrix, individual selections within each specific category are displayed using numbers referring to the various options. For example, the user is able to select choices such as (1) smartphone or (4) other wireless. The number is then placed in the block corresponding to the appropriate time. Another heading is the action that the participants take as they interact with their respective device. For example, the user is able to select options such as (3) problem solving, (12) sharing, or (15) other.

TIME	Device	Location	Uses	Effects	Actions				
						Actions			
Early morning						1) Found something you were not looking for			
						2) Searching for something			
						3) Problem solving			
7am to 10am						4) Learning			
						5) Maintaining personal relationships			
						6) Maintaining business relationships			
10am to 1pm						7) Responding			
						8) Reviewing			
						9) Multitasking			
1pm to 4pm						10) Making an impact			
						11) Implimentation of an idea			
						12) Sharing			
4pm to 7pm						13) connectivy			
						14) Creating			
						15) Teaching			
Evening						16) Leveraging			
						17) Other or write in box			
	Device	**Location**	**Uses**	**Device Effects**					
	1)Smartphone	1)Office-physical)	1)Email	1) Satisfied					
	2)Laptop Wireless	2)Home-physical	2)Social Media	2)Chaotic					
	3)Tablet	3) business remote	3)Organization	3)Bothersome					
	4) Other Wireless	4) personal-self	4)Texting	4)Anxioty					
		5) family / friends	5)Talking	5)Balanced					
		6)Other	6) Pictures	6)Other					
			7) Video						
			8)Recording						
			9) Internet						
			10) Other						

Figure 4. The matrix used for data-gathering in the self-observation log.

The number was then placed within the matrix while also recording the time of day the action was taking place. Additionally, multiple numbers were placed within the same blocks of time in the matrix because multiple devices, locations, uses, or actions were completed by each individual within the three hour time block. The use of the self-observation log format described above originated from Hoover (1994), who used a structure which included numbered topics to choose from, while also offering the flexibility of adding additional topics or comments within the matrix.

There are definitions provided for each property and category (see Appendix D). The definitions were generated through reviewing all the transcriptions relating to the overall general theme of this study. Specific words were chosen to be used in the respective definitions by identifying the direct words from each research participant.

Incorporating the flexibility in the self-observation log structure as illustrated by Hoover (1994), the participants were able to choose the term *other* and/or write their own descriptive phrase within each block for a time span. This new self-observation log structure evolved into a user-friendly software application that the user was able to download to a smartphone or tablet, using the device as a tool to record the data in real time.

Self-observation Log Data Gathering

The 15 participants kept records of daily activity, in the six time blocks, most of 3 hours each, for two weeks with a 12 week break between the weeks. Two participants (2 and 8) discontinued participation after the first day of the second week, so for them, data is available for 8 days rather than 14. For most purposes, the unit of analysis was the time block, with no distinction made between individuals or days of the week. There were a total of 1188 time blocks across the 15 participants. In each time block, the participant was encouraged to enter responses indicating the device used, location, uses, effects, and actions.

The application consists of seven separate matrixes representing each day of the week. The application also includes a clock that triggers the device to vibrate every 3 hours, gently reminding the participant to access the journal. Specific instructions were given to each participant to NOT record the practice of recording self-observation log data as a specific use or action during the study.

In each time block, the participant was encouraged to enter responses indicating the device used (smartphone, laptop wireless, tablet, other wireless), location (office-physical, home-physical, business remote, personal-self, family / friends, other), uses (email, social media, organization, texting, talking, pictures, video, recording, internet, other), effects

(satisfied, chaotic, bothersome, anxiety, balanced, other), and actions (found something you were not looking for, searching for something, problem solving, learning, maintaining personal relationships, maintaining business relationships, responding, reviewing, multitasking, making an impact, implementation of an idea, sharing, connectivity, creating, teaching, leveraging, other or write in box). These were defined for the participants (see Appendix A).

Each participant had the ability to borrow an Apple iPad for their use for data collection if they did not already have a tablet or other wireless device which could be accessed for data collection. The participant could also choose to use their smartphone as well as any other wireless mobile device of their choice. Of the 15 participants, eight participants borrowed the tablet, two participants utilized their own tablets and five participants used their smartphones. Each device was given to the researcher to download the self-observation log application for use in this study. The eight borrowed tablets were returned to the researcher after the self-observation log stage of the study was completed. The researcher obtained the borrowed devices from Apple and returned them to the company at the conclusion of the self-observation log stage.

The duration of this self-observation log stage was one week (7 days), 24/7. This process was repeated after 3 months for one additional week (7 days), 24/7. The rationale for having 24 hour journal entries allowed the flexibility for each participant as some might travel or have different schedules than others. In addition, the 2 month lapse between data collection provided the researcher a more accurate data set. For example, if the self-observation logs were being used by the participants for two consecutive weeks and a participant was away from the office on a several week business trip the data which was collected would have represented a segregated period which may not have been a proper representation of overall device usage.

The self-observation log period was staggered in thirds, where five participants started the data collection on the first Monday of August, 2012. The next five participants began their collection on the second Monday and the third group of five participants began their data collection on the third Monday of the same month. This process was repeated three months after the original starting date, starting on the last Monday of October, 2012. The staggering of the groups was necessary to allow the researcher to observe the data collection as well as allocate time to answer questions which arose during the collection of the data. The logs were turned in on Thursday morning and on Monday morning following their journaling week.

Observations. During the 5-month timespan of data gathering, the researcher also arranged to observe participants in their offices while they were using the self-observation logs. He was generally allowed to sit outside their office (most of the time in a cubical), and in their office as well. The times of day varied depending on the individual. All of the observations were during a 3-hour time block and took place Monday through Friday (7-10am, 10-1pm or 1-4pm). The researcher tried to be consistent and chose one specific 3-hour time block for each person, but some individual schedules made this impossible.

Data Processing

The data was transferred from the iPad or other device on which it had been recorded by each participant to 30 Excel documents with 7 worksheets in each. Figure 5 shows an example of the record (slightly reformatted) for one day (Tuesday), of one week (the second), for one participant (#5). As this shows, each time block included three lines to allow the participant to distinguish between locations, uses, etc. for different devices. In the time period 7am to 10am, Participant 5 recorded using both a smartphone and a tablet. Presumably the uses recorded on the lines were intended to match those devices; that is, 3 and 9 for the tablet, and 4 and 5 for the smartphone. A similar distinction can be seen between uses in the 10am to 1pm time block, in that Use 1 (email) is presumably linked to Actions 12, 13, and 1, while Use 5 (talking) is paired with Actions 16 and 7.

Early morning	1	4,5	3	1	2,6,12,13
					12,13,1,2
7am to 10am	3	1	3,9	1,2	
	1	1	4,5		7,5,6
10am to 1pm	1	3	1	1,2	12,13,1
			5		16,7
1pm to 4pm	1	1	2	1	4,6,5,8,12
					13
4pm to 7pm	1	1,3	1,3,5	1	3,7,8
					16
Evening	3	1	9	1	2,8

Device	**Location**	**Uses**	**Device Effects**	**Actions**
1)Smartphone 2)Laptop Wireless 3)Tablet 4) Other Wireless	1)Office-physical) 2)Home-physical 3) business remote 4) personal-self 5) family / friends 6)Other	1)Email 2)Social Media 3)Organization 4)Texting 5)Talking 6) Pictures 7) Video 8)Recording 9) Internet 10) Other	1) Satisfied 2)Chaotic 3)Bothersome 4)Anxiety 5)Balanced 6)Other	1) Found something you were not looking for 2) Searching for something 3) Problem solving 4) Learning 5) Maintaining personal relationships 6) Maintaining business relationships 7) Responding 8) Reviewing 9) Multitasking 10) Making an impact 11) Implementation of an idea 12) Sharing 13) connectivity 14) Creating 15) Teaching 16) Leveraging 17) Other or write in box

Figure 5. Example of Excel worksheet.

However, it should be noted that not all participants made such distinctions consistently. For example, there were many instances in which several devices were listed on the same line. In such cases, it was impossible to distinguish which locations, actions, etc. were associated with which device, so it was decided to treat each of the characteristics to the right as applying to each device. Similarly, it was presumed that any characteristics recorded to the right applied to each of the instances recorded in a column to its left. For example, in early morning, the four actions shown were scored as applying equally to the two locations; in the 7am to 10am time block, the three actions recorded on the third line were scored as associated with each of the two uses. These conventions undoubtedly introduced some error in the data, but they were judged to be minimal and likely to even out across the various records. It may also be noted that in some cases responses to the right appear with nothing to the left; in these instances they were presumed to apply to the closest line that did have an entry. An example of this appears in the 7am to 10am block, in which the four actions on the first line were treated as if they were associated with the device, location, etc. on the middle line. Similarly, in the 1pm to 4pm time block, Action 13 was scored the same as if it had been entered on the second line. It was presumed that in most such cases, the participant had simply used additional lines to enter values when the original line was filling up.

Preliminary organization of the data was conducted within the Excel files using macros since there were a total of 210 worksheets (15 participants × 2 weeks × 7 days). First, all cells were converted to text for consistency. Second, actions were broken up into recorded or not for each line. For example, in the second line of early morning in Figure 5, a *1* was scored in variables representing Actions 2, 6, 12, and 13, and a *0* in variables for the other 13 possible actions. Similarly, dichotomous variables were created for the six effects (satisfaction ratings), ten uses, six locations, and four devices. The next step involved creating an SPSS file for each worksheet and merging them into a single data document with 3780 rows (6 time blocks × 3 lines each = 18 lines for each of the 210 worksheets) and 52 variables. In SPSS, data to the right was matched with appropriate values on the left, as described above; for example, for Participant 5, Week 2, Tuesday, 7am to 10am, first line, the scores for actions were shifted down one line. In cells in which the respondent had typed in a response (most often under location: “airport,” “dr’s office,” etc.) the code for Additional was added.

Various additional computations were performed; for example, the numbers of actions, effects (satisfaction), etc. per row were counted, and rows representing the three lines

within each time block were summed into a single row representing the time block, then those were summed into single rows representing days. In comparisons of using the various levels of data in preliminary analyses, it was found that results were virtually identical when using original lines and time blocks, suggesting that the choice of which line to record data on was somewhat arbitrary, so the latter was used for most presentations of the results below. There did not appear to be useful distinctions between days of the week, except when Saturday and Sunday were examined separately from weekdays, so for most reports, this distinction is ignored.

To reduce confusion, new terms will be used throughout the display of the results to refer to some categories presented to participants. Specifically, instead of *other* for the miscellaneous entries, *additional* will be used (so that *other* can refer to collections of entries, as in "smartphones vs. other devices…"), and *satisfaction* will be used instead of *device effects* (to avoid phrases such as "the effect of effects…"). Furthermore, it should be kept in mind that the terms *laptop* and *tablet* refer only to the use of these devices when they are connected to the Internet via broadband smartcard. The collected data from Stage 1 and Stage 2 is presented in the Results chapter within the context of each of the five research questions.

Current research does not provide a standard for evaluating data generated through the use of learning (self-observation) logs, but the literature supports several approaches, which include content analysis, variations of qualitative and quantitative narrative analysis, and case study analysis (Friesner & Hart, 2005b). Various tools can be created and used for the evaluation of transcribed or recorded data (GAO, 1989).

Based on recommendations from the literature, the researcher narrowed down the quantitative analysis in Stage 2 to two choices which included content analysis or methods associated with factor analysis. The researcher found that content analysis is a tool that has been used by social scientists to analyse and evaluate tendencies and patterns or rhythmics within a textual context. For example the United States GAO (General Accounting Office, later Government Accountability Office) uses content analysis to track the number of events that occur and analyse the patterns and frequency of these patterns in relation to these events (Chelimsky, 1989). In one instance, to investigate alleged censorship of news stories in *Stars and Stripes*, the GAO used content analysis to define the sources and nature of articles in the newspaper. Krippendorff (1980) argued that a researcher must address six concepts underlying the tenets of content analysis within the following framework. (1) Can the collected data be transformed into numerical representation? (2) Define the substance to be evaluated. (3) Identify research participants. (4) Establish a coding scheme which correlates

with word usage. (5) Identify and describe the frame for the analysis. (6) Analyse the emerging data derived from the analysis. If a researcher addresses the components within content analysis, the analysis, according to Hsieh and Shannon (2005), can be structured as a method of research where the researcher performs interpretation analysis, which is accomplished through sourcing word patterns, creating associated codes, and category or property identification.

After reviewing the large data set from the self-observation logs and concluding that content analysis would primarily review work patterns in order to identify themes, the researcher decided to use a variant of factor analysis known as principal component analysis (PCA). Researchers have identified principal component analysis as a multivariate analysis tool (Jackson, 1991; Locantore & Marron, 1999; Takane & Shibayma, 1991; Wold, Esbensen, & Geladi, 1987) that is used as a statistical method in various disciplines (Jolliffee, 1986) including business studies (Jackson, 1991). Within this context, Takane and Shibayama (1991) provided an example of how principal components analysis would be used:

> A researcher may be interested in what attributes of stimuli (e.g., political candidates, commercial products, etc.) are important in determining preferences towards them. The researcher may collect preference judgments on a set of stimuli from a group of subjects, analyze how the preferences toward the different stimuli are related with each other, and find out what attributes of the stimuli are commonly preferred or not preferred by which subjects. (p. 97)

Supporting this premise, research conducted by Joliffe (1986) found that principal component analysis focuses on differences within the data set, stating,

> PCA [reduces] the dimensionality of a data set consisting of a large number of interrelated variables, while retaining as much as possible of the variation present in the data set. This is achieved through transforming to a new set of variables, the principal components (PCs), which are uncorrelated, and which are ordered so that the first *few* retain most of the variation present in *all* the original variables. (p. 1, italics in original)

This process is substantiated by Wold et al. (1987), who outlined several goals of principal component analysis, which include simplifying the data, reducing the data, data models, identification of data outliers, ranges, cataloging or grouping, extrapolation, and un-mingling. The goals of PCA stated by Wold et al. (1987) were acknowledged by Jackson (1991) who also stressed another goal of PCA, which is referred to as retention. This is explained as the retention of the integrity of the data, which is simultaneously occurring as the data is being reduced and organized into a logical form (Jackson, 1991). Using such a technique enables the researcher to use objectivity within the representation (Takane & Shibayama, 1991) and to prepare a statistical narrative of the results (Jackson, 1991).

PCA assumes that the data has a number of characteristics (Fabrigar, Wegener, MacCallum, & Strahan, 1999). First, variables should be measured on a continuous scale. Second, relationships between variables should be linear. Third, there should be at least 5, and preferably 10, cases for each variable. Fourth, correlations among the variables need to be moderately high. Fifth, there should be no significant outliers.

CHAPTER 4 RESULTS

PILOT STUDY RESULTS

As the results of this study are rather lengthy (over 20 pages) and have been previously published (Carayannis & Clark, 2011; Carayannis et al., 2013), they will be presented in Appendix C and results and conclusions will be summarized here. Three principal domains emerged from the analysis. These were: serendipitous discoveries, productivity and process, and social/individual networking behaviors.

Serendipitous discoveries. Although none of the 33 participants reported knowing the meaning of Strategic Knowledge Arbitrage and Serendipity (SKARSE), the majority of them intuitively practiced its fundamental components on a regular basis. Of the 33 participants interviewed, 73% indicated some level of unplanned surprise (serendipity), while searching for other information.

Designing and leveraging a business network along with identifying technological change and entrepreneurial initiatives are essential components of leadership development. Recognizing serendipitous events and communicating them to colleagues is an important function of a network. Our global environment is changing the way CEOs interact. The use of serendipitous discoveries in business networks provides the individual with strategic learning opportunities which give the CEO a long term perspective. This creates new approaches, routines and environments to accumulate knowledge and proper positioning in the marketplace.

For example, one of the participants had reached out to their network of legal professionals in order to answer a tax question. Becoming impatient for a return call, the participant decided to use their mobile device to instantly search for an answer to their question. While deciding to learn through searching various search engines, blogs, and webpages, the participant reported experiencing a serendipitous event by searching for something with intent and un-expectantly finding a business broker who specializes in the sale of service based businesses.

Example 1:

> I was searching for a tax code question using my device. While using Yahoo tax I was directed to a site that brokers payroll clients. I contacted the broker who initiated and closed the sale of my payroll tax division. I sold off our firms' book of payroll clients to a national payroll provider. It was a great solution for us since managing our payroll tax department was taking a lot of time. The transition was also seamless

> for my clients too. I did not think about selling this division of our business until I found this particular broker. This transaction enabled me to focus more attention on our core business, better our clients experience and we were able to make some great money.

Whether this exercise was conducted with intention or not, the CEO used their existing knowledge base or collective knowledge assets ("generic knowledge," De Jong & Ferguson-Hessler, 1996) to recognize an event which might add value to their organization. Another example of a serendipitous discovery which led to strategic learning opportunities was presented by a CEO of a technology company. The CEO explained a situation where they were attending a conference on the benefits and risks of laparoscopic surgeries. The CEO felt disconnected to the conference topics as they did not pertain directly to her field of experience. The CEO then began to use their smartphone to access various websites to review unfamiliar terms which were presented and become more engaged. During this learning process, a medical technology pertaining to laparoscopic surgeries was discovered by the CEO as a potential new market for his company which had traditionally specialized in heart valves. Similar to the first example, the CEO was able to draw from their existing knowledge base. In this circumstance the CEO's intuition or prior experience led her to believe that the conference would not add value to her personal or business initiatives. This perception led the CEO to use their mobile device to search for terms which she was not familiar with. This act of searching with a focus resulted in finding something of relevance.

As the examples indicate, the practice of serendipitous discovery has a direct relationship to entrepreneurial outcomes and new venture performance. Since the CEOs were open to absorbing the information shared with them by others through their smartphone communication, there was an opportunity for them to create new ventures and discover new information leading to newly acquired knowledge. These events lead to vision, creativity, connections, organization, larger networks, and new ideas.

The results indicated that CEOs reported using serendipitous events to obtain knowledge through formal or informal learning activities, altering it for their specific uses, and leveraging it personally, professionally, or organizationally, resulting in a transformation of their business or personal productivity.

Productivity and process. The participants indicated that they believed the smartphone was a life changing device that has the ability and practicality to integrate personal and business relationships. The participants also specified that the smartphone enhanced their mobility while traveling, creating a flexible working environment. The concept of connectivity was verified by the participants, who stated that the smartphone

allowed them to be attached to their clients, creating better relationships and ability to solve problems. The participants in the study reported improvements in productivity and process by embracing smartphone technology on a daily basis. These improvements were in the following core areas: (a) efficiency, (b) effectiveness, (c) reach, and (d) integration.

Participants showed an increase in their reach through ability and access. CEOs and their organizations indicated an improved ability to create greater efficiencies around the management of inventory, business development activities, social relationship management practices, and response time to suppliers, customers or other participants within their networks. The integration of knowledge and technology was judged to create new employment opportunities during a recessionary period and most importantly increase profits and shareholder wealth.

Conclusion. Being a life changing device, the smartphone increases the effectiveness of exchanging information within business networks. Networks contribute to enhancing the firm's bottom line by increasing the depth of knowledge exchange, economic efficiency, and learning among the participants (Wilson et al., 2007). This is further supported by Knott (2007) who specified that firms are able to reduce expenses by extracting knowledge from organizations that have efficiency measures in place. One's openness to explore, learn, and continuously change are important characteristics for innovating, efficiency, and creating value for the organization (Kim, 2008).

The basis of analysis for this pilot study was seeking relationships between the words in the transcriptions and the three units of analysis listed above. Although this process was effective, the data was constrained based on the requirement to fit the results within the three domains.

The pilot study concluded that the research question warranted further research, but the results also presented the need for emerging themes to be developed within the context of the research question, which was not done in the pilot study. This was identified by the researcher since Spradley's analysis is directed to more literal interpretation from the transcriptions and the research question is social and cultural in nature, which warranted the need to explore a deeper understanding of CEOs and their interactions with wireless mobile devices. More detail on the pilot study can be found in Appendix C, Carayannis and Clark (2011), and Carayannis et al. (2013).

STAGE 1 RESULTS

Introduction

Data from Stage 1 consisted of transcripts of open-ended interviews (see Appendix D). It was evaluated as described in the previous chapter. The ideas and common concepts derived from the transcripts were used to verify and support the generated categories and properties that evolved from the data. This resulted in the development of three categories (themes) and nine properties (subthemes). These are summarized in Table 3, and the following section will describe them in detail. Table 3 identifies themes (categories), subthemes (properties) and definitions. Each of the components of the table was derived from the direct words of the participants.

Table 3

Matrix of Themes (Categories) and Subthemes (Properties)

Theme (Category) 1	Definition
Cultural mobility evolution (CME)	Interdependencies: people and environment
Sub-theme (Properties)	
Cultural shift for necessity (CSN)	Immersing oneself: integrating technology into meaningful activities
Proactive replacement device (PRD)	Real time device with you at all times
Evolution of relationships (ER)	Creating business connections with old friends and colleagues
Theme (Category) 2	**Definition**
Serendipity (S)	Situational searching with a purpose and finding unexpected relevance
Sub-theme (Properties)	
Unexpected circumstances through random use (UCRU)	The freedom of mobility: Enhancing your ability to randomly find things you are not looking for even while searching with a focus
Smarter business (SB)	Leveraging unforeseen circumstances or using the concept of arbitrage for better business
Theme (Category) 3	**Definition**
Blueprint for life (BL)	The inherent interest to use the Smartphone to create a framework of balance for life's work
Sub-theme (Properties)	

Globally affording opportunity (GAO)	Functionally having global access while creating connections with others
Structural transformation (ST)	Shifting from one platform to another, enabling executives to conduct personal and business agendas
Establishing and maintaining virtual communities (EMVC)	The evolution of communities of interest and practice
Social struggles of smartphone (SOS)	The inefficiency and unproductive use of mobile technologies and the smartphone

Category 1: Cultural Mobility Evolution (CME)

Definition: The interdependencies between chief executive officers and their mobile environment.

Property 1: Cultural Shift for Necessity (CSN)

Definition: The ability to immerse oneself, integrating technology into meaningful activities.

The participants identified cultural shift for necessity (CSN) in a variety of ways. Evident among the executives is how and why wireless mobile technologies, particularly the smartphone, are being used to efficiently and effectively communicate both on a personal and professional level. The participants stressed the importance of the devices to accelerate their retrieval of information and enhance decision making on an ongoing basis. Thus they displayed "knowledge acquisition knowledge" (De Jong & Ferguson-Hessler, 1996). This occurred multiple times throughout a given day. Mobile device activities reportedly enabled the CEOs to create informal and formal learning activities, build upon their existing knowledge base and transfer information to family, friends, colleagues, and individuals who they felt might benefit from it. Benefits were derived and expressed through the necessity of use, while creating a balance of life. The participants also expressed ways in which wireless mobile technology enhanced individual leadership attributes, education, and communication skills.

Opportunity costs were also prevalent within the data: For example, one participant stated they were "able to communicate with friends and family while conducting business activities." The ability to multitask and manage different relationships may increase one's ability to manage time more efficiently. However, an individual's ability to concentrate on a specific task may be interrupted when the person makes the inherent choice of constant

connectivity to each respective device. Proper management is required since constant interruptions could cause poor work performance or a decrease in productivity. The data also showed mobile technology immersion is a transformative process in itself whereby expectations of real time dialogue exchange exist. A CEO's interactions require immediate responses. Immediate response time could be advantageous or detrimental depending on the situational context. Philosophical questions arose as to whether business may be interrupted when an individual responds to personal issues during corporate time. When an executive was optimally functioning as a leader and leveraging mobile devices as device enablers, proper boundary and priority execution was emphasized in order to transform and embrace the benefits of wireless communication devices. Transformation and evolution enabled the user to leverage mobile device functionality, being a creator of individual efficiency practices and sustained profitability of their organization, they stated.

Property 2: Proactive Replacement Device (PRD)

Definition: Real time device with you at all times.

The participants identified mobile devices as a proactive replacement device (PRD) in a variety of ways. Evident among CEOs is the use of wireless mobile devices replacing tangible, physical goods such as the Rolodex, watch, physical office space, and books. Within this context, Participant 2 noted using mobile devices as a *remote management* tool enabling micro and macro organizational management while traveling. The mobile device has partially replaced his physical office space. In his professional opinion, "if I did not use wireless mobile devices, I would not be able to provide optimal customer service to my clients and my business revenues would decrease as a result." The mobile device appeared to afford the participant a virtual office, leveraging attributes of increased customer service and networking actions. This virtual management allowed coordinating the decision making process with his subordinates, he reported. Although the mobile device enabled such activities to occur, one must also recognize the loss of human to human contact. Within this context, developing relationships in a physical office space may create deeper relationships consisting of a foundation of trust, dependability, and active engagement. Although the use of technology to create knowledge in real time may give the user and recipient a deeper context of the subject matter for their decision making by removing one's ability to misconstrue the message, the recipient may also only receive a limited version of what the user of the technology wants them to see. For example, as described immediately below, Participant 3 sent a video of a crane tipping over to a colleague. One may ask the question,

why did the crane tip over and what was the result of the crane tipping over? Those questions cannot be answered solely by the receipt of the photo.

As presented in support of Property 2, the mobile device also was perceived as enabling its users to obtain and exchange knowledge through connecting to the internet. The replacement of these items and knowledge exchange created an increase in productivity, harnessed information for decision making, and enabled the user to drive business strategies, according to reports. For example, Participant 3 was present on a large construction site. Using their tacit knowledge of how to properly secure an engineered crane during high winds, the CEO recognized that the crane was not safely secured. The CEO approached the un-operated crane and saw it teetering from side to side. Recognizing that this had become an unsafe situation, the participant did not approach the crane and instead used their smartphone as a video recorder. The participant recorded the incident which included the crane tipping over into the construction site and forwarded the video to his director of safety. The video was then sent to the general contractor who was overseeing the site. Thus, the participant leveraged the features of the device during a serendipitous moment to create knowledge of an event, stored this knowledge, and then exchanged the respective information to ultimately create new business opportunities. Therefore, the recognition, acknowledgement and practice of knowledge acquisition and knowledge transfer activities become an approach for a business executive to evolve into a transformational business leader.

Additionally, transcription support was provided for Property 2 whereby Participant 1 reported that she is no longer purchasing or reading tangible or physical books. She is now using wireless mobile technologies, specifically wireless tablets to read these books electronically. Therefore, wireless mobile devices may be perceived by some researchers or practitioners as a green technology. Reading books through an electronic device saves paper and no trees have to be cut down to produce books. Reading the content is all done electronically through the wireless mobile device. Although mobile technologies may be a replacement device and viewed by some as a green initiative, there are also shortcomings. Electronics don’t decompose or dissolve as easily as paper products. The consumable goods or in this case mobile devices have to be purchased by the consumer, used for a specific time period and then when replaced due to continuous redevelopment of technology they are disposed of in landfills throughout the world. Also, reducing printing, distributing, and selling books and/or paper products may reduce employment within these sectors. However, this may be balanced by creating jobs within the technology sector.

The responses indicated that the respective users of the wireless mobile technology must recognize practical business and personal usages, which could include an increase in one's ability to obtain knowledge, efficiently exchange information, and also conduct networking activities with others. In order to achieve the benefits of these activities, the user must decide how to manage the respective wireless mobile technology to best fit their individual needs and priories in order to achieve an increase in individual or organizational productivity.

Property 3: Evolution of relationships (ER)

Definition: Creating business connections with old friends and colleagues.

The research from the transcriptions indicated that six participants have emphasized using wireless mobile technologies, specifically their smartphones, for evolving personal and business relationships. Through the use of their smartphones, the participants have recognized the advantages of self-education, connecting and reconnecting with others, and learning from experience. Consequently, these activities have increased the level of engagement more frequently through building trust, integrity, and credibility with others. For example, the transcriptions show that three of the six participants used wireless mobile technologies for formal and informal learning activities. These activities broadened their scope for information retrieval, which resulted in a greater knowledge base. Subsequently knowledge has become the impetus for increased delivery of reliable information and consistent execution, as well as enhanced and growing relationships in a well-planned, productive manner. During their interviews, two of the participants described the smartphone as the cornerstone for business and personal connections. These connections allow the user and their varied connections to become centric through greater proactive relationship management activities. This connection hub was reportedly accomplished through frequency of contact, improved customer service, tapping into a larger diverse pool of ideas, and recognizing visibility.

Category 2: Serendipity (S)

Definition: Situational searching with a purpose and finding unexpected relevance

Property 1: Unexpected Circumstances through Random Use (UCRU)

Definition: The freedom of mobility: Enhancing your ability to randomly find things you are not looking for even while searching with a focus.

In the seven instances of this cited in Appendix D the participants used the smartphone for both business and personal reasons. The CEOs were searching for something

specific and found something unexpected. It should also be recognized that the participants referenced above were experimenting with their respective devices, which in turn could also be deemed by some as a distraction. These distractions could include a lack of engagement with others around you leading to missed opportunities, a lack of attention ultimately leading to distortion of messages and a potential to be excluded from formal or informal learning opportunities.

Although it is acknowledged that mobile technologies may become a distraction and serendipitous activities may take place without the use of the smartphone the participants in these interviews reported using their devices during down time and may have not searched for the same information during productive business and personal time. This tool afforded them the opportunity and time to do so which in one instance made a difference in other people's lives since he was able to fundraise naturally and freely (Example 2 below). One of the participants was actually multitasking while using his smartphone as a learning tool. As noted in Example 1, the CEO was searching for tax code information and found a source to sell his payroll division. This event was unplanned and spontaneous, resulting in an unexpected event leading to additional revenues for the organization, greater business efficiencies, potential to create business development opportunities, and customer retention processes, according to the CEO.

The following example of random use was noted by Participant 7 where the CEO had integrated his smartphone for personal uses.

Example 2:

> While searching for a grill recipe I found a website which listed the name of a local BBQ restaurant. The branding seemed interesting so I clicked on the link. The link forwarded me to a local fundraiser located at a major league baseball park. The fundraiser consisted of $25 donation and the monies benefited a local nonprofit that worked with children in the area. The $25 donation included a ticket to the baseball game and a meal prior to the event. I decided to contact the organizer to see if the company could donate items for the event. The organization did not need material items, but was in desperate need for people to volunteer time at the event. I committed 40 volunteers from my company. A local financial institution also volunteered team member to participate in the event. Our company ended up being a co-sponsor and was featured in local newspaper, radio and television programming. We ended up receiving great publicity and helped raise $40,000 for a great cause.

Since the CEOs were open to absorbing the information shared with them by other participants through their smartphone communication device there was an opportunity for them to create a new venture and discover new information leading to newly acquired

knowledge. These events lead to vision, creativity, connections, organization, larger networks, and new ideas.

Property 2: Smarter Business (SB)

Definition: Leveraging unforeseen circumstances or using the concept of arbitrage for better business.

As the data indicated, a chief executive officer must be able to respond to unforeseen circumstances and in many instances with agility. The results listed above represented that CEOs used serendipitous events to capture intelligence through formal or informal learning activities, altered it for their specific uses and leveraged it personally, professionally, or organizationally resulting in an empowering transformation of their business or personal productivity. This transformation occurred through learning, unlearning, and relearning concepts, which evolved into usable knowledge for smarter business. Although the chief executive officers did not specifically indicate the use of serendipity or arbitrage as a strategic advantage individually or organizationally, the transcriptions did indicate that they inadvertently practiced both serendipity and arbitrage.

For example, many of the chief executive officers recorded that they were completing a task and found something they were not looking for. Several of these CEOs leveraged the unforeseen event and used new knowledge to better their company, themselves, their lives, and the lives of others.

> Example 3:
>
> I was waiting for the Dr., to get a checkup. He was running behind. I used my smartphone to look for a car wash promotion idea and while searching for the promotion I found a large benefit that was taking place near one of my stations. I sent an employee to the benefit with snacks and water. The employee gave it to the radio personalities who were on the air hosting the benefit. The radio personalities called me on my cell phone and gave me a radio spot for free. I was able to talk about my gas station locations, and gas prices. I offered free car washes for any person who could show a 94.9 sticker on their car.

Having the ability to leverage the serendipitous event and leveraging or arbitraging the knowledge led to an expanded network of influential media personalities and a promotional campaign the participant stated he "could have only dreamed of."

Another example of how unknowingly leveraging unforeseen circumstances or serendipitous events was applied when a chief executive officer was consciously learning new things, in order to personally drive towards continued excellence for their organization. In this example the data showed that this participant was open minded and was willing to search for new ideas. The CEO of this advertising company was meeting with his firm's

planning committee in regard to the expansion of their operations. In order to plan accordingly for the meeting, the CEO needed to hire a moving company, or several companies depending on their various services, to migrate some of the key employees to a new space.

> Example 4:
>
> I am always looking for things that will give me a competitive advantage in life. This can range from personal investment opportunities to business opportunities. While searching for a moving company I noticed many hauling companies' advertisements. Most of these companies haul worthless trash. There were no advertisements to haul away items of value. Items that can be recycled or high ticket items that can be donated or sold. I created a company that serves a special niche. I created a company that caters to the wealthy. I connect buyers with sellers for large ticket items and charge a pick up and delivery fee. These items are generally larger in nature and have significant value. For example a baby grand piano. Who wants to move a piano? I do! I also get rid of larger items people do not want. For example: I will pick up commercial restaurant equipment or a fiberglass spa. These items are donated or recycled depending on the material.

The company was franchised 6 months ago, and has 12 locations in three states. Additionally, the participant indicated that this newly formed company is marketed as a green company since its mission is to recycle furniture or other large items which would have traditionally been thrown away. The participant further explained that traditional nonprofit organizations such as the Salvation Army or Disabled American Veterans (DAV) don't accept large, heavy home furnishing items such as couches for donation pick up.

Although a different circumstance, this example is similar to Example 3 provided above where the chief executive leveraged a donation of food to a fundraiser and unexpectedly received free advertising to market their organization. The smartphone was also used in Example 4 to problem solve and as a result the CEO founded a new company. A third example occurred when another participant found an unforeseen problem-posing event (a crane tipping over) and their smartphone device afforded them the opportunity to take action and potentially save lives in the community. In this instance, the wireless mobile device was used as a multifunctional mechanism bridging the gap between society and business.

One of the CEOs was using their mobile device in an effort to enhance the organization's inventory process by investigating the uses of RF technology in an attempt to tighten control measures.

> Example 5:
>
> I was researching RF technology while waiting for a plane going from San Francisco to Oregon. While reviewing articles, I came across a technology called V-CAP. V-

> Cap technology is a chip which is embedded inside the aluminum cap located at the top of the cork. Information is loaded into the small device. The information gives tasting notes, paring suggestions, ratings, quality etc. The inventory can also be tracked by restaurants, retailers, etc. The consumer is able to swipe their Smartphone device across the cap and blue tooth technology allows the information to appear on their device. The technology is currently being used in European countries but not in the U.S. This is due to technological limitations from the wireless providers.

After reviewing this technology, his company has made the decision to embed the technology into their product. There is no benefit now, but they feel it will be a great marketing tool for the future and they wanted to be prepared.

As the transcriptions indicated, today's business environment is changing the way CEOs obtain knowledge and disseminate it within their personal and professional lives. Consequently, the data showed that the core competencies of each of the CEOs leveraged learning and allowed them to enhance their individual business acumen. Although informally practiced, the chief executive officers represented self-empowerment leadership styles and seized each opportunity, leveraging knowledge, building stronger relationships and trust, and an expanded network.

Category 3: Blueprint for Life (BL)

Definition: The inherent interest to use the Smartphone to create a framework of balance for life's work.

Property 1: Globally Affording Opportunity (GAO)

Definition: Functionally having global access while creating connections with others.

The four examples cited from the transcriptions represent various aspects of increasing one's business and personal competitive advantage. This was achieved through the affordances of smartphone technologies. Participants indicated an increase in one's reach through the connectivity of global access. The participants believed the smartphone was a life changing device that has the ability and practicality to integrate personal and business relationships. The participants also specified that the smartphone enhanced their mobility while traveling creating a flexible working environment. This flexible environment afforded the users the ability to conduct meaningful activities while creating freedom, allowing them to obtain significant business and personal information. In turn, this information was used strategically in knowledge management initiatives which included the creation and exchange of knowledge in the context of entrepreneurship activities.

The participants stressed the importance of their availability and access. This ability for universal usage bridges the gap between time and space because it involves real time

contact from anywhere at any time. This advantage of global use allows the user to manage their time in a well-organized productive manner. This management crosses two areas of cultural context. One area is in the culture of technology. As the participants reported, unless one is familiar and proficient with the smartphone and/or mobile technologies their access will be limited. There is a learning curve which the participants stressed in order to become familiar enough that doing business using the smartphone becomes automatic. The other cultural context is the recognition that ethnicity doesn't play a role in the same way that face to face relationships are built and managed in the creation of relationships. This enables the user to create and disseminate knowledge in a more meaningful way, ultimately building stronger connections with others across the globe resulting in crossing paths with additional opportunity.

Property 2: Structural Transformation (ST)

Definition: Shifting from one platform to another, enabling executives to conduct personal and business agendas.

Creating operational efficiency, the participants leveraged emerging technologies such as mobile devices to connect with office activities and others while enjoying the freedom of flexibility designing their blueprint for life. The smartphone has afforded them the opportunity to create an individualistic structure. This allows them to drive revenue, develop and maintain customer relationships through effective networking activities, and streamline marketing and sales initiatives. For example, Participant 2 used the smartphone as a global, virtual office. The participant is a frequent traveler and needs the ability to be mobile. Physical distance no longer creates inefficiencies and there is potential for anonymity. Having the virtual office reportedly allowed the leader to connect participants within the organization's network to participants in networks outside the organization to quickly execute on actions pertinent to the success of the organization. The ability to use this device as a multifunction facilitator of information and connectivity allowed the user to benefit from collaborative work, reduced overhead costs, increased productivity, and improved employee morale.

As noted from the example of Participant 2 the smartphone has established a paradigm shift through the use of technology to integrate knowledge management and knowledge sharing. Mobile technologies have moved universal business from traditional business models to a paradigm shift which results in a change in the basic set of assumptions and beliefs about the ability and capability of obtaining meaningful information for conducting business. Accordingly, the concept of doing business has changed due to the new

technological advancements which have afforded leaders in various business sectors to embrace new means of a new philosophy in conducting business activities and/or transactions.

One must note, conducting business within a brick and mortar environment continues in society today, but expectations have changed. Business colleagues, friends and family expect immediate response. A person who is in dialogue with another can no longer wait to obtain information. Due to the immediacy of mobile technologies the sender and/or recipient of any type of information becomes proactively involved in their decision making process and dialogue exchange.

Property 3: Establishing and Maintaining Virtual Communities (EMVC)

Definition: The evolution of communities of interest and practice.

Building virtual communities of interest and practice through social and individual networking behaviors are the impetus for interacting, management, and leadership styles using the smartphone technology. As a collaborative device, the smartphone increases productivity and searching for informal / formal learning opportunities through the balance of personal and professional interaction. Creating and maintaining virtual networks leveraging the use of the smartphone results in a transformational process which addresses entrepreneurs acknowledging their leadership styles and capturing approaches to communication which result in effective management. Online social media should be used to efficiently and effectively organize and communicate with other participants virtually within the network context.

Property 4: Social Struggles of Smartphone (SOS)

Definition: The inefficiency and unproductive use of mobile technologies and the smartphone.

The social struggles of the smartphone according to the participants may result in an inefficient and unproductive use of the device. Using the smartphone has the potential for social distortion resulting in either user misconstruing the message during the communication process. One participant stressed how they were upset to see a breakdown in communication through grammatical errors and abbreviations. The participants also expressed difficulty and limitations with the hardware and software aspects of mobile devices. There were times when the participants expressed concerns in respect to the functionality of their devices. For example the participants did not like the size of the screen and some of their devices had small keys which led to typing errors and longer communication times. One participant was concerned with the security of the device while searching on the internet. In addition to the

potential of security breaches, one participant expressed an interest in understanding the value the smartphone added to their work and life. There is an intrinsic desire to learn but the participant expressed a feeling to be enlightened as to the uses before taking the initiative to maximize the use of their device. It was also noted that a mobile technology, especially the smartphone, can be a complex communication tool. With the concern of the complexity of the device the participants noted actual physical reaction to their frustrations.

The smartphone affords human interaction between the communication device and its user. According to the participants this human interaction may lead to a physical addiction to the device to such an extent that one could physically shake due to thoughts of work insufficiency. To properly address the practicality of social struggles and mobile devices, one CEO was quoted as saying,

> Example 6:
>
> If I did not have my Blackberry and wireless card, I would literally shake since I have these items all the time and then to not have it (participant paused) literally my efficiency would go way down. (pause) Yesterday, I was in the office and I spent about three hours working on a strategy document and I could not do it with my Blackberry buzzing. It makes me crazy, it makes me feel anxious. I feel like I am immediately distracted instantly. I'm distracted and go for the Blackberry; I put in my password and see what the email is. I want to know. It's an addiction. Because what I think it is, is a need to feel important.

This addiction to communicate in real time through technology leads the user to keep the device with them at all times. Having this device on them in every situation has led the participant to express their frustration towards the technology as an intrusion during certain circumstances. This intrusion has led various participants to physical and emotional distress. Some examples include anxiousness, stress, nausea, increased heart rate, life unbalances, and fear, and being troubled, inconvenienced, and worried.

> Example 7:
>
> I worked through 2006 and 2007 without a vacation. I was connected to others professionally and personally 24/7. During June 2008, my family and I decided to take a long needed vacation to Cabo San Lucas, Mexico. Cabo is located at the tip of Baja California. The city is known for tourism, relaxation and beaches. It was the perfect destination for my family and I since it was a 2 hour plane flight, a different country and I did not obtain an international package for my Smartphone. We related for several days and then decided to rent a car, and drive 90 miles through the desert to a remote beach town known as To-dos Santos. We spent the day walking through the town, and absorbing the culture of this artisan town. I was extremely relaxed and enjoying my family. After a long lunch, we walked into a small art gallery. While viewing local paintings I felt something buzzing in my pocket and heard a loud ringing sound. I reached into my pocket and noticed it was my phone. How could this be? I asked myself. Then I decided to look at the email I received. It was a

> colleague from work. I was connected without knowing. Mad at the world, and feeling stressed I completed the email marked urgent and then tried to decompress and enjoy my vacation.

Overall Research Question

Research question: How and why do CEOs use wireless mobile communication devices and what is their perceived usefulness?

The qualitative study and data supported the research question by presenting four adaptations which include physical, emotional, personal, and business. This research question will be addressed here by presenting the findings from Stage 1.

The qualitative data derived from Stage 1 addressed the research question through the emergence of three themes or categories stated as cultural mobility evolution, serendipity, and blueprint for life. Each theme or category is also inclusive of related subthemes or properties which also address how CEOs are using mobile technologies and their perceived usefulness. A complete list of the three themes or categories and nine subthemes or properties with corresponding definitions was displayed in a matrix (Table 3) above. The themes, subthemes and corresponding definitions were derived directly through the words from the 15 participants. Appropriate support for the data including quotations and data analysis for each of the three themes (categories) and the nine sub-themes (properties) were presented above. A summary analysis for each of the three themes restated as CME, S, and BL is presented below in support of how and why CEOs are using mobile devices and their perceived usefulness.

Category 1: Cultural Mobility Evolution (CME)

Definition: The interdependencies between Chief Executive Officers and their mobile environment.

Category one (CME) and allocated properties (CSN, PRD, ER) address the research question of how CEOs are using mobile devices and what their perceived usefulness of the devices are. To further support the research question the participants emphasized the use of a virtual office, also referred to as the internet cloud, to facilitate both business and personal knowledge exchanges, including mutual engagement in business and personal research.

Example 8:

> I forward tenant laws, court documents, eviction information etc. to my attorney and apartment managers. I also search for articles in my spare time mostly related to real estate and finance. I forward these articles to my colleagues and friends. I will also

> obtain articles on topics I feel others might be interested in and then forward to the appropriate person. I also post them to Facebook from time to time. For example: My friend loves to cook. I forwarded a cooking recipe to my friend through Facebook. I am an avid Facebook user. This site allows me to manage my personal life by communicating with my family and friends more often. My company also uses social media to market and advertise the properties we have for lease. I also use these sites to build business relationships by communicating more often.

In this example, the CEO's wireless mobile device enabled the participant to conduct a real time exchange, resulting in an immediate transfer of their research findings when they occurred. As a direct result, this action further advanced his relationship with a colleague.

The data additionally supported the premise that wireless mobile devices afforded CEOs with the ability for complete immersion of oneself resulting in meaningful activities. It must also be noted that complete immersion was captured and recorded by the CEOs as both an unproductive and productive interaction with others in the quest to obtain and share what was perceived as pertinent information. In addition, it was reported that the smartphone has a connection to various components of cultural sensitivity resulting in an extension of personal use. The data also represented that cultural sensitivity was not strictly focused on organizational uses alone. Consequently, according to the participants, mobile devices have empowered chief executive officers to communicate holistically from a foundational level: exchanging ideas, sharing best practices, providing real time information, and engaging in cross cultural world emphasis research.

This cultural shift, according to the participants, has made it necessary to embrace such emerging technologies ensuring that one becomes more efficient and effective within the context of evolution. In this way, personal and business relationships circularly evolve, becoming unified. Unity is transformed and embraced as the participants stressed the importance of mobile devices as replacement devices being portable, handheld apparatuses which permit real time connections and world geographic mobility.

Category 2: Serendipity (S)

Definition: Situational searching with a purpose and finding unexpected relevance.

Category (S) and allocated properties (UCRU, SB) address the research question of how and why CEOs are using mobile devices and their perceived usefulness. To further support the research question the data suggested that through the situational, frequent, or infrequent use of mobile devices, unexpected circumstances can be leveraged and result in the technique of creating and refining smarter business decisions. Consequently, the data presented the process of spontaneous serendipity as accidental or unsystematic while it also

introduced induced serendipity, which occurred when searching with a purpose and finding unexpected outcomes. The data also presented various actions such as problem solving connected to serendipity (Appendix D). Such processes of serendipity, according to the participants, are a circular evolution: subconsciously seeking, identifying, refining, looking, relooking, and harvesting new findings of relevance which were not intended from an original search. This circular process can be differentiated philosophically due to the situational context, an individual's perception and their ability to be proactive based on the individual's action taking place.

The participants shared their individual practice of searching both business and social explorations by means of each respective mobile device. As each participant gained knowledge from their particular research they were able to determine how their original search led to a new discovery, ultimately creating value individually and for their organization. Discovery resulted in the ability to leverage new knowledge into learning concepts, sprouting into serendipity. The participants also discussed their purposeful direction of individual searching. For example: searching for a personal item using their smartphone, while in the process finding an unexpected charity (Example 2 above). The participant then processed the discovery and networked with others, creating a partnership between their individual organization, the charity, and another large organization. This newly established partnership became a social discovery by raising tens of thousands of dollars for a local children's charity.

This example displayed the systematic way and means that the participant was able to leverage the interconnectedness of knowledge and learning resulting in smarter business decision making or arbitrage which in this case included business, personal and purposeful fulfillment. Another byproduct of the concept of serendipity, as well as smarter business, is the kindness that human beings are able to show for others in both a personal and business sense. Serendipitous events occur as unplanned circumstances leading to unintended outcomes through people's desire to explore the unknown. Consequently, inducement is derived when prior knowledge of individual circumstances inherently occurs while questioning and curiosity seeking new information.

Category 3: Blueprint for Life (BL)

Definition: The inherent interest to use the smartphone to create a framework of balance for life's work.

Category BL and allocated properties (CAO, ST, EMVC, SOS) address the research question of how CEOs are using mobile devices and what is their perceived usefulness. To further support the research question the data suggested that the participants are using mobile technologies in the interest of creating a balance for their life's work. An example was a participant's ability to create personal time with their family while having voice and data dialogue with their colleagues (Appendix D). Mobile devices afforded participants the use of various applications to manage their physical and emotional health by controlling their diet and recording exercises. This dietary management activity was concurrently followed while also using additional mobile software applications which provided a gateway to obtain pertinent company reports which were needed to make financial decisions.

The participants expressed excitement both verbally and non-verbally towards the multitude of ways this mobile device changed their individual lives, positively. In addition, the data also suggested that mobile devices changed the way business was conducted and the way and means they were able to interact with colleagues, friends and family. One example included travel flexibility, enabling engagement in leisure activities such as surfing while on vacation and communicating with others to collaborate on ongoing business decisions (Appendix D). Another participant explained how the device was linked to the company's server which acted as a vehicle towards various forms of communication between management employees inter-organizationally (Appendix D). Personally, this participant also used their device for banking needs and retrieving sports information.

The participants also expressed positive changes in decision making, becoming more fiscally responsible with personal and business needs through the use of mobile devices. The flexibility of mobile devices, in this case the smartphone, created optimal efficiency for conducting personal and business agendas. Additionally, it was noted the smartphone assisted CEOs in establishing and maintaining virtual communities through global connectivity, presenting an opportunity to create connections with others and streamlining business operations.

As a result of global connectivity the participants reported perceiving a sense of transformation of their respective companies. The participants also stressed that mobile technologies empowered them to strive towards emotional fulfillment while creating freedom to fulfill each of their individual dreams. Unrestricted fulfillment is also expressed as an

interconnectedness of professional transactions and personal satisfaction. This personal fulfillment is able to be derived through potential connectedness of family and friends. Several examples include a participant's belief that the smartphone affords the ability to stay in business; another example is that the device allows the user to make decisions and communicate important information while away from the office. This allowed for more effective time management (Appendix D).

The three themes or categories and nine subthemes described above were the results from Stage 1, becoming the impetus for Stage 2 quantitative self-observation logs. To further address the research question, the themes were converted into various actions recorded by the participants (Table 4).

The 17 actions, 6 effects, and 9 uses were recorded by the participants in relation to time and became the unit of analysis to provide additional context to address the research question. Within this precept, the participants had the ability to select predetermined actions or write in self-evaluated or detailed actions. These results formed the basis for the methodology of Stage 2.

Table 4

Theme/Sub-Theme Conversion to Actions, Effects, Usage

Actions	**Theme (Categories)**	**Sub-Theme (Properties)**
1) Found something you were not looking for	Serendipity	Serendipity
2) Searching for something	Cultural Mobility Evolution	Cultural Shift
3) Problem solving	Cultural Mobility Evolution	Cultural shift
4) Learning	Cultural Mobility Evolution	Cultural shift for necessity
5) Maintaining personal relationships	Cultural Mobility Evolution	Evolution of relationships
6) Maintaining business relationships	Cultural Mobility Evolution	Evolution of relationships
7) Responding	Cultural Mobility Evolution	Proactive replacement device
8) Reviewing	Cultural Mobility Evolution	Proactive replacement device
9) Multitasking	Cultural Mobility Evolution	Proactive replacement device
10) Making an impact	Serendipity	Smarter Business
11) Implimentation of an idea	Serendipity	Smarter Business
12) Sharing	The Blueprint for life	Enabling and maintaining virtual communities
13) connectivy	The Blueprint for life	Globally affording opportunity
14) Creating	Cultural Mobility Evolution	Cultural shift for necessity
15) Teaching	The Blueprint for life	Globally affording opportunity
16) Leveraging	Serendipity	Smarter Business
17) Other or write in box	N/A	N/A
Device Effects	**Theme (Categories)**	**Sub-Theme (Properties)**
1) Satisfied	The Blueprint for life	social struggles
2)Chaotic	The Blueprint for life	social struggles
3)Bothersome	The Blueprint for life	social struggles
4)Anxioty	The Blueprint for life	social struggles
5)Balanced	The Blueprint for life	social struggles
6)Other	N/A	NA
Uses	**Theme (Categories)**	**Sub-Theme (Properties)**
1)Email	The Blueprint for life	Globally afforing opportunity
2)Social Media	The Blueprint for life	Enabling & Maintaining virtural communities
3)Organization	Cultural Mobility Evolution	Proactive replacement device
4)Texting	The Blueprint for life	Globally afforing opportunity
5)Talking	Cultural Mobility Evolution	Proactive replacement device
6) Pictures	Cultural Mobility Evolution	Proactive replacement device
7) Video	Cultural Mobility Evolution	Proactive replacement device
8)Recording	Cultural Mobility Evolution	Proactive replacement device
9) Internet	Cultural Mobility Evolution	Proactive replacement device

STAGE 2 RESULTS

Overview

Stage 2 was a quantitative study with the same 15 CEO participants as were studied in Stage 1. The categories and properties derived in the previous stage were developed into a self-observation log to be completed by the participants. This process included a focus group of five additional executives to help design the self-observation log format and procedure. A matrix-format log was developed for recording, in 3-hour time blocks, the devices used and the locations, uses, effects (satisfaction), and actions associated with each.

General Results

The 15 participants generated 30 write in responses within the self-observation log. These are described in detail in Appendix E. The written responses included descriptive words, such as "gym," which indicates physical fitness. This addressed the research question by displaying the participant's individual interdependence of using the device within their respective environment. This is culturally significant because the participant indicated that the way the device is being used as well as its perceived usefulness corresponds with the activity of being physical, whereas technology becomes an integrator of proactive relationships and multiple, real time activities.

Out of the 1188 time blocks, smartphones were used in 708, tablets in 221, laptops in 61, and additional devices in 23. The manner of recording uses, actions, etc. allowed for reports of several at the same time (that is, during the same three-hour time block). Therefore, there was overlap such that two or three devices could be used during the same period. Figure 6 illustrates the overlap between uses of devices (omitting the additional devices). For example, out of a total of 708 blocks in which the smartphone was used, in 49 a tablet was also being used, in 32, a laptop was also used, and in 3 all three devices were being used. The same applies to characteristics other than device; it was quite common for a participant to record more than one action during a time block, and in fact up to 12 actions were noted.

As Figure 6 shows, smartphones were reported as the overall most used device. In addressing the research question of how CEOs are using mobile technologies and their perceived usefulness, the data has shown that CEOs are actively using mobile technologies across blocks of time and are using smartphones the most.

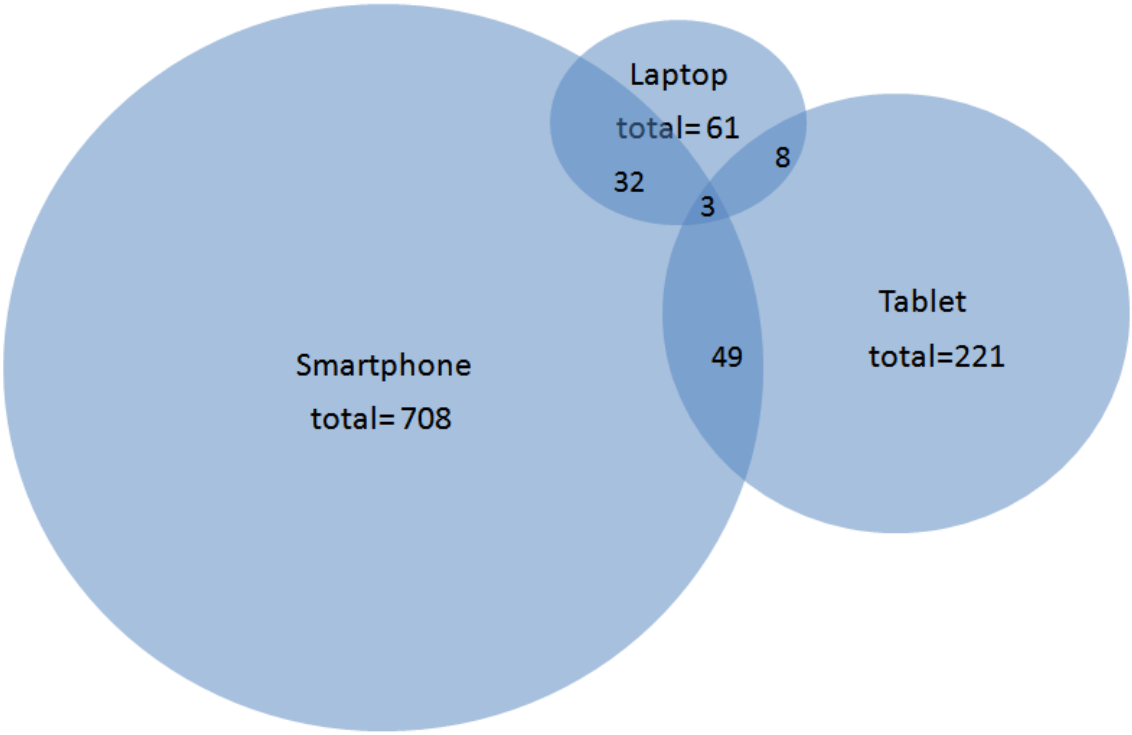

Figure 6. Venn diagram showing the overlap between different devices used in any given time block.

Within the context of individual devices being used, the quantitative data also provided information on the frequency of mobile device usage. The smartphone was used on average across 47 of the time blocks or 75% of the time, the smartcard laptop was used on average across 4 time blocks or 6% of the time, and the tablet was used on average across 18 time blocks or 29% of the time (Table 5). This frequency of use for the smartphone of 75% relates to all categories and properties generated in Stage 1 as the smartphone is acting as a vehicle, affording the user an opportunity to perform the various tasks which are related to each of the respective themes. Additionally, the data represented that the CEOs perceived tablets being useful in the early morning time block or prior to 7am and during the evening time block or after 7pm. The data on location supports the research question and relates to category one (CME) and properties (PRD), (CSN) and (ER).

Table 5

Distribution of Actions across Time Blocks

Action		Percentage	
		of all time blocks (1188)	of time blocks with any action (891)
	n	%	%
1) Found something you were not looking for	45	3.8	5.1
2) Searching for something	303	25.5	34.0
3) Problem solving	181	15.2	20.3
4) Learning	245	20.6	27.5
5) Maintaining personal relationships	222	18.7	24.9
6) Maintaining business relationships	293	24.7	32.9
7) Responding	473	39.8	53.1
8) Reviewing	393	33.1	44.1
9) Multitasking	109	9.2	12.2
10) Making an impact	63	5.3	7.1
11) Implementation of an idea	39	3.3	4.4
12) Sharing	331	27.9	37.1
13) Connectivity	140	11.8	15.7
14) Creating	123	10.4	13.8
15) Teaching	45	3.8	5.1
16) Leveraging	74	6.2	8.3
17) Other or write in box	61	5.1	6.8

Individual Differences

Although it was not planned to compare individuals to one another, it was thought useful to note the similarities and differences between their uses of devices. A full description of this data is presented in Appendix F.

Devices being used and their frequency of use across the 15 participants were compared. The data represented that the smartphone was being used the most by all participants. Participant 3 used the smartphone across 63 time blocks which was the most, compared with Participant 8 who used it the least at 28 times (although Participant 8, along with Participant 2, provided data for only 8 days). Appendix F also shows variations across individuals in frequency of actions performed.

Location and Time

The data on time and location relates to individual actions as they were recorded by the participants to indicate how they were using mobile devices and their perceived usefulness. The actions recorded by the participants within the self-observation log are associated with the 3 categories and 9 properties which were identified during the Stage 1 qualitative analysis process (Table 4 above). Both of these processes address the research question. The distributions of actions were shown in Table 5. The table represents actions 1-17 associated with the categories and properties. This table will also be referenced as a unit of analysis to address the subsequent research questions.

The research questions are interrelated to how CEOs are using mobile devices and their perceived usefulness. For answering the additional research questions, it proved necessary to expand on the data regarding actions. Additionally, the four research questions below deal with not just individual actions, but groups of several actions combined. The intent of the questions is to assess how often the participants took these actions together within the context of how and why CEOs are using mobile devices and their perceived usefulness. Therefore, the unit of analysis is not the time block in itself, but the time block and all possible actions that could have been included in it.

Comparisons of devices and locations across blocks of time. A main interest of this research was variation in the use of the devices over time of day. On the assumption that weekday patterns might look quite different from weekend patterns, these were examined separately. Figure 7 shows device usage as it varied over time on weekdays, and Figures 8 and 9 show the same for Saturday and Sunday, respectively.

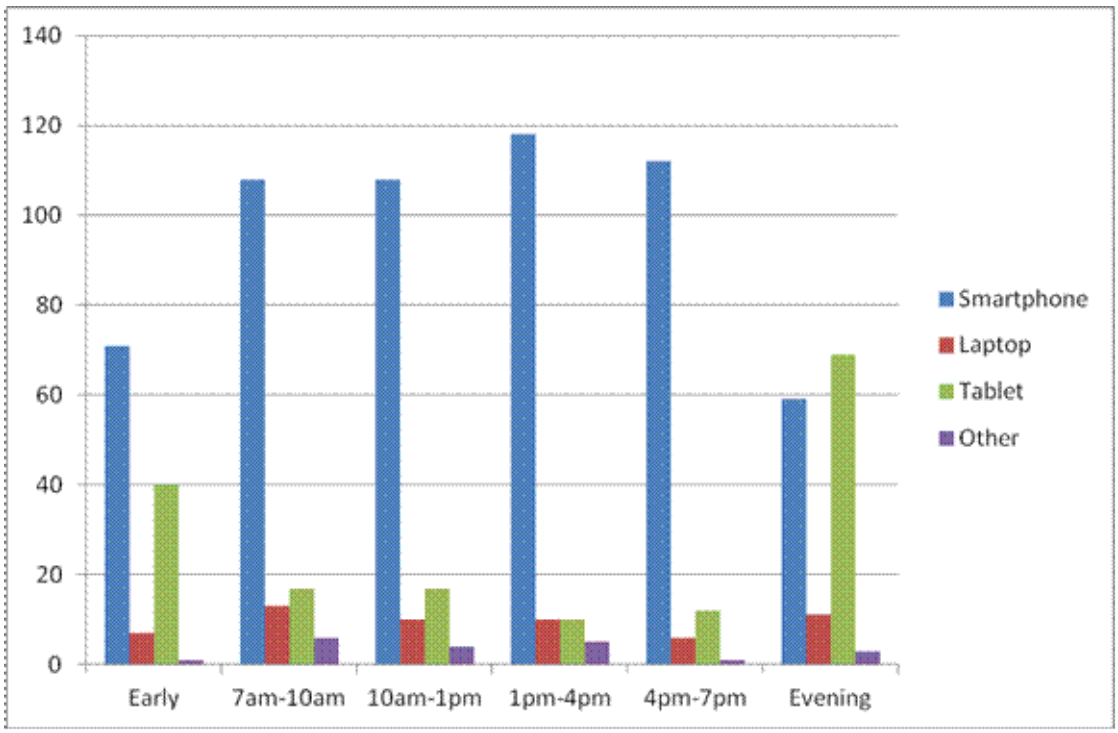

Figure 7. Use of devices at varying time blocks, Monday through Friday combined.

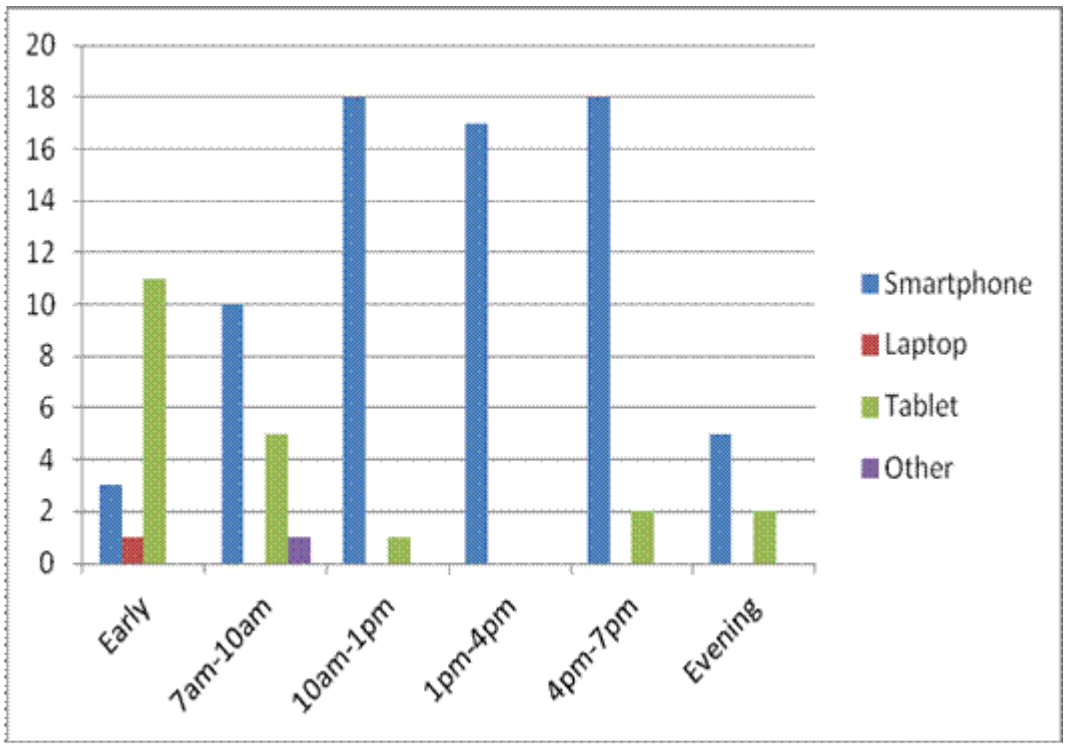

Figure 8. Use of devices at varying time blocks, Saturday only.

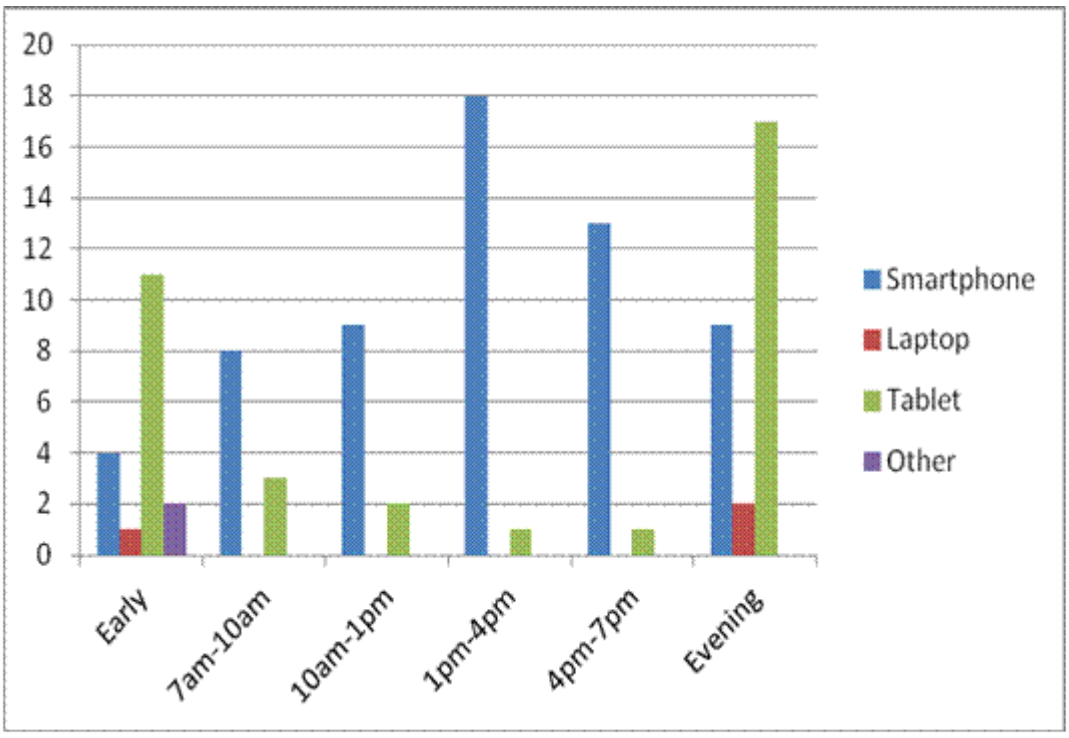

Figure 9. Use of devices at varying time blocks, Sunday only.

The wireless mobile devices were used by the participants throughout all time blocks and all locations. The smartphone was used the most and smartcard wireless (laptop) the least. However, the relative commonness of different devices varied greatly over time blocks in each day. In particular, the tablet was much more often used in early morning and evening than during the day, and this was true on weekends as well. Mobile devices afforded the participants the opportunity to integrate technology, in real time, in multiple environments while creating personal and business connections.

Finally, Figure 10 shows how various locations were related to device use.

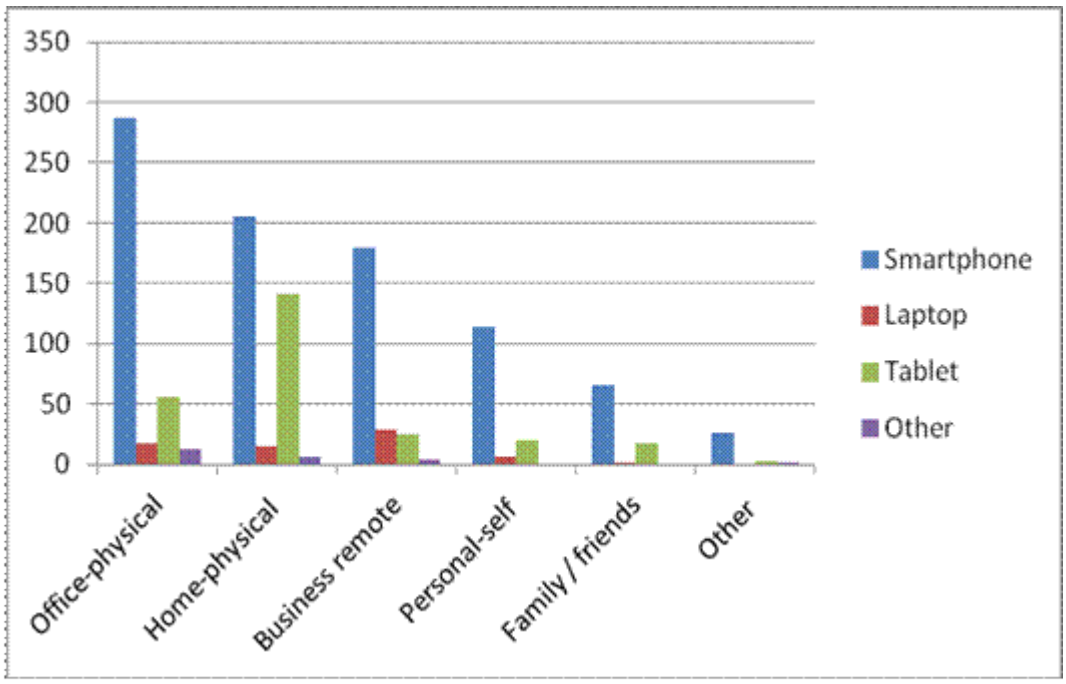

Figure 10. Use of devices at various locations.

Actions

Although most of the actions were performed, 4 participants did not record at least one of the 17 actions. For instance Participant 7 did not record the action of teaching within any time block or device. Participant 8 did not record an action related to found something you are not looking for, making an impact or selecting other usage. Participant 10 did not record an action for found something you are not looking for. Participant 15 did not record usage for implementation. It must be noted that of the 4 actions that were not recorded at least once: making an impact, creating, teaching, and other, 14 of the 15 participants or 93% of the sample recorded usage of these actions. The fifth action, found something you are not looking for, was recorded by 13 of the 15 participants or 87% of the sample.

Distribution of actions across time blocks. Since the unit of analysis for most purposes is the time block, commonness of actions means the number/percent of time blocks in which each action was reported. Below the percentages are expressed two ways – one over all possible time blocks, and the other over all time blocks that had any action at all (this happened to be 75.0% of them, which is a noteworthy statistic in itself). Table 5 above showed the distribution of actions across time blocks. Table 6 breaks down these distributions into those associated with smartphones only and other devices combined. Finally, Table 7 breaks these down further to each device. Note that if you compare the numbers in Table 6 to those in Table 5, they will not add up. This is because any given time block can include more than one action. For example, for Action 1, Table 6 indicates that there were 34 instances of

using a smartphone for this, + 23 for other devices = 57, but the corresponding figure in Table 5 is 45. This means that in 57-45=12 of the time blocks, more than one device was reported as being used. Many tables include this duplication, so this must be kept in mind in comparing them.

Table 6

Distribution of Actions Across Time Blocks, broken down by Smartphone vs. Any Other Device

Action	Smartphone			Any other device		
		Percentage			Percentage	
	n	of all time blocks (1188) %	of time blocks with any action (891) %	*n*	of all time blocks (1188) %	of time blocks with any action (891) %
1) Found something you were not looking for	34	2.86	3.82	23	1.94	2.58
2) Searching for something	197	16.58	22.11	151	12.71	16.95
3) Problem solving	139	11.70	15.60	73	6.14	8.19
4) Learning	142	11.95	15.94	138	11.62	15.49
5) Maintaining personal relationships	190	15.99	21.32	57	4.80	6.40
6) Maintaining business relationships	235	19.78	26.37	97	8.16	10.89
7) Responding	404	34.01	45.34	130	10.94	14.59
8) Reviewing	284	23.91	31.87	144	12.12	16.16
9) Multitasking	94	7.91	10.55	32	2.69	3.59
10) Making an impact	34	2.86	3.82	37	3.11	4.15
11) Implementation of an idea	28	2.36	3.14	21	1.77	2.36
12) Sharing	252	21.21	28.28	115	9.68	12.91
13) Connectivity	89	7.49	9.99	69	5.81	7.74
14) Creating	85	7.15	9.54	54	4.55	6.06
15) Teaching	30	2.53	3.37	21	1.77	2.36

16) Leveraging	54	4.55	6.06	23	1.94	2.58
17) Other or write in box	45	3.79	5.05	25	2.10	2.81

A single "case" in these tables consists of one time period during a day. In other words, the actions, satisfaction, etc. are those associated with each device. For example, in Table 7, for the action "Found something you were not looking for," this occurred in 4.80% of the times a smartphone was being used, 6.56% of the times a laptop was used, etc. People tended to use a tablet or laptop when they were "Searching for something," but seldom used a tablet when "Multitasking." Under Location (Table 8), we can see that people were far more likely to use a tablet at home than other locations.

At the bottom of Table 8 are devices used at the same time as the device named at the top of each column. Obviously, when the smartphone was being used, the smartphone was "also" being used 100% of the time. But other devices were not likely to be used at that time, that is, during the same three-hour time block. In contrast, people using a laptop were also using a smartphone. It should be kept in mind that because of this overlap it is not possible to precisely match devices to actions, satisfaction, etc. For example, if both smartphone and tablet were used in a time block, a rating of satisfied would be associated with both, although it might have been intended to apply to one or the other or both.

Table 7

Actions by Device

	Device							
	Smartphone: *N*= 708		Laptop: *N*= 61		Tablet: *N*= 221		Additional: *N*=23	
	n	%	*n*	%	*n*	%	*n*	%
Action								
Found something you were not looking for	34	4.80	4	6.56	18	8.14	2	8.70
Searching for something	197	27.82	30	49.18	121	54.75	4	17.39
Problem solving	139	19.63	35	57.38	47	21.27	11	47.83
Learning	142	20.06	31	50.82	118	53.39	8	34.78
Maintaining personal relationships	190	26.84	14	22.95	44	19.91	1	4.35
Maintaining business relationships	235	33.19	30	49.18	74	33.48	11	47.83
Responding	404	57.06	43	70.49	95	42.99	15	65.22
Reviewing	284	40.11	27	44.26	115	52.04	8	34.78
Multitasking	94	13.28	16	26.23	17	7.69	4	17.39
Making an impact	34	4.80	8	13.11	30	13.57	2	8.70
Implementation of an idea	28	3.95	8	13.11	13	5.88	0	0.00
Sharing	252	35.59	18	29.51	96	43.44	5	21.74
Connectivity	89	12.57	17	27.87	59	26.70	12	52.17

Creating								
	85	12.01	12	19.67	42	19.00	1	4.35
Teaching								
	30	4.24	6	9.84	15	6.79	0	0.00
Leveraging								
	54	7.63	3	4.92	20	9.05	2	8.70
Additional or write in box								
	45	6.36	10	16.39	21	9.50	8	34.78

Table 8

Locations and Other Devices by Device

	Device							
	Smartphone: *N*= 708		Laptop: *N*= 61		Tablet: *N*= 221		Additional: *N*=23	
	n	%	*n*	%	*n*	%	*n*	%
Location								
Office-physical	287	40.54	17	27.87	56	25.34	12	52.17
Home-physical	205	28.95	15	24.59	141	63.80	7	30.43
Business remote	180	25.42	29	47.54	25	11.31	4	17.39
Personal-self	114	16.10	7	11.48	20	9.05	0	0.00
Family / friends	66	9.32	2	3.28	18	8.14	0	0.00
Additional	26	3.67	0	0.00	3	1.36	1	4.35
Device								
Smartphone	708	100	32	52.46	49	22.17	6	26.09
Laptop Wireless	32	4.52	61	100	11	4.98	10	43.48
Tablet	49	6.92	11	18.03	221	100	12	52.17
Additional Wireless	6	0.85	10	16.39	12	5.43	23	100

In addition to these analyses, similar data was generated using each line (one-third of a time block) as the unit of measurement. Those results were nearly identical to the ones displayed in Tables 7 and 8, hence are omitted. This suggests that participants' entering two devices or actions, etc. on the same line within a time period, rather than on different lines, probably was rather arbitrary.

Combined Actions

Several of the research questions deal with not just individual actions, but groups of several actions combined. The intent of the questions is to assess how often the participants took these actions together. In other words, the unit of analysis is not the time block but the time block and all possible actions that could have been included in it. For example, in a particular time block, a participant could have reported using a smartphone and taking only the action of problem solving, or could have reported problem solving AND learning AND teaching. If just the time block is used, these would count as equal, that is, a block in which one or more of those actions appeared. So each action was counted separately instead. Table 9 is parallel to Table 5 and shows the distribution of combined actions across time blocks. For percentages in Table 9 to be parallel, they should count all possible blocks × actions. Therefore, for example, 802 is 16.9% of 4752 (which is 1188 time blocks × 4 possible actions).

Table 9

Distribution of Combined Actions Across Time Blocks

Combined Actions		Percentage	
		of all possible time blocks × actions	of all possible time blocks with any action × actions
	n	%	%
Problem solving + Learning + Teaching + Sharing	802	16.9	22.5
Found something + Searching for something	348	14.6	19.5
Found something + Searching for something + Making impact + Leveraging	485	10.2	13.6
Found something + Searching for something + Problem solving + Learning + Reviewing + Making impact + Implementation + Sharing + Leveraging	1674	15.7	20.9

Since the idea behind these combined actions is how many different actions were being performed at the same time (more or less—within the same time block), the combined actions are themselves continuous variables that could be used in other comparisons. Therefore, a little more descriptive information on them might be useful. This is presented in Table 10.

Table 10
Descriptive Statistics for Combined Actions (N= 1188)

	Value[a]	*n*	%	Mean	*SD*
Problem solving + Learning + Teaching + Sharing				0.68	0.849
	0	646	54.4		
	1	318	26.8		
	2	190	16.0		
	3	32	2.7		
	4	2	0.2		
Found something + Searching for something				0.29	0.503
	0	867	73.0		
	1	294	24.7		
	2	27	2.3		
Found something + Searching for something + Making impact + Leveraging				0.41	0.642
	0	799	67.3		
	1	298	25.1		
	2	86	7.2		
	3	5	0.4		
Found something + Searching for something + Problem solving + Learning + Reviewing + Making impact + Implementation + Sharing + Leveraging				1.41	1.493
	0	477	40.2		
	1	216	18.2		
	2	210	17.7		
	3	146	12.3		
	4	102	8.6		
	5	30	2.5		
	6	7	0.6		

[a] Number of actions performed within the same time block.

As an example, Figure 11 shows, for weekdays only, the distribution of frequency of the Combined Actions of Problem solving + Learning + Teaching + Sharing across the six time blocks. This illustrates that for these actions, combining them is less common in the morning than in the afternoon or evening, and the greatest combining is done between 1 and 4 pm and in the evening. Similarly, Figure 12 shows the distribution for Found something +

Searching for something + Problem solving + Learning + Reviewing + Making impact + Implementation + Sharing + Leveraging.

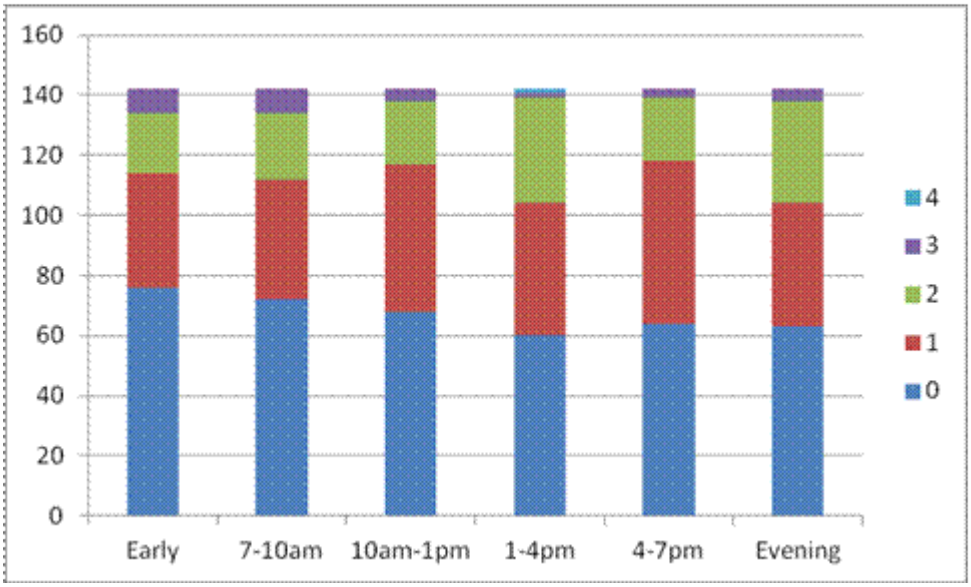

Figure 11. Distribution of Problem solving + Learning + Teaching + Sharing across time blocks.

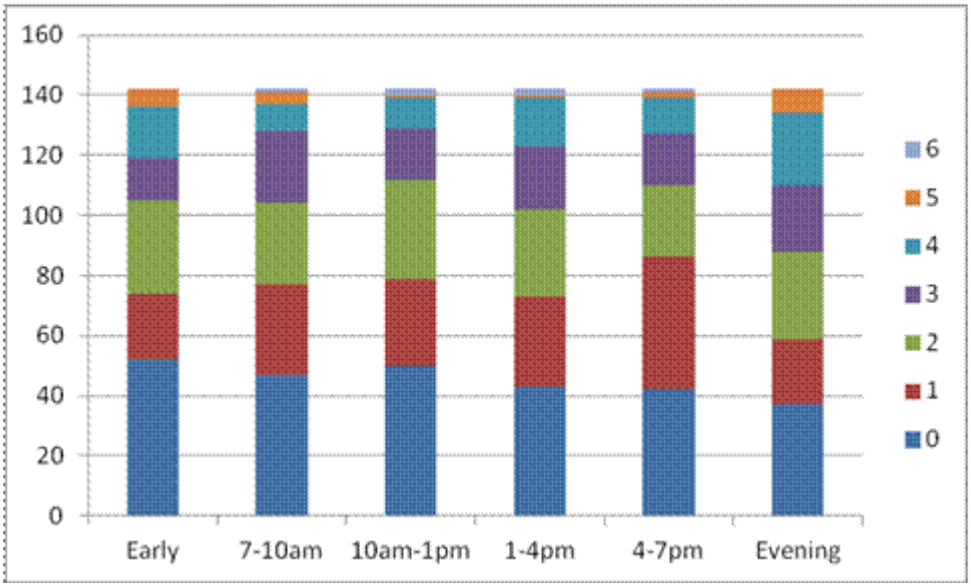

Figure 12. Distribution of Found something + Searching for something + Problem solving + Learning + Reviewing + Making impact + Implementation + Sharing + Leveraging across time blocks.

Additional Context on Actions

For answering the research questions, it proved necessary to expand on the data regarding actions. In Tables 11 and 12, the first line under each action is the same as the lines in Table 7: the percentages of the times in which a device was reported as being used for that action (e.g., Table 11: for Smartphone, Found something you were not looking for: 34 ÷ 708 = 4.80%). The middle line shows the percentages of times that the participant reported the particular action that it was associated with that device (e.g., for the same cell as above: 34 ÷ (34 + 4 + 18 + 2) = 58.62%). This shows the percentage of the time participants were solving problems, that they used each device. Unlike the percentages based on device, these total 100%. From this perspective, it is clear that participants mainly used smartphones (58.62%), and seldom used laptops (6.90%). However, these figures are also misleading, because smartphones were simply more commonly used in general: 69.89% of the time overall, whereas laptops were only used 6.02% of the time. Therefore, the third line shows the proportion of (percent used for this action) ÷ (percent used overall). In this case, that is 58.62% ÷ 69.89% = .86 for smartphones, and 6.90% ÷ 6.02% = 1.15 for laptops. Therefore, in this sense, laptops were used somewhat more for problem solving than one would expect based on the frequency of laptop use, and smartphones were used for this action somewhat less often than one would expect. Similarly, tablets and additional devices were often used for this action.

Finally, note that since there were only 23 reports of use of additional devices, the statistics for this device category should not be regarded as very reliable (in the statistical sense, meaning stable—if the study was repeated with a new group of participants, results might be similar with the first three devices, but the results for "additional devices" might be different). Note also that, since there is no real way of computing inferential statistics on this data, terms such as "more" or "less" are relative—we cannot say definitively that the figures are significantly more or less than would be expected by chance.

Table 11

Actions by Device, with Percentage by Action and Comparative Proportion

	Device							
	Smartphone: *N*= 708		Laptop: *N*= 61		Tablet: *N*= 221		Additional: *N*=23	
	n	%	*n*	%	*n*	%	*n*	%
Action								
Found something you were not looking for								
% by device	34	4.80	4	6.56	18	8.14	2	8.70
% by action		58.62		6.90		31.03		3.45
(Proportion)		(0.84)		(1.15)		(1.42)		(1.52)
Searching for something								
% by device	197	27.82	30	49.18	121	54.75	4	17.39
% by action		55.97		8.52		34.38		1.14
(Proportion)		(0.80)		(1.42)		(1.58)		(0.50)
Problem solving								
% by device	139	19.63	35	57.38	47	21.27	11	47.83
% by action		59.91		15.09		20.26		4.74
(Proportion)		(0.86)		(2.51)		(0.93)		(2.09)
Learning								
% by device	142	20.06	31	50.82	118	53.39	8	34.78
% by action		47.49		10.37		39.46		2.68
(Proportion)		(0.68)		(1.72)		(1.81)		(1.18)
Maintaining personal relationships								
% by device	190	26.84	14	22.95	44	19.91	1	4.35
% by action		76.31		5.62		17.67		0.40
(Proportion)		(1.09)		(0.93)		(0.81)		(0.18)
Maintaining business relationships								
% by device	235	33.19	30	49.18	74	33.48	11	47.83
% by action		67.14		8.57		21.14		3.14
(Proportion)		(0.96)		(1.42)		(0.97)		(1.38)
Responding								
% by device	404	57.06	43	70.49	95	42.99	15	65.22

% by action		72.53		7.72		17.06		2.69
(Proportion)		(1.04)		(1.28)		(0.78)		(1.19)
Reviewing								
% by device	284	40.11	27	44.26	115	52.04	8	34.78
% by action		65.44		6.22		26.50		1.84
(Proportion)		(0.94)		(1.03)		(1.21)		(0.81)
Multitasking								
% by device	94	13.28	16	26.23	17	7.69	4	17.39
% by action		71.76		12.21		12.98		3.05
(Proportion)		(1.03)		(2.03)		(0.59)		(1.35)

Table 12

Actions by Device, with Percentage by Action and Comparative Proportion (continued)

	Device							
	Smartphone: *N*= 708		Laptop: *N*= 61		Tablet: *N*= 221		Additional: *N*=23	
	n	%	*n*	%	*n*	%	*n*	%
Action								
Making an impact								
% by device	34	4.80	8	13.11	30	13.57	2	8.70
% by action		45.95		10.81		40.54		2.70
(Proportion)		(0.66)		(1.80)		(1.86)		(1.19)
Implementation of an idea								
% by device	28	3.95	8	13.11	13	5.88	0	0.00
% by action		57.14		16.33		26.53		0.00
(Proportion)		(0.82)		(2.71)		(1.22)		(0.00)
Sharing								
% by device	252	35.59	18	29.51	96	43.44	5	21.74
% by action		67.92		4.85		25.88		1.35
(Proportion)		(0.97)		(0.81)		(1.19)		(0.59)
Connectivity								
% by device	89	12.57	17	27.87	59	26.70	12	52.17
% by action		50.28		9.60		33.33		6.78
(Proportion)		(0.72)		(1.60)		(1.53)		(2.99)
Creating								
% by device	85	12.01	12	19.67	42	19.00	1	4.35
% by action		60.71		8.57		30.00		0.71
(Proportion)		(0.87)		(1.42)		(1.37)		(0.31)
Teaching								
% by device	30	4.24	6	9.84	15	6.79	0	0.00
% by action		58.82		11.76		29.41		0.00
(Proportion)		(0.84)		(1.95)		(1.35)		(0.00)
Leveraging								
% by device	54	7.63	3	4.92	20	9.05	2	8.70

% by action		68.35		3.80		25.32		2.53
(Proportion)		(0.98)		(0.63)		(1.16)		(1.12)
Additional or write in box								
% by device	45	6.36	10	16.39	21	9.50	8	34.78
% by action		53.57		11.90		25.00		9.52
(Proportion)		(0.77)		(1.98)		(1.15)		(4.20)

As noted above, some of the research questions include combined actions. Table 13 shows the same data as Table 9, but broken down by device and with percentages and proportions computed as in Tables 11 and 12.

Table 13

Combined Actions by Device, with Percentage by Action and Comparative Proportion

	Device							
	Smartphone: *N*= 708		Laptop: *N*= 61		Tablet: *N*= 221		Additional: *N*=23	
	n	%	*n*	%	*n*	%	*n*	%
Combined Actions								
Problem solving + Learning + Teaching + Sharing								
% by device	563	19.88	90	36.89	276	31.22	24	26.09
% by action		59.08		9.44		28.96		2.52
(Proportion)		(0.85)		(1.57)		(1.33)		(1.11)
Found something + Searching for something								
% by device	231	16.31	34	27.87	139	31.45	6	13.04
% by action		56.34		8.29		33.90		1.46
(Proportion)		(0.81)		(1.38)		(1.55)		(0.64)
Found something + Searching for something + Making impact + Leveraging								
% by device	319	11.26	45	18.44	189	21.38	10	10.87
% by action		56.66		7.99		33.57		1.78
(Proportion)		(0.81)		(1.33)		(1.54)		(0.78)
Found something + Searching for something + Problem solving + Learning + Reviewing + Making impact + Implementation + Sharing + Leveraging								
% by device	1164	18.27	164	29.87	578	29.06	42	20.29
% by action		59.75		8.42		29.67		2.16
(Proportion)		(0.85)		(1.40)		(1.36)		(0.95)

Analyses for Additional Research Questions Across all Stages

Question 2: How and why do CEOs leverage mobile devices as a tool for learning?

This question was examined using a mixed method approach in relation to five analyses, using word identification involving the self-observation log actions of problem solving, learning, teaching, sharing, and these four actions combined. The actions emerged from the themes produced in Stage 1 (Table 3). The four actions are segmented into four parts listed below. See Appendix F for a breakdown by individual participants.

Part A: Problem Solving (Action #3). Problem solving was reported in 181 of the time blocks, 15.2% of them or 20.3% of time blocks in which any action was reported (Table 5). Furthermore, this action can be broken down by device (Table 7).

When participants used a wireless laptop, also referred to as a broadband smartcard, they focused on problem solving. That is, 57.38% of the time they used a smartcard, they were using it for problem solving (Table 7). In contrast, when participants used a smartphone, they were using it less than the other devices for problem solving (19.63%). Although the smartphone was used less as a percentage than other devices for problem solving, it is clear the participants used smartphones more as a total percentage of all devices (59.91%). Similarly, tablets were seldom used for this action, but additional devices were often used. In terms of individuals, it was observed that problem solving was reported between 8 and 21 times by each.

Part B: Learning (Action #4). Table 5 indicates that learning was reported 245 times, 20.6% of all time blocks or 27.5% of all with any action. According to Table 11, laptops and tablets were used more for learning than would be expected overall, additional devices about the same amount, and smartphones much less. Participants ranged from 9 to 25 in reports of this action.

Part C: Teaching (Action #15). Teaching was an uncommonly reported action, with only 45 reports (3.8% of all time blocks, 5.1% of those with actions; Table 5). As above, laptops and tablets were commonly used for teaching, but additional devices were not used at all for this action, and smartphones were seldom used. Individuals reported as few as 0 instances, or as many as 6.

Part D: Sharing (Action #12). Sharing was one of the most frequently reported actions (Table 5), with 331 reports, or 27.9% of all blocks and 37.1% of those with actions. Only responding and reviewing were more common. As represented by Table 12, the mobile devices tended to be used about the same for sharing. Additional devices were used

somewhat less commonly, and tablets somewhat more commonly. Participants ranged from 12 to 31 in reports of sharing.

Part E: Problem Solving (Action #3) + Learning (Action #4) + Teaching (Action #15) + Sharing (Action #2). As shown in Table 9, this combination of actions (that is, one or more occurring in the same time block) was reported 802 (16.9%) times out of a possible 4752 instances (1188 time blocks × 4 possible actions), or 22.5% of possible cases with any actions. Furthermore, Table 10 indicates that the majority of these instances consisted of only one action in isolation, and in only two time blocks did all four occur together.

Integration of Qualitative and Quantitative Results

Action 3, problem solving, is associated with category 1 (CME) and property 1 (CSN) (Table 4). Fifteen of the fifteen CEOs used their wireless device to problem solve during 181 blocks of time. Problem solving is related to CSN as the CEO has integrated wireless mobile technologies into their personal and business environment (Table 4). The data suggests wireless mobile technologies have created interdependence between the CEO and each respective mobile device being used. The real time device has afforded each of the 15 CEOs the opportunity of technology integration, resulting in meaningful activities being performed such as problem solving.

Action 4, learning, was developed through category 1 (CME) and property 1 (CSN). Fifteen of the fifteen CEOs used their wireless device for the purpose of learning during 245 blocks of time. The practice of learning was recorded as the sixth strongest connection between actions being performed and blocks of time, where Participant 6 recorded learning the most with 25 blocks of time and the majority of the CEOs recorded learning approximately 20 times throughout the 14 days.

The data represented the action of learning as a direct relationship of category 1 (CME) and properties CSN and PRD. Learning is being performed by CEOs in real time on weekdays and weekends through the use of wireless mobile technologies. Consequently, the qualitative data represented that CEOs are culturally dependent upon wireless mobile technologies as a mechanism to reach complete immersion, integrating technology into meaningful learning activities (Table 4).

Action 15, teaching, was developed through category 3 (BL) and property 1 (GAO). Fifteen of the fifteen CEOs used their wireless device for the purpose of teaching in 45 blocks of time. The data represented the action of teaching as a direct relationship of category 3 (BL) and property 1 (GAO). Consequently, wireless mobile devices are being used by CEOs to

teach others. Wireless mobile devices enable CEOs to have real time global access to a multitude of applications which facilitate aspects of teaching (Table 4).

Action 12, sharing, was developed through category 3 (BL) and property 3 (EMVC). Fifteen of the fifteen CEOs used their wireless device for the purpose of sharing. The action of sharing was the third most common action reported by the CEOs, being represented by 37.1% across all time blocks, while using wireless mobile devices. Participant 5 recorded sharing throughout 31 blocks of time where the majority of other CEOs reported sharing at least 20 times. The data represented the action of sharing as a direct relationship of category 3 (BL) and property 3 (EMVC). Consequently, wireless mobile devices are being used by CEOs to share with others. The qualitative analysis represented that the action of physically sharing something is noted as an integral component to the framework of a CEO's life work. Additionally, the data showed that sharing is recognized as a strong component to enabling, evolving, and maintaining virtual communities of interest and practice since wireless mobile technologies are providing CEOs a virtual method to share with others and more importantly the act of sharing is being practiced real time from multiple locations.

Question 3: How and why do mobile technologies afford CEOs an opportunity to experience serendipitous events?

This research question was examined in three parts: searching for something, found something you were not looking for, and those two actions combined.

Part A: Searching for something (Action #2). This action was reported quite frequently, with 303 entries (25.5% of all time blocks or 34.0% of those with any action, Table 5). As shown in Table 11, tablets or laptops tended to be used more for this action than might have been expected, smartphone or additional devices less. In terms of individual responses, participants ranged from 12 to 30 reports of this action.

Part B: Found something you were not looking for (Action #1). Table 5 shows that this action was among the least common, with 45 reports (3.8% of all, or 5.1% of time blocks with actions). Only implementation of an idea had fewer entries. As Table 11 indicates, tablets or additional devices were used more often than smartphones when this occurred; laptops with about average frequency. Note that this is similar to the results for searching for something, which makes sense, as one is likely to find something new when searching for something else. In fact, we might have expected the two patterns of results to be even closer. Actual overlap was that of the 45 entries, 27 of those were associated with "searching for something," vs. 18 that were not. Participant reports of this ranged from 0 to 10, an unusually wide range.

Part C: Searching for something (Action #2) + Found something you were not looking for (Action #1). Table 9 shows that this combination of actions occurred 348 times, or 14.6% of all possible occurrences (19.5% of those with any actions). Table 10 indicates induced serendipity whereas 27 blocks were both actions reported at once and 294 independently. That is, $294 + (27 \times 2) = 348$.

Action 2 is associated with category 1 (CME) and property 1 (CSN). Fifteen of the fifteen CEOs searched for something during 303 blocks of time. The performed action was increased through the inducement by other actions such as creating or responding. Action 2 also acted as an inducement to other actions such as serendipity which increased its recorded frequency. Action 2, searching for something, is a deliberate action taking place by the CEOs through use of wireless mobile devices. Within this context the wireless device becomes an intermediary between the CEO and their meaningful act.

Action 1 is associated with category 2 (S), property 1 (UCRU) and property 2 (SB). Fourteen of the fifteen CEOs found something that they were not looking for during 45 occasions. The performed action induced serendipity as a situational searching process whereby the CEOs found unexpected relevance. This random circumstance becomes a component for smarter business to occur since the CEO has identified something with the potential of being leveraged. The self-observation log data showed the occurrence of spontaneous serendipity as well. Spontaneous serendipity was not acknowledged through the qualitative analysis; however the data showed acts of induced serendipity. This is supported through the qualitative analysis in Stage 1 as noted in Appendix D, example 6, the CEO was searching for tax code information and found a source to sell his payroll division. This event was unplanned and spontaneous, resulting in an unexpected event leading to additional revenues for the organization.

Question 4: How and why do CEOs practice the concepts of SKARSE through the use of their mobile devices?

This was addressed in two parts: Found something you were not looking for + searching for something + making an impact + leveraging; and Found something you were not looking for + searching for something + problem solving + learning + reviewing + making an impact + implementation of an idea + sharing + leveraging.

Part A: Found something you were not looking for (1) + searching for something (2) + making an impact (10) + leveraging (16). Table 9 shows that this combination occurred 485 times, or 10.2% of all time blocks (13.6% of those with actions). Table 10 shows five instances of a combination of three actions. However the combination of actions within a

respective time block does not indicate behavior based on SKARSE. The behavior of SKARSE is based on the individual actions and/or components within its makeup regardless of timing of when an action occurs. The more relevant quantitative number which supports this question is the individual actions which occur 485 times. Table 13 breaks combined actions down to individual devices.

Part B: Found something you were not looking for (1) + searching for something (2) + problem solving (3) + learning (4) + reviewing (8) + making an impact (10) + implementation of an idea (11) + sharing (12) + leveraging (16). As seen in Table 9, there were 1674 occurrences of one or more of these actions, or 15.7% of all possible instances (20.9% of those with any action). In Table 13, actions are broken down per individual mobile device.

Action 10, making an impact, is associated with category 2 (S) and property 2 (SB). Fourteen of the fifteen CEOs made an impact during 63 time blocks. Making an impact is a direct result of using the concept of arbitrage to leverage unforeseen circumstances to achieve better business.

Action 16, leveraging, was derived from and relates to category 2 (S) and property 2 (SB). Fifteen of the fifteen CEOs used their wireless devices to leverage something within 74 blocks of time. The performed action was enhanced while other actions were noted during the same time block. The action of leveraging is a driving force to effectively practice (SB) which in itself is leveraging or the concept arbitrage for better business.

Action 11, implementation of an idea, is associated with category 2 (S) and property 2 (SB). Fourteen of the fifteen CEOs implemented an idea during 39 time blocks. The performed action was enhanced while other actions were noted during the same time block; specifically while problem solving and responding. The implementation of an idea does not relate to (S) or property 2 (SB). The data showed that CEOs were using their device to implement an idea but it is not a component of any category or property; it is an action between process and practice.

Action 4, learning, was developed through category 1 (CME) and property 1 (CSN). Fifteen of the fifteen CEOs used their wireless device for the purpose of learning during 245 blocks of time. The practice of learning was recorded as the sixth strongest connection between actions being performed and blocks of time. The data represented the action of learning as a direct relationship of category 1 (CME), and properties CSN and PRD. Learning is being performed by CEOs in real time on weekdays and weekends through the use of wireless mobile technologies. Consequently, CEOs are culturally dependent upon wireless

mobile technologies as a mechanism to reach complete immersion, integrating technology into meaningful learning activities.

Action 8, reviewing: Fifteen of the fifteen CEOs used their wireless device for the purpose of reviewing something meaningful in 393 blocks of time. The action of reviewing was recorded as the second most common between actions being performed and blocks of time. The data represented the action of reviewing as a direct relationship of category 1 (CME), and property 2 (PRD). Reviewing meaningful information is being performed by CEOs in real time through multiple blocks of time on weekdays and weekends through the use of wireless mobile technologies. Consequently, CEOs are culturally dependent upon wireless mobile technologies as a replacement device to review meaningful information within their current environment. The real time nature of wireless mobile devices allows CEOs to be proactive within a situational context at all times.

Action 3, problem solving, is associated with category 1 (CME) and property 1 (CSN). Fifteen of the fifteen CEOs used their wireless device to problem solve during 181 blocks of time. Problem solving is related to (CSN) as the CEO has integrated wireless mobile technologies into their personal and business environment (Table 4). The data suggests wireless mobile technologies have created interdependence between the CEO and each respective mobile device being used. The real time device has afforded each of the 15 CEOs the opportunity of technology integration, resulting in meaningful activities being performed such as problem solving.

Question 5: How and why do CEOs use smartphones as a mechanism for knowledge transfer?

This was addressed as follows.

Making an impact (10) + implementation of an idea (11) + sharing (12) + connectivity (13) + teaching (15), in relation to only one device: the smartphone. Unlike the previous questions, this question asks for a comparison between actions, within only the smartphone device. That is, it asks whether smartphones are used more frequently for some actions than others. The results (Table 12) show that smartphones were used far more often for sharing (35.59%) than for any of the other actions. Connectivity was also a common use of smartphones (12.57%), but for the other three actions, smartphones were seldom used (under 5% of the time). Of course, to some extent this reflects the fact that participants simply spent more time sharing in general than on the other actions. A comparison of these results to the comparative proportions shown in Table 12 does support the predominant use of

smartphones for this action, but they also were used often for teaching and implementation compared to the others, though uncommonly for connectivity or making an impact.

Action 13: The data represented connectivity as a direct relationship of category 1 (BL) and property 1 (GAO). Fifteen of the fifteen CEOs used their wireless device for the purpose of connectivity within 140 blocks of time. Connectivity is practiced by CEOs through wireless mobile devices which are globally affording them the opportunity to connect with others. The mobile elements of wireless mobile devices become a central component of social connectivity.

Action 15, teaching: The data represented the action of teaching as a direct relationship of category 3 (BL), and property 1 (GAO). Fifteen of the fifteen CEOs used their wireless device for the purpose of teaching in 45 blocks of time. Consequently, wireless mobile device are being used by CEOs to teach others. Wireless mobile devices enable CEOs to have real time global access to a multitude of applications which facilitate aspects of teaching.

In support of the themes generated in Stage 1 as well as the actions recorded by the participants in Stage 2 an exploratory analysis was conducted to test the related themes as well as actions. These will be described below.

Summary of Research Questions

The main research question was the foundation for conducting open ended interviews and the collection of self-observation log data eliciting actions being performed. The three parts of this research design assisted the researcher in answering how and why CEOs are using mobile technologies and their perceived usefulness. Comparability of data occurred not only through the methods being used, but also through the practical application of the mobile devices and the participants themselves. This allowed the researcher to obtain in depth experience and also augment the data through the process of capturing and recording immediate data collection. The findings suggested that mobile devices are being used within a business and personal context. For example the actions of maintaining personal and business relationships were recorded across 222 time blocks or 18.7% of the time and 293 time blocks or 24.7% of the time respectively. Mobile device activities enabled the CEOs to create informal and formal learning activities, build upon their existing knowledge base and transfer information to both personal and business networks while stressing the importance of the devices to accelerate their retrieval of information and enhance decision making on an

ongoing basis. For example, the combined actions *of Problem Solving (Action #3) + Learning (Action #4) + Teaching (Action #15) + Sharing (Action #2)* was reported 802 (16.9%) times out of a possible 4752 instances (1188 time blocks × 4 possible actions), or 22.5% of possible cases with any actions.

The data also showed mobile technology immersion is a transformative process in itself whereby expectations of immediate dialogue exchange exist. Increased expectations are a direct result of the practice of using mobile devices. Enabling and providing immediate responses have become an unintended consequence of enhanced mobility, while simultaneously serving as a cultural shift of necessity resulting in increased problem solving and decision making, a flexible working environment, and universally bridging the gap between time and space. For example responding was the most recorded action by the participants. Within this context, the statistical results of the self-observation log indicated that the action of responding was recorded across 473 time blocks or 39.8% of the time. Additionally the action of sharing was recorded across 331 time blocks representing 27.9%.

The data also indicated that wireless mobile devices are culturally significant and shift towards the replacement of tangible, physical goods. For example, mobile devices are widely used for organizational tasks such as meeting requests, calendar items, travel management, email, informal and formal learning and research, among others. These examples show a present and future replacement of paper products such as physical calendars and books, letters and manpower. Replacement was recoded through the CEOs' acknowledging all 17 actions such as multitasking (9.2%), learning (20.6%), and problem solving (15.2%).

The other cultural context is the recognition that ethnicity doesn't play a role in the same way that face to face relationships are built and managed in the creation of relationships. This enables the user to create and disseminate knowledge in a more meaningful way ultimately building stronger connections with others across the globe resulting in crossing paths with additional opportunity.

The foundation of knowledge is impetus for exploring the unknown in a technological perspective resulting in people questioning their purpose of life; their need for creativity is a sense of creating something from the unknown, and their exploration of human connections.

Additional Analyses

Although the primary goal of the study was to answer the research questions, the rich data made it possible to address some other matters of secondary interest. This section presents results of analyses of some of the more interesting issues.

Satisfaction with Devices

Distribution of satisfaction across days and time blocks. Degree of satisfaction with mobile devices was expected to be a useful indicator. As a preliminary exploration of this, satisfaction with mobile devices was assessed across days of the week (Table 14 and Figure 13). Clearly, the overwhelming effect of device use was satisfaction. It may or may not be significant that there were almost no negative expressions on weekends. To see if there was a difference over the course of the workday, these values were also compared across time blocks for weekdays only (see Table 15). Although responses of satisfaction were fairly constant across time blocks, negative responses clearly peaked at the middle of the workday.

Table 14
Satisfaction with Mobile Devices (Combined) across Days of Week (N= 1188)

	Day of week							
Satisfaction	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Total
Satisfied	149	138	133	131	117	92	89	849
Balanced	2	1	1	0	0	0	1	5
Other (Add'l)	0	0	1	2	0	0	2	5
Chaotic	15	20	17	11	14	0	0	77
Bothersome	7	8	9	9	7	1	2	43
Anxiety	5	1	4	5	3	0	1	19

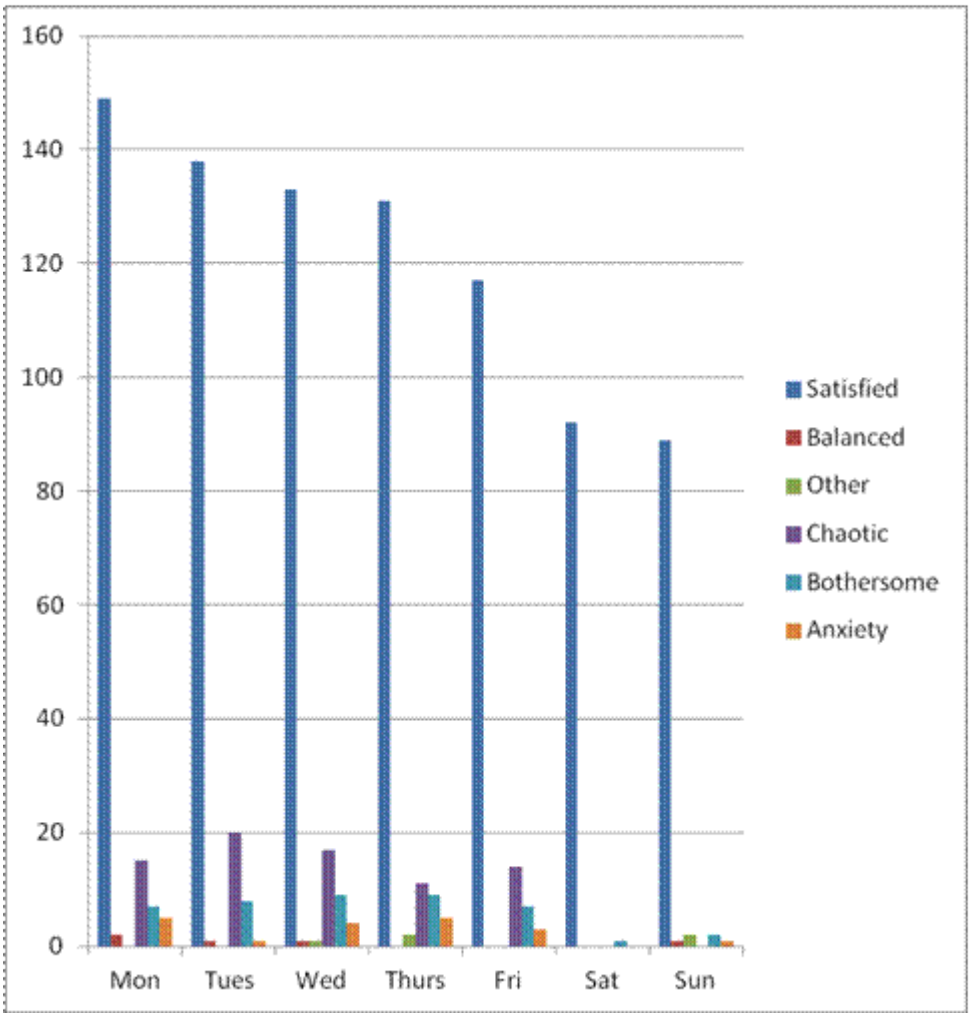

Figure 13. Satisfaction with mobile devices (combined) across days of week (*N*= 1188).

Table 15
Satisfaction with Mobile Devices (Combined) across Time Blocks (Weekdays only) (N= 852)

	Time block						
Satisfaction	Early morn	7am-10am	10am-1pm	1pm-4pm	4pm-7pm	Even-ing	Total
Satisfied	100	118	113	112	114	111	668
Balanced	1	1	0	0	1	1	4
Other (Additional)	0	1	0	0	1	1	3
Chaotic	0	12	24	22	17	2	77
Bothersome	4	12	8	7	6	3	40
Anxiety	1	2	2	6	2	5	18

Satisfaction can also be broken down by device. Table 16 shows this, along with a breakdown of use by device.

Table 16

Satisfaction and Use by Device

	Device							
	Smartphone: *N*= 708		Laptop: *N*= 61		Tablet: *N*= 221		Additional: *N*=23	
	n	%	*n*	%	*n*	%	*n*	%
Satisfaction								
Satisfied	655	92.51	51	83.61	213	96.38	22	95.65
Chaotic	77	10.88	10	16.39	4	1.81	0	0.00
Bothersome	43	6.07	6	9.84	6	2.71	0	0.00
Anxiety	17	2.40	2	3.28	3	1.36	1	4.35
Balanced	4	0.56	0	0.00	3	1.36	0	0.00
Additional	4	0.56	0	0.00	3	1.36	0	0.00
Use								
Email	300	42.37	49	80.33	71	32.13	10	43.48
Social Media	112	15.82	13	21.31	75	33.94	6	26.09
Organization	178	25.14	34	55.74	58	26.24	17	73.91
Texting	202	28.53	18	29.51	25	11.31	7	30.43
Talking	331	46.75	24	39.34	27	12.22	8	34.78
Pictures	26	3.67	3	4.92	22	9.95	0	0.00
Video								

	23	3.25	2	3.28	13	5.88	0	0.00
Recording								
	29	4.10	1	1.64	8	3.62	1	4.35
Internet								
	256	36.16	34	55.74	161	72.85	6	26.09
Additional								
	37	5.23	9	14.75	20	9.05	3	13.04

This question focuses on ratings of satisfaction across time blocks. That is: Are effects associated with smartphone use more negative when, during the same time block, the participant was using it for several uses or taking several actions?

For completeness, the question was extended so that in addition to using the negative effects, we also looked at positive effects and positive minus negative for comparison purposes. However, this did not prove useful, so results are presented in Appendix G. Note that the term "several" above can be interpreted in two ways: more than one at a time, and the actual total number of uses/actions. Therefore, the comparisons reported here will be between 1 and 2+ (dichotomous) for one set of analyses, and total number of uses/actions (continuous) for another set. Finally, for completeness, we will also look at this effect when there were multiple locations or devices used during the time block.

Table 17 shows results of dichotomous tests of this question. These are presented as not just descriptive statistics, but with inferential statistics included, although it must be noted that the statistical assumption of independence of scores was not met. Therefore, these results must be interpreted very cautiously. The analyses were performed only on time blocks that had a use of smartphone reported.

Table 17 shows means and *SD*s of the effects, which are simple sums of the number of negative (chaotic, bothersome, anxiety, or additional) effects reported within a time block. Scores on the negative scale ranged between 0 and 3; as can be seen, scores tended to be quite low, reflecting the general overall satisfaction with the device.

Table 17

Comparisons between Negative Effects and Dichotomized Uses and Tasks (and Locations and Devices)

	Single			Multiple			Differ-ence
Variable	Mean	*SD*	*N*	Mean	*SD*	*N*	*t*
Actions	0.10	0.319	136	0.22	0.494	572	3.74***
Uses	0.04	0.198	270	0.30	0.553	438	8.82***
Locations	0.18	0.454	561	0.27	0.515	147	1.79
Devices	0.17	0.442	625	0.39	0.601	83	3.09**

***p*< .01, ****p*< .001, all 2-tailed (Note: assumption of independence of scores not met).

Parallel results were also computed for the usage scores kept as continuous variables. Since both effects and usage scores were continuous, the appropriate statistic is the Pearson *r*. Negative effects correlated with multiple uses and tasks as follows: with Actions, *r*= .266, *p*< .001; with Uses, *r*= .362, *p*< .001; with Locations, *r*= .073, *ns*; with Devices, *r*= .125, *p*< .001.

The pattern of the results was very similar for the two approaches. In summary, there is strong evidence that when the respondents were engaged in multiple actions or uses, and to a lesser extent were using multiple devices, their ratings of satisfaction were more negative than when their focus was on a single action or use or device.

Connections Between Themes

Themes in actions. To stay parallel with factor analyses, actions (only) were reviewed below. Actions were derived from the themes as follows (as shown in Table 4):

Serendipity

1) Found something you were not looking for

2) Searching for something

10) Making an impact

11) Implementation of an idea

16) Leveraging

Cultural Mobility Evolution

3) Problem solving

4) Learning

5) Maintaining personal relationships

6) Maintaining business relationships

7) Responding

8) Reviewing

9) Multitasking

14) Creating

The Blueprint for Life

12) Sharing

13) Connectivity

15) Teaching

Tables 18, 19, and 20 show the intercorrelations of actions within each theme. In all three cases, there is quite a bit of variation among the intercorrelations, and although many are significant, most are not very strong. Theme scores were also generated by adding the scores (0 or 1) for each action within a theme. The correlations among these three theme scores are shown in Table 21. These show moderately high correlations, suggesting that the themes were linked.

Table 18
Intercorrelations among Actions from the Theme of Serendipity (N= 1188)

Action		1) Found something you were not looking for	2) Searching for something	10) Making an impact	11) Implementation of an idea	16) Leveraging
1) Found something you were not looking for	*r*=	—				
2) Searching for something	*r*=	.157***	—			
10) Making an impact	*r*=	-.008	.155***	—		
11) Implementation of an idea	*r*=	.038	.120***	.188***	—	
16) Leveraging	*r*=	.077**	.057*	.017	.011	—

***p*< .01, ****p*< .001, all 2-tailed (Note: assumption of independence of scores not met).

Table 19

Intercorrelations among Actions from the Theme of Cultural Mobility for Evolution (N= 1188)

Action		3) Problem solving	4) Learning	5) Maintaining personal relationships	6) Maintaining business relationships	7) Responding	8) Reviewing	9) Multitasking	14) Creating
3) Problem solving	*r*=	—							
4) Learning	*r*=	.207***	—						
5) Maintaining personal rels	*r*=	.007	.033	—					
6) Maintaining business rels	*r*=	.170***	.119***	.417***	—				
7) Responding	*r*=	.138***	.032	.214***	.408***	—			
8) Reviewing	*r*=	.145***	.278**	.067*	.104***	.119***	—		
9) Multitasking	*r*=	.174***	.054	.050	.143***	.147***	.099***	—	
14) Creating	*r*=	-.029	.004	-.050	-.073*	-.017	.196***	.016	—

*$p < .05$, **$p < .01$, ***$p < .001$, all 2-tailed (Note: assumption of independence of scores not met).

Table 20
Intercorrelations among Actions from the Theme of The Blueprint for Life (N= 1188)

Action		12) Sharing	13) Connectivity	15) Teaching
12) Sharing	*r*=	—		
13) Connectivity	*r*=	.262***	—	
15) Teaching	*r*=	.083**	.023	—

**p< .01, ***p< .001, all 2-tailed (Note: assumption of independence of scores not met).

Table 21
Correlations among Themes (N= 1188)

Theme		Serendipity	Cultural Mobility Evolution	Blueprint for Life
Serendipity	*r*=	—		
Cultural Mobility Evolution	*r*=	.275***	—	
Blueprint for Life	*r*=	.246***	.290***	—

***p< .001, 2-tailed (Note: assumption of independence of scores not met).

Factor Analysis

A principal components (PC) factor analysis was performed on the data (17 actions including "Other"), with each "case" being a single time period. The results are shown in Tables 22 and 23. Several major caveats should be noted. First, there is a lack of independence of the various scores (since the cases are not independent individuals, but rather are reports within any given time period in a day—that is, data consists of multiple reports by the same individuals and on the same day). As mentioned in the Methods chapter, data should be appropriate in other ways to ensure valid results (Fabrigar et al., 1999). First, variables should be measured on a continuous scale. Although the scales for items were technically continuous, they were very highly skewed. However, according to Jolliffee (1986), this is not an important consideration if the analysis is being used for data reduction or exploratory purposes. Second, relationships between variables should be linear. This was the case with the 17 actions used in the analysis. Third, there should be at least 5, and preferably 10, cases for each variable. Since for this analysis, "cases" were defined as each time period across all days and participants, N= 4,950, this requirement was easily met. Fourth, correlations among the variables need to be moderately high. Most intercorrelations were above r= .10, and averaged approximately r= .30. All were positive. Fifth, there should be no significant outliers. In this data, although there were many outliers, the very large number of cases should mitigate that.

Table 22 displays variance explained. This shows the degree to which factors (components) are able to explain or summarize the data. The first component accounts for only 14.5% of the variance, and the first six for only 51.5%. This suggests that the different actions are quite independent. It is common in PC to find that out of about 17 variables, the first factor accounts for over half the variance, and it only takes three or four to cover around 80%. Thus, it appears that the categories were tapping distinctive information in the reports of the various actions.

Table 23 shows the rotated component matrix. Each component (factor) is a hypothetical latent variable that is presumed to underlie the actual results obtained on the questions asked. This table shows the correlations between the six hypothetical factors across the top and the questions on the left. In this case, it cannot be said they are characteristics of individual people, but rather a combination of sets of characteristics of people at a specific 3-hour period on any given day. The goal of PC is to derive reasonable labels for the factors. This is done simply by seeing which variables load heavily on the factor, which are low, and

which negative (in this data, there were no high negative weights at all, so that can be ignored). Loadings between .400 and .600 are shown in blue, higher ones in red.

Table 22
Factor Analysis of Actions: Variance Explained (N= 1188)

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Comp-onent	Eigen-value	% of Variance	Cumu-lative %	Eigen-value	% of Variance	Cumu-lative %
1	2.46	14.49	14.49	1.94	11.42	11.42
2	1.70	9.98	24.47	1.84	10.83	22.25
3	1.26	7.41	31.88	1.37	8.04	30.29
4	1.15	6.79	38.67	1.31	7.70	37.99
5	1.15	6.74	45.41	1.23	7.25	45.24
6	1.03	6.05	51.46	1.06	6.22	51.46

Table 23
Factor Analysis of Actions: Rotated Component Matrix (N= 1188)

	Component					
Action	1	2	3	4	5	6
Learning	.779	.031	.099	.007	-.118	.036
Searching for something	.752	-.064	.022	.016	.053	.178
Reviewing	.474	.161	.104	.071	.342	-.107
Sharing	.435	.389	-.153	.280	.230	-.015
Maintaining business rels	.072	.767	.226	-.072	-.094	-.037
Maintaining personal rels	.030	.722	-.123	-.008	-.038	-.083
Responding	-.053	.656	.247	.001	.053	.197
Multitasking	-.065	.176	.566	.188	.088	.031
Problem solving	.254	.104	.556	.137	-.200	-.011
Implementation of an idea	.060	-.045	.507	-.102	.488	.021
Making an impact	.365	-.045	.411	-.193	.062	-.299
Leveraging	.007	-.092	.057	.668	.018	.057
Other or write in box	-.008	-.018	.219	.608	-.086	.074
Connectivity	.229	.161	-.250	.527	.177	-.266
Creating	.021	-.066	-.048	.032	.838	.022
Found something not looking for	.199	-.014	.034	.083	.032	.860
Teaching	.222	-.184	.147	.133	.017	-.234

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 11 iterations.

Components were named as follows by a person with considerable experience in factor analysis. Of course, such labels are subjective and might not match those of another

person. The names and descriptions are followed by some examples of typical actions from the Stage 1 qualitative interview data.

Component 1: High weights on Actions 4 (learning) and 2 (searching for something), fairly high on Actions 8 (reviewing) and 12 (sharing). Low on actions such as creating, leveraging, etc. So one might call this "Absorbing information." There is a relatively passive tone to these actions. In Example 1, the participant was simply searching for an answer to a tax code question. While this was somewhat active in that it was in the service of a client, it led to a radically different outcome than might have been expected (the sale of his payroll division). Perhaps more closely related to this component are the actions reported in Example 8. Here, the CEO described his practice of idly browsing the internet and forwarding items that might be of interest to a colleague or friend.

Component 2: High on 6 (maintaining business relationships), 5 (maintaining personal relationships), and 7 (responding). Clearly this component is "Relationships." The high weight on 7 fits nicely with the other two, since few things are more important to establishing and maintaining personal relationships than getting back to people quickly (that is, within the same 3-hour period). A large fraction of the interview reports involved relationships. In Example 2, for instance, the CEO noticed a local fund-raiser and contacted the organizer, who asked for volunteers. The participant arranged for 40 of his employees to assist, which established a number of good connections with people at other institutions. Similarly, in Example 3, the participant described making a generous offer to a benefit event and having it develop into free advertising. As noted above, the CEO in Example 8 frequently forwarded internet items to others, and explicitly noted that this practice builds business relationships. However, portable communication devices do not always improve relationships, as illustrated in Example 7, in which the CEO's vacation was interrupted by an unexpected email.

Component 3: High on 9 (multitasking), 3 (problem solving), 11 (implementation of an idea), and 10 (making an impact). One might call this something like "Taking action." It seems almost the inverse of Component 1, which was passive. It would not be surprising if it turned out that high emphasis on Component 1 is followed a few hours later by high emphasis on Component 3. Not surprisingly, taking action was a frequent activity of the CEOs. This is shown in Example 1, in which a chance bit of information led to a participant's selling a division of his company. Less dramatically, the CEO in Example 5 discovered a technology he was not previously aware of, and adopted for it his own products.

Component 4: High on 16 (leveraging), 17 (other or write in box), and 13 (connectivity). These seem to be rather obscure. It is unclear why these three should be related.

Component 5: Almost purely Action 14, (creating). It is unclear why creating should be so distinct from other actions. Many of the participants described a creative use of information obtained via their smart phones. A good illustration of this was Example 4, in which the CEO became aware of a gap in the hauling industry and filled it with an entirely new service, leading to franchises in 12 locations.

Component 6: Almost pure Action 1, (found something you were not looking for), or serendipity. Here the above question applies even more strongly. One might have expected serendipity to be associated with certain other actions, but it is not. (Notably, it is not associated highly with 2, searching for something, 10, making an impact, 11, implementation of an idea, or 16, leveraging, which were grouped along with found something you were not looking for under the theme of Serendipity.) Perhaps the point of serendipity is that it is NOT particularly associated with anything else; it occurs unpredictably. Many of the interview statements included serendipity. For instance, Example 1 describes the CEO happening upon a broker engaged in company sales, and realizing that he could spin off an underperforming division of his company. Example 2 relates a rather extended case, in which a search for a grilling recipe led to a local restaurant, which led to a fund-raising event, which led to "great publicity" and new business relationships.

CHAPTER 5 DISCUSSION

As noted in chapter 3, research projects are not always linear but instead sometimes lead in unforeseen directions; purposes can change over time (Newman et al., 2003). This study shifted considerably over the six years in which it unfolded. Thus, there is not as clear a connection between the original goals and ultimate conclusions as is usual in a narrower piece of research. Nonetheless, in retrospect it can be seen that it did in fact progress from a general exploration of how CEOs use mobile devices, to a consideration of if and how they incorporated the principles of SKARSE into their personal knowledge management, to quantitative data on their use of the devices. This culminated in the six factors summarizing the data. Therefore, the end product of the research, the six factors, is essentially a model of how CEOs use mobile devices in knowledge management.

The results of this study fall into three main categories. These are: The effects of mobile devices on (a) the individual CEO, (b) interpersonal relationships, and (c) culture. Effects on individual CEOs can be further broken down into changes in practice, new methods for learning, and drawbacks. Effects on interpersonal relationships include providing a blueprint for life and the implementation of interpersonal practices. Effects of mobile devices on the cultures of CEOs and the society at large include a number of topics, such as a change in the definition of knowledge resources, the rise of expectations of immediate response time and accessibility, and the use of mobile technology as replacement devices and portable offices. This chapter will conclude with brief sections on implications and recommendations.

Effects on Individual CEOs

Changes in Practice

CEOs are intuitively and naturally using mobile devices for a variety of actions including online banking, but the data from this study also verified that CEOs are using mobile devices to perform an array of other actions and have also integrated mobile devices across varied locations and throughout multiple blocks of time.

Mobile devices make CEOs knowledge workers. The results from the study represented the CEO as an integral component of the knowledge management process, that is, a knowledge worker. Through numerous research studies, Peter Drucker developed the term knowledge worker, describing the term and its significance from an organization's line-level

or lower- to mid-level employee. Drucker held that "Every knowledge worker in a modern organization is an executive if by virtue of his position or knowledge, he is responsible for a contribution that materially affects the capacity of the organization to perform and obtain results" (Drucker, 2001, p. 194). This study expanded the definition of the knowledge worker to also include upper level management, specifically CEOs. Within this context, knowledge workers are individuals who have valuable, intangible, internal assets comprised of interconnected experience, productivity, and an inherent desire to share (Drucker, 2001).

The CEO's desire and willingness to practice and implement knowledge and related activities makes them knowledge workers. Their willingness to engage with knowledge, combined with their hierarchical position of management within organizations, makes them higher order executive knowledge workers. Mobile devices and the technology embedded within them, such as social software and the internet, augment these activities. The results of this study extend the literature and add to Drucker's conception of the knowledge worker, thus contributing to this paradigm shift, by identifying CEOs who use mobile devices regularly as executive or higher order knowledge workers.

As knowledge workers, CEOs are managing and integrating personal knowledge-related activities as well as supporting and leading knowledge management from the meta point of view. The CEO is pulling individual knowledge up through the organization while pushing it down the organization at the same time. The results indicated that CEOs are integrating their mobile device into everyday communication activities including both business and family. Mobile devices are being used in a continuous manner whereby actions are performed with fractional limitations of time or geography. The CEOs are personally seeking information and problem solving while simultaneously integrating learning outcomes into the organization through line level employee connections (bottom up) as well as through executive level employees (top down) therefore practicing the push-pull method. Consequently, this process is practiced continuously throughout the organization since the CEO is personally practicing strategic knowledge initiatives in both a formal and informal way, creating an alliance with the organization's knowledge workers.

The study showed that CEOs are using mobile devices as tools for their individualized actions, whereby the mobile device is a vehicle to effectively manage both individual and organizational information and knowledge. In this study, the mobile device was a tool used by CEOs to perform various actions. For example, CEOs in the study are seeking information and knowledge by the action of searching for something. CEOs are also performing the actions of responding and sharing. These individualized actions are small examples of actions

and combined actions the data indicated the CEOs were practicing. The combination of actions and reflection also resulted in learning.

It should be emphasized that while CEOs are knowledge workers, they perform knowledge related tasks at an executive level. Thus they are referred to here as executive or higher order knowledge workers. This implication was noted from the CEOs' actions in performing various knowledge related functions using mobile devices. Being a CEO or in a position of authority allows one to not only create new policies, procedures, or initiatives supporting knowledge and learning but also to be in an authoritative position where the implementation can be pulled up or pushed down throughout the organization without the approval of others.

CEOs of small to mid-sized organizations hold this position as executive knowledge workers because they are actively engaged in all aspects of the organization, since they embody the organization and are directly accessed rather than insulated by others or by slower communications. This enables the CEO to practice the push-pull model with any strategic initiative, such as the management of knowledge or any action within the composition of knowledge. Being the primary decision maker, the CEO has the ability to make the final decision as well as suffer any intended or unintended consequences which result from the decision. The data from this study showed that the decision making process was connected to measures of self-development or activities which support enhancements in learning and knowledge.

Thus it is clear that the main research question, "*How and why do CEOs use wireless mobile communication devices and what is their perceived usefulness?"* has been answered by this study, at least for the CEOs studied here, and the answer is complex. This complexity is illustrated by the principal components factor analysis. Unusually for such analyses, the CEOs' actions did not load mainly on one or two components, but rather could only be encompassed by all six. Furthermore, with the exception of Component 4, the factors were unusually distinct and clear.

Component 1, labeled "absorbing information," is clearly a necessary characteristic of a knowledge worker. The fact that the second component was "relationships" shows that, unlike lower-level knowledge workers, a CEO must deal constantly with interpersonal relationships. Again, due to being top-level knowledge workers, CEOs cannot simply pass on knowledge to others, but are ultimately responsible for all the company's dealings, thus the importance of Component 3, "taking action." Finally, Components 5 and 6, "creating" and "serendipity," are not particularly distinctive of top-level workers, but could be general

characteristics of knowledge workers. It might be predicted that if the study were repeated with mid-level knowledge workers, an analysis of their actions would emphasize Components 1, 4, and 5, with little loading on Components 2 and 3. Also, as with SKARSE, the factors that define the CEOs' actions are not merely a catalogue of skills, but must be integrated for full effectiveness.

Mobile Devices Provide New Methods for Learning

As noted in the Introduction chapter, learning is a circular or spiral process, in which meaning is constructed by integrating new information with prior knowledge. According to learning theorists (e.g., Nonaka, 1991; Polanyi, 1966), sometimes the prior knowledge is tacit, and receiving more information makes this explicit. This process is experienced as realization (literally, making something real). Interestingly, however, this concept ("realized," "recognized," "it came to me," etc.) was not expressed at all by the participants in either the pilot study or Stage 1. It is unclear why this might have been so. It might be speculated that, as higher order knowledge workers, constantly communicating with others, the CEOs have long since made most of their tacit knowledge explicit. That is, there may be very little that they know, but don't know that they know.

Nonetheless, the results of the study indicated that CEOS are unknowingly practicing various components of knowledge management from both a personal and organizational perspective. For example, knowledge transfer was prevalent among the participants in the study. Knowledge transfer occurred when a CEO used the mobile device to record a safety hazard and this knowledge was immediately sent to a key decision maker within their organization. This action resulted in an immediate solution which shut down the construction site until further investigation could be conducted. Additionally, the data presented other examples of components of Knowledge Management which were recorded by the CEOs in the study, which can be found in Appendix D. Mobile devices affected CEOs in a number of ways.

Cognition and intellect. Mobile devices bring a cognitive change in learning and knowledge management. This change consists of moving from intuitiveness to awareness in actions which augment or enhance learning and knowledge. Users can identify, refine, and repeat their actions. This study has recognized mobile technologies as a tool for CEOs.

Reflection and learning. Mobile technologies afforded the CEO a tool to not only perform the action of learning in a literal sense but also perform additional actions which are components of learning. This is evident in both the qualitative and quantitative data, whereby

during the interviews the participants indicated that they were using their mobile devices in an attempt to seek information, problem solve, and respond to both personal and business connections. Information derived from the interviews was supported by the self-observation logs in Stage 2, which represented that the CEOs were searching for something 25.5% of the time, responding 39.8% of the time, and recorded the action of learning 20% of the time. Technically, the data has indicated that collectively CEOs are learning 20% of the time, but the other actions presented such as responding and searching for something are both actions which can be used as part of the learning process, therefore increasing the percentage of time CEOs are using mobile devices for components or activities which support the learning process. Various activities or actions of learning were also acknowledged by the CEOs during the interviews where they described the relationship between formal and informal learning and their mobile device as an integrated reflective process. The device was used to seek information and the CEO used their prior knowledge to evaluate the discovered information through a continuous reflective process. These results support the conclusion by Clough (2007), who found that an individual learns by the use of action and reflecting on that action.

Adaptations of learning with mobile devices. Within the context of mobile devices, the literature indicated that learning is immediate, real time. Qualitative and quantitative data from this study found that the action or adaptation of learning is based on the portability and unlimited access to the internet of the devices, changing the way people use mobile devices. This is supported by Kim (2008) and Liang et al. (2007), whose research concluded that the evolution of mobile devices has made such devices more cost friendly to users, designed to be light weight and more portable, and the technology supports emerging software applications. These examples of technological innovation create an opportunity for increased users, portability, and interactive functionality to conduct business, communicate, and learn.

Advancing the literature with individualized actions of learning. The literature supports the action of learning as a link to knowledge, as presented by Clough (2007), whose study found that technology is a link or mechanism to create or construct knowledge. The current study supports Clough's results but advances the literature, in that the CEOs were not only recording the individualized action of learning but were also recording sub-actions of learning such as responding and searching for something. Additional actions of the learning process such as teaching and problem solving are presented below.

Learning through problem solving. The CEOs in this study leveraged their mobile devices to problem solve without geographical barriers. The ability to be mobile yet connected enabled the CEOs to use their devices frequently, removing physical boundaries

such as wires and cords to communication and information seeking. Having mobility and connectedness resulted in an acceleration of information retrieval, while expediting their decision-making process and affording the CEO an opportunity to problem solve. Affordances have propelled mobile devices to become what are referred to here as advanced replacement devices. The development of this study created an opportunity for added language in the area of knowledge management research. The term "advanced replacement device" adds to the definition and application of mobile devices. This term is described as the replacement of physical objects such as books, music, dictation, calendars, videos, maps, etc., which have been historically used to seek new information and learn using a physical or tangible object. Today, integrated software applications embedded within mobile devices perform such activities. In addition to physical objects, services such as banking, in-house libraries, appointment secretaries, travel agencies, etc. are incorporated into the ongoing process or technological development of mobile devices. Mobile devices as hardware and embedded applications are affording CEOs the opportunity to obtain the same content through electronic means, without geographical barriers and in real time. The data indicated that advanced replacement devices have increased the CEO's ability to acquire knowledge, efficiently exchange information, and learn.

Serendipity as an enhancement tool. In certain circumstances serendipity played a large role in the decision making process, as CEOs used their current knowledge to reinforce their existing knowledge or seek information as a building block for new knowledge. This is referred to by Schneckenberg (2009) as internal connections or linking knowledge in order to construct new knowledge. Steve Jobs referred to this as, "you can't connect the dots looking forward; you can only connect them looking backwards. So you have to trust that the dots will somehow connect in your future." (Jobs, 2005, para. 9). The process of personally managing their individual knowledge related activities through their mobile devices created a serendipitous experience, whereby the CEO found something they were not looking for. This experience was the impetus for collecting information which translated to new knowledge, consequently creating a cycle for individual and organizational learning. It is acknowledged that a serendipitous moment or event can occur under many circumstances; for example, through technology, a conversation, a walk, reading a book, etc. However, this study focused specifically on serendipity within the context of mobile devices. By using the mobile device, the CEOs recorded haphazard actions of serendipity and in many cases it stimulated the entrepreneurial process. For example, the study recorded serendipity in both qualitative and quantitative aspects. During the interview process one of the CEOs discussed a serendipitous

event which diversified their business activities to include a transport division (Example 4 above). Such outcomes of serendipity are explained by knowledge researchers in many ways. For example, Silver (1985) described entrepreneurship as a series of collisions, in which one may end up in a different business.

The opportunity of serendipity created a learning moment for the CEO as a springboard for additional knowledge. The process of managing knowledge through serendipitous moments is supported by Dew (2009), who found that serendipitous experiences build upon previous knowledge and can create an opportunity to enrich the management of knowledge through new information. This study built upon Dew's premise by recording actions of learning by CEOs which included searching for something and finding something unexpected or performing other actions of mobile device usage in their everyday experiences. These are specific steps for learning, changing, and managing knowledge as they are actively engaged in using the respective mobile devices. The CEO's personal management of knowledge also included the action of implementing something which was connected to the action of serendipity. The implementation of an idea was an intuitive process by the CEOs. This intuitive ability included leveraging unforeseen circumstances or unknowingly using the concept of arbitrage to achieve the benefits of serendipitous moments. The combination of both concepts of serendipity and arbitrage transformed the CEO's capacity for learning.

The process of serendipity and connected actions. The action of serendipity was connected to other deliberate actions though a variety of circumstances. For example, several CEOs were traveling and used their mobile device to problem solve. While researching the problem, the CEOs stumbled upon something unexpected. One situation occurred where a CEO was researching tax law and in the process discovered compelling information regarding bookkeeping services (Example 1 above). While reviewing this newly discovered information the CEO made a decision to sell the organization's bookkeeping service division.

In many cases the data that was found was stronger than anticipated. For example, the action of finding something unexpected was connected to other performed actions. The combination of such actions resulted in induced serendipity. The concept of induced serendipity goes beyond that of Koen et al. (2001), who believed serendipity is a passive process, whereas the current writer designates it as an unplanned active process. Serendipity as an unplanned, active process was supported statistically through the self-observation log which showed intercorrelations between the qualitative theme of serendipity and the CEO actively performing mobile device actions such as searching for something, making an

impact, implementation of an idea, and leveraging. The underpinnings of serendipity also include the process of collection or the reconnection of connected actions. The qualitative data also indicated that having a serendipitous experience, whether or not induced, resulted in a stronger decision making process. Serendipity also had an impact on the CEO's creativity, innovation, and productivity. These findings are consistent with knowledge management literature which states that a well-organized knowledge management system enhances aspects of creativity and innovation (Ring et al., 2002).

Driving knowledge in a mobile, continuous, and interactive way was deemed an intellectual process, which included discovering something unexpected or serendipitous while also being potentially relevant. Through this multifaceted knowledge driven process it was determined that mobile devices augment the presence of serendipity, whereby the device is not a detraction to the discovery nor a vehicle for acceleration. The approach needs the elements of humanity and intellect as well as technology. The CEO intuitively applies intellect in an attempt to perform various actions and mobile devices are facilitators of such actions, capturing and recording both spontaneous serendipity and induced serendipity, where the mobile device user is creating the conditions through performing intended actions in which serendipity is likely to occur. These conditions include both technology and a mind-set, being open to ideas beyond the immediate task. The essence of spontaneous serendipity is being accidental or unsystematic; while this research also captured and recorded induced serendipity as several connected actions performed independently or simultaneously. These connected actions occurred when searching with a purpose and finding unexpected outcomes. This implication of the study acknowledges both spontaneous serendipity and induced serendipity and that such processes of serendipity should represent a circular progression where the object changes: subconsciously seeking, identifying, refining, looking, relooking, and harvesting new findings of relevance which were not intended from an original search.

Performed actions of serendipity and arbitrage were referred to by Carayannis (2008) as strategic knowledge arbitrage and serendipity, or SKARSE. Thus, another implication of this study is that CEOs are participating in knowledge management processes through performed actions of SKARSE, using mobile devices as facilitators of individual and combined actions. Recorded actions included searching for something, leveraging, finding something which was not intended, and implementing. These behaviors provide new opportunities for learning, managing knowledge, and entrepreneurship. The individual and combined actions are the impetus for change, which could be a byproduct of SKARSE.

Conceptually, the principles of SKARSE were anticipated by Rahmandad (2008) as exploring the unknown, the creation of new ideas and reinventing learning experiences. In addition to serendipity and arbitrage, the data indicated action and combined actions of leveraging, implementation, and creating are also part of SKARSE within the context of CEOs and mobile devices. Mobile devices were used in a social context by the CEOs to creatively leverage information, implement the information, and create learning opportunities. Thus, the present study has demonstrated that the principles of SKARSE apply to the individual, as well as to the organization.

When the CEOs in the study explained their process of information retrieval using their mobile devices they also expanded their interpretation of the information and learning process. This was described as a connection to learning once the acquired information was applied to changes of circumstance. When a connection was formed, the CEOs experienced an accelerated learning process by leveraging unforeseen circumstances or the application of the practice of arbitrage. Carayannis (2008) had supported this connection through his research by acknowledging that serendipity and arbitrage are interconnected actions of learning and identified as "happy accidents in learning," leading to improved organization performance.

In Example 5 above, a CEO's exploration of information on RF technology for use in inventory control led him to realize that it could be used in an innovative way. Specifically, the company implemented the first use of RF technology by the wine industry in the US. The CEO further explained that their mobile device afforded him the opportunity to enhance his organization's customer experience by enabling current and potential buyers to use their individual mobile devices as a scanner placed at the top of the wine bottle. When the mobile device is placed over the aluminum insert on the top of the cork, RF technologies sync with the user's device and display information relevant to their specific wines. Some of the content includes winemakers' notes, food and dessert pairing suggestions, industry wine ratings, and other interesting information.

This example of RF technology, known as a V-cap, arose through a journey of discovery, learning, and implementation, becoming the impetus for creativity, innovation, and entrepreneurship within the wine industry. Aspects of this example represent various actions the CEO intuitively practiced in the context of personal knowledge management, including the actions and processes of SKARSE at both the individual and organizational levels. Several of these actions included searching for something, found something you were not looking for, sharing, reviewing, making an impact, leveraging, learning, and problem

solving in an intuitive way, as the CEO was introduced to a new approach which proactively solved an unrecognized problem. SKARSE practiced at the individual level by the CEO became a spiral process throughout the organization through a collaborative and innovative process, thereby contributing to organizational knowledge and internal knowledge management initiatives at the corporate level. The combined actions of this example, or SKARSE as an individual and organizational improvement mechanism, is directly applicable to the literature through research conducted by Pentland et al. (2011), who found when people focus on how to exploit newly discovered clusters of knowledge they are increasing their chances of success factors occurring. These success factors could be directly or indirectly related to intra-organizational initiatives such as knowledge acquisition or transfer activities, or to creating items of action inter-organizationally such as finding appropriate growth initiatives or the proper person to implement strategic opportunities.

As explained throughout the current study, mobile devices afforded the CEOs the opportunity to encounter serendipitous events and acquire new unintended knowledge through a multistage approach which included:

- New acquisition of information, key learnings and knowledge.
    - Intended or unintended.
- Intuitively identifying and pulling fragments of knowledge from their existing base of knowledge.
- Through an intellectual process, applying their existing base of knowledge to new discoveries thereby combining all learning and knowledge assets.

This multistage approach of combining and pooling actions of knowledge and learning was explained and recorded as a continuous, reflective, and evaluative approach to the learning cycle. The output of knowledge also transformed into an innovative process in an attempt to better themselves and the organizations they represent, and in some cases transforming the lives of others. Transformative learning is supported by Foster and Ford (2003), who specified how individuals who are willing to learn look at events or happenings with a new vision through multiple lenses.

Acceleration and interconnectedness through actions. CEOs should recognize that there are many compounded actions, which can induce other actions. The terms compounded, induced, and interconnected are used since actions were performed by CEOs in a way similar to using Legos in an effort to build or construct an end product or structure. Actions and Legos can be explained in a similar fashion. An individualized action is performed as a component to the larger vision. For example, the action of searching is connected to finding

something you are not looking for, and both actions combined can be a link or support system to the action of responding. This example of compounding or building and interconnectedness is similar to the individualized action of a single Lego block. The single Lego is a component or action of the larger project, vision, or end result. The single Lego in itself doesn't fully support the end result. It takes the interconnectedness of several Legos and one Lego compounding on top of the other to construct and complete the framework to completion. For example, a participant in the pilot study was deciding on a gift of liqueur for a colleague. "While I was looking for the gift …I saw several liqueurs and variations of other drinks which had different types of flavors [including] an absinthe drink…. I also saw a cinnamon drink that had gold flakes inside once the bottle was shaken. This struck an idea. I thought it would be a good idea to infuse tapioca balls within an absinthe liqueur."

To take the metaphor a bit further, CEOs may be developing several structures in parallel—a new block might be wrong for one structure, but the CEO may see that it would be a good fit in another; two structures that might seem unrelated could, when seen in the same light, prove to fit together. Conversely, two elements presumed to be united could be seen as separable and more useful attached to other structures. An example of this was seen in the case of one participant in the pilot study (Example 1), who stumbled upon a broker who could sell the company's bookkeeping department. They went on to say "As a management team it was decided that our bookkeeping department and activities associated with it was a distraction to our core business activities."

Drawbacks of Using Mobile Devices

Although mobile technologies afford CEOs the opportunity to manage actions of knowledge and learning, individual social struggles have been reported as an unintended consequence of transformation and mobile technology integration. As one participant in Stage 1 stated, "I am able to manage my life differently by having the ability to stay in touch. Sometimes it creates more balance in my life and sometimes it makes things more hectic." Social struggles were explained by the CEOs as inefficiencies and unproductive uses of mobile devices. Specifically, mobile devices can evolve into controlling devices. It was noted that the CEO's time and energy was controlled by the device, thereby creating a distraction and in some cases developing emotional anxiety. Additionally, mobile devices have become interrupters during the communication process of others, impeding socialization. As reported in Example 6, one CEO found himself unable to resist the awareness that he was receiving emails, even though it disrupted the work he was doing. As indicated by the data,

the social struggles of mobile device technology can affect the CEO's wellbeing through physical anxiety and a potential imbalance of life.

There has been a change also in how people position written correspondence with others which can either increase the speed of the written message or damage the intended message. For example, a CEO may use the subject line to write the entire message so the receiver is able to quickly view what is being communicated. Having this approach does deliver the complete message in an efficient manner since the receiver doesn't have to open the email to view the dialogue. The unintended consequence is the message could have abbreviated words, lack of context or have various symbols such as question marks or capital letters used where the sender of the message was trying to gain the receiver's attention and the receiver is reviewing the message thinking the sender is yelling at them by using capital letters or exclamation points. Other issues that were raised during the study included the inherent desire to continuously review the device in an attempt to see if there is a message to respond to. Response time also raised the issue of having to perform additional actions such as problem solving or reviewing items in real time in an effort to respond quickly. These actions can disrupt other competing priorities, whereby other important items are disrupted or not completely addressed.

This research shows how mobile communication devices and smartphones can incur opportunity costs through social struggles by causing physical and emotional distress, distraction, and disruption of the otherwise regular and natural flows of daily business and CEOs' personal lives. It was reported in the research that people suffered from physical ailments and anxiety due to the use of mobile communication devices. This implies the possibility of a negative impact on their well-being. Unless carefully managed and controlled, various mobile technologies and the smartphone technology can negatively impact the balance in one's life. On the more optimistic side, emerging mobile technologies or the smartphone may simply help liberate and unleash the creative genius of individuals and teams by enabling a virtual "omni-presence" and collaborative innovation commons. This property implies that users need interludes by silencing the device from time to time in order to focus and enjoy their surroundings with themselves, family, and friends.

Interpersonal Relationships

A second major set of findings from this study is concerned with social or interpersonal relationships. On the first page of chapter 1 it was noted that business and society have become globally connected. This was frequently expressed by participants in

reference to using their mobile devices, for example: “I am always able to be attached to my clients, partners, and office staff.” The effects of mobile devices on interpersonal relationships can be found in two categories: the blueprint for life and implementation of interpersonal practices.

The Blueprint for Life

Constructs of intellect, integrated with mobile devices, become the CEO’s blueprint for life, representing the architecture of personal and organizational knowledge management. As a CEO in Stage 1 noted, “I have complete immersion between my business and personal life. I use my devices for everything.” The blueprint for life is a platform for knowledge and learning through the application and integration of mobile devices. This framework creates a balance for life’s work affording opportunity and creating connections with others on a global spectrum. Thus the concept of the blueprint for life falls at the boundary between individual actions and social interactions. Connections, integration, access, and being global are actions of structural transformation. Several examples were evident in the study which support the blueprint for life. While traveling extensively, one CEO used their mobile devices to quickly obtain information and participated in a crowd funding project, investing individual monies to be a contributor to and promote entrepreneurship initiatives in a third world company.

Creating new opportunities by quickly obtaining information and connecting to others through mobile devices is supported by Hemp (2009), who explained how the expediency of information helps business executives become more effective leaders. Another example was experienced through the portable nature of mobile devices. With a multi-location approach, several CEOs used their mobile devices as a tool for multitasking in an attempt to transfer knowledge, seek information, and simultaneously communicate with figures in the community as well as employees and family. The premise of portability and unlimited access to the internet is supported by Giles (2010), Ibarra and Hunter (2007), and Liaw et al. (2010), who found that mobile devices change behavior through forms of communication such as online networks, portable access to the internet, mobile links to relationships, rapid response time, and boundless connectedness.

Implementation of Interpersonal Practices

The literature review in chapter 2 described a number of principles of learning and good business practice that are facilitated by the use of mobile devices.

Collective learning and face-to-face interactions. As described earlier, collective learning is considered important by learning theorists (e.g., Prahalad & Hamel, 1990), and knowledge is constructed in a social context (e.g., Papert, 1993). As shown in Stage 2 of the current study, a great deal of learning was conducted while using the mobile device to communicate with others. Although traditionally, it has been assumed that collective learning takes place mainly in face-to-face situations, the results show that this need not be the case. As noted in the literature review, emerging technologies such as email have resulted in an evolution from face-to-face communication to remote communication. This may have drawbacks; as a Stage 1 participant stated, "Nonverbal context is eighty to ninety percent of how we communicate." On the other hand, as another CEO argued, "Being mobile and still completing these important tasks allow me to build a stronger bond between all the people I need to constantly interact with and myself." These somewhat contradictory statements can be resolved if we assume that any single remote communication may be less informative, but instant communication may allow a much higher volume and frequency of such contacts, thus being more productive overall.

Accessibility to knowledge traders and learning by hiring. One participant in the pilot study recalled "a client who had a possible taxable solution on a settlement they were going to receive through mediation. I wasn't very familiar with her situation so I contacted several law firms to discuss the issue." Although a mobile device was not essential for this knowledge trading, the ease of identifying several appropriate law firms and contacting them immediately was made simpler by having the necessary information all in a single device.

The CEO who was inspired to sell the company's bookkeeping business went on to say, "After the sale of the division we then leveraged the funds by purchasing core accounting practice business such as audits and reviewed level financial statements. We purchased several small firms and retained the accountants as senior level accounting managers." Thus, rather than having to train new managers, the CEO simply obtained the necessary knowledge by hiring those with the appropriate skills.

Knowledge and learning hubs. The review of literature on the importance of knowledge in business noted that knowledge diffusion can be greatly facilitated by the establishment of knowledge and learning hubs. There were some examples in the results of how the use of remote devices can facilitate such hubs. One Stage 1 participant described a discussion board designed by his company. It is "a live feed board which allows employees to pose questions, obtain information, post ideas, strategies and solutions. It acts similar to a think tank since our crucial partners also have access to it."

Mobile Devices and Culture

Finally, many findings of the study can be categorized as cultural, including both the culture of CEOs and society at large. The data indicated that CEOs are practicing knowledge related activities within a cultural context through the affordances of mobile devices. Wiig (2004) supported a link to culture within the context of knowledge and explained that the appraisal and dissemination of culture have a direct impact on a person's ability to construct or manage knowledge. The current study reported many examples, some small and others amounting to a paradigm shift, of how the widespread use of mobile technology has affected the culture.

Paradigm shift. One dimension in the context of culture is experiencing a paradigm shift as explained by Kuhn (1970). In this context, the scientific revolution of a paradigm shift recognizes the viewpoint of culture including shifting from what is perceived as normalcy and acceptance of new actions that are directly related to new ideas. Consequently, a shift is occurring when an individual or group of individuals change their thinking process, values, and beliefs to embrace a new system, thereby equating it to a paradigm shift. For example, West Coast International Bank (WCIB) might change their current business model, which could include charging an account fee to all current and potential banking customers, to strategically offering no fee checking accounts to individuals of ages 18 to 25. This change is not a paradigm shift but a new strategic approach for organic sales growth. However, a paradigm shift occurred in the banking industry when WCIB as a company decided to devote resources to create an online banking platform. Creating an infrastructure and direction to consumers became a change in the basic set of assumptions, values and beliefs about the way banking customers conduct their banking transactions. Therefore, this became a paradigm shift in the banking industry. Other banking institutions followed, which created more awareness and acceptance towards conducting banking transactions via the internet.

The examples described in this section support how society can view culture and the mobility of culture which is constantly evolving. Another example is how online banking has evolved from a process with many boundaries, including the historical use of PCs which needed a physical Ethernet cable to access the online banking platform to the acceptance of mobile devices to perform the same actions but in a boundless environment.

The definition of knowledge resources. It was noted in the introduction that, according to Leiponen and Helfat (2010), organizations that have more extensive and thorough knowledge resources create more opportunities for learning to occur. While this is no doubt

still true, the evidence of the present study suggests that "resources" are now less likely to be accumulated explicit knowledge and more likely to be individual skills in locating knowledge and communicating it to others. Thus, a company that relies on its extensive in-house accumulation of experience may find itself overtaken by a firm that lacks such knowledge but knows where to find it.

Immediate response time is an expectation of conducting business. This study discovered that the action of response time is directly related to the cultural shift mobile technologies have created in relation to CEOs of small to mid-sized organizations. Culturally, CEOs are being called to task from a position of complacency to immediacy in relation to response time. Being called to task is one of many components of the cultural evolution of mobile devices. Through cultural expectations, CEOs are now faced with having to conform to heightened expectations of business and personal relations. For example, the self-observation logs in Stage 2 recorded that CEOs are responding across all time blocks and locations 39.8% of the time.

These heightened expectations have forced CEOs to discover new ways to seek information, problem solve, teach, and learn through the use of their mobile devices, resulting in the evolution of the knowledge worker, whereby CEOs of small to mid-sized organizations have become higher order, executive knowledge workers by leveraging mobile devices for the purpose of managing knowledge. These findings are supported by Clough (2007), whose research found that individuals need to continuously find new approaches to managing knowledge.

Stage 2 of this study also confirms and quantifies what is well known anecdotally—modern CEOs are always at work, lines between private and public life are blurred, and the distinction between the CEO and their company has also become less clear. (The most familiar example of this is the US President, who works and lives in the same building, whose personal life is inextricably associated with his public life, and who is the personal embodiment of his administration.)

Heightened expectations of others. The current study found that CEOs are not only personally using their mobile devices to perform individualized actions but are also expecting their subordinates to use the devices as everyday tools. The CEOs have noted the widespread use of mobile devices among managers and subordinates in the business community and the heightened expectations surrounding perceived responsiveness. Mobile devices have become a cultural movement or are at least culturally accepted. This acceptance has evolved from a tolerance based mobile movement to an expected or implied use. For example, one of the

CEOs spoke to Bluetooth technology and explained that during early stages of the technology they would become upset or irritated when they saw someone walking around and speaking into a device which was attached to their ear. Another CEO expanded on a similar theme and also explained that they would physically encounter people within the office wearing a Bluetooth device while walking down the hall of the office and would loudly speak into it, which the CEO felt was rude. The CEOs also explained how the device became more mainstream and is now mostly ignored. It has become a common practice to walk and talk with a mobile device in one hand and a linked Bluetooth device embedded within the ear.

It appears that the continuous practice of fast response time or immediate feedback and engagement has introduced a global expectation of performing business and personal tasks via mobile technology in real time. The inherent use of mobile devices by CEOs and the implied expectations they have played on others to use such devices represent a paradigm shift or a change in the basic set of assumptions or beliefs (Kuhn, 1970) in the action of conducting business.

Mobile devices are advancing technology as replacement devices. The discovery that mobile devices are used as advanced replacement devices as a means to acquire and share knowledge is an extension of a prior study conducted by Thomas et al. (2002), who found that information exchange conducted through websites and email correspondence allowed for increased communication to occur between small agricultural firms. In addition, their research showed that information communication technology influences the social and cultural behavior of less populated areas, such as rural communities. Although their study was conducted prior to the widespread use of mobile devices such as smartphones, their data recorded the use of email and websites, which are internet-based software technologies that use the internet as the means for communication. Internet based technology is now embedded within mobile devices.

Individualized actions of responding are related to using mobile technologies as replacement devices. In an attempt to quickly problem solve, review or search for something, CEOs are using their devices to replace physical objects such as books, CDs, or videos, and services such as brick and mortar businesses in an effort to efficiently and effectively respond to or deliver a message with the proper communication or correspondence.

Portable offices are a result of mobile devices. The integration of mobile technologies can create portable office capabilities for CEOs leading to scalable connectivity, flexible access, and the blending of home and work activities, ultimately resulting in blended work life activities. According to Liaw et al. (2010), mobile communication devices are forever

changing the fundamental ways people interact, communicate, and learn. However, having the ability to integrate personal and business activities can have unintended consequences. For example, the data indicated that CEOs could use work or personal tasks as drivers to disengage from either obligation. The unintended consequence of disengagement could occur through implied expectations of increased response speed, meaning that the CEO could be attending an important business meeting and partially listening to the speaker while responding to email or text messages on their mobile devices, becoming only partially engaged with the meeting or discussion which is being conducted. For example, one of the CEOs was attending a family event. Although the CEO was physically present at the personal event, she also felt she was distracted and disengaged from rich fulfillment of the event since it was held during implied or expected business hours. Due to the time of the event the CEO felt a need to interact with their device in an effort to conduct a business transaction which included responding to others immediately.

Limitations

As previously explained in chapter 3 there are a variety of limitations to this research study. One specific example is that the study consisted of 15 CEOs of small to mid-sized organizations with employee sizes of fewer than 200 and revenue of under $100 million (US). Thus, results of the present study might not generalize to CEOs of smaller or larger companies. Another limitation was the geographical location of the participants which included CEOs located in California only, who might not be representative of those elsewhere in the US or in other countries. Additionally, the CEOs had to have an understanding of and practice with various mobile technologies. Therefore, findings may be limited to this category of persons. Another limitation was the gender differences between the participants. Specifically, in the purposeful sampling more male than female CEOs were available with the specific knowledge to participate in this study, although the gender breakdown probably was representative of the pool of CEOs from which the sample was drawn.

Another limitation in this study is related to time sampling. The self-observation log was organized using three hour blocks of time. The use of three hour blocks of time restricted the research participants to record items solely within these time increments. The in-person observations were predetermined and scheduled. Thus, the participants may have conducted themselves differently from their usual behavior, and these time blocks might not have fully reflected all the participants' activities. The limitations to this study were restated above in order to reacquaint the reader with them prior to reviewing the implications. The

implications section will begin with a general overview of the implications from the study and will then provide additional context on the implications of theory, policy and practice within the framework of the limitations.

Implications

Overall implications. Most of the implications of the present results stem from the fact that this appears to have been the first study gathering a wealth of data on how CEOs use mobile devices in their personal knowledge management. As such, it should provide a great deal of information for others interested in this topic. Many insights were gained into the effects of mobile devices on the individual, interpersonal relationships, and culture. These include the development of the concept that CEOs are high-level knowledge workers, with some commonalities with others, yet distinctive characteristics due to their need to oversee an entire organization. It was also argued that the devices serve as "advanced replacement devices," fulfilling the functions of a number of previous objects or institutions. Although serendipity is known to be an important component of success in management, this study was the first one to extensively show that the principles of SKARSE apply to the individual as well as the organization. A number of other findings pointed out the advantages and disadvantages of mobile devices. One area in the field that has not received much prior attention considering its importance is the simple fact that CEOs now expect communications to be almost instantaneous. Finally, the results provide the beginnings of a model of how CEOs use mobile devices in knowledge management.

A number of recommendations stem from the present research, many of which have been discussed in great detail in the previous sections of this chapter. These recommendations were derived from not only the data which was collected and analyzed, but from experience with the research methodology and tools which were used for data collection. Due to the applied nature of this study, there is a spillover of recommendations and implications related to several areas of interest that could benefit from the results of this study. Specifically, there are implications for theory, policy, and practice. In an effort to clearly outline the contributions generated from the reported research to these three areas, the researcher has added specific sections to properly demonstrate their connections. Some content is restated from previous sections or has been reworded and built upon in an effort to provide the reader a better understanding of how this research is applicable to both academics and business practitioners.

Implications for Theory

Academic business theory is constructed through historical published theory, current and proven policies in business, and the application of techniques within business practice. Since theory is important to business it could be argued that academic theory is the starting point for the establishment of policy and ongoing practice. It could also be argued that progress in theory is the sum of existing theory, policy, and practice since all three areas build upon one another and are tools used to construct new theory; therefore the researcher has used the application of theory as a starting point for the discussion of applied implications. The discussion below will consist of various examples derived from the research and their relationship to theory. Each example could be connected to another or could be independent.

This study has added to existing management theories through modeling the behavioral aspects of mobile technologies. The study developed the beginning of a model which visually demonstrates how CEOs use mobile devices in knowledge management. This appears to be the first working model representing how CEOs are integrating mobile technologies into knowledge management.

Knowledge management researchers cannot ignore senior level executives and their impact on knowledge workers since CEOs are executive knowledge proponents. This study developed the concept that CEOs are high level knowledge workers, with some commonalities with other knowledge workers. The recorded actions of CEOs and their willingness to practice and implement knowledge and related activities makes them knowledge workers.

Knowledge Management and Business researchers cannot ignore the impact of culture within organizations. Specifically, the affordances the CEOs encounter through mobile technology are forming a culture of mobile technologies within themselves, changing the paradigm of what each of them expects in relation to how and why they use mobile devices. Therefore, the term *cultural mobility* need not reference people of different cultures or ethnicities or refer to geography. As stated, cultural mobility represents a paradigm shift where CEOs are leading others by example and have not only accepted mobile technologies for their individual uses, but are managing their subordinates or influencing their peer group to regularly leverage mobile devices to perform actions.

The cultural movement of mobile devices has paved the way to worldwide expectations of others and how quickly they are able to respond to various business or personal related issues.

The word *culture* needs to be re-evaluated by managerial theorists and practitioners to look beyond the ethnicity and geographic region that defines one's own culture and accept the premise that the use of mobile technologies is a culture in itself. Through examples of a paradigm shift, this study extends the utility of the concept of culture in various contexts.

The study should be expanded beyond the current limitations. As previously discussed, the current study consisted of 15 CEOs of small to mid-sized organizations with employee sizes of fewer than 200 and revenue of under $100 million (US). Researchers could expand the current study by collecting data from CEOs of smaller or larger organizations, and leaders of government agencies and universities. The collection of data within this study could also be compared to data collected from government agencies and university officials relating to the same topics and expand upon other business theories such as the triple or quadruple helix theory.

Although it is recommended that existing theories could be expanded through this research, it should be noted that these research participants were selected partly on the basis of their use of such devices and their interest in them. Future research might establish whether all CEOs use the technology so extensively, and if not whether those who do not are at a disadvantage compared to others. Nonetheless, this study has established the central place of mobile devices in modern practice. A participant in Stage 1 put it succinctly: "You can't have a business without a smartphone now. Why would you?" It is hoped that future research will focus on ways of maximizing the utility of this paradigm-shifting technology.

As indicated above, academic theory has a direct relationship with the methodologies and results of this study. The examples presented have a direct impact on behavioral traits of CEOs as well as the policies and business practices of the organizations they lead. The following section will discuss the implications for policy relative to this research study.

Implications for Policy

Weighing in on knowledge as a competitive advantage was an important outcome of this study. As evidenced in the discussion, the factor analysis suggested that CEOs practice the push-pull model with most strategic initiatives such as the management of knowledge or any action within the composition of knowledge. The data from this study showed the CEO has the ability to make the final decision as well as suffer any consequences which result from the decision. The potential benefits as well as potential unintended consequences affect the current and ongoing policy of the organizations in which they serve.

The CEOs individual practice of the push pull model has a direct impact on organizational policies related to mobile technologies. Through a virtual lens, mobile device policies are changing the physical behavior of the organizations team members. The data showed that there has been a change in how people position written correspondence with others, which can either increase the speed of the written message or distort the intended message. This is evidenced by mobile technologies being used to send text messages in an effort to increase efficiencies or transfer information from one person to another using their mobile device to perform the action. Previously, this was performed by physically calling someone or writing and sending a message from their computer terminal at work or through the mail system or courier. In the present environment, legal documents are being signed virtually through document signing platforms, corporate documents are being reviewed remotely, and the communication efforts to create and review these documents is flowing through abbreviated messages at a rapid speed. The migration to virtual documents has resulted in new policies being created and implemented regarding the sharing or transferring of such documents. Policies have also been put in place to guide people on the proper documentation of communication as well as where documents are able to be shared or virtually stored.

The applications of mobile devices have created internal corporate programs surrounding these technologies since its many affordances to the user have aided a paradigm shift. CEOs are using mobile technologies to be more efficient with written communication and collaborating or connecting with others. These actions are forming a culture of mobile technologies within themselves, changing the paradigm of what each of them expects in relation to how and why they use mobile devices. This is referred to by the researcher as *cultural mobility*, representing a paradigm shift where CEOs are leading others by example and have not only accepted mobile technologies for their individual uses, but are managing their subordinates or influencing their peer group to regularly leverage mobile devices to perform actions.

An example of a corporate program directly related to cultural mobility was discussed on page 90 of this study. The discussion focused on the results of the pilot study influenced the formation of a project team for WCIB in 2009. The company pilot incorporated the use of mobile devices in their managers daily work routes in an effort to study the actions performed, affordances and effectiveness of several mobile devices. This mobility pilot resulted in creation of additional projects concerning mobile devices.

Another example of a corporate program which has a correlation to cultural mobility, and CEOs practicing the push pull model is evidenced by the leadership of CEO John Stumpf of Wells Fargo Bank. During a recent town hall on October 10, 2015 in Charlotte, NC, Mr. Stumpf stated, "I am delighted that Steve Ellis, head of our new innovations group joined me for a conversation about some of the technology we are introducing to create a sustainable corporate advantage and provide even more value to our customers. The innovations group is a catalyst for launching new technologies form many different areas around our company." Mr. Stumpf also discussed the various technologies being implemented to better serve the banks customers such as biometrics and cybersecurity.

It has become evident that organizations and their executives are approaching technology from a futuristic point of view. The study indicated that CEOs are unknowingly approaching emerging technologies with the mindset that the technology will provide unforeseeable uses in the future. CEOs need to become seekers of such devices, supporting software or internet based applications and embed them within corporate policies and procedures as necessary. CEOs need to be visionaries and embracers of emerging mobile technologies, not late adopters.

The examples above demonstrated CEOs individualized actions of mobile devices, and the impact on corporate policy. The final section will present an overview of the implications for practice.

Implications for Practice

As indicated at the beginning of this section, many applicable examples within corporate policy can also be used to support organization practice since policy is constructed through current or implied practice and practice is comprised of demonstrated or implied policy. Moreover, a number of conclusions presented above lend themselves to practical advice. For example, the Lego model of constructive learning suggests that CEOs and managers in business recognize that one performed action of knowledge or learning alone does not get a CEO closer to the individual or organizational vision. It takes multiple actions and refinement of those actions. Furthermore, the advantages of mobile technology and its universality suggest that CEOs should personally use and be an organizational proponent of the use of mobile devices. The more interconnections there are, the more the advantages of devices can be realized.

It can be argued that mobile devices are being used by business practitioners. The research has indicated that CEOs are regularly using mobile technologies in a business

context. Although individualized outcomes of actions which were performed were relatively constant, the individualized processes to perform such outcomes varied due to the location or devices being used by each CEO participant. It was also noted that the technology which drives each device is constantly evolving, as is the individual who is benefiting from the affordances of each mobile device.

CEOs are unknowingly practicing the integration and balance of applied actions. The CEOs' actions did not load mainly on one or two components, but rather could only be encompassed by all six. The integration of all six components influences and impacts the various connections throughout the organization. For example, Component one, "absorbing information," is clearly a necessary characteristic of a knowledge worker. Another example was the second component, "relationships," which shows that unlike lower level knowledge workers, a CEO must deal constantly with interpersonal relationships. Response time also raised the issue of having to perform additional actions such as problem solving or reviewing items in real time in an effort to respond quickly. CEOs now expect communications to be almost instantaneous.

These component examples indicate that mobile devices are being used as advanced replacement devices, whereby actions are being performed through the device versus physically taking place. Examples are presented in prior sections detailing the functional replacement of a number of previous objects or institutions. For example, the data indicated that physical objects such as books were being replaced by mobile applications.

Another area of practice is capturing and recording impactful managerial uses. The method of data collection in this study could be a useful tool in business practice. The actions and time recording format was developed through a test and learn and focus group of CEOs similar to the ones in this study. Their individual experiences with various formats of this data collection tool, professional expertise, collaboration, and recommendations developed this electronic learning tool. Business practitioners can leverage this tool as a framework to collect pertinent data within their organizations. For example, this appears to be the first study gathering a wealth of data on how CEOs use mobile devices in their personal knowledge management. This was accomplished through recording various actions of each CEO throughout a given time period. Location, uses, and frequency were also able to be captured and recorded. These recorded buckets provided support to show that CEOs expect the integration of mobile devices into everyday activities for both personal and business efforts.

In collecting data with self-observation logs, the researcher found they could be used by CEOs as a measurement, growth, and learning tool. Recording daily tasks, allocation of time, etc. could serve as a self-reflective exercise helping individuals to better understand, hence control, their use of time. It is recommended that CEOs individually use electronic or written self-observation logs to record the actions they perform, locations where actions occur, technology being used or not, and their emotional state. Collecting and reflecting on this information will provide the data necessary for the CEOs to transform into more effective leaders by leading by example and becoming knowledge and learning champions. There are a number of ways CEOs can enhance their individual knowledge and learning. For example, mobile devices can be used as an electronic learning diary to record learning events and to analyze key learnings, recommendations, and ideas, creating a diversified approach to learning and development. It is also recommended that CEOs have their management subordinates also perform this same self-observation log process for the same reasons.

The research also showed that social struggles are common among executives and can be a result of excessive use of mobile technologies, causing physical and emotional distress, distraction, and disruption. It was noted that CEOs' time and energy was controlled by the devices, thereby creating a distraction and in some cases developing emotional anxiety. Another implication for practice is that mobile devices have become interrupters during the communication process of others, impeding socialization. It was also recognized that social struggles of mobile devices can affect the CEO's wellbeing through physical anxiety and a potential imbalance of life.

The uses of mobile devices have created new opportunities by affording users the ability to quickly obtain information and connect with others. With a multi-location approach, CEOs used their mobile devices as a tool for multitasking in an attempt to transfer knowledge, seek information, and simultaneously communicate with figures in the community as well as employees and family. The ability to quickly connect virtually has changed how social and interpersonal relationships are practiced. The ongoing management of these business and personal relationships is taking place from remote locations. The practice of remote relationship management is evolving the architecture of personal and organizational knowledge management.

Although implications have each been discussed under one specific area of focus, it must be noted that many of the examples below could relate to more than one of the three areas. For example, the research concluded that a great deal of learning was conducted by CEOs while using mobile devices. This conclusion could be discussed under theory, policy,

and practice. The implication for theory is that collective learning does not only take place in face-to-face situations, but also through collaboration in a virtual environment. Within the context of policy, it was found that CEOs are intentionally using mobile technologies as a learning tool. Their individualized use of the mobile device for learning has informally and in some cases formally influenced the culture of learning as well as the use of mobile devices within and outside their organizations. The evolution of the way learning takes place, such as corporate tutorial videos being reviewed through mobile devices, has had an impact on corporate policy concerning learning, where it is practiced inside and outside the organization and how its delivered.

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APPENDIX A: SELF-OBSERVATION LOG DEFINITIONS

The self-observation log definitions were described as well as provided to the participants in the self-observation log stage of the study (Stage 2).

DEVICE = Mobile devices which access the internet. These devices may also perform additional functions such as email, phone, texting, etc.

1. Smartphone = Programmable cellular phone which includes software applications. The user is able to make phone calls, send and receive emails / texts, access the internet, as well as download various applications. Example: Apple iPhone.

2. Laptop Wireless = Laptop computer on which a USB wireless modem is being used. This does not include the use of WiFi. Example: Verizon Wireless USB 4G modem.

3. Tablet = A tablet computer which has a touch screen or pen enabled interface and built-in Internet connectivity. Examples: Apple iPad, Android, Google Nexus, etc.

4. Other Wireless = Any wireless device not listed above which is portable and has access through the internet. Examples: Kindle, PDA.

LOCATION: Physical location or variable locations; you may be with others.

1. Office = Physically being in your respective office building. You may be in your individual office, conference room, walking around, etc.

2. Home = Physically being in your residence or on your property.

3. Business remote = Off business premises, but specifically going to, coming from, or being somewhere for the purpose of conducting business activities. Examples: conducting business at a client's place of business, business trip, etc.

4. Personal self = On the go, personal time, by yourself. You could be at the gym, outside, driving for a non-business purpose.

5. Family / Friends = Spending time with family, friends, or both. You could be physically anywhere.

6. Other location = Locations which are not described above.

USES = Various options you are able to use with your mobile device.

1. Email = Electronic mail which is used to communicate, mostly in written form.

2. Social Media = Internet based services which facilitate human interaction through a connected network of relationships. These sites allow network participants to create and manage personal profiles and connect with family, friends, colleagues, and strangers.

3. Organization = Structuring, coordination, time management.

4. Texting = Text messaging, sending or replying to a brief message through a text.

5. Talking = Using your mobile device to speak to someone else or leave a message.

6. Pictures = Using the camera feature on your mobile device to physically take pictures, upload or download pictures.

7. Video = Using the video recording feature of your mobile device to physically record a video of something or someone, watch a video, or upload a video.

8. Recording = Recording your voice using the recording feature of your mobile device. This could also be the use of a note taking application which is facilitated through your mobile device where you are physically taking notes on your device using an electronic pen.

9. Internet = Physically accessing the internet using your mobile device.

10. Other = Any other use which is not listed above or would better describe what you are doing.

DEVICE EFFECTS = How the device is making you personally feel.

1. Satisfies = A feeling of content.

2. Balanced = A feeling of control in multiple areas of your life. Example: Balance of work and home.

3. Bothersome = Annoyed or irritated.

4. Anxiety = An inner feeling, stresses.

5. Other = Feelings which are not listed above.

ACTIONS = What tasks you are initiating and/or completing with your device.

1. Found something you were not looking for = The use of your device for a specific reason (for example: looking for the menu of a particular restaurant) and during your search you found something else of interest.

2. Searching for something = Seeking, trying to find.

3. Problem solving = The process or fractions of the process where issues are identified and you are working toward or seeking strategies and organizing various aspects of knowledge.

4. Teaching = Instruction, opening of minds, the transfer of knowledge.

5. Maintaining personal relationships = Participating in various activities to efficiently and effectively manage or keep up with personal relationships.

6. Maintaining business relationships = Participation in various activities to efficiently and effectively manage or keep up with business relationships.

7. Responding = Replying to someone or something, answering a message.

8. Reviewing = What you or others are analyzing or looking over.

9. Multitasking = Working on more than one task or process at the same time. For example: talking on the phone or texting while searching on the internet.

10. Making an impact = Enlightening, fulfilling a need.

11. Implementation of an idea = The act of doing, acting on knowledge, driving instruction.

12. Sharing = Learning community, collaboration, transferring.

13. Connectivity = Making connections with objects, people.

14. Creating = The process of thinking and developing an idea. Initiation or initiating.

15. Teaching = Instruction, opening of minds, the transfer of knowledge.

16. Leveraging = The process of using something of perceived or actual benefit to you, someone or something.

17. Other = Other actions not described or listed above.

APPENDIX B: INFORMED CONSENT FORMS

Interview consent form

Please consider this information carefully before deciding whether to participate in this research.

Purpose of the research: To understand the experiences of CEOs with mobile devices.

What you will do in this research: If you decide to volunteer, you will be asked to participate in one semi structured interview. You will be asked several questions. Some of them will be about your personal experineces with mobile devices. Others will be about actual uses and perceptions.With your permission, I will tape record the interviews so I don't have to make so many notes. You will not be asked to state your name on the recording.

Time required: The interview will take approximately 2 hours.

Risks: Some of the questions may cause discomfort or embarrassment depending on how and why you are using mobile devices.

Benefits: This is a chance for you to tell your story about your experiences concerning the various uses of mobile devices.

Compensation: This interview is conducted on a volunteer basis. No compensation will be provided.

Confidentiality: Your responses to interview questions will be kept confidential. At no time will your actual identity be revealed. You will be assigned a random numerical code. Anyone who helps me transcribe responses will only know you by this code. The recording will be destroyed after the content is transcribed. The estimated time is 90 days. The transcript, without your name, will be kept until the research is complete.

The key code linking your name with your number will be kept in a locked file cabinet in a locked office, and no one else will have access to it. The data you give me will be used for a

research study being conducted for a Doctorate of Business Administration as well as current articles realted to the DBA research content. The interview data may be used as the basis for articles or presentations in the future. I won't use your name or information that would identify you in any publications or presentations.

Participation and withdrawal: Your participation in this study is completely voluntary, and you may refuse to participate or withdraw from the study without penalty or loss of benefits to which you may otherwise be entitled. You may withdraw by informing the experimenter that you no longer wish to participate (no questions will be asked). You may skip any question during the interview, but continue to participate in the rest of the study.

To Contact the Researcher: If you have questions or concerns about this research, please contact: Stephen Clark, ====, clarkst@====.com. You may also contact the faculty members supervising this work: Elias Carayannis, email: caraye@gwu.edu or Savvas Papagiannidis, email: savvas.papagiannidis@newcastle.ac.uk

Whom to contact about your rights in this research, for questions, concerns, suggestions, or complaints that are not being addressed by the researcher, or research-related harm: contact either supervisor listed above of the related universities they are affiliated with.

Agreement:

The nature and purpose of this research have been sufficiently explained and I agree to participate in this study. I understand that I am free to withdraw at any time without incurring any penalty.

Signature: _____ Date: _____

Name (print): _____

Interview consent form (open ended interview)

Please consider this information carefully before deciding whether to participate in this research.

Purpose of the research: To understand the experiences of CEOs with mobile devices.

What you will do in this research: If you decide to volunteer, you will be asked to participate in one open ended interview. You will be asked several questions. Some of them will be about your personal experineces with mobile devices. Others will be about actual uses and perceptions.With your permission, I will tape record the interviews so I don't have to make so many notes. You will not be asked to state your name on the recording.

Time required: The interview will take between 1 and 3 hours. There may also be follow-up questions in order to better understand your statements or answers.

Risks: Some of the questions may cause discomfort or embarrassment depending on how and why you are using mobile devices.

Benefits: This is a chance for you to tell your story about your experiences concerning the various uses of mobile devices.

Compensation: This interview is conducted on a volunteer basis. No compensation will be provided.

Confidentiality: Your responses to interview questions will be kept confidential. At no time will your actual identity be revealed. You will be assigned a random numerical code. Anyone who helps me transcribe responses will only know you by this code. The recording will be destroyed after the content is transcribed. The estimated time is 90 days. The transcript, without your name, will be kept until the research is complete.

The key code linking your name with your number will be kept in a locked file cabinet in a locked office, and no one else will have access to it. The data you give me will be used for a research study being conducted for a Doctorate of Business Administration as well as current

articles realted to the DBA research content. The interview data may be used as the basis for articles or presentations in the future. I won't use your name or information that would identify you in any publications or presentations.

Participation and withdrawal: Your participation in this study is completely voluntary, and you may refuse to participate or withdraw from the study without penalty or loss of benefits to which you may otherwise be entitled. You may withdraw by informing the experimenter that you no longer wish to participate (no questions will be asked). You may skip any question during the interview, but continue to participate in the rest of the study.

To Contact the Researcher: If you have questions or concerns about this research, please contact: Stephen Clark, ====, clarkst@====.com. You may also contact the faculty members supervising this work: Elias Carayannis, email: caraye@gwu.edu or Savvas Papagiannidis, email: savvas.papagiannidis@newcastle.ac.uk

Whom to contact about your rights in this research, for questions, concerns, suggestions, or complaints that are not being addressed by the researcher, or research-related harm: contact either supervisor listed above of the related universities they are affiliated with.

Agreement:

The nature and purpose of this research have been sufficiently explained and I agree to participate in this study. I understand that I am free to withdraw at any time without incurring any penalty.

Signature: _____ Date: _____

Name (print): _____

Focus Group consent form

Please consider this information carefully before deciding whether to participate in this research.

Purpose of the research: To understand the ease or potential challenges of learning logs.

What you will do in this research: If you decide to volunteer, you will be asked to participate in a focus group which is intended to use and alanyze the potential benefits and weaknesses of learning logs. For example: efficiency (time), structure, ease, etc

Time required: The focus group meeting will take approximately 2-3 hours. The participants will also be asked to write in various tasks into a log book throughout the day and evening. The tasks will be related specifically to the uses of mobile devices.

Risks: This exercise could be very time consuming and become a competing priority to other ongoing priorities.

Benefits: This is a chance for you to tell your story about your experiences concerning the various uses of mobile devices and recording them real time. You will also be able to discuss your opinions freely in a group setting regarding your experiences with learning logs.

Compensation: This interview is conducted on a volunteer basis. No compensation will be provided.

Confidentiality: Your responses within the focus group as well as the tracked learning log activities will be kept confidential. At no time will your actual identity be revealed. You will be assigned a random numerical code. Anyone who helps me transcribe responses will only know you by this code. The recording will be destroyed after the content is transcribed. The estimated time is 90 days. The transcript, without your name, will be kept until the research is complete.

The key code linking your name with your number will be kept in a locked file cabinet in a locked office, and no one else will have access to it. The data you give me will be used for a

research study being conducted for a Doctorate of Business Administration as well as current articles realted to the DBA research content. The interview data may be used as the basis for articles or presentations in the future. I won't use your name or information that would identify you in any publications or presentations.

Participation and withdrawal: Your participation in this study is completely voluntary, and you may refuse to participate or withdraw from the study without penalty or loss of benefits to which you may otherwise be entitled. You may withdraw by informing the experimenter that you no longer wish to participate (no questions will be asked). You may skip any question during the interview, but continue to participate in the rest of the study.

To Contact the Researcher: If you have questions or concerns about this research, please contact: Stephen Clark, ====, clarkst@====.com. You may also contact the faculty members supervising this work: Elias Carayannis, email: caraye@gwu.edu or Savvas Papagiannidis, email: savvas.papagiannidis@newcastle.ac.uk

Whom to contact about your rights in this research, for questions, concerns, suggestions, or complaints that are not being addressed by the researcher, or research-related harm: contact either supervisor listed above of the related universities they are affiliated with.

Agreement:

The nature and purpose of this research have been sufficiently explained and I agree to participate in this study. I understand that I am free to withdraw at any time without incurring any penalty.

Signature: _____ Date: _____

Name (print): _____

Learning log consent form

Please consider this information carefully before deciding whether to participate in this research.

Purpose of the research: To understand the use of mobile devices

What you will do in this research: If you decide to volunteer, you will be asked to participate in a learning log excercise (either electronic or written) where you will record various actions which take pleace during the day while you use your mobile devices. These actions will be represented by numerical numbers. A sample learning log will also be provided. You will be provided an Apple I-Pad for your use during this study (if you choose). The Apple device will be returned by the participant after the duration of the study.

Time required: The learning log process will take approximately 2 weeks (14 days) and will be broken up into 2 separate weeks.

Risks: This exercise could be very time consuming and become a competing priority to other ongoing priorities.

Benefits: This is a chance for you to record you various uses of mobile devices.

Compensation: This interview is conducted on a volunteer basis. No compensation will be provided.

Confidentiality: Your responses within the learning logs will be kept confidential. At no time will your actual identity be revealed. You will be assigned a random numerical code. Anyone who helps me transcribe responses will only know you by this code. The recording will be destroyed after the content is transcribed. The estimated time is 90 days. The transcript, without your name, will be kept until the research is complete.

The key code linking your name with your number will be kept in a locked file cabinet in a locked office, and no one else will have access to it. The data you give me will be used for a research study being conducted for a Doctorate of Business Administration as well as current articles realted to the DBA research content. The interview data may be used as the basis for

articles or presentations in the future. I won't use your name or information that would identify you in any publications or presentations.

Participation and withdrawal: Your participation in this study is completely voluntary, and you may refuse to participate or withdraw from the study without penalty or loss of benefits to which you may otherwise be entitled. You may withdraw by informing the experimenter that you no longer wish to participate (no questions will be asked). You may skip any question during the interview, but continue to participate in the rest of the study.

To Contact the Researcher: If you have questions or concerns about this research, please contact: Stephen Clark, ====, clarkst@====.com. You may also contact the faculty members supervising this work: Elias Carayannis, email: caraye@gwu.edu or Savvas Papagiannidis, email: savvas.papagiannidis@newcastle.ac.uk

Whom to contact about your rights in this research, for questions, concerns, suggestions, or complaints that are not being addressed by the researcher, or research-related harm: contact either supervisor listed above of the related universities they are affiliated with.

Agreement:

The nature and purpose of this research have been sufficiently explained and I agree to participate in this study. I understand that I am free to withdraw at any time without incurring any penalty.

Signature: _____ Date: _____

Name (print): _____

APPENDIX C: PILOT STUDY

Pilot Study Empirical Findings and Discussion

The data is represented in the three following tables: (1) Strategic Knowledge Arbitrage / Serendipity (SKARSE) Serendipity and Arbitrage, (2) Productivity and Process, and (3) Social / Individual Networking Behaviors.

Table 1:

Serendipitous discoveries

Although none of the 33 participants knew the meaning of Strategic Knowledge Arbitrage and Serendipity (SKARSE), the majority of them unknowingly practiced the fundamental components on a regular basis. Of the 33 participants interviewed, 73% indicated a level of unplanned surprise (serendipity), while searching for other information. As examples indicate:

> Example1: There was a time recently when one of my accounting managers came to speak with me in regards to a client who had a possible taxable solution on a settlement they were going to receive through mediation. I wasn't very familiar with her situation so I contacted several law firms to discuss the issue. While I was waiting to hear from them I decided to use my tablet to see if I could find a tax code which would clarify the situation. My quest for the IRS code was interrupted when I noticed a flashy website for a company who specialized in the sales of businesses. I searched through their site and found a link to a person who specialized in sales / mergers and acquisitions of accounting firms. This was something that I wasn't intending to do. It gave me a lot to think about. I ended up communicating with this person for several months. Ultimately, I decided to sell off the bookkeeping services of our firm which was quite large. As a management team it was decided that our bookkeeping department and activities associated with it was a distraction to our core business activities due to the volume of calls, time constraints and squeezed profit margins. After the sale of the division we then leveraged the funds by purchasing core accounting practice business such as audits and reviewed level financial statements. We purchased several small firms and retained the accountants as senior level accounting managers.

> Example 2: I remember a time when I was using my smartphone to search for a gift for a colleague. A mutual friend told me that a good gift would be an after dinner drink. I was waiting for an airplane so I had some extra time on my hands so I thought it would be a good time to purchase something. While I was looking for the gift I saw so many different types of drinks. Liquorish, red hot, wine and others. I'm having a hard time remembering. It's on the tip of my tongue. The plane was boarding so I had to put down my phone. While on the plane, an idea came to my mind. I saw several liqueurs and variations of other drinks which had different types of flavors. One of the

drinks that caught my eye was an absinthe drink. I remembered seeing absinthe bars in the Czech Republic so it seemed even more interesting. I also saw a cinnamon drink that had gold flakes inside once the bottle was shaken. This struck an idea. I thought it would be a good idea to infuse tapioca balls within an Absinthe liqueur. I used my note pad application while on the plan to notate my ideas. When I arrived in Chicago I was pretty excited so I forwarded my ideas to my marketing director and attorney as well. This occurred 6 months ago and since then I have created this product and it is being distributed by Youngs Market. I am currently putting together a business plan to approach either an investor or buyout. .

Example 3: I was traveling to a client meeting with our national sales manager to meet with one of our largest clients. While in the car we were talking about ways to increase company profits organically. My national sales manager used my tablet to search words like technology, innovation and profits. He was reading off various ideas which were presented by company websites and one of the items was inventory tracking. He started to search for inventory tracking ideas and companies. This search led to software companies who specialized in GPS systems and packages to better manage inventory management. This website and discussion led to discussions surrounding costs of good as well as inventory management. We felt this was a good way to increase profits. A few weeks later I met with a consultant who specialized in cost analysis. He was hired and is currently working on a new company strategy.

The following table represents the domain analysis based on Spradley's (1979) model for Serendipity and Arbitrage.

Domain Analysis Worksheet (Cause / Effect)

Included Term	*Relationship*	*Cover Term*
Searching for tax code (Business Related)	a cause of	Serendipity
Searching for after dinner drink	a cause of	Serendipity
Searching for technology while traveling	a cause of	Serendipity

Analysis of cause and effect:

The three examples above used the affordances of mobile technologies for both business and personal matters. Many of the CEO's were searching for something specific and found something unexpected. One of the participants was multitasking while using his smartphone as a tool for learning.

Example 1: The CEO was searching for tax code information and found a source to sell his company's payroll division. This event was unplanned and spontaneous, resulting in a serendipitous event. The event was then internalized and leveraged, further leading to

additional revenues for the organization, greater business efficiencies, potential to create business development opportunities and customer retention activities.

Example 2: The CEO of a middle sized organization had some free time available and decided to use their mobile device to find a gift for a personal friend. The CEO used their existing network to find out what the personal friend / colleague would enjoy. While looking for an after dinner drink, the CEO noticed other alcohol based drinks which could be packaged differently for resale. The CEO used their tacit knowledge to internally catalogue various potential product types. Although, there was not an immediate product discovery while researching a gift idea, the CEO was able to bring two concepts together to fill a gap in the marketplace.

Example 3: The CEO was using his Smartphone as a learning device. While driving to a client meeting, the CEO and the organizations national sales manager decided to search for measures which could increase efficiencies within the organization in an attempt to increase the performance of the organization and the bottom line. Using the device to perform learning activities the national sales manager encountered many ideas such as inventory management and sales tracking processes. During the search they collectively came across GPS tracking companies which specialize in raw material or cost of goods analytics as well as inventory management. This discovery was recorded by the CEO and was discussed within the organizations leadership meeting. The meeting was structured in a fashion to promote collaboration among the participants. The teams' diverse experiences and knowledge led to the conclusion to move forward with strategic initiatives to promote structural and technological changes within the workplace. It was also determined that the current team did not have the background to facilitate such a large technological initiative so a knowledge broker was retained in an effort to support such initiatives.
This domain matrix of Serendipity addresses the following research questions.

Why are networks important? Recognizing serendipitous events and communicating them to colleagues is an important function of a network. Our global environment is changing the way CEOs interact. The use of serendipitous discoveries in business networks provides the individual with strategic learning opportunities which give the CEO a long term perspective of current and future business opportunities. This creates new approaches, routines and environments to accumulate knowledge and proper positioning in the marketplace.

How can technology drive and monitor interactions and innovations within a network through the use of Smartphone Technology?

The practice of serendipitous discovery using Smartphone technology is a direct relationship to interaction and innovation within a network. Serendipity impacts the day to day business activities of CEO's including strategic initiatives for the organization. Designing and leveraging a business network along with identifying technological change and entrepreneurial initiatives are essential components of leadership development.

What is the impact of networks on entrepreneurial outcomes and new venture performance?

The practice of serendipitous discovery is a direct relationship to entrepreneurial outcomes and new venture performance. Since the CEOs were open to absorbing the information shared with them by others through their smartphone communication, there was an opportunity for them to create new ventures and discover new information leading to newly acquired knowledge. These events lead to vision, creativity, connections, organization, larger networks, and new ideas. Unforeseen events or knowledge spillovers are further substantiated by Silver (1985, p. 16), "Entrepreneurship is a series of random collisions. Sure, you start with a plan and follow it systematically. But even though you start out in the alternative energy business, you are just likely to end up in real estate development."

Table 1: Serendipity Discussion

These three examples represent the ability for CEO's who are using forms of mobile technologies to quickly obtain information, which according to Hemp(2009) affects their decision making, creativity, innovation and productivity ultimately enhancing their bottom line. The literature supports this process of internalizing and transforming serendipitous events that are the result of using mobile technologies. This decision making and productivity is supported by Knott et al. (2009:373) who stated that "Spillovers (the leakage of knowledge across firms) are one central constraint in the economies of innovation." Knott's concept is the impetuous for competitive advantage and business liaisons. In addition, the ability to have serendipitous events in learning, according to Foster and Ford (2003), can be leveraged to benefit the learner in a variety of circumstances resulting in unanticipated outcomes. This leveraging is explained by Carayannis (2008) within the concept of competitive advantage he discusses information mapping as the impetus for the hierarchy of learning. This hierarchy becomes circular to establish business firm's social networking creation and capacity leading to collaborative, boundary-less networks of professional relationships. Foster and Ford (2003:331) states, serendipity events, "opens your eyes up to a whole new set of views" Recognizing collaboration, creativity, and unanticipated outcomes, Dew (2009) suggests entrepreneurs need to understand how serendipity influences their day to business activities leading to recurring greatness.

Table 1.1

Arbitrage of happy accidents

The results indicated that CEOs used serendipitous events to obtain knowledge through formal or informal learning activities, altered it for their specific uses, and leveraged it personally, professionally, or organizationally, resulting in a transformation of their business or personal productivity.

For Example:

Example 1: While I was driving to our local stadium I saw a billboard advertisement for a Las Vegas casino. The premise of the advertisement was showing the general public the success behind their hotel which was their employees. There were several billboards with various images of sayings of a diverse talent pool of employees. One of the advertisements showed an employee with their daughter. The daughter had a softball uniform on and a glove in her hand. The father was beside her with words above which stated, "my name is George, I am a father, softball coach and I am Red Rock Casino." I felt empowered by this message which I quickly glanced at. I pulled the car around and took several pictures of it. I emailed the pictures to the COO of our company with the words WOW. When I returned from the trip I had a strategy meeting with my direct reports. We had several take aways from this meeting. The first one was as

Example 2: I am always looking for things that will give me a competitive advantage in life. This can range from personal investment opportunities to business opportunities. While searching for a moving company I noticed many hauling companies' advertisements. Most of these companies haul worthless trash. There were no advertisements to haul away items of value. Items that can be recycled or high ticket items that can be donated or sold. I created a company that serves a special niche. I created a company that caters to the wealthy. I connect buyers with sellers for large ticket items and change a pick up and delivery fee. These items are generally larger in nature and have significant value. For example a baby grand piano. Who wants to move a piano? I do! I also get rid of larger items people do not want. For example: I will pick up commercial restaurant equipment or a fiberglass spa. These items are donated or recycled depending on the material.

Example 3: While inspecting my employees on a job site I noticed a subcontractor using a power washer to blast old paint off of a barn located in Southern California. Two large companies were installing a large communications tower through an old barn structure. The companies wanted to paint the barn to make it more appealing to ones eye. While reviewing the power washing I noticed water runoff going into a stream nearby. I remembered reading an environmental impact report in regards to high levels of lead being imbedded in the paint. I was really upset to see the breakdown in communication, so I emailed the environmental company and asked them to email me a copy of the impact report. I received the report within a few minutes and was able to review the summary pages via PDF. I then, searched the internet to find out what levels of lead were considered hazardous. The lead on this

> particular building was 50 times the maximum levels. I then used my device to take pictures of what was going on. I had the site shut down immediately to potential ground water contamination.

The following table represents Spradley's domain analysis for Arbitrage.

Domain Analysis Worksheet (Cause / Effect)

Included Term	*Relationship*	*Cover Term*
Traveling and being observant	Are the cause of	leveraging Serendipity / arbitrage
Transformation of life -Looking for competitive adv.	Are the cause of	leveraging Serendipity / arbitrage
Problem solving -A potential catastrophe	Are the cause of	leveraging Serendipity / arbitrage

Analysis of cause and effect for Arbitrage:

The three examples above used the Smartphone for both business and personal reasons. The CEO's were completing a task and found something unexpected, leveraged the serendipitous event and used unforeseen knowledge to better their company, themselves, their lives and lives of others.

Example 1: The CEO was traveling for business and noticed various billboard advertisements. Through prior experiences or tacit knowledge the CEO felt compelled to pull over their vehicle to the side of the road, turn around, stop at the advertisement and take a picture of the message. After further thought and analysis of the messaging behind the advertisement the CEO leveraged the serendipitous event and decided to create a diversity campaign by leveraging current and future diverse candidates. The CEO also contacted their advertising agency and integrated the messaging they saw into the organizations current advertising program. Leveraging this serendipitous event by taking a picture of the billboard and acting on their prior experience the CEO had the ability to leverage this serendipitous event and arbitraged the combined knowledge to create an ongoing advertising campaigning which included the use of the organizations employees. The campaign was a deemed a

success through measured sales growth. In addition, the billboards were also noticed by local media and were showcased on local morning shows and talk radio.

Example 2: The CEO in this example is constantly learning new things and driving towards excellence. The participant is open minded and is searching for new things. The advertising company was expanding their operations and needed to moving company to migrate some of the key employees to a new space, this also included the move of a non working, classic car.. In the search of the moving company, the CEO noticed there was no advertising for a hauling company specializing in larger items. Using his knowledge of the industry and local economy, the CEO started a hauling company catering to the rich. The company was franchised 6 months ago, and has 12 locations in 3 states.

Example 3: The Smartphone was used to problem solve and as a result helped the environment and society. One participant found an unforeseen problem posing event and their Smartphone device afforded him the opportunity to take action and potentially save lives in the community. The device was used as a multifunctional mechanism bridging the gap between society and business.

The domain matrix of Arbitrage addresses the following research questions.

Why are networks important?

Recognizing serendipitous events and arbitraging these initiatives to subordinates or colleagues is a direct relationship to the importance of a network. Today's business environment is changing the way CEO's obtain knowledge and disseminate it within their networks. Understanding how to build inter-firm business relationships and leverage them is a key component to the future success of the organization. These core competencies leverage learning and allow leaders to push the performance envelope. A SKARSE enabled leader seizes each opportunity, building stronger relationships, trust and a greater network.

How can technology drive and monitor interactions and innovations within a network through the use of Smartphone Technology?

The practice of leveraging unforeseen discovery using Smartphone technology is a direct relationship to interaction and innovation within a network. Serendipity impacts the day to day business activities of CEO's. Designing and leveraging a business network along with

identifying technological change and entrepreneurial initiatives are essential components of leadership development. These core competencies will provide the organizational leader with a more efficient and effective competitive advantage within their respective industry, which in turn will allow them to rationally weigh values with uncertainties. When a firm's leader has a greater and deeper social network, the easier and long lasting the acceptance of this unique advantage will be. Carayannis (2007).

What is the impact of networks on entrepreneurial outcomes and new venture performance?

As a business leader, one must be able to respond to unforeseen circumstances with agility. The ability to recognize opportunities leads to improved organizational performance. Agility is a result of a person's database of intellectual assets. Knowledge management researchers, Jafari et al., 2009, focused on the concepts of serendipity and arbitrage as factors integrated within intellectual capital.

The literature recognizes the domain analysis of arbitrage by (Teece 2005), learning from others improves economic efficiencies in functional areas such as sales, research and development, purchasing, distribution, and manufacturing. A decrease in unit costs leads to a firm's competitive succession in the marketplace. Expanding on the concept of learning further, Bierly & Chakrabarti, 1996 conducted a research study on the pharmaceutical industry and the impacts of external and internal learning. The study speaks to one's reflection of past occurrences which allows them to act on opportunities in the present while influencing the future. This ability to alter knowledge can be evolved from perceptional learning theory. Gibson (2003) discusses perceptual learning theory as it relates to children's learning ability that begins in the whom, pertaining to creativity, learning, knowledge and information. In the same way that Gibson (2003) explains perceptional theory from fundamental learning as a child; perceptional learning theory can be applied in the same manner from an adult context. Therefore, arbitrage of happy accidents can be explained by this theory since the business executive transforms unintended learning activities into intended knowledge ultimately leveraging this acquired knowledge to their benefit.

Table 2

Productivity / Processes

The participants believed the smartphone was a life changing device that has the ability and practicality to integrate personal and business relationships. The participants also specified

that the smartphone enhanced their mobility while traveling, creating a flexible working environment. The concept of connectivity was verified by the participants who stated that the smartphone allowed them to be attached to their clients, creating better relationships and ability to solve problems.

Effectiveness

Example 1: I would be out of business if I did not have access to this device. I have the ability to be out and about creating opportunity and have instant access to everything. Fifty percent of my time is devoted to travel. I am able to make pertinent decisions while on the road.

Example 2: I am always able to be attached to my clients, partners, and office staff. I am connected while waiting for trial at the courthouse, driving, walking or meeting with others. If my staff has a pertinent question I am able to be reached, answer it quickly and then we can all move on.

Efficiency

Example 1: I am able to log into my companies intranet system, to obtain emails and financial statements. The ability to obtain this information and view it on my device saves me multiple of hours per week.

Example 2: I am able to manage my gas inventory and C-store inventory for all 13 gas stations I own. Managing the inventory this way saves me time and money. I am able to be on the road or in a meeting, check my inventory and place an order if needed. I am able to monitor the inventory levels and rarely run out. Managing my inventory more closely also allows me to keep more cash in the bank.

Example 3: I am able to obtain more clients and be more efficient, ultimately increasing top line revenues and decreasing expenses.

Example 4: I am more efficient with my email response time. I am able to forward PDF or word documents real time when I used to have to boot up my laptop, put in the air card, etc. It used to take me about 30 minutes, now it takes 2.

Reach

Example 1: My device allows for mobility and reach-ability. I am constantly traveling to find new fruit, going to wine maker dinners and attending conferences worldwide. . Having this device allows for a virtual office.

Example 2: I would be out of business if I did not have access to this device. I have the ability to be out and about growing my business and creating opportunity while having instant access to everything. Fifty percent of my time is devoted to travel. I meet with executives from major hotel chains in Las Vegas, California and New York.

Integration

Example 1: I am able to make important decisions during non traditional work hours.

Example 2: I am connected all the time. If I want a break I will turn it off. More often than not I will reply to an inquiry. This enables me to check it off the list. She stated that she will even check her device while on the treadmill. I asked her if she was a swimmer, she replied yes. I then asked her if she is connected while underwater. She laughed and said if they come out with an underwater device she would purchase one.

Example 3: I am able to travel, work anywhere anytime and be connected with my family, friends, colleagues, customers, vendors and staff. I use this device as my personal computer.

The following table represents Spradley's (1979) domain analysis for Productivity and Process.

Domain Analysis Worksheet (Attributes of)

Included Term	Relationship	Cover Term
Ability and access	Attributes of	Productivity / Process
Inventory Management	Attributes of	Productivity / Process
Business Development	Attributes of	Productivity / Process
Social Relationships	Attributes of	Productivity / Process
Response Time	Attributes of	Productivity / Process
Creation of employment	Attributes of	Productivity / Process
Ongoing Business and Social Affiliation	Attributes of	Productivity / Process

Analysis of attributes of

The participants in the study showed improvements in productivity and process by embracing smartphone technology on a daily basis. These improvements were in the following core areas:

1) Efficiency
2) Effectiveness
3) Reach
4) Integration

Analysis of Cause and Effect

The 11 examples above represent various aspects of increasing ones competitive advantage. This is achieved through the affordances of Smartphone technologies. Participants showed an increase in their reach through ability and access. CEOs and their organizations were able to create greater efficiencies around the management of inventory, business development activities, social relationship management practices, response time to suppliers, customers or other participants within their networks. The integration of knowledge and technology created new employment opportunities during a recessionary period and most importantly increased profits and shareholder wealth.

One example from each category above; effectiveness, efficiency, reach and integration are explored below.

Effectiveness

Example1: The CEO stated "I would be out of business if I did not have access to this device." He spends the majority of his time traveling. While traveling he is able to set the direction for his organization. Through the use of his Smartphone he is able to communicate the vision of the organization to his department heads and influence them to follow this vision. This device allows the CEO to be agile and manage change accordingly.

Efficiency

Example 2: The CEO which was interviewed was able to manage the company's inventories from remote locations. Having the ability to access inventory data from the Smartphone device allowed her to manage her time more efficiently by producing more with less effort. This allows her to spend additional time with her family and search for additional

opportunities while improving her performance. Prior to leveraging the Smartphone device she would have to travel to each location to obtain inventory information or she would have to rely on communication from her retail management team. The importance of efficiency in relation to managing ones time is an important aspect of competitive advantage. As a leader, you are able to expand your basic principles, events can be carefully planned and organized and time may be allocated to other income driving activities.

Reach

Example 1: The Smartphone was used as a global, virtual office. The participant is a frequent traveler and needs the ability to mobile. Physical distance no longer creates inefficiencies, there is potential for anonymity. Having the virtual office allowed the leader to connect participants within the organizations network to participants in networks outside the organization to quickly execute on action items pertinent to the success of the organization. The ability to use this device as a multifunction facilitator of information and connectivity allowed the user to benefit from collaborative work, reduced overhead costs, increased productivity and improved employee morale.

Integration

Example 1: The Smartphone technology was used to integrate business decision making during the executives personal time, which was during non traditional work hours. According to Hemp (2009) in an economy that is driven by knowledge and innovation, information is our most valuable asset which leads to a more efficient organization. Knott (2009) concurs with Hemp, but specifies that exclusive knowledge is transmitted by individuals to teach those with inferior knowledge. By the transfer of knowledge according to Knott businesses can leverage innovation and technology to become more efficient and effective. According to Mouzas (2006), the terms efficiency and effectiveness are related to the assessment of the performance of an organization and their management. To increase efficiency and effectiveness, Teece (1986) has explained in order to innovate; leaders need to translate their learning's into usable knowledge. The application of this acquired knowledge will give them the technical tools to make their products or services better than the existing state of the art. Additionally, Clough (2007) states that participants are willing to use and tailor the features of mobile devices to suit their informal and formal learning activities.

The domain matrix of productivity and processes addresses the following research questions.

Why are Networks important?

Being a life changing device, the smartphone increases the effectiveness of exchanging information within business networks. Networks contribute to enhancing the firms' bottom line by increasing the depth of knowledge exchange, economic efficiency, and learning among the participants (Wilson et al., 2007). This is further supported by Knott (2007) who specified that firms are able to reduce expenses by extracting knowledge from organizations who have efficiency measures in place. One's openness to explore, learn, and continuously change are important characteristics for innovating, efficiency, and creating value for the organization (Boutellier et al., 2008).

How can technology drive and monitor interactions and innovations within a network through the use of Smartphone Technology?

A recent study by Kim (2008, p. 390) acknowledged that the "relevance made the relationship between perceived usefulness and users' behavior strong. As individuals use a smartphone to perform their job, they feel that the technology is useful, which affects their positive intention to use it." Smartphone applications create a remote office environment allowing executives to perform many business related activities without the limitation of geography and create more efficient time management (Liang et al., 2007). Creating a remote office using the integration of mobile technology results in scalable connectivity, flexible access, and the blending of home and work, gaining efficiencies in both.

What is the impact of networks on entrepreneurial outcomes and new venture performance?

The impact of networks on entrepreneurial outcomes and new venture performance was explained by Teece (1986) as an improvement on economic efficiencies in functional areas such as sales, research and development, purchasing, distribution, and manufacturing. Teece's work ties into the four attributes of the ability for reach, integration, efficiency, and effectiveness. Efficiency and effectiveness are terms related to assessing the performances of an organization and their management (Mouzas, 2006). Entrepreneurs who have the ability to generate additional resources through network activities are more accomplished than those participants that are not able (Kristiansen, 2004). This concept, according to Teece (1986), allows leaders to create an organization free of boundaries, enabling themselves and others to learn from leaders outside of the organization. Leveraging learning activities is an imperative

function for innovating firms. Those who consistently question and explore the unknown have more opportunity to discover and learn about new models of innovation and growth (Rahmandad, 2008)

Table 3

Social / Individual Networking Behaviors.

Social and individual networking behaviors are the impetus for interacting, management, and leadership styles using the smartphone technology. As a collaborative device, the smartphone increases productivity and searching for informal / formal learning opportunities. Creating a social network with the use of the smartphone technology results in a transformational process that addresses entrepreneurs, acknowledging their leadership styles, and captures approaches to communication which result in effective management. As examples indicate:

Interacting

Example 1: I am an avid Face book user. This site allows me to manage my personal life by communicating with my family and friends more often. My company also uses social media to market and advertise the properties we have for lease.

Example 2: I forward financial information such as financial statements, and tax returns to clients, banks, attorneys and my partners. Most of this information is used to help my clients businesses grow.

Example 3: I am able to be sitting on a plane, servicing an existing client or a prior client, while traveling to see a new or potential one, absolutely incredible.

Example 4: I use this device as a phone, to email, chat online, company intranet, creates, forwards and reply to messages, and I research to provide context to questions.

Leadership Style

Example 1: I am able to produce more on my own time. I am always connected. I check my email every hour. I am able to communicate when I am attending personal matters such as events for my children, waiting for an appointment, waiting in line, etc.

Example 2: I review information through the use of email and the internet. It allows me more time to research the competition and what others are saying about our organization. This allows for more strategic marketing schemes, and it gives me

additional insight on what our competition is doing. This research is done through blogs, websites, search engines, critics, lists, etc.

Example 3: I am able to lead the organization while conducting business on the road. I am able to research and share new ideas through online tools. I now have the ability to manage existing initiatives with my management team. I am able to obtain more clients and be more efficient, ultimately increasing top line revenues and decreasing expenses.

Management Styles

Example 1: I am able to manage my retail gas business more closely through the use of my device. This is done through the use of marketing ideas, better organization and better communication. The best thing that I have done for this business is link of a camera system to manage it more closely when I'm not around. I was able to link each of my 12 locations to a website tied into my camera system. I have full access from my mobile phone. I have communicated this system to my management staff and all employees. I estimated approximately $200 / day of employee theft in each location. This includes cash, gift cards, lottery tickets, and C-store inventory. This is estimated to be approximately $73,000 year in employee theft. I have 12 locations which equals $876,000 in annual theft. I estimate the theft was reduced by 60% by having a state of the art real time system which I am able to access through my phone anytime, anywhere. This is $525,000 straight to the bottom line.

Example 2: I am able to communicate with my key management staff members more quickly. I am able to respond to risk management decisions on the fly. I am also able to give necessary approvals instantly. By having this device I am able to manage multi million dollar investments more closely. I have put measures in place where I am able to save money yet make decisions sooner. There is no time delay in the decision making process.

One example from each category above (Interacting, leadership style and management style) is explored in greater detail below.

Interacting

In example 3, using Smartphone technology the participant discussed the versatility of being able to use skills in a multi-dimensional framework for interacting in a social and individual way. The participant was able to communicate with family and friends simultaneously while conducting business related activities. This type of flexibility was an example of multitasking, information sharing, and knowledge transfer while engaging in social interaction. This leads to greater efficiencies in building personal and business relationships while creating and implementation commerce related activities.

Leadership Style

In example 3 the participant was able to use technology to lead the organization while traveling and developing new business. He was able to share new ideas and information with his management team, and communicate strategic initiatives with his staff. According to Hemp (2009), business executives are able to be more effective leaders with a broad knowledge base do to their ability to obtain information quickly in many different ways. This information seeking may be obtained through text messages, face book friend alerts, Smartphone voicemail, instant messages, twitter tweets, email, online industry reports and industry data, blogs written by colleagues, wikis, corporate internet, discussion forums on topics their following, and continuous updates from other participants who are part of their various networks.

Management Style

In example 2 the participant was able to manage their 12 station retail gas business more closely through strategically creating networks and using advanced technology. These strategies resulted in $525,000 straight to the bottom line. Professional networks give leaders an unpresented competitive advantage. This is accomplished by effectively managing complex relationships with customers, suppliers, partners, influencers and others. These networks make it easier for leaders to manage their existing relationships while continuously looking for and adding new ones (Giles, 2010).

The following table represents the domain analysis for Networking Behaviors.

Domain Analysis Worksheet (is a means to)

Included Term	Relationship	Cover Term
Interaction	Is a means to	Networking Behavior
Information Sharing	Is a means to	Networking Behavior
Multi Tasking	Is a means to	Networking Behavior
Passage	Is a means to	Networking Behavior
Learning	Is a means to	Networking Behavior
Leadership attributes	Is a means to	Networking Behavior
Knowledge Transfer	Is a means to	Networking Behavior

Analysis of Is a means to

Technology is changing the way CEOs interact, work, and learn from other participants within their networks. Smartphone technology is the new gateway for rapid communication. This technology allows participants to reshape how they communicate and behave as leaders of emerging companies. It has been reported by Liaw et al. (2010) that due to portability and unlimited access to the internet, the use of mobile devices is forever changing the way we do business, communicate and learn through network activities**.** Giles (2010) substantiated this claim, reporting that online social networks present a unique and user friendly format which allows for a huge upgrade in leaders' ability to effectively and efficiently communicate globally with one another. This concept is collaborated by Ibarra and Hunter (2007), who stated that a person's ability to create and manage personal and business relationships which offer the participant support, feedback, and insight encourages the exchange of information, learning, and resources.

Rationale for revising research question

The exploratory pilot study addressed one main research question and three sub questions. Based on the process and results of Spradley (1979) domain analysis of cause and effect, means end and attribution it was determined that the research question stated as *How do chief executive officers use wireless mobile communication devices and what is their perceived usefulness?*

The pilot study addressed the stated research question. The research question was open ended in nature using the word "How" in the beginning of the question. The basis for analysis of the pilot study was seeking relationships between the words in the transcriptions and the three units of analysis listed above. Although this process was effective, the research question was open ended in nature and the data was constrained based on the requirement to fit the results within the three domains.

Topics for the pilot study were not developed through themes and were specific in nature in order to address Spradley's (1979) three units of domain analysis. The basis of analysis for this pilot study was seeking relationships between the words in the transcriptions and the three units of analysis listed above. Although this process was effective, the data was

constrained based on the requirement to fit the results within the three domains. Therefore, Spradley's analysis is directed to more literal interpretation from the transcriptions.

In order to achieve a thick description of understanding the use of mobile communication devices among chief executive officers, the researcher designed two additional stages of this mixed method research study to further explore the research question. The first stage provided the researcher with the opportunity for the evolution of themes and ideas to derive and transform directly from the participants transcriptions by allowing them to freely discuss their thoughts, experiences, and/or opinions from an expert perspective.

APPENDIX D: DATA FROM STAGE 1

Category 1: Cultural Mobility Evolution (CME)

Definition: The interdependencies between Chief Executive Officers and their mobile environment.

Property 1: Cultural Shift for Necessity (CSN)

Definition: The ability to immerse oneself, integrating technology into meaningful activities

Participant 5: My Smartphone is used to manage my daily business activities. This is done through using GPS, while traveling; responding and sending email, obtaining needed documents from my companies' server, sending important documents to others while on the road, forwarding emails with attachments, updating myself with the news. For example I check CNN, CNBC and morning star).

Participant 2: If I didn't have access to do these things and you are not accessible for a week at a time you will lose a client. Since everything is so fast you have to be even faster otherwise you just lose the business because they can wait a week since everything is so immediate now you have to have a smartphone.

Participant 7: I able to be more productive and take care of email and small documents while traveling or being at home. I have complete immersion and a "virtual office" my fax machine is also an e-fax which emails me a PDF document when I receive something.

Participant 4: I have complete immersion between my business and personal life. I use my devices for everything.

Participant 5: I use my Smartphone to obtain information via the Web. I use the web to search for business and personal information. I use Yahoo, Google, and other search engines. I also look for articles or other information in my spare time. I use these sites to obtain financial information, read blogs, reports etc. I use my Smartphone to manage my daily business activities. This is done through using GPS (while traveling), responding and sending email, obtaining needed documents from my companies server, Sending important documents to others, forwarding emails with attachments, updating myself with the news (checking CNN, CNBC, and Sign on San Diego.) I am always doing business development through being active in the community.

Participant 6: I look to obtain information for business and personal purposes. This includes sites for email, financial information, weather, directs, restaurant recommendations, etc. I also use the device to obtain business information on my clients, and D & B ratings. My device allows me to integrate my business and personal life. I able to spend more time with my family and friends and I am also able to connect with clients or with the office when needed.

Participant 8: I able to communicate with family and friends while conducting work activities and vice versa. There are times when I am running to a work meeting and I am able to text a picture or message to my friends. This allows me to stay in the loop during my busy work schedule.

Participant 9: I able to manage my life differently by having the ability to stay in touch. Sometimes it creates more balance in my life and sometimes it makes things more hectic.

Participant 10: I am always connected and am able to communicate with colleagues, staff and clients. I look to obtain information for personal and business benefit. Personally I could be banking, reading articles, emailing, using blogs on

topics I find interesting such as the financial market, sports, real estate, etc. For business purposes I may look up particular codes of the law or do research on a topics I could use to help benefit one of the firm's clients.

Property 2: Proactive Replacement Device (PRD)

Definition: Real time device with you at all times.

Participant 1: The only time when I read a book, admittedly when I am traveling is when I can use my approved electronic device, so during takeoff and landing, as long as I have my screen protector on I will use my mobile devices.

Participant 2: I use my I Phone to run this business. We have many workstations at the office but we travel a lot and there always constantly moving parts to get approvals and everything to our clients as fast as we can, its text, email and internet through the iPhone, for sure. You can't have a business without a Smartphone now. Why would you? With a Smartphone you don't need a watch; you have 1 device with you at all times.
If I didn't have access to do these things and I'm not accessible for a week at a time you will lose the client. Since everything is so fast you have to be even faster or otherwise you just lose a client because they can't wait a week since everything is so immediate now you have to have a Smartphone.

Participant 3: I used the phone to take a video of a crane tipping over and I sent the video via email to my office manager. She catalogued the video for future correspondence with the contractor. She hired us and the insurance company.

Participant 14: This decision to purchase and use a Smartphone had assisted me in becoming a more efficient and effective manager and decision maker within the respective organization. This web enabled device had allowed me to replace paper for the most part I review sales production reports, company press releases, review training materials, approve compensation, accept and create meeting invites, manage compliance, communicate real time, do banking online, pay bills etc. Basically I have created a virtual office. This virtual office has enabled me to not only manage my business activities more efficiently and effectively, but it has also facilitated the acquisition, transfer and diffusion of knowledge on a daily basis.

Participant 7: I use this device to monitor gas prices from the distributor. I am also able to check my companies gas inventory by checking the gas loads (monies) being pulled from my bank accounts. This allows me to lien on my inventory more often and not run out of gas.

Property 3: Evolution of relationships (ER)

Definition: Creating business connections with old friends and colleagues.

Participant 2: I use the Facebook application on my Smartphone a lot. I have been getting a lot of business through connecting with old friends and colleagues that have business now, I have actually created business relationships that have been created while traveling and through Facebook and through my phone, Incredible

Participant 1: I use Linked In to track companies and connect with other professionals. Every once in a while I use Facebook.

Participant 5: I use different applications; financial, games and social media. I use it mainly for investing or banking. My 6 year old son plays games on it. I use Facebook and Linked In to check in with family, friends and business associates. I keep getting connection reminders to connect with people I lost track of. Even

elementary school. Some of these people I wanted to forget but there are some I was very excited to communicate with. I met up with a friend from grade school. He turned out to be an attorney in Los Angeles; we have even done some business together.

Participant 6: I use my Smartphone and various mobile applications to forward financial information; financial statements and tax returns to my clients, banks, attorneys and business partners. Most of this information is used to help my clients businesses grow. Being mobile and still completing these important tasks allow me to build a stronger bond between all the people I need to constantly interact with and myself. Having the ability to build these relationships with my clients through mobile technologies and their applications has played a part in my firm being named one of the top 5 financial investment firms in Southern California by a local business magazine.

Participant 8: I forward tenant laws, court document, eviction information etc. to my attorney and apartment managers. I also search for articles in my spare time mostly related to real estate and finance. I forward these articles to my colleagues and friends. I will also obtain articles on topics I feel others might be interested in and then forward to the appropriate person. I also post them to Facebook from time to time. For Example: My friend loves to cook. I forwarded a cooking recipe to my friend through Facebook. I am an avid Facebook user. This site allows me to manage my personal life by communicating with my family and friends more often. My company also uses social media to market and advertise the properties we have for lease. I also use these sites to build business relationships by communicating more often.

Participant 10: I review articles, topics in California Law, new etc. If I find something of interest I will email it myself. Once I am back in the office I will review my email, add commentary and then forward it to my clients, partners, family or friends via email or social networking sites. I do this while on the go, at home or in the office.

Category 2: Serendipity (S)

Definition: Situationally searching with a purpose and finding unexpected relevance

Property One: Unexpected Circumstances through Random Use (UCRU)

Definition: The freedom of mobility: Enhancing your ability to randomly find things you are not looking for even while searching with a focus.

Participant 1: I use it on the Plane, I use it at the airport, and I have the internet card so I can use the internet anywhere. I have used the device or will use it to look up any type of random topic. I was doing some stuff on culture for a class I will be teaching so I was looking that up to see what sites were out there not so much that I was going to do a deep dive on any of the sites but just to see what was out there by Google-ing some statements like culture, culture in organizations, that sort of thing and see what would come up but looking at the content at a search level and not digging into the web pages. While searching for culture I found things that I didn't intend to find such as world culture, ethnicities, diversity came up.

Participant 2: I am constantly finding things I am not looking while using my various mobile device. I think the reason for this is sometimes I get bored while waiting and I start playing with it.

Participant 7: I was waiting for the Dr., to get a checkup. He was running behind. I used my smartphone to look for a car wash promotion idea and while searching for the promotion I found a large benefit that was taking place near one of his stations. I sent an employee to the benefit with snacks and water. The employee gave it to the radio personalities who were on the air hosting the benefit. The radio personalities called me on my cell phone and gave me a radio spot for free. I was able to talk about my gas station locations, and gas prices. I offered free car washes for any person who could show a 94.9 sticker on their car.

Participant 11: I was researching RF technology while waiting for a plane going from San Francisco to Oregon. While reviewing articles, I came across a technology called V-CAP. V-Cap technology is a chip which is embedded inside the aluminum cap located at the top of the cork. Information is loaded into the small device. The information gives tasting notes, paring suggestions, ratings, quality etc. The inventory can also be tracked by restaurants, retailers, etc. The consumer is able to swipe their Smartphone device across the cap and blue tooth technology allows the information to appear on their device. The technology is currently being used in European countries but not in the US. This is due to technological limitations from the wireless providers. After reviewing this technology, his company has made the decision to use embed the technology into their product. There is no benefit now, but they feel it will be a great marketing tool for the future and they wanted to be prepared.

Participant 12: I am a frequent user of Google and will scroll down to topics that seem interesting to me.

Participant 14: While searching for information, there are many moments of serendipity. I may press an additional key on my device and then receive results that I may have not been looking for.

Participant 8: I was searching for a tax code question using my device. While using yahoo tax I was directed to a site that brokers payroll clients. I contacted the broker who initiated and closed the sale of my payroll tax division. I sold off our firms' book of payroll clients to a national payroll provider. It was a great solution for us since managing our payroll tax department was taking a lot of time. The transition was also seamless for my clients too. I did not think about selling this division of our business until I found this particular broker. This transaction enabled me to focus more attention on our core business, better our clients experience and we were able to make some great money.

Example 2: While searching for a grill recipe I found a website which listed the name of a local BBQ restaurant. The branding seemed interesting so I clicked on the link. The link forwarded me to a local fundraiser located at a major league baseball park. The fundraiser consisted of $25 donation and the monies benefited a local nonprofit that worked with children in the area. The $25 donation included a ticket to the baseball game and a meal prior to the event. I decided to contact the organizer to see if her company could donate items for the event. The organization did not need material items, but was in desperate need for people to volunteer time at the event. I committed 40 volunteers from my company. A local financial institution also volunteered team member to participate in the event. Our company ended up being a co-sponsor and was featured in local newspaper, radio and television programming. We ended up receiving great publicity and helped raise $40,000 for a great cause.

Property Two: Smarter Business (SB)

Definition: Leveraging unforeseen circumstances or using the concept of arbitrage for better business.

Participant 6: I was attending a union meeting. The union spokesperson was talking about the Inland Empire being a transportation HUB for 60% of businesses in the United States. I believe the reason for this is the location being close to the Long Beach port, LA and interstates heading South, North and East. I knew the IE was popular for trucking but I was surprised to hear the facts. I grabbed my tablet and started searching for who has a presence in the inland empire and what companies drive through the area. I noticed Starbucks didn't have a presence. I was surprised to not see them. A portion of my company is cold, perishable beverages. I own a large cold storage facility in San Bernardino County where our company presses fruits and vegetables. Our company had extra space in our facility so I decided to my attorney contact Starbucks to see if they would be interested in sub leasing cold storage space from us. The real estate director was interested in speaking and wanted to bring another executive with them. Prior to the meeting, I woke up in my sleep thinking of an idea to see if they would like to buy one of the divisions of the company. I couldn't sleep so I went to my couch to do some so research on Starbucks. I didn't see a large retail cold beverage line so I thought we would be a match. Long story short, we were able to reach an agreement to bring the companies together.

Participant 15: One of my uses of smartphones and tablets is to develop and execute ideas. My work and home schedule is very busy so having these tools allows me to put things into motion. I used to have great ideas but no execution. It wasn't because I didn't want to execute, it was because I didn't have the time. Now I have the time. I found that I am now able to generate more ideas and execute them as well.

Participant 5: I leverage 2.0 technologies through the Smartphone. I use it to market to others; they use it for hotel and promotions.

Participant 12: In January I was researching past diagnoses for patients who have vivid dreams. I came across a company called Res Med who manufacturer C-pap machines. These machines act as a support for people who have tough time breathing during their sleep. I researched this further and was convinced that it was a good therapy for people who have issues sleeping. This finding led me to open a sleep clinic where I test patients for sleep apnea conditions/

Participant 3: I pulled my phone out of my suit pocket to take a picture of a building I walked by in the city. I emailed the picture to my attorney and we purchased it as part of our organizations expansion plans.

Category 3: Blueprint for life (BL)

Definition: The inherent interest to use the Smartphone to create a framework of balance for life's work.

Property 1: Globally Affording Opportunity (GAO)

Definition: Functionally having global access while creating connections with others

Participant 1: I use it when I travel. I use it on the plane, at the airport. I have an Internet card so I can access the internet anywhere. I don't have to have public or network available, so I am pretty much online 24/7 and work while I'm traveling.

Participant 2: I'm always checking out multiple sites using my phone. I'm searching for new business ideas, sending business documents, checking in with my

family and friends. I used my iPhone to make a loan to a bean farmer in Asia for $28 through a micro lending website. The farmer was looking for $1200 to grow her small business.

Participant 3: I purchased my Smartphone two weeks ago and I am becoming more familiar with the functionality of this device. Having the Smartphone has virtually allowed me to replace my PC.

Participant 4: I insert business contact information as I meet people in the community. I also facilitate interaction using the device, specifically forwarding information to others.

Property 2: Company Structural Transformation (CST)

Definition: Shifting from one platform to another, enabling executives to conduct personal and business agendas.

Participant 2: I transferred our company onto the Google platform so were basically on the cloud enabling us to get access to anything, papers, documents, emails and numbers all from our phones. I use mobile applications for my expenses (real easy to punch in now) I use aps for eating on the road, to control my diet and I also… just got back from a ski work vacation and I use my phone to not only track all of my skiing (vertical miles) but I was also on the lift for about 4 hours per day responding to emails approving art work sending out budgets, approving television commercials, If I didn't have access to do these things and you are not accessible for a week at a time you will lose a client. Since everything is so fast you have to be even faster otherwise you just lose the business because they can wait a week since everything is so immediate now you have to have a smartphone.

Participant 3: Prior to having the use of my Smartphone I brought my laptop with me when I traveled which I do 100 days + per year. Having this device has allowed me to virtually replace my PC except for when I need to prepare reports or type larger documents. I am more efficient and effective in my email response time. I use to have to boot up my computer, put in my internet card which used to take me 30 minutes. Now I am able to do these tasks in 2 minutes.

Participant 13: I have integrated my personal and business life through the use of the Smartphone. This has created a better balance in my life since I like to travel around the word and do leisure activities such as surfing.

Participant 4: I use the device to access industry information. I am also linked to my companies' server to access HR information, company email, reports, etc. Personally I use the device to access bank accounts, transfer money, pay bills and sports information.

Property 3: Establishing and Maintaining Virtual Communities (EMVC)

Definition: The evolution of communities of interest and practice.

Participant 1: I use my smartphone to access the website for calorie counting, I am also able to track physical exercise and invite friends to see what I am doing. I gave my personal trainer access. The site is really cool. More than anything now I know what I am eating. If I go to a restaurant I will use this site to see exactly what I am eating, there is a huge database. Due to the smartphone application and ease of access I am always connecting to others who also care about their personal health.

Participant 2: I'm constantly connecting with business and personal friends who have the same interests as I do. This allows me to view post and create new ideas. I use my smartphone and various mobile applications for eating on the road and to control my diet.

Participant 4: I use Twitter, Facebook and Linked In. My son Tony plays on the high school baseball team. We are a baseball family. A group of us set up RBV Baseball Twitter so all of the parents and friends are able to obtain updates on players, statistics, and game times.

Participant15: As a leadership team, we implemented an internal discussion board which can be accessed through a proprietary mobile application which we designed. The discussion board is a live feed board which allows employees to pose questions, obtain information, post ideas, strategies and solutions. It acts similar to a think tank since our crucial partners also have access to it.

Property 4: Social Struggles of Smartphone (SOS)

Definition: The inefficiency and unproductive use of mobile technologies and the smartphone.

Participant 1: If I did not have my blackberry and wireless card…I would literally shake since I have these items all the time and then to not have it, literally my efficiency would go way down. Yesterday, I was in the office and I spent about three hours working on a strategy document and I could not do it with my Blackberry buzzing , it makes me crazy, it makes me feel anxious. I feel like I am immediately distracted instantly. I'm distracted and go for the Blackberry; I put in my password and see what the email is. I want to know. It's an addiction. Because what I think it is a need to feel important.

Participant 1: There are times where I or others; our ability to communicate through writing can be challenged in an email environment because you don't have the nonverbal context; nonverbal context is eighty to ninety percent of how we communicate. You pull that out and just leave email and there, I believe there is an absorbent amount of opportunity to misconstrue the message. Whether it be positive or negative, whatever. But not to understand exactly what you are trying to say. And so I think that is prevalent and a challenge.

Participant 3: I was really upset to see the breakdown in communication.

Participant 2: There are grammatical errors or abbreviations or typing errors when you are banging out 3, 4, 5 sentence emails.

Participant 7: The internet sites are not as user friendly as I would like. I am also worried about internet security so I have hesitant to click on certain sites.

Participant 6: The device itself is not simple.

Participant 2: I think our whole culture is actually addicted to it now because you can do things so fast and the human mind wants to keep doing stuff it's not healthy for us but it is good for business and achieving that American Dream.

Participant 14: I worked through 2006 and 2007 without a vacation. I was connected to others professionally and personally 24/7. During June 2008, my family and I decided to take a long needed vacation to Cabo San Lucas, Mexico. Cabo is located at the tip of Baja California. The city is known for tourism, relaxation and beaches. It was the perfect destination for my family and I since it was a 2 hour plane flight, a different country and I did not obtain an international package for my Smartphone. We related for several days and then decided to rent a car, and drive 90 miles through the desert to a remote beach town known as To-dos Santos. We spent

the day walking through the town, and absorbing the culture of this artesian town. I was extremely relaxed and enjoying my family. After a long lunch, we walked into a small art gallery. While viewing local paintings I felt something buzzing in my pocket and heard a load ringing sound. I reached into my pocket and noticed it my phone. How could this be? I asked myself. Then I decided to look at the email I received. It was a colleague from work. I was connected without knowing. Mad at the world, and feeling stressed I completed the email marked urgent and then tried to decompress and enjoy my vacation.

Participant 8: I am connected all the time. If I want a break I turn it off. More often than not I reply to the inquiry. Even while on the treadmill. The device goes off and my mind feels the need to engage with it.

APPENDIX E: STAGE 2 WRITTEN ANSWERS

Write in information

A small number of responses were written in and were later recoded as *additional.* As data indicates, the written responses from the self-observation logs relate to the qualitative themes generated from Stage 1. Within this context, the participants designated words within the five headings of device, location, uses, effects, and action. Table E1 shows the written responses. Unless indicated by a number in parentheses, each was recorded only once. The entries “Off” and “Traveling” were made in each category by the same person during time blocks of, respectively, 1-4pm and 4-7pm

Table E1

List of Written Responses

Device:	**Uses:**	**Effects (Satisfaction):**
Off	Alarm (2)	Confused
Traveling	Calculator	Off
	Checked time	Traveling
Location:	Football	
Airport	Music	**Actions:**
Day Off	Note taking	Bank
Doctor	Off	Bible Study
Gym (7)	Skype	Checking
Park	Sports scores	Event
Traveling	Traveling	Note taking (8)
Walking (3)		Off
		Sports scores
		Traveling

The words which were most often inserted under location were *gym* (7x) and *walking* (3x). The activity of gym and walking are within the culture of physical fitness and can be related to the category of cultural mobility evolution and the property of proactive replacement device. Physical fitness and any physical activity represented by the participant in the self-observation log directly apply to their individual interdependence of using the device within their respective environments. This is culturally significant because the participant indicated that they have a proactive relationship with their mobile device integrating it within multiple activities in real time.

The term that was most often inserted under the heading *action* was note taking (8). The activity of note taking relates to Category 1, CME, and property CSN and property PRD. Electronic note taking is the ability to immerse oneself, integrating technology into meaningful activities. For example, Participant 2 recorded note taking in the late afternoon while away from the office. The participant indicated that they were using their mobile device as a tool to record specific events which transpired throughout the day. This note

taking process became a reflective process where the participant recorded meaningful activities which became the basis for skill enhancement.

The other written words within the self-observation log were recorded one time within various headings. Although these words were recorded once, the term *travel* was recorded one time within all five headings by one participant. This did not occur with any of the other words. The significance of the word travel within the headings is a support for category three (BL) and the property (GAO), where the wireless device provides the participant global access while creating connections with others.

APPENDIX F: INDIVIDUAL DIFFERENCES

Individual participants. Although there was no intention to compare individuals to one another, it might be useful to note the similarities and differences between their uses of devices. Table F1 shows the relative frequency of uses of the devices over the 84 time blocks (2 weeks × 7 days × 6 blocks) for each. Figure F1 illustrates this data.

Table F1

Frequency of Use of Various Devices by Participants (N= 84 except N= 48 for Participants 2 & 8)

	Device			
Participant	Smartphone	Laptop	Tablet	Addl
1	57	3	11	1
2[a]	36	2	7	0
3	63	9	9	0
4	50	3	13	0
5	56	7	13	0
6	48	2	24	1
7	48	2	17	1
8[a]	28	0	4	0
9	52	2	13	1
10	53	1	17	0
11	40	1	15	1
12	51	7	14	2
13	46	3	18	0
14	43	3	17	2
15	37	16	29	14

[a] *N*= 48.

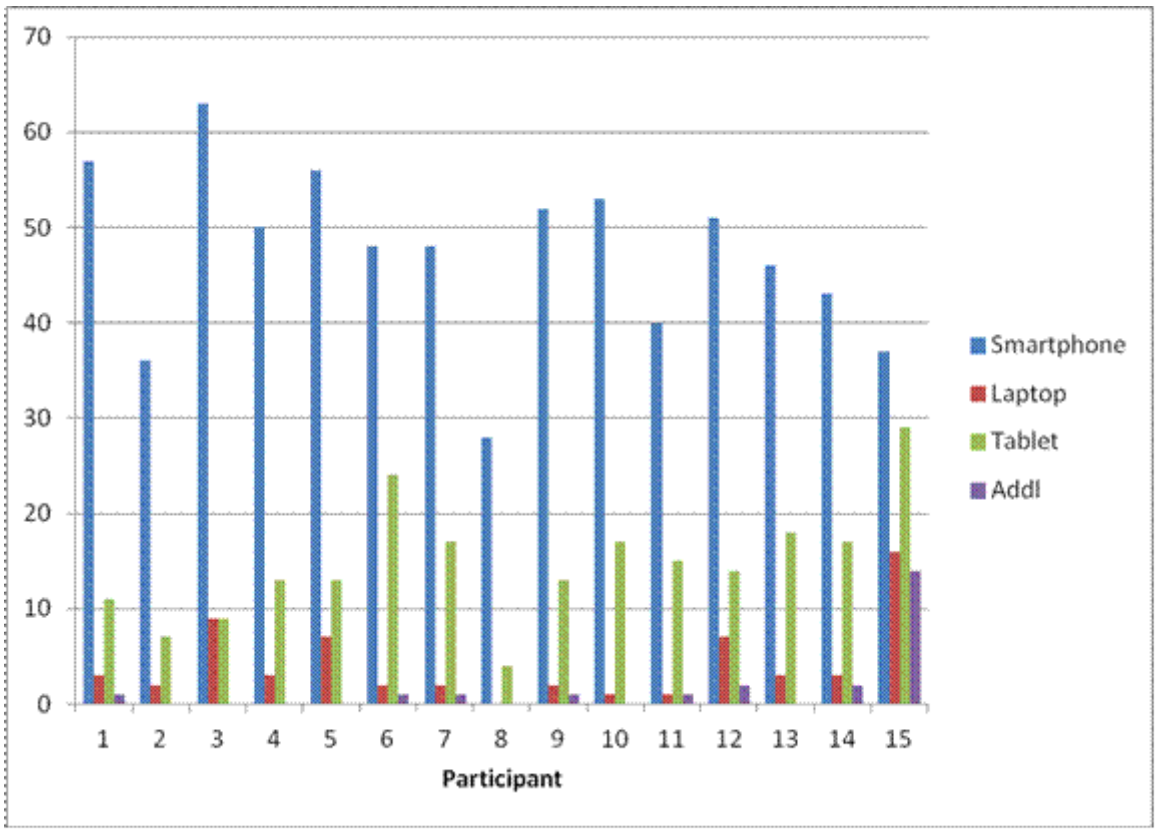

Figure F1. Frequency of use of various devices by participants (*N*= 84 except *N*= 48 for participants 2 & 8).

As these show, smartphones were used most frequently by all participants, although there was some variation in relative use of the other devices.

Table F2 and Figure F2 show a breakdown of actions by individual participants.

Actions compared to individual participants

Table F2

Table 3

Frequency of Various Actions by Participants (N= 84 except N= 48 for Participants 2 & 8)

	Action																
Par-tici-pant	Found	Search	Prob solve	Learning	Pers rels	Bus rels	Responding	Reviewing	Multitasking	Make impact	Implement	Sharing	Connectivity	Creating	Teaching	Leveraging	Addl
1	5	30	11	19	13	15	36	31	13	5	5	29	9	9	6	9	9
2[a]	6	19	6	16	8	6	22	14	7	1	2	17	4	4	2	4	6
3	4	26	16	15	8	20	32	21	10	3	5	22	5	8	2	3	2
4	3	19	11	13	16	14	37	23	7	3	2	26	9	9	4	8	1
5	3	25	11	11	15	12	30	25	3	7	2	31	8	12	1	4	2
6	3	16	15	25	11	11	30	33	11	3	3	29	17	10	5	10	6
7	3	16	8	15	15	25	32	19	8	2	2	20	6	13	0	5	1
8[a]	0	7	8	5	10	17	16	9	4	0	1	9	3	2	2	2	0
9	4	16	12	13	18	18	29	25	10	4	2	23	11	8	3	8	4
10	0	19	9	17	19	22	38	31	4	4	3	20	8	10	2	4	6
11	2	14	12	15	15	28	29	33	5	9	2	24	7	7	1	4	2
12	2	25	14	20	20	25	34	43	10	7	2	19	6	11	5	4	9
13	4	26	14	22	21	27	33	37	5	8	2	28	10	10	6	4	2
14	2	27	13	19	20	26	28	30	6	6	6	22	9	6	2	3	2
15	4	18	21	20	13	27	47	19	6	1	0	12	28	4	4	2	9

[a] *N*= 48.

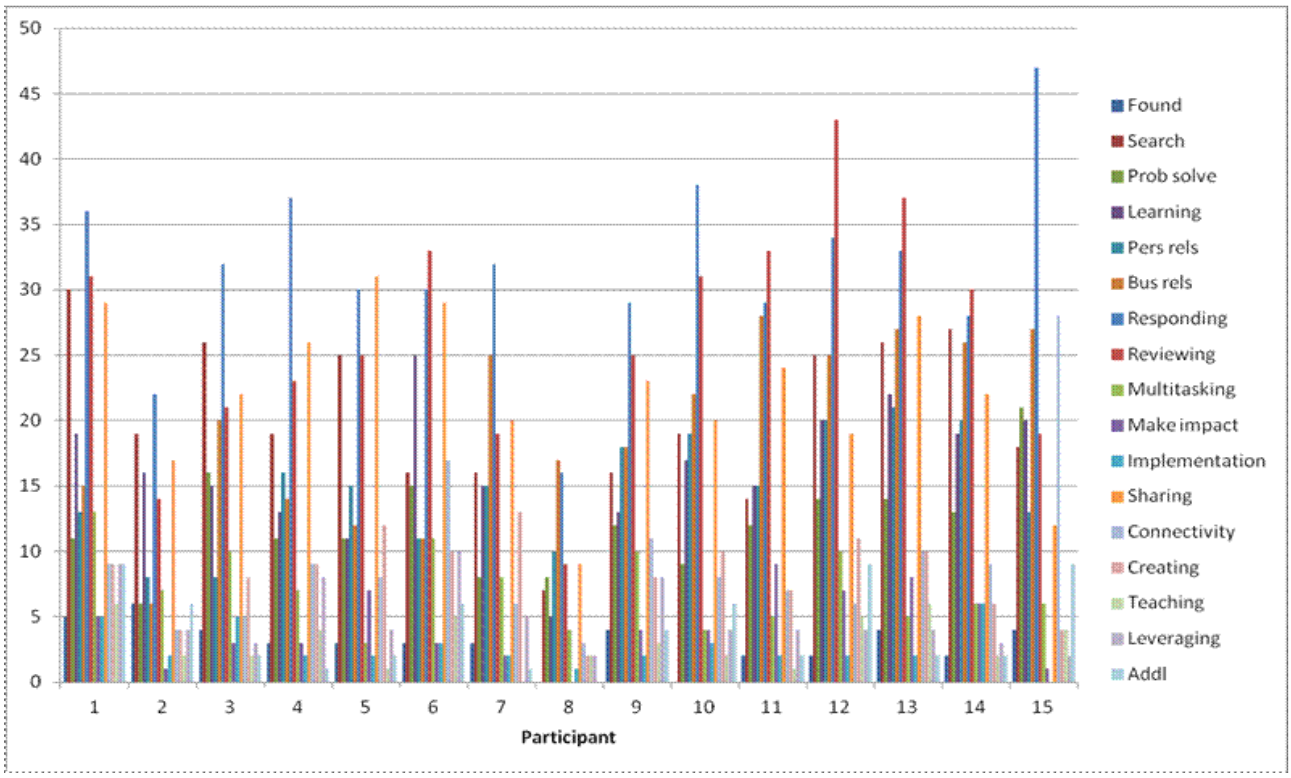

Figure F2. Frequency of various actions by participants (*N*= 84 except *N*= 48 for participants 2 & 8).

Figures F3 and F4 identify the 15 participants individually to the corresponding four actions within the context of the individual. The four actions are separated and compared to individuals.

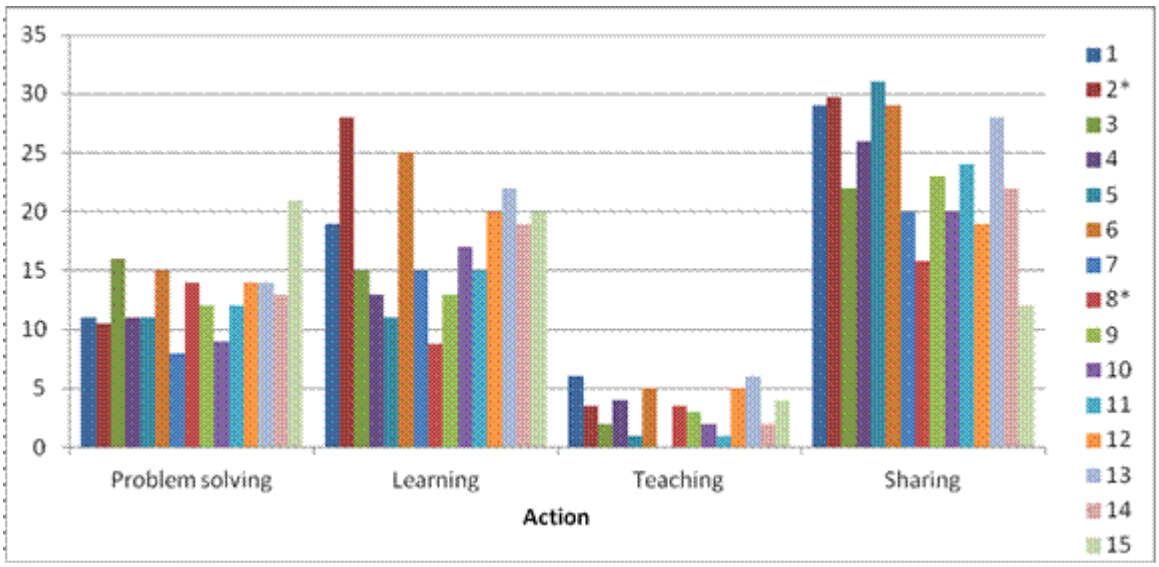

Figure F3. Comparison between participants for four actions.

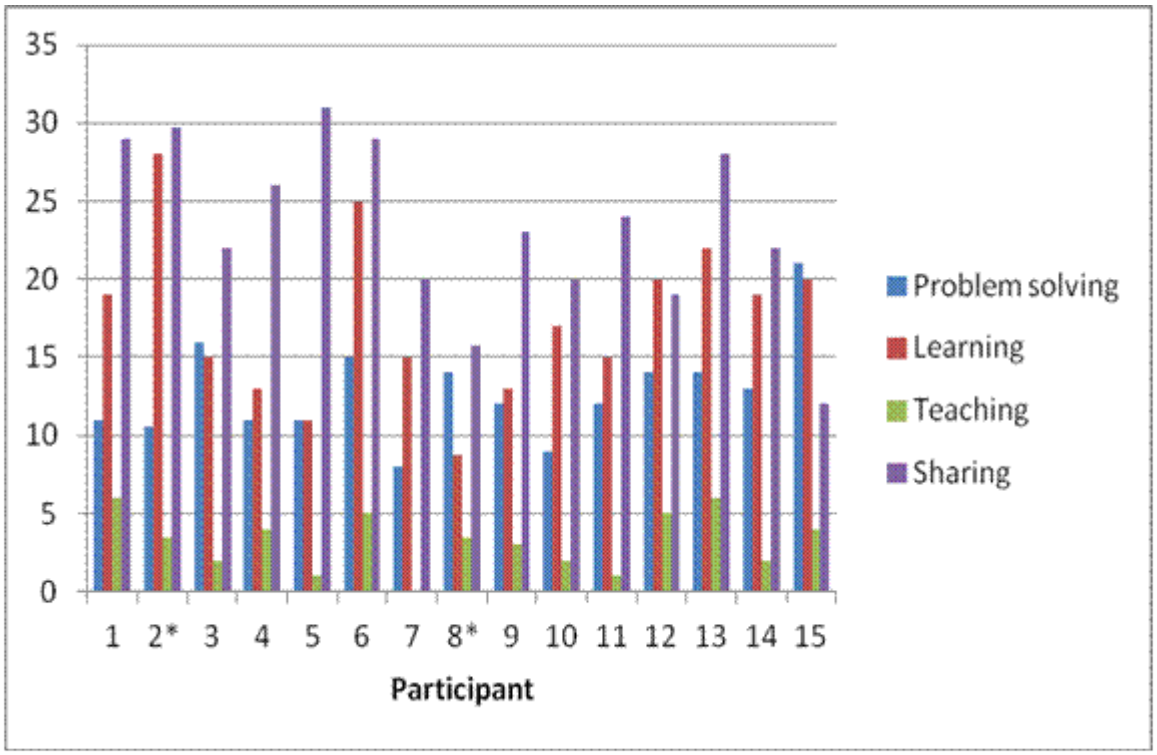

Figure F4. Frequency of four actions related to leveraging mobile devices as a tool for learning, across participants. *Scores multiplied by 1.75 to adjust for data available on 8 days only

APPENDIX G: ADDITIONAL ANALYSES OF SATISFACTION

For completeness, the question was extended in several ways: (a) in addition to using the negative effects, looking at positive effects and positive minus negative was tried for comparison purposes. See Table G1. The vast majority of reports were of Satisfied. Therefore, it was thought it might be more informative to see in which time blocks participants simply did not report Satisfied, and take this to be a (relatively) negative report. (b) In the question, "Are effects associated with smartphone use more negative when, during the same time block, the participant was using it for several uses or taking several actions?", the term "several" can be interpreted in two ways: more than one at a time, and the actual total number of uses/actions. That is, the comparison could be made between 1 and 2+ (dichotomous) for one set of analyses, and total number of uses/actions (continuous) for another set. (c) For completeness, this effect was also examined when there were multiple locations or devices used during the time block.

Tables G1 and G2 show results of tests of this research question. These are presented as not just descriptive statistics, but with inferential statistics included, although it must be noted that the statistical assumption of independence of scores was not met. Therefore, these results must be interpreted very cautiously. The analyses were performed only on time blocks that had a use of smartphone reported.

Table G1 shows means and *SD*s of the effects, which are simple sums of the number of negative (chaotic, bothersome, anxiety, or additional) or positive (satisfied or balanced) effects reported within a time block. A score of the difference between them (negative score minus positive score) is also shown. Thus, in all cases, slightly less than 1 report of a positive effect was noted on average out of scores that could range between 0 and 2. Scores on the negative scale ranged between 0 and 3; as can be seen, scores tended to be quite low, reflecting the general overall satisfaction with the device. Scores on the difference scale ranged between -2 and 3, and all means were negative, indicating again that in general, effects were positive.

Table G1
Table 48 (10)
Comparisons between Negative Effects and Dichotomized Uses and Tasks (and Locations and Devices)

		Single			Multiple			Differ-ence
Variable	Effects	Mean	*SD*	*N*	Mean	*SD*	*N*	*t*
Actions								
	Negative	0.10	0.319	136	0.22	0.494	572	3.74***
	Positive	0.88	0.346	136	0.94	0.248	572	1.91
	Neg-Pos	-0.79	0.614	136	-0.72	0.653	572	1.15
Uses								
	Negative	0.04	0.198	270	0.30	0.553	438	8.82***
	Positive	0.95	0.231	270	0.92	0.291	438	1.72
	Neg-Pos	-0.91	0.395	270	-0.62	0.740	438	6.79***
Locations								
	Negative	0.18	0.454	561	0.27	0.515	147	1.79
	Positive	0.93	0.252	561	0.93	0.333	147	0.24
	Neg-Pos	-0.75	0.623	561	-0.66	0.726	147	1.39
Devices								
	Negative	0.17	0.442	625	0.39	0.601	83	3.09**
	Positive	0.94	0.249	625	0.86	0.387	83	1.96
	Neg-Pos	-0.77	0.599	625	-0.47	0.888	83	2.95**

*p< .05, **p< .01, ***p< .001, all 2-tailed (Note: assumption of independence of scores not met).

Table G2
Correlations between Negative Effects and Multiple Uses and Tasks (and Multiple Locations and Devices), N= 708

		Actions	Uses	Locations	Devices
Positive Effects	*r*=	.018	-.046	.032	-.088*
Negative Effects	*r*=	.266***	.362***	.073	.125***
Negative minus positive effects	*r*=	.185***	.281***	.039	.127***

*p< .05, ***p< .001, both 2-tailed (Note: assumption of independence of scores not met).